CAREER POINT
INTERNATIONAL JOURNAL OF RESEARCH
ISSN: 2583-1895

RIETSL-2021

INTERNATIONAL CONFERENCE

on

Recent Innovations in Engineering & Technology for Sustainable Living (RIETSL-2021)

8th-9th September 2021

Jointly Organized By:

Career Point University, Kota, India and

Statistical & Informatics Consultation Center (SICC),

Faculty of Computer Science and Maths,

University of Kufa, Iraq

CAREER POINT UNIVERSITY

SICC

Conference Proceedings

Published By:

Career Point International Journal of Research (CPIJR)

www.cpijr.com

About the Conference

International Conference on **"Recent Innovations in Engineering & Technology for Sustainable Living (RIETSL-2021)"** is organizing with the objective of bringing together innovative scientists, professors, research scholars, students and industrial experts in the field of Computing and Communication to a common forum. The primary goal of the conference is to promote the exchange of innovative scientific information between researchers, developers, engineers, students, and practitioners. Another goal is to promote the transformation of fundamental research into institutional and industrialized research and to convert applied exploration into real time application.

Overall the conference will provide the researchers and attendees with prospects for national and international collaboration and networking among universities and institutions from India and abroad for promoting research. RIETSL-2021 is jointly organizing by **Career Point University, Kota, Rajasthan, India and Statistical and Informatics Consultation Center (SICC), Faculty of Computer Science and Maths, University of Kufa, Iraq** on 08th-09th September 2021. Abstracts of all the accepted papers will be published in special edition of Career Point International Journal of Research (CPIJR).

KEYNOTE SPEAKERS

Prof. Sheng-Lung,
National Taipei University of Business, Taiwan.

Prof. Dharm Singh Jat,
Namibia University of Science and Technology (NUST), Namibia

Dr. Ahmed J. Obaid.
SICC, University of Kufa,Iraq

Dr. Neyara Radwan
King Abdulaziz University, Saudi Arabia

Dr. Mohammad Kamrul Hasan,
Universiti Kebangsaa, Malaysia (UKM)

Dr. Md. Nur Alam
Pabna University of Science & Technology Pabna, Bangladesh

Prof. Chuan-Ming Liu
National Taipei University of Technology,Taipei,Taiwan

SESSION CHAIRS

Prof. N.N. Jani,
SKPIMCS-KSV,Gandhinagar

Prof. Vijay Singh Rathore,
IIS University, Jaipur (Raj.)

Dr Ihtiram Raza Khan
Jamia Hamdard University, Delhi

Dr. Anubha Jain
IIS University, Jaipur (Raj.)

Dr. Salini Suresh
DSCASC College ,Bangalore

Dr. Arvind K Sharma
University of Kota, Kota (Raj.)

Dr. Bhavna Nigam
Deepotics Pvt. Ltd., Indore,
(M.P.)

Dr. Niranjan Murthy M
MSRIT, Bangalore,
Karnataka

Prof. Dinesh Birla
RTU, Kota (Raj.)

CONFERENCE REVIEWER BOARD

S. No.	Name of Reviewer	Designation	Affiliation
1	Dr. Amit Sharma	Associate Professor	VCET, Bundi (Rajasthan)
2	Dr. Niranjanmurthy M.	Associate Professor	MSRIT, Bengaluru, Karnataka, India
3	Dr. Suresh Kumar K	Associate Professor	Saveetha Engineering College, Chennai
4	Dr. Veena Khandelwal	Assistant Professor	SRM Institute of Science and Technology Delhi-NCR Campus, Ghaziabad
5	Dr. Astha Pareek	Sr. Assistant Professor	Dept. Of Computer Science And IT, The IIS University, Jaipur
6	Prof. Tarun Shrimali	Director (R & D Cell)	JRN Rajasthan Vidyapeeth Udaipur, Rajasthan
7	Dr. Kiran Sood	Professor	Chitkara University, Rajpura, Punjab
8	Dr. Soniya Lalwani	Associate Professor	BKIT, Kota, Rajasthan
9	Dr. Ashish Khanna	Professor	MAIT, Rohini, Delhi
10	Dr. Tanupriya Chaudhary	Associate Professor,	Department of CSE, UPES, Dehradun
11	Dr. Navneet Sharma	Associate Professor	Dept. Of Computer Science And IT, The IIS University, Jaipur
12	Dr. Soumi Dataa	Associate Professor	IEM, Kolkata(W.B.)
13	Dr. Sandeep Poonia	Associate Professor	CHRIST University, Bangalore
14	Dr.C.Priya	Associate Professor	VELS University, Chennai
15	Dr.Akash Saxena	Associate Professor	Compucom Institutes of Information Technology,Jaipur
16	Dr.Nilam Chaudhary	Associate Professor	SKIT, Jaipur, Rajasthan
17	Dr. Yogesh Kumar Sharma	Dean and Professor	School of Engineering &

			Technology, Om Sterling Global University, Hisar, Hariyana
18	Dr. Priyanka Verma	Sr. Assistant Professor	Dept. of Computer Science & IT, IIS(Deemed to be)University, Jaipur, Rajasthan
19	Dr.Anubhav Kumar	Professor & Dean	Faculty of Engineering & Technology, Mandsaur University, Mandsaur (M.P.)
20	Dr. Anubha Jain	Associate Professor	Dept. of Computer Science & IT, IIS(Deemed to be)University, Jaipur, Rjatshan

ORGANIZING COMMITEE

General Chair: RIETSL-2021	**Co-organizing Secretary: RIETSL-2021**
Mr. Kamal Arora	Mr. Ashik Hussain
Co-Chair/PC Chair	Prof. (Dr.) Surendra Yadav
	Prof. (Dr.) K. M. Sharma
	Prof. (Dr.) Hemlata Saxena
Co-ordinators	Mr. Arshad Hussain
	Ms. Nikita Jain
	Mr. Devendra Chaturvedi
	Mr. Vinod Kumar
	Mr. Mohnish Vidyarthi
	Mr. Rohit Maheswari
Advisory Board	Prof. (Dr). K.S. Verma
	Prof. (Dr). P.L. Gautam
	Prof. (Dr). Sushil Kr, Trivedi
	Prof. (Dr). M. K. Gupta
	Prof. (Dr). Nitu Nawal
	Dr. Sukhvinder Singh
	Dr. Surbhi Shrivastava
	Dr. Pushpendra Yaduvanshi
	Dr. Aditi Gaur

Chief Patron's Message

Er. Pramod Maheshwari,
Chancellor, Career Point University, Kota, Rajasthan, India

It's a moment of great pleasure that Career Point University, Kota is Organizing International Conference On **"Recent Innovations in Engineering & Technology for Sustainable Living (RIETSL-2021)"** under the flagship of Career Point University in association with SICC, University of Kufa, Iraq. Organizing an event does not come without effort. It requires vision, mission and hard work. Conferences of such nature provide a great opportunity to Engineering fraternity, not only to update knowledge and keep abreast of the latest developments in the respective field, but also an occasion for the resource persons, delegates to exchange ideas and interact with each other.

I take this opportunity to congratulate the organizing committee and to extend warm welcome to the resource persons and delegates. I thank all the national and international delegates who have come from various parts of the country and across the globe. We consider it a privilege and honour to have all of you here.

I wish you all for the grand success of this wonderful event.

Patron's Message

Prof. (Dr.) Gurudatt Kakkar, Pro-Vice Chancellor
Career Point Univerisity, Kota, Rajasthan, India

It is a matter of great pleasure to host the International Conference on **"Recent Innovations in Engineering & Technology for Sustainable Living (RIETSL-2021)"** on 8th - 9th September 2021. This conference aims to develop insights into the international scenario of engineering and IT industrial and academic research by offering a common platform to scientists, researchers and students.

The conference will stimulate the scientific temper among students, teachers and industrial leaders for building a bridge between academia and industry. Industrialists across the region will participate as invited speakers to address the current need in the field of Engineering and Technology.

Conferences are meant essentially for scientific exchange and generation of new ideas in the chosen field along with personal interaction and networking. I understand that a number of national and international speakers are participating to speak on a variety of topics thus enriching the knowledge of all participants.

I wish the conference all the success and my heartiest congratulations to the organizing committee.

Convener's Message

Dr. Abid Hussain
Associate Professor, School of Computer Applications,
Career Point University, Kota, Rajasthan, India

I am gratified being designated as the convener/conference chair for International Conference on **"Recent Innovations in Engineering & Technology for Sustainable Living (RIETSL-2021)"** to be held at Career Point University,Kota from 8th - 9th September 2021. The conference is being jointly organizing by Career Point University, Kota, Rajasthan, India and Statistical and Informatics Consultation Center (SICC), Faculty of Computer Science and Maths, University of Kufa, Iraq**.** The aim of the conference is to bring together researchers, scientists, engineers, and practitioners to exchange and share their experiences, new ideas and research results about all aspects of main themes and tracks.

The conference has solicited and gathered technical research submission related to all aspects of major conference themes and tracks. After the rigorous peer-review process, the submitted papers were selected on the basis of originality, significance, and clarity for the purpose of the conference.

I am grateful to all those who have contributed to the success of RIETSL-21, especially all the authors and the participants who responded to our call for papers. I also express my sincere gratitude for the efforts put by conference Technical Programme Committee, Conference Steering Committee, Advertising, Publicity and Sponsorship Committee, who made this event possible.

Honorary Conference Chair's Message

Dr. Ahmed J Obaid
Assistant Professor, Faculty of Computer Science and Mathematics,
University of Kufa, Iraq

On behalf of the Organizing Committee of this International Conference on **"Recent Innovations in Engineering & Technology for Sustainable Living (RIETSL-2021)",** we would like to extend our warm welcome to all of the presenter and participants, and in particular, we would like to express our sincere gratitude to our plenary and invited speakers. This international conference is jointly organizing by the Career Point University, Kota,, India Statistical and Informatics Consultation Center (SICC), Faculty of Computer Science and Maths, University of Kufa, Iraq.

It is intended to be the first step towards a top class conference on Engineering & Technology. We believe that this international conference will give opportunities for sharing and exchanging original research ideas and opinions, gaining inspiration for future research, and broadening knowledge about various fields in advanced computer science and information systems, amongst members of organization communities, together with researchers from India and other countries.

Organizing Secertary's Message

Ms. Garima Tyagi
HoD, School of Computer Applications,
Career Point University, Kota, Rajasthan, India

We are pleased to organize two days international conference on **"Recent Innovations in Engineering & Technology for Sustainable Living (RIETSL-2021)"** on 8th -9th September, 2021 in the collaboration of SICC "Statistical and Informatics Consultation Center (SICC), Faculty of Computer Science and Maths, University of Kufa, Iraq".

As the theme of the conference is about recent innovation in Engineering and Technology, its subthemes cover all the branches of Engineering including Mathematics.

The objective of the conference is to bring together the computational experts in various fields of Engineering and Technology. The conference showcases the expertise both from academia and industry from various institutes, universities and industries all over the world, discover novel opportunities on the theme of the conference.

I on the behalf of the organizing committee and on my personal behalf, delighted to welcome all the delegates and the participants in the conference.

I am sure that this conference will bring together the professionals and researchers for the innovation and that will help in the sustainable development of the society. I will help in the overall development of the new technologies with the multidisciplinary approach.

General Chair's Message

Mr. Kamal Arora
Registrar, Career Point University, Kota, Rajasthan, India

On behalf of the Career Point Univeristy, Kota, I heartily extend warm welcome to all the National/International Delegates, Renowned Scientists and participants to this International Conference with the theme of **"Recent Innovations in Engineering & Technology for Sustainable Living (RIETSL-2021)"** on 8th – 9th September 2021. The presence of other dignitaries during the two days conference is a further testimony to our sincere pursuits to achieve nothing less than the 'best', they have long trails of success behind them.

I am confident that the conference shall provide an effective platform for innovation, technology transfer and entrepreneurship concurrently meet to share and disseminate the knowledge and the rich experience of the IT and Engineering Professionals, and to look forward solutions to the challenging problems.

I intend to take this event ahead as an ideal, the motive not only is to generate discussions around contemporary issues, but also to propel the culture of academic exchange, which is the only way to achieve excellence in this field.

I hope this event fruitful for everybody. I assure you that we will make your time spent with us and in the conference a memorable one.

TABLE OF CONTENTS

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Detection of Diseases in Plants and Recommending Products to cure it

*Ananya Shatrughan Tiwari[1], Abhay Shukla[2], Abhishek Jadoun[3], Abhishek Swaroop[4],Vernika Singh[5]

[1]*Computer Science Engineering Student, RKGIT Ghaziabad, India*

[2]*Computer Science Engineering Student, RKGIT Ghaziabad, India*

[3]*Computer Science Engineering Student, RKGIT Ghaziabad, India*

[4]*Computer Science Engineering Student, RKGIT Ghaziabad, India* [5]

Assistant Professor, CSE Department, RKGIT Ghaziabad, India

[1]astiwari2020@gmail.com, [2]abhayshukla918@gmail.com, abhishek.swaroop.sen[3]gmail.com, [4]abhishekjadoun.288@gmail.com,[5]vernikasingh8@gmail.com

Abstract: The plants, agrarian division and the nation's economy play a crucial portion in climate alter. The support of plants is in this manner profoundly imperative. Like individuals, various illnesses of microbes, organism and infections have an affect on plants. Convenient distinguishing proof and remedy of these illnesses is significant to dodge misfortune of whole plants. A significant learning show named the plant infection finder was given in this ponder. The demonstrate can distinguish numerous plant conditions utilizing the picture of its clears out. Demonstrate location of plant malady is made with the nueral framework. The primary step is to extend the test measure of the information collection.Afterward meeting Neural organize (CNN) with numerous layers of concentration and pooling is utilized. The information set for Plant Village is used for show preparation. After the demonstration has been prepared, the comes about are tried accurately. This show has been utilized by us for a few examinations. For testing purposes, 15 percent of information from PlantVillage information includes photographs of sound or debilitated plants. 98.3% of the test accuracy was achieved within the proposed show. This work centers on the significant learning show for infection location in plant clears out. Be that as it may, within the future demonstrate rambles or any other framework may be consolidated to recognize ailments of the plant and inform them to people so that they can be cured accordingly.

Keyword : Plant Disease , Convolution Neural Network (CNN) , Deep Learning , Agriculture and PlantVillage.

1. INTRODUCTION

Within the financial and climate alter, plants play a critical part. Since climate alters have moreover become an around the world point within the Common Mystery Gathering of the Joined together Countries in 2019, a few nations like India are on a mission to plant more trees and plants, causing ozone hurt and resulting global warming owing to the mechanical employments. In long term, the anticipated pace for climate alter is 10-100 times higher than the DE ice warming rate [1]. These plants moreover contribute essentially to the nourishment segment. A

key concern is additionally the balance of world nourishment production[2]. In expansion, plants have a vital work in wellbeing care[3] . Along side the plants, it is additionally a worldwide issue to require care of them. for human survival. Like human wellbeing, various ailments may have an affect on the wellbeing of plants. In financial terms, hundreds of trillions of dollars are anticipated to result in annually nourishment, fiber and decorative generation framework caused by plant bothers and diseases[4]. Parasites or fungal-like orgasms trigger such sicknesses. In any case, viral and bacterial organams[5] are dependable for extra extreme sicknesses of nourishment and nourish crops. Certain infections are vulnerable to transmission, which suggests they can exchange from one plant to another and so ought to be perceived and taken care of expeditiously. Maladies in plants at exceptionally early stages are especially troublesome to distinguish. A few of the visit indications incorporate leaf rust, stem rust, fine mold, etc. Scratching. The physical characteristics of plant clears out offer assistance recognize these ailments. Either plant is imperfect may be recognized by pros not by looking at clears out or natural products. It isn't exceptionally viable, in these age of innovations and mechanization, to have an computerized framework that consequently distinguishes ailments in plants would be much more viable. Numerous inquire about is been carried out to realize this objective, most of which utilize standard strategies of machine learning[6]. The point of this work is to construct programmed frameworks for location by means of profound learning techniques of ailments in plants. Significant learning may be a machine learning subset. The advantage of significant instruction over apparatus is that you just do not need to stress over space skill since, not at all like standard machine learning strategies, building isn't fundamental in this respect [7]. Our strategy employments pictures of clears out of plants for plant malady location. Plastic infection finder is an computerized plant illness conclusion gadget based on computer vision, utilizing machine learning to precisely recognize sicknesses and solid plants as well as illnesses. The picture Convolution Neural Arrange (CNN) may be utilized to realize this significant learning arrange. CNN is utilized for extricating picture usefulness i.e. flat, vertical, RGB, etc. For the extraction of visual features, CNN has the most excellent significant Neural organize [8]. By giving colossal sums of sound and malady plants and prepared show, the arrange based on CNN may be instructed for plant illness discovery.

2. Related Work

Currently, the study in a complex environment for plant disease detection focuses mainly on three aspects: segmentation of the picture, extraction and diagnosis of illness.

2.1 Image Segmentation

Within the complex environment, the key challenge is how pictures are portioned when clears out of maladies are localised and recognized, as the most objective of the picture division is to recognize indications from the background. It is being considered in profundity by various analysts. In 2017,

the Delta E colour contrast strategy was used by Ali et al. to recognize the influenced locale. A few studies combine intrigued run (ROI) and other procedures to fragment pictures. The convolutionary autoencoder was, concurring to Kao et al., utilized as a scenery channel to distinguish an image's ROI[15]. The moment strategy fair centers on locales that are fragmented. A inquire about was distributed in 2013 by Pujari and colleagues (Pujari et al.). They found that photos were isolated into a few areas, each having a particular importance, which the pictures were taken from them [16]. Akram and collaborators have made an picture handling worldview with synchronous preparing in genuine time. The picture is partitioned into three colour spaces, and can perform differentiate expansion, vector acknowledgment and zone location [17]. Other analysts have moreover used significant learning strategies to section and recognize pictures. In arrange to improve location of plant illness, Marko et al. proposed a depth-based target distinguishing proof innovation and connected a two-stage algorithm.[18]. In any case, there's a reality that cannot be disregarded. Due to the complexity of color data within the complex environment, the visioning approach based on color, ROI, and limit is ineffectively polished.

2.2. Feature Extraction

Extraction of plant illness highlights postures an assortment of issues when the ailment is recognized. Surfaces, shape, color, and movement-related highlights, all of which are vital for the extraction of ailment characteristics[21, 22]. Raza and colleagues[23] proposed a procedure to expel spots based on the characteristics of color and surface. Hu et al. proposed the hypothesis of prove and multifunction combination of Dempster–Shafer (D-S) for extricating highlights and included fluctuation to improve rules on D-S confirmation theory[24]. In expansion, Turkoglu displayed moved forward forms of the Neighborhood Double Design (LBP) approach, utilizing the initial neighborhood LBP esteem to convert the picture into a dark scale and handle the picture channels R and G whereas taking into thought both in general and region[25]. Li et al. examined an IoT-Function Extraction for the Keen City on the premise of the profound moving learning model[26]. There's a program for music which can extricate sound components in arrange for visuals to be able to adjust to music[27]. For example, in order to extract significant and distinctive characteristics from the electroencephalogram (EEG), Meziani et al. proposed two novel specific estimators which were resistant to non-Gaussian, non-linear and non-stationary signals[28].

2.3. Disease Identification

As for the precise personality, so numerous approaches for precise discoveries have been made and investigated. The distinguishing proof show was based on course names and a fine-grained picture classification framework was created [31]. Zhang et al. detailed an picture distinguishing proof framework on the premise of a half breed clustering for plant illnesses [32]. Content-based imaging (CBIR) framework was created by Patil et al. in 2017 to extricate surface and cruel values for calculating color highlights, and

the classification course of the back vector machine (SVM) was utilized [33]. The most objective was to create classification frameworks and picture examination in arrange to extricate and distinguish highlights. Through the aforementioned ponder. As of late, other ways of recognizing the ailment more dependably and precisely have been built up. A unused approach based on photography determination and brief written clarifications permitted non-experts to analyze plant ailments which will be utilized remotely from the PC, in a smartphone, or in computerized individual assistants[34]. Pertot et al. displayed an innovation that employments portable phones to photo wiped out plants in real-time, as well as leaf division and location of illness patches with progressed k-means clustering[35]. An infinitesimal imaging framework has been distributed by Yang et al. on the premise of the tree bewildering lattice choice and a synergistic evaluation of surface and frame attributes[36]. In addition, the neural arrange of convolution is utilized within the recognizable proof of maladies. Chad et al. have formulated a procedure for identifying plant infection in field-based photos of maize plants. 1632 corn bit pictures were learned and delivered by Ni et al. by means of a profound, convolutionary neural arrange, corn detector [38]. Through the research findings, some progress has been made in three fields: segmentation of leaf, leaf lesion extraction, and identification of leaf diseases. Many problems remain nevertheless to be resolved in such a complex environment to apply the detection of plant diseases.

3. System Methodology

• Profound Learning is an progressed strategy of machine learning that settled the trouble of conventional machine learning include building. Space information is now not vital and significant learning is completely regarded. The spine of more profound learning is the Neural Counterfeit Arrange (ANN). Numerical models recreating the common standards of brain work utilizing neurons and neural connections are counterfeit neural systems. Tensorflow is one of the foremost widely-used libraries for the advancement of neural systems. It incorporates all fake neural organize libraries. Tensorflow may be utilized for taking care of content and picture categorization forms.

3.1 Convolution Neural Network

Convolution Neural Networks (CNNs) are used for the detection of diseases in plant leaves. CNN is a more sophisticated standard ANN version which gives superior outcomes in the picture. Because pictures include recurrent patterns of a certain object or picture.Two important elements of CNN are concentration and pooling. Pooling is used to reduce the picture size and converting is used to discover pattern edges in an illustration. A lot of CNN architectures may be utilised to tackle the same problem: - (a)VGG16 (b)VGG19 - (b)VGG19 (c) ResNet50(d)ResNet101(e)ResNet150 (e)ResNet152
(f) EfficientNet (g) Inception V3.

But here, with distinctive layers, we have built our possess demonstrate. In expansion,

Google Colab and Tensorflow's Keras API are utilized for preparing these models. Keras may be a free Python open-source system to construct and assess significant however easy-to-use models of learning. It covers two effective numerical computing systems Theano and TensorFlow, permitting you to construct and prepare neural arrange models with some lines of code.

3.2 Dataset Discussion

Downloaded and introduced the dataset from Kaggle on Google Drive. The dataset has been utilized for plant infection discovery. The dataset incorporates 13 classes for show preparing (14180 photos) and 40 pictures for demonstrate testing. The discoveries of the paper are based on a dataset from PlantVillage, which comprises of 13 classes of 2 plants.

Tables I (a) provide descriptions of these classes and datasets (b).

Class	Plant Name	Healthy or Diseased	Disease Name	Image No.
C1	Potato	Diseased	Early Blight	123
C2	Potato	Healthy		125
C3	Potato	Diseased	Late Blight	1021
C4	Tomato	Diseased	Bacterial Spot	1026
C5	Tomato	Diseased	Early Blight	2236
C6	Tomato	Healthy	Late Blight	3423
C7	Tomato	Diseased	Leaf Mold	4968
C8	Tomato	Diseased	Septoria Leaf Spot	7212
C9	Tomato	Diseased	Spider Mites Two Spotted Spider Mite	8855
C10	Tomato	Diseased	Target Spot	10200
C11	Tomato	Diseased	Tomato Mosaic Virus	
C12	Tomato	Healthy		12255

By using this table, you can see how many pictures in each class.Each class has around 1000 pictures.Two distinct plants exist in this dataset.Healthy and diseased pictures of all plants are accessible.Most of the pictures are of tomato plant.

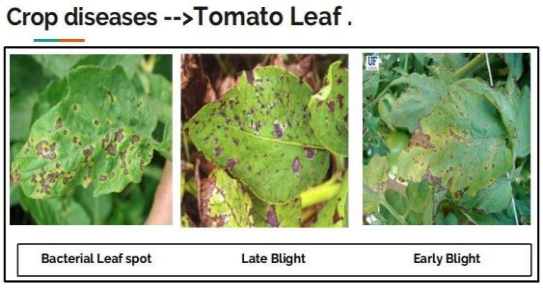


Figure No. 1 - Tomato leaf

- The data is divided into the training components one, and the test components.
- The dataset will have a random 80/20 split.

- The training data is 95% of the whole, compared to 5% of the total. The test data set is 95%.
- The training dataset includes 14,178 pictures, whereas the test data set includes 100 images.
- To increase its accuracy, the model was trained with 14178 photographs and 100 images were undetected by the model.

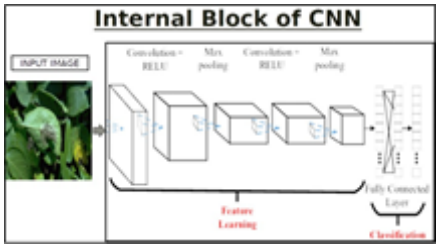


Figure No. 2 - Disease Spots on plant leaves

4. Model Description

- In order to achieve greater accuracy, the dataset is pre-processed in the form of an increase to extend the data set size.
- The images then have a smaller size of 256x256 pixels.
- Afterwards, a neural network-based convolution model with several layers of pooling and convolution and a dense prediction layer is developed.
- Three MaxPooling layers are used with a 2x2 filter and three 3x3 filter convolution layers.This approach also offers standardisation of batch.
- Standardization batch is a technique for the scaling of data at a given level, but differs not only on the input level, but also on hidden layers.
- After this, numerous filters such as 32 filters and 64 filters are visualised after each layer.

Paramater	Value
Epochs	15
Batch Size	32
Learning Rate	0.001
Activation in Middle Layers	Relu
Activation in Final Layer	Softmax

5. System Description

In this approach, it is too limited to detect diseases in different plant types and this is done by CNN(Convolution Neural Network). It requires several layers to build a CNN model, which completely takes each layer of the system to decide separately and to identify image changes. Various layer convolution, Maxpool, Softmax, dense layers, are categorised in this system and have certain parameters with completely linked layers.

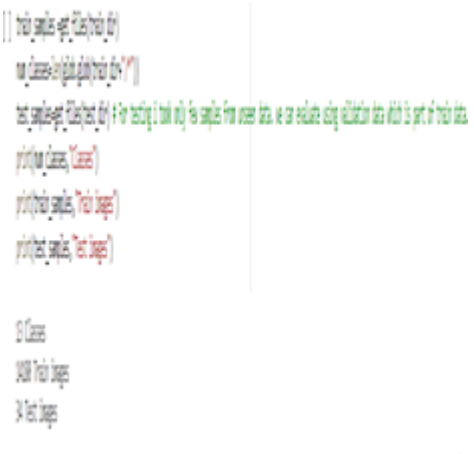


Figure No. 3 - System's Various Stages

6. System Implementation

6.1 Disease Detection

Differing illnesses are recognised in diverse plants[4], utilising the notion of machine learning and profound learning. Any picture of the plant is thus classified that each change is easily measured.

6.2. Steps to build Plant Dieases CNN Model

6.2.1 Convolution:- is the initial layer in which the input picture extracts features and learns the link between functions that use the Kernel or input image filters.

6.2.2 ReLU Layer:- ReLU is the non-linear operation's Rectified Linear Unit. The result is = max(x) (0,x). We utilise it because the non-linearity of the CNN is introduced.

6.2.3 Pooling Layer:- It is used by the maintenance of the pertinent data to advance prepare the number of parameters. There are types of Pooling:

• . Max Pooling (Choose this).

• Average and Sum pooling.

6.2.4 Flattening:- We are straightening our entirety network into a vertical vector. So, it is transmitted to a layer of input.

6.2.5 Fully Connected Layer:- We nourish the straightening vector into the layer of input. To build a demonstrate, we coordinates these properties. At last, we have an actuation include for classifying yields, such as softmax or sigmoid.

6.3. After CNN Part

6.3.1 Gathering Data (Images):- Collect as numerous information sets as conceivable utilizing disease-affected and solid pictures. A tremendous sum of information ought to be required.

6.3.2 Building CNN:- CNN builds with different conspicuous open source libraries for ML and DL advancement.

6.3.3 Choose any cloud based IDE:- It's great to memorize cloud modules, as our tablets require gigantic computer control and the computer won't support them. You'll be able prepare on your possess PC on the off chance that you have got a great GPU setup portable workstation. We select Google Colab which permits you to choose from anything you need.

6.4. Algorithm

Step 1. Mount the Google Drive dataset first

Step 2.Purport os, glob, matplotlib.pyplot, NumPy, and Keras API Library Step 3. We mentioned in Step 4 to import layers from Keras Phase Step 4.To consequence layers from Keras Phase 4. Importation of Keras.layers Dense,Dropout,Pooling2D, AveragePooling2D, BatchNormalisations,Batches from Keras,ImportConv2D,MaxPooling2D Step 5. Uploading Prepare and test information in person factors

Step 6.13 Classes are there in the system,14180 Train Images and 34 Test Images

Step 7 Preprocessing Data with Parameters

Image values between(0-1) termed Standardization Rescaling and whatever preprocessing is done in parallel with the train.The variable "train datagen and test datagen" contains all of these parameters."

Step 8.Generation of increased train and test directory data

In this stage we set the input picture height and colour. Enhanced train and test directory data are created

Step 9.Getting 12 Diseases Name/Classes from the Code

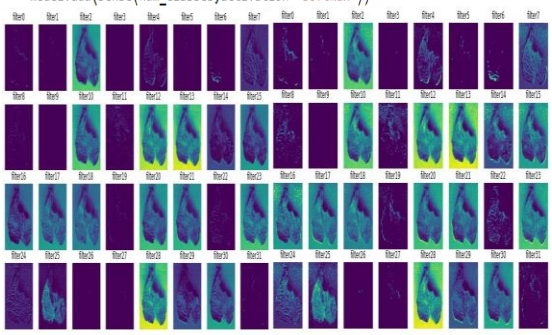
```
# The name of the 12 diseases.
train_generator.class_indices
```

```
{'Potato___Early_blight': 0,
 'Potato___Late_blight': 1,
 'Potato___healthy': 2,
 'Tomato_Bacterial_spot': 3,
 'Tomato_Early_blight': 4,
 'Tomato_Late_blight': 5,
 'Tomato_Leaf_Mold': 6,
 'Tomato_Septoria_leaf_spot': 7,
 'Tomato_Spider_mites_Two_spotted_spider_mite': 8,
 'Tomato__Target_Spot': 9,
 'Tomato__Tomato_mosaic_virus': 10,
 'Tomato_healthy': 11}
```

These are the 12 diseases available in the dataset

Step 10. Building CNN Model

```
# CNN building.
model = Sequential()
model.add(Conv2D(32, (5, 5),input_shape=input_shape,activation='relu'))
model.add(MaxPooling2D(pool_size=(3, 3)))
model.add(Conv2D(32, (3, 3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Conv2D(64, (3, 3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Flatten())
model.add(Dense(512,activation='relu'))
model.add(Dropout(0.25))
model.add(Dense(128,activation='relu'))
model.add(Dense(num_classes,activation='softmax'))
```



Above Code we may essentially create our claim, CNN Show, in any case, in this venture, we have built our claim show by utilizing Pre Done Show such as VGG16 and VGG19. We connected a layer of Conv2D to evacuate 32 highlights and 64 highlights from the input picture. Cast-offs! (Amended straight actuation to fire up neurons). The 4D cluster smoothing layer is 1D. Dropout is unwinding for certain neurons. Here, for Likelihood Yields, we utilized softmax activation.

This is the Output of the Every Layer-

Layer (type)	Output Shape	Param #
conv2d_1 (Conv2D)	(None, 252, 252, 32)	2432
max_pooling2d_1 (MaxPooling2	(None, 84, 84, 32)	0
conv2d_2 (Conv2D)	(None, 82, 82, 32)	9248
max_pooling2d_2 (MaxPooling2	(None, 41, 41, 32)	0
conv2d_3 (Conv2D)	(None, 39, 39, 64)	18496
max_pooling2d_3 (MaxPooling2	(None, 19, 19, 64)	0
flatten_1 (Flatten)	(None, 23104)	0
dense_1 (Dense)	(None, 512)	11829760
dropout_1 (Dropout)	(None, 512)	0
dense_2 (Dense)	(None, 128)	65664
dense_3 (Dense)	(None, 12)	1548

Total params: 11,927,148
Trainable params: 11,927,148
Non-trainable params: 0

CNN Diminishes parameters and obtains highlights and spares imperative data yield after all layers. There are add up to parameters, and the yield clearly appears the trainable parameters and untrained parameters.

Step 11. Visualization of images after Every Layer

We took a picture from our dataset to

confirm the changes after each layer. Any ailments plant picture of the potato or tomato is this test picture.

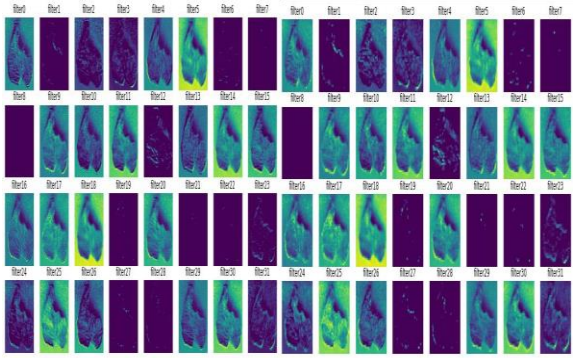


Figure No. 4 - Visualization of Images

Step 12. Training the CNN Model with Different Parameters

Distinctive parameters such as Adam Optimizer are used for preparing the CNN demonstrate with a learning rate =0.001. Function of Misfortune For our Multi Classification issue, Categorical Crossentropy is utilized. "Precision" is measurements. The CNN demonstrate is prepared through fit generator.

```
Epoch 10/15
467/467 [==============================] - 494s 1s/step - loss: 0.2078 - acc: 0.9285 - val_loss: 0.1335 - val_acc: 0.9530
Epoch 11/15
467/467 [==============================] - 491s 1s/step - loss: 0.1859 - acc: 0.9341 - val_loss: 0.1962 - val_acc: 0.9347
Epoch 12/15
467/467 [==============================] - 488s 1s/step - loss: 0.1827 - acc: 0.9392 - val_loss: 0.0764 - val_acc: 0.9744
Epoch 13/15
467/467 [==============================] - 490s 1s/step - loss: 0.1729 - acc: 0.9427 - val_loss: 0.2126 - val_acc: 0.9384
Epoch 14/15
467/467 [==============================] - 489s 1s/step - loss: 0.1672 - acc: 0.9413 - val_loss: 0.0782 - val_acc: 0.9735
Epoch 15/15
467/467 [==============================] - 495s 1s/step - loss: 0.1671 - acc: 0.9434 - val_loss: 0.1029 - val_acc: 0.9662
```

Step 13. Save the Model Weights to prevent Retraining and then Load the model from saved weights.

Step 14. Predictions

We must pre-process our picture to figure a model. First we resize the picture(150,150), at that point change over the picture to the cluster to include channels=image (150,150,3) RGB Tenserflow truly works with the picture parts to indicate the picture tests (1,150,150,3)

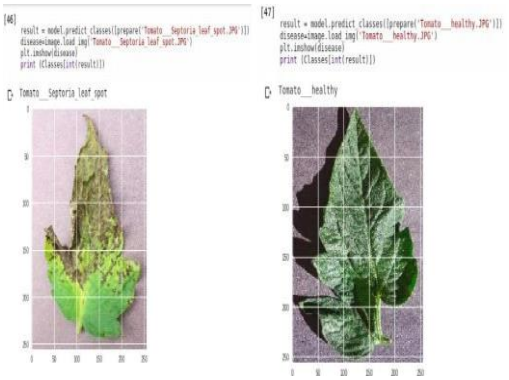


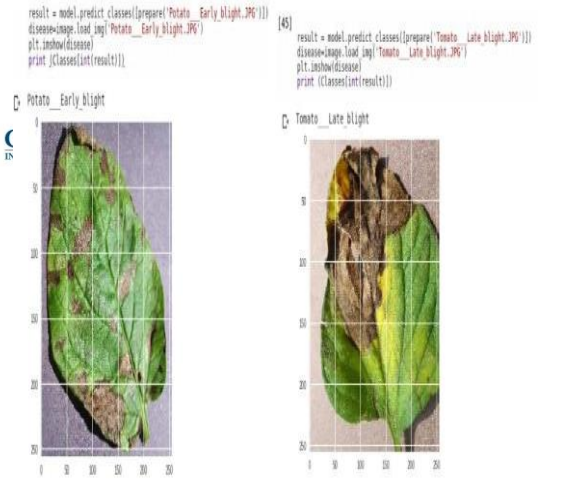
Figure No. 5 - Images used by Tensorflow

Step 15 Now Convert This Model into 'tflite'

To associate with our show app, tflite is for portable phone forms and needs to be changed over to the TensorFlow lite form. This permits us to communicate with our show.

7. Results

There are two results as shown in figure 6, first result show the potato early blight disease and another one is tomato late blight disease .Similarly, we can find out the different types of diseases in different types of plants either potato or tomato or someone else.



8. Future Work

Future work involves progressing demonstrate exactness, how to modify the estimates to guarantee that this will be done speedier and more precisely than some time recently using distinctive sorts of structures recorded over. and to grow plant infection location to recognize blooms and to maintain a strategic distance from the manures and chemicals from being utilized day by day by the farmer's natural cultivating region.

REFERENCES

1. Y. Ampatzidis, L. De Bellis, and A. Luvisi, “iPathology: robotic applications and management of plants and plant diseases,” Sustainability, vol. 9, no. 6, p. 1010, 2017.
2. A. Breukers, D. L. Kettenis, M. Mourits, W. V. D. Werf, and A. O. Lansink, “Individual-based models in the analysis of disease transmission in plant production chains: an application to potato brown rot,” Academy of Sciences, vol. 90, no. 1–3, pp. 112–131, 2006.
3. S. Ghosal, D. Blystone, A. K. Singh, B. Ganapathysubramanian, A. Singh, and S. Sarkar, “An explainable deep machine vision framework for plant stress phenotyping,” Proceedings of the National Academy of Sciences, vol. 115, no. 18, pp. 4613–4618, 2018.
4. E.-C. Oerke, “Crop losses to pests,” The Journal of Agricultural Science, vol. 144, no. 1, pp. 31– 43, 2006.
5. X. E. Pantazi, D. Moshou, and A. A. Tamouridou, “Automated leaf disease detection in different crop species through image features analysis and One Class Classifiers,” Computers and Electronics in Agriculture, vol. 156, pp. 96–104, 2019.
6. J. G. A. Barbedo, “Factors influencing the use of deep learning for plant disease recognition,” Biosystems Engineering, vol. 172, pp. 84–91, 2018.
7. G. Geetharamani and J. Arun Pandian, “Identification of plant leaf diseases using a nine-layer deep convolutional neural network,” Computers & Electrical Engineering, vol. 76, pp. 323–338, 2019.
8. P. F. Konstantinos, “Deep learning models for plant disease detection and diagnosis,” Computers & Electrical Engineering, vol. 145, pp. 311–318, 2018.
9. V. Singh and A. K. Misra, “Detection of plant leaf diseases using image segmentation and soft computing techniques,” Information Processing in Agriculture, vol. 4, no. 1, pp. 41–49, 2017.
10. S. P. Mohanty, D. P. Hughes, and S. Marcel, “Using deep learning for image-based plant disease detection,” Frontiers in Plant Science, vol. 7, p. 1419, 2016.
11. Y. Guo, X. Hu, Y. Zou et al., “Maximizing E-tailers’ sales volume through the shipping-fee discount and product recommendation system,”

Discrete Dynamics in Nature and Society, vol. 2020, pp. 1–14, 2020.

12. R. Amanda, B. Kelsee, M. C. Peter, A. Babuali, L. James, and D. P. Hughes, "Deep learning for image-based cassava disease detection," Frontiers in Plant Science, vol. 8, p. 1852, 2017.
13. H. Ali, M. I. Lali, M. Z. Nawaz, M. Sharif, and B. A. Saleem, "Symptom based automated detection of citrus diseases using color histogram and textural descriptors," Computers and Electronics in Agriculture, vol. 138, pp. 92–104, 2017.
14. H. M. Alexander, K. E. Mauck, A. E. Whitfield, K. A. Garrett, and C. M. Malmstrom, "Plant- virus interactions and the agro-ecological interface," European Journal of Plant Pathology, vol. 138, no. 3, pp. 529–547, 2014.
15. I.-H. Kao, Y.-W. Hsu, Y.-Z. Yang, Y.-L. Chen, Y.-H. Lai, and J.-W. Perng, "Determination of Lycopersicon maturity using convolutional autoencoders," Scientia Horticulturae, vol. 256, p. 108538, 2019.
16. D. Pujari, R. Yakkundimath, and A. S. Byadgi, "Grading and classification of anthracnose fungal disease of fruits based on statistical texture features," International Journal of Advanced Science and Technology, vol. 52, pp. 121–132, 2013.
17. T. Akram, S. R. Naqvi, S. A. Haider, and M. Kamran, "Towards real-time crops surveillance for disease classification: exploiting parallelism in computer vision," Computers & Electrical Engineering, vol. 59, pp. 15–26, 2017.
18. A. Marko, K. Mirjana, S. Srdjan, A. Andras, and S. Darko, "Solving current limitations of deep learning based approaches for plant disease detection," Symmetry-Baseline, vol. 11, no. 7, p. 939, 2019.
19. J. Li, W. Tang, J. Wang, X. Wang, and X. Zhang, "Multilevel thresholding selection based on variational mode decomposition for image segmentation," Signal Processing, vol. 147, pp. 80–91, 2018.
20. M. A. Elaziz, D. Oliva, A. A. Ewees, and S. Xiong, "Multi-level thresholding-based grey scale image segmentation using multi-objective multi-verse optimizer," Expert Systems with Applications, vol. 125, pp. 112–129, 2019.
21. A. Cruz, Y. Ampatzidis, R. Pierro et al., "Detection of grapevine yellows symptoms in Vitis vinifera L. with artificial intelligence," Computers and Electronics in Agriculture, vol. 157, pp. 63–76, 2019.
22. Z. Iqbal, M. A. Khan, M. Sharif, J. H. Shah, M. H. ur Rehman, and K. Javed, "An automated detection and classification of citrus plant diseases using image processing techniques: a review," Computers and Electronics in Agriculture, vol. 153, pp. 12–32, 2018.
23. M. Raza, M. Sharif, M. Yasmin, M. A. Khan, T. Saba, and S. L. Fernandes, "Appearance based pedestrians' gender recognition by employing stacked auto encoders in deep learning," Future Generation Computer Systems, vol. 88, pp. 28–39, 2018.
24. M. Hu, X. Bu, X. Sun, Z. Yu, and Y.

Zheng, "Rape plant disease recognition method of multi- feature fusion based on D-S evidence theory," Mathematical and Computational Applications, vol. 22, no. 1, p. 18, 2017.

25. M. Turkoglu and D. Hanbay, "Leaf-based plant species recognition based on improved local binary pattern and extreme learning machine," Physica A: Statistical Mechanics and Its Applications, vol. 527, p. 121297, 2019.
26. D. Li, L. Deng, M. Lee, and H. Wang, "IoT data feature extraction and intrusion detection system for smart cities based on deep migration learning," International Journal of Information Management, vol. 49, pp. 533–545, 2019.
27. Dhiraj, R. Biswas, and N. Ghattamaraju, "An effective analysis of deep learning based approaches for audio based feature extraction and its visualization," Multimedia Tools and Applications, vol. 78, no. 17, pp. 23949–23972, 2019.
28. A. Meziani, K. Djouani, T. Medkour, and A. Chibani, "A Lasso quantile periodogram based feature extraction for EEG-based motor imagery," Journal of Neuroscience Methods, vol. 328, p. 108434, 2019.
29. Y. Xu, H. Ding, Y. Xue, and J. Guan, "High-dimensional feature extraction of sea clutter and target signal for intelligent maritime monitoring network," Comput. Commun., vol. 147, pp. 76– 84, 2019.
30. C. Xu, Y. Chai, H. Li, Z. Shi, L. Zhang, and Z. Liang, "A feature extraction method for the wear of milling tools based on the Hilbert marginal spectrum," Machining Science and Technology, vol. 23, pp. 847–868, 2019.

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Use Of Cashew Nut As A Source Of Bio-Diesel For A Circular Economic Approach With Reduced Carbon Footprint In The System Of Production Of Processed Cashew: - A Novel Study

Tunnisha Das Gupta[1]*, Monideepa Pati[2], Ujjayan Majumdar[3]

Student, Jalpaiguri Government Engineering College
Research Assistant, Indian Institute of Social Welfare and Business Management
Researcher, The State University of New York at Buffalo

Abstract : One of the biggest question in today's world is how we can save non-renewable sources of energy?. Apart from that India faces a big problem to estimate the carbon footprint in a supply chain. This paper takes into consideration of a supply chain for the production of cashew nuts and estimates the time till it reaches the customer. This time is used to calculate the minimum carbon content in a process and plan accordingly to inculcate a circular economy within the process of production. Here, we have come up with a novel approach where we can manufacture bio-diesel from the cashew nuts and include that bio-diesel as a source of energy for the process of production. Thus, we propose to achieve a green supply chain with the inclusion of bio-diesel from cashew nut as a source of energy for the supply chain of production of cashew. Here, we have estimated the reduction of carbon footprint within the planned production supply chain with the inclusion of bio-diesel and imbibed circular economy in the process.

Introduction: -

We know that India faces a big problem due to the wastage of food which could have been provided to the needy people and could have been used elsewhere. This turns out to be because we many a times not plan properly using several supply chain optimization techniques. This not only increases food scarcity in the country but also causes a lot of harm to the environment.

Hence, it is very essential to estimate the time within a supply chain so that we can plan accordingly to reduce the emission within a supply chain.

Several theories have been proposed in previous literature to reduce the wastage of food, some focusing on perishable food whereas a few throw lights on how overproduction results in a significant amount of food waste [15, 16]. We know that less the price and more the demand and more the supply more is the profit as per the demand and supply curve. This is all done in order to cover the excess demand for food that we have in India. However, due to the price and profitability it turns out to be very difficult to

cover the entire nation. However, even if it reaches specific community of users, we can estimate the time and hence we can say that it should be reaching the consumer community in order to reduce the extensive reduction in the expiration of the products that we have. Hence a transportation optimization is required in order to estimate the maximum time within the process and from here we can come to a conclusion of by the optimization process we can estimate the min carbon foot print within a supply chain and this amount of carbon footprint will definitely be present within the chain.

In order to estimate the time we have taken into consideration of PERT which stands for Program Evaluation Review Technique. By using this technique we can estimate the maximum time required for the process. From here with the maximum time taken into consideration we will calculate the definite amount of carbon footprint present within the process. We will then find out different processes that can be used for the reduction in the carbon footprint within the process. The Program Evaluation and Review Technique is a statistical tool used in project management and is used to analyse and represent the tasks involved in the completion of a given project. This technique is used to get the Critical Path within a supply chain. This critical path will take into consideration of the maximum time and this maximum time will help us estimate the definite carbon footprint within the process. Here, by taking the PERT we have nullified the Queuing time or the waiting time which we have given an uncertainty mark and as in the pessimistic time is taken into consideration which takes into consideration the queuing time or the waiting time of the process.

Carbon Footprint is a very important part in every supply chain. Carbon emission in India is also a great problem and this problem should be reduced in the process. We have used design optimization technique from different references and this in turn helps is the estimation of a carbon footprint in the process. This estimate is the minimum carbon content that will be present or the definite carbon footprint in the entire process. Carbon footprint is the total amount of greenhouse gases that is generated by our actions. We are going to estimate the carbon footprint in the process and then we are going to propose a solution that will be used for the reduction in the carbon footprint and this will take place with the advent of circular economy in the process.

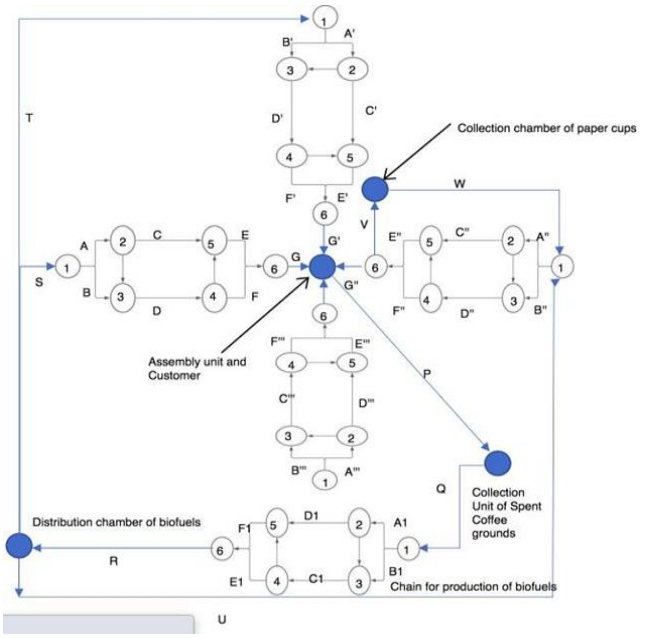
This will take place where we will use Cashew nut shells to produce bio diesel or bio fuel and this bio fuel will be used to suffice the energy requirement in the entire process. We have discussed various processes within the supply chain of the production of the biofuel as well.

Resource limitations, environmental concerns and unstable petroleum costs in India have led to an increased effort to develop alternative liquid fuels that will suffice the energy requirements within the process. Cashew nuts are an excellent source for good potential low-cost feedstock. We have seen the combustion potential of the biofuel produced from Cashew nut are good enough to suffice the energy requirements for transportation of raw materials to the storehouse of the product in our case this is a product of cashew, milk, sugar and placed in a paper cut cup and this recycling of cashew nut shells in the form of biofuel will lead us to a conclusion that the use of spent cashew nut grounds will lead to circular economy in the process which is essential to get a green supply chain.

Paper cups or plastic cups are definitely reusable cups that can be reused again and again in order to reduce the use of plastic or use of paper. If we can take a look at the big picture, we can see that paper is manufactured from Tree which leads to deforestation and we all know the environmental degradation that is led to by the advent of plastic in our day to day lives. We know that if we can reuse paper of plastic cups or any of them in particular then we can definitely somehow reduce the manufacturing of plastics or paper which in turn will definitely beneficial as it in turn reduces environmentaldegradation. This also falls under circular economy as this takes into account of the reusability of paper cups or plastic cups that leads to circular economy in the process.

Now, the question comes that what is circular economy. A circular economy is an alternative to a traditional economy (Make, use, Dispose) in which we keep the resources in use for as long as possible reduce, and recycle them extract the maximum value from them whilst in use and then recover and regenerate products and materials at the end of each service life. Here, we have used two circular chains. Firstly, the cashew nut have been used which helps in the manufacture of the bio diesel and this biodiesel have been definitely been important as it helps in the recycling of the waste that we have in the form of cashew nut used grounds. This CNSL is then used in the production of biofuel and it in turns reduces the amount of carbon footprint in the process. The next important process that reduces waste content in the process is the reuse of paper cups or plastic cups that are used in drinking. We have detailed each procedure in the cases to follow through.

As we have all the data which we have assumed are distributed in the distribution



Methodology:

We can divide the entire supply chain that space and we have checked whether the data is normally distributed or not using the Q-Q plot or the normal distribution plot. The distribution has been checked using the Analysis of variance or ANOVA. This is done in order to take into consideration of the rejection region which is due to the presence of the uncertainty in the process. We have taken the confidence interval of 95% with a significance level of 5% which is the rejection region.

has been provided in the diagram into different several supply chains termed as parts. These parts are then analyzed in the context one by one and the critical path for each supply chain is then provided up. We have arranged for one unit called as G which turns out to be the assembly unit. Let us take into consideration 4 parts of the initial supply chain. Where we take into consideration of cashew production, Sugar, paper cup and milk as these four units are required in order to have the consumer consume the readymade Cashew from the consumer unit. The unit G is the consumer unit or the assembly unit where the sugar, Cashew and milk are put inside a paper cup or a plastic cup and provided to the consumers to consume the Cashew. So, we have divided the supply chain into four parts and they are:

1.Supply Chain for cashew
2.Supply chain for Sugar
3.Supply chain for Paper Cup.
4.Supply chain for Milk.

Next what we do is analyze each supply chain and describe what each of them are and say how those times are important for the supply chain.

Next what we do is analyze each supply chain and describe what each of them are and say how those times are important for the supply chain.

Part 1. Supply Chain for cashew nuts

Here, we have taken into consideration of the production of the cashew nut. The production of the Cashew starts from the harvesting unit and we have marked each of the unit numerically. First the harvesting of the Cashew is done then the harvested Cashew goes to the processing unit and then after processing we require the Cashew to be dried up and this requires the Cashew to be taken up to the drying unit and from the drying unit we have the processed Cashew and then the Cashew is taken to the packaging unit and from the

packaging unit the Cashew is then taken to the assembly unit which we have here as the assembly unit.

Part 1: Cashew nut production	
Stations	Description
1	Harvesting unit
2,3	Processing unit
4,5	Drying unit
6	Packaging unit
7	Assembly Unit

We won't go into the details of the Cashew production process and is described in several references provided. The main purpose of the research is to consider the time and estimate the related variables in the process.

Part 2. Supply Chain for Sugar

The sugar is first harvested from sugarcane in the harvesting unit and then the sugar is taken to the crushing unit and the cane sugar is then crushed and then the made sugar is taken to the crystallizing unit and then after crystallizing the sugar is taken to the packaging unit and after packaging the sugar is taken to the assembly unit and this is the consumer unit and from here the Cashew is manufactured and provided to the consumer We are not going deep into the process of manufacturing of the Cashew as the project deals with the proposition of estimating the time within a simplified supply chain and hence we are not going deep in details of each processes.

Part 2: Sugar	
Stations	Description
1	Harvesting unit
2,3	Crushing unit
4,5	Crystallizing unit
6	Packaging unit
	Assembly Unit

Part 3. Supply chain for Paper Cup.

We are taking into consideration of recyclable paper cup or plastic cup and we take into consideration of different units within the supply chain of each of them, namely, the manufacturing unit, where the manufacturing of the paper cups is done and are taken into consideration. The next step that comes up is the processing unit where the papers are processed for scaling of the cups and are then manufacturing. Next comes the packaging unit where the packaging of the paper cups is done and made ready for distribution and then comes the distribution unit from where we will distribute the cups respectively.

Part 3: Paper Cups	
Stations	Description
1	Manufacturing unit
2,3	Processing unit
4,5	Packaging unit
6	Distribution unit
7	Assembly Unit

We are not going deep into the process of manufacturing of the Cashew as the project deals with the proposition of of each processes.

Part 4. Supply chain for Milk.

The milk is first collected from the farm and then it is taken to the separation and collection chamber and then the milk is taken to the pasteurizing chamber which is also the pasteurizing unknit and then to the

Now, we will analyze each of the parts of the supply chain or the part supply chains and we will estimate the definite carbon content in the process which is also the minimum carbon footprint that will be present within the supply chain and hencewe go further.

Part 4: Milk	
Stations	Description
1	Farm
2,3	Separation and collection chamber
4,5	Pasteurizing Chamber
6	Packaging Unit
7	Assembly Unit

Part 1. Supply Chain for Cashew nuts

Activity	Optimistic time (to)	Pessimistic time (tp)	Most likely (tm)	Immediate Predecessor
A	2	3	3	-
B	1	3	2	-
C	3	5	4	A

estimating the time within a simplified supply chain and hence we are not going deep in details

D	5	8	6	A, B
E	10	10	10	C, D
F	3		4	D
G	9	9	9	E, F

Activity	to	tp	tm	Mean	$\sigma 2$
A	2	3	3	3	0.33
B	1	3	2	1	0.66
C	3	5	4	4	0.66
D	5	8	6	7	2
E	10	10	10	10	0
F	3	4	4	4	0.33
G	9	9	9	9	0

the milk is mixed with Cashew to produce the readymade Cashew for the consumer. Here, the unit is also the consumer unit where the distribution is made to the consumers.

packaging unit also the distribution unit here and then to the assembly unit where

We won't go into the details of the Cashew production process and is described in several references provided. The main purpose of the research is to consider the time and estimate the related variables in the process.

Here,

to= Optimistic Time
tp= Pessimistic Time
tm= Most likely Time
Te= Expected Time (Time in which process is to be executed)

σ^2= Variance
σ = Standard Deviation
Ts=Scheduled Time

Critical path: A, D, E, G.

Value of Optimistic time(to) along the Critical path: 26

Value of Pessimistic time(tp) along the Critical path: 30

Value of most likely time(tm)along the Critical path: 28

Te= (to+4tm)/6 +tp
= (26 + 4*28)/6+30 = 52.33~53 days.

Total Variance (σ^2) = 3.98
Standard deviation (σ) = $\sqrt{3.98}$

=1.99P(Z≤ (Ts-Te)/ σ)=0.95

From Normal Distribution Chart, Z(0.95) =1.64

(Ts-Te)/ $\sigma \geq 1.64$

So, in order to have the minimum Scheduled Time for 95% accuracy, we have

$$\frac{Ts-Te}{\sigma} = 1.64$$

We have Te= 53 days

So on Calculating Ts = 56days

Therefore, with the help of CPM and PERT Technique, we can select the most optimal path and for 95% of time Sugar will reach in 56 days.

Activity	Optimistic time (to)	Pessimistic time (tp)	Most likely (tm)	Immediate Predecessor
A′	2	2	2	-
B′	1	2	2	-
C′	2	4	3	A′
D′	3	4	4	A′, B′
E′	3	5	3	C′, D′
F′	1	2	2	D′
G′	4	4	4	E′, F′

Part 2. Supply Chain for Sugar

Activity	to	tp	tm	Mean	$\sigma 2$
A′	2	2	2	2	0
B′	1	2	2	2	0.33
C′	2	4	3	3	0.66
D′	3	4	4	4	0.33
E′	3	5	3	4	1
F′	1	2	2	2	0.33
G′	4	4	4	4	0
Total					2.65

Here,

to= Optimistic Time
tp= Pessimistic Time
tm= Most likely Time
Te= Expected Time (Time in which process is to be executed)

σ^2= Variance
σ = Standard Deviation
Ts=Scheduled Time

Critical path: A′, D′, E′, G′.

Value of Optimistic time(to) along the Critical path: 12

Value of Pessimistic time(tp) along the Critical path: 15

Value of most likely time(tm)along the Critical path: 13

Te= (to+4tm)/6 +tp
= (12+ 4*13)/6+15 = 25.66~26 days.

Total Variance (σ^2) = 2.65
Standard deviation (σ) = $\sqrt{2.65}$ =1.62

P(Z≤ (Ts-Te)/ σ)=0.95
From Probability Distribution Chart, Z(0.95) =1.64
(Ts-Te)/ $\sigma \geq 1.64$

So, in order to have the minimum Scheduled Time for 95% accuracy, we have

$$\frac{Ts-Te}{\sigma} = 1.64$$

We have Te= 26 days

So, on Calculating Ts = 29days

Therefore, with the help of CPM and PERT Technique, we can select the most optimal path and for 95% of Cashew nuts will reachin 29 days.

Part 3. Supply chain for Paper Cup.

Here,
to= Optimistic Time
tp= Pessimistic Time
tm= Most likely Time
Te= Expected Time (Time in which process is to be executed)

σ^2= Variance
σ = Standard Deviation
Ts=Scheduled Time

Critical path: A'', D'', E'', G'' .
Value of Optimistic time(to) along the Critical path: 23

Value of Pessimistic time(tp) along the Critical path: 29

Value of most likely time(tm)along the Critical path: 26

Te= (to+4tm)/6 +tp

Te= (23+4*26)/6 + 29 =50.1 ~50days

Total Variance (σ^2) = 6.66

Standard deviation (σ) = $\sqrt{6.66}$

=2.5P(Z≤ (Ts-Te)/ σ)=0.95

From Normal Distribution Chart, Z(0.95)
=1.64

(Ts-Te)/ $\sigma \geq 1.64$

So, in order to have the minimum Scheduled Time for 95% accuracy, we have

$$\frac{Ts-Te}{\sigma} = 1.64$$

We have Te= 50 days

So, on Calculating Ts = 54.2 ~55days

Activities	to	tp	tm	Mean	σ2
A''	2	4	3	3	0.66
B''	1	3	2	2	0.66
C''	3	3	3	3	0
D''	4	8	6	6	2.67
E''	10	10	10	10	0
F''	8	12	10	10	2.67
G''	7	7	7	7	0
Total					6.66

Therefore, with the help of CPM and PERT Technique, we can select the most optimal path and for 95% of time Paper cup will reach in 55 days.

Part 3. Supply chain for Paper Cup.

Activity	Optimistic time (to)	Pessimistic time (tp)	Most likely (tm)	Immediate Predecessor
A'''	3	3	3	-
B'''	1	2	2	-
D'''	2	4	3	A'''
C'''	4	4	4	A''', B'''
E'''	2	3	2	D''', C'''
F'''	1	1	1	C'''
G'''	5	5	5	E''', F'''

Activity	to	tp	tm	Mean	σ2
A'''	3	3	3	3	0
B'''	1	2	2	2	0.33
D'''	2	4	3	3	0.66
C'''	4	4	4	4	0
E'''	2	3	2	3	0.66
F'''	1	1	1	1	0
G'''	5	5	5	5	0
Total					1.65

Here,
to= Optimistic Time
tp= Pessimistic Time
tm= Most likely Time

Te= Expected Time (Time in which process is to be executed)

σ^2= Variance
σ = Standard Deviation
Ts=Scheduled Time
Critical path: A''', C''', E''', G'''.

Value of Optimistic time(to) along the Critical path: 14

Value of Pessimistic time(tp) along the Critical path: 15

Value of most likely time(tm)along the Critical path: 14

Te= (to+4tm)/6 +tp

= (14 + 4*14)/6+15 = 52.33~53 days.

Total Variance (σ^2) = 1.65

Standard deviation (σ) = $\sqrt{1.65}$

=1.28P(Z≤ (Ts-Te)/ σ)=0.95

From Probability Distribution Chart,
Z(0.95) =1.64

(Ts-Te)/ $\sigma \geq 1.64$

So, in order to have the minimum Scheduled Time for 95% accuracy, we have

$$\frac{Ts-Te}{\sigma} = 1.64$$

We have Te= 26.6~27 days

So, on Calculating Ts = 28.6 ~29days

Therefore, with the help of CPM and PERT Technique, we can select the most optimal path and for 95% of time Milk will reach in29 days.

Analysis of time:

Now once we have received the time for each of the process, we will analyze the time so that we can take into consideration of the time of the process which in turn will help us in the identification of the estimation of the carbon footprint or carbon emission in the entire process.

First let us know what time each process is taking.

The table below shows the time taken for each process and hence, will be values as such.

Serial Number	Supply chains	Total time required in the process
1.	Cashew	56
2.	Sugar	29
3.	Paper Cup	55
4.	Milk	29

Now, in order to nullify the waiting time for each process we will start the process which is having maximum time so that there is no wastage of the perishable products and the next processes starts henceforth in descending order.

Serial Number	Supply chains	Started after how many days
1.	Cashew	56
2.	Sugar	27
3.	Paper Cup	1
4.	Milk	27

In this way everything reaches within 56 days and we avoid the expiration of the products.

Now, we will use this time to estimate the carbon footprint in the process, however, first we require to optimize the carbon content in the process and it is as follows

Mathematical Formulation [28]

Some assumptions should be considered for modeling the queue:

1. The queue model is as M / M / S / ∞ /Pri.
2. Total number of transportation fleet as well as their capacity is specified.
3. The number of servers in each center consists two parts of loading and unloading fleets, which queue systems operate separately.
4. Servers in each loading or unloading centers can be multiple parallelservers.
5. The distance between centers is specified.
6. The discharge rate in centers is directly related to the distance between thecenters.
7. The number of parallel servers is fixed and specified in the loading and unloading centers.
8. The quantity of waste which comes from the market to the recycling center is specified.
9. The fleet movement rate between different centers is specified.
10. The production rate in factories centers is specified.
11. The amount of waste isspecified.
12. The amount of the final product should be maintained in the factories in any order is specified in terms of order.
13. The withdrawal rate of discharge machines (unloaded) in each center is fixed.
14. The fleet movement between centers is reciprocating.
15. It is assumed that system is stable in eachcenter:

$$p = \frac{Arrival\ rate}{(Arrival\ rate) \times (Service\ rates)} < 1$$

L: Warehouse centers
J: Factories centers
K: Distribution centers
L: Recycling centers

The parameters considered in this model include:

Z: Traffic volume between the two centers

*Z*0*:* Amount of waste that enters the waste storage from market

σj: Percentage of waste in the factory *j*

γj: Percentage of production rate at the factory *j*

Hj: Quantity of products entered into the warehouse after production at the factory *j TNV:* Total number of fleets in the entire chain

CV: Carrying capacity of the fleet

λ: Arrival rate of vehicles to discharge

μ: Rate of discharged vehicles outflow

S: The number of parallel servers in each center unloading section

λ: Fleet arrival rate for loading

μ: Rate of loaded vehicles withdrawal.

S: The number of parallel servers in each center loading sector

*π*0*:* Idle percentage in state zero

LQ: Average length of queue

WQ: average waiting time in queue

W: The average waiting time in the system

P: The percentage of servers' or utilization agent's operating time

D: Distance in center (*m*)

T: Transportation time unit per distance unit

C: The percentage of pollutants generated by the operation time of transportation fleet

The decision variables in this model are as follows:

NV: Number of fleets in the different centers between layers of the supply chain

NT: Number of fleet commutes between centers

For this purpose of the present study, the time function is used. C coefficient is used to

calculate the consumption of contaminants over time. This means that the shorter the transit and waitingtime, the lower the energy consumption.

MinC= this stands for minimum of emissions.

MinC

$$(\sum_i \sum_j 2T_{ij} d_{ij}\, NT_{ij} + \sum_j \sum_k 2T_{jk} d_{jk}\, NT_{jk} + \sum_j \sum_l 2T_{jl} d_{jl}\, NT_{jl} + \sum_l \sum_i 2T_{li} d_{li}\, NT_{li} + \sum_i (W_i LQ_i + \acute{W}_i \acute{LQ}_i) + \sum_j (W_j LQ_j + \acute{W}_j \acute{LQ}_j) + \sum_j (W_k LQ_k) + \sum_k (W_l LQ_l + \acute{W}_l \acute{LQ}_l)) \quad (1)$$

S.t.

$$\sum_i \sum_j N\, V_{ij} + \sum_j \sum_k N\, V_{jk} + \sum_j \sum_l N\, V_{jl} + \sum_l \sum_i N\, V_{li} = \text{TNV} \quad (2)$$

$$\begin{cases} Z_{ij} = c & (3) \\ Z_{jl} = \sigma_j \gamma_j \sum_i Z_{ij} \ \forall j, l & (4) \\ Z_{jk} = \sum_i Z_{ij} - \sum_l Z_{jl} - H_j \ \forall j, k & (5) \\ Z_{li} = \sum_j Z_{jl} + Z_0 \ \forall l, i \end{cases}$$

$$\begin{cases} NT_{ij}.NV_{ij} \geq \frac{Z_{ij}}{CV} \ \forall i, j & (6) \\ NT_{jk}.NV_{jk} \geq \frac{Z_{ik}}{CV} \ \forall i, k & (7) \\ NT_{jl}.NV_{jl} \geq \frac{Z_{jl}}{CV} \ \forall j, l & (8) \\ NT_{li}.NV_{li} \geq \frac{Z_{li}}{CV} \ \forall l, i & (9) \end{cases}$$

$$\lambda_i = \sum_l \frac{NV_{li}}{T_{li} d_{li}} \ \forall i \quad (10)$$

$$\acute{\lambda}_l = \sum_i \frac{NV_{li}}{T_{li} d_{li}} \ \forall l \quad (11)$$

$$\lambda_j = \sum_i \frac{NV_{ij}}{T_{ij} d_{ij}} \ \forall j \quad (12)$$

$$\acute{\lambda}_i = \sum_j \frac{NV_{ij}}{T_{ij} d_{ij}} \ \forall i \quad (13)$$

$$\lambda_k = \sum_j \frac{NV_{jk}}{T_{jk} d_{jk}} \ \forall k \quad (14)$$

$$\acute{\lambda}_j = \sum_k \frac{NV_{jk}}{T_{jk} d_{jk}} + \sum_l \frac{NV_{jl}}{T_{jl} d_{jl}} \ \forall j \quad (15)$$

(16) $$\lambda_l = \sum_j \frac{NV_{jl}}{T_{jl} d_{jl}} \ \forall l$$

(17) $$\begin{cases} P_i = \frac{\lambda_i}{s_i \mu_i} \ \forall i \\ \acute{P}_i = \frac{\acute{\lambda}_i}{\acute{s}_i \acute{\mu}_i} \ \forall i \end{cases}$$

(18)

(19) $$\begin{cases} P_j = \frac{\lambda_j}{s_j \mu_j} \ \forall j \\ \acute{P}_j = \frac{\acute{\lambda}_j}{\acute{s}_j \acute{\mu}_j} \ \forall j \end{cases}$$

(20)

(21) $$P_k = \frac{\lambda_k}{s_k \mu_k} \ \forall k$$

(22) $$\begin{cases} P_l = \frac{\lambda_l}{s_l \mu_l} \ \forall l \\ \acute{P}_i = \frac{\acute{\lambda}_l}{1} \ \forall l \end{cases}$$

(24) $$\begin{cases} \pi_i^0 = \frac{1}{\left[\sum_{n=0}^{S_i - 1} \frac{\left(\frac{\lambda_i}{\mu_i}\right)^n}{n!} + \frac{\left(\frac{\lambda_i}{\mu_i}\right)^{S_{i,j,l}}}{S_i!(1-P_i)}\right]} \ \forall i \end{cases}$$

(25) $$\begin{cases} \acute{\pi}_l^0 = \frac{1}{\left[\sum_{n=0}^{\acute{S}_l - 1} \frac{\left(\frac{\acute{\lambda}_l}{\acute{\mu}_l}\right)^n}{n!} + \frac{\left(\frac{\acute{\lambda}_l}{\acute{\mu}_l}\right)^{\acute{S}_l}}{S_{i,j,l}!(1-\acute{P}_l)}\right]} \ \forall i \end{cases}$$

(26) $$\begin{cases} \pi_j^0 = \frac{1}{\left[\sum_{n=0}^{S_j - 1} \frac{\left(\frac{\lambda_j}{\mu_j}\right)^n}{n!} + \frac{\left(\frac{\lambda_j}{\mu_j}\right)^{S_j}}{S_j!(1-P_j)}\right]} \ \forall j \end{cases}$$

(27) $$\begin{cases} \acute{\pi}_j^0 = \frac{1}{\left[\sum_{n=0}^{\acute{S}_j - 1} \frac{\left(\frac{\acute{\lambda}_j}{\acute{\mu}_j}\right)^n}{n!} + \frac{\left(\frac{\acute{\lambda}_j}{\acute{\mu}_j}\right)^{\acute{S}_j}}{\acute{S}_j!(1-\acute{P}_j)}\right]} \ \forall j \end{cases}$$

(28) $$\pi_k^0 = \frac{1}{\left[\sum_{n=0}^{S_k - 1} \frac{\left(\frac{\lambda_k}{\mu_k}\right)^n}{n!} + \frac{\left(\frac{\lambda_k}{\mu_k}\right)^{S_k}}{S_k!(1-P_k)}\right]} \ \forall k$$

(29) $$\begin{cases} \pi_l^0 = \frac{1}{\left[\sum_{n=0}^{S_l - 1} \frac{\left(\frac{\lambda_l}{\mu_l}\right)^n}{n!} + \frac{\left(\frac{\lambda_l}{\mu_l}\right)^{S_l}}{S_i!(1-P_l)}\right]} \ \forall l \end{cases}$$

$$\begin{cases} \acute{\pi}_l^0 = \frac{1}{\left[\sum_{n=0}^{\acute{S}_l - 1} \frac{\left(\frac{\acute{\lambda}_l}{\acute{\mu}_l}\right)^n}{n!} + \frac{\left(\frac{\acute{\lambda}_l}{\acute{\mu}_l}\right)^{\acute{S}_l}}{\acute{S}_l!(1-\acute{P}_l)}\right]} \ \forall l \end{cases}$$

(30)

$$\begin{cases} LQ_i = \frac{\left(\frac{\lambda_i}{\mu_i}\right)^{S_i} P_{i,j,l}}{S_i!(1-P_i)^2}\pi_i^0 \ \forall i & (31) \\ L\acute{Q}_\iota = \frac{\left(\frac{\acute{\lambda}_\iota}{\acute{\mu}_\iota}\right)^{\acute{S}_\iota} P_{\acute{\iota},j,l}}{\acute{S}_\iota!(1-\acute{P}_\iota)^2}\acute{\pi}_\iota^0 \ \forall i & (32) \end{cases}$$

$$\begin{cases} LQ_j = \frac{\left(\frac{\lambda_j}{\mu_j}\right)^{S_j} P_j}{S_j!(1-P_j)^2}\pi_j^0 \ \forall j & (33) \\ L\acute{Q}_J = \frac{\left(\frac{\acute{\lambda}_J}{\acute{\mu}_J}\right)^{\acute{S}_J} \acute{P}_J}{\acute{S}_J!(1-\acute{P}_J)^2}\acute{\pi}_J^0 \ \forall j & (34) \end{cases}$$

$$LQ_k = \frac{\left(\frac{\lambda_k}{\mu_k}\right)^{S_k} P_k}{S_k!(1-P_k)^2}\pi_k^0 \ \forall k \quad (35)$$

$$\begin{cases} LQ_l = \frac{\left(\frac{\lambda_l}{\mu_l}\right)^{S_l} P_l}{S_l!(1-P_l)^2}\pi_l^0 \ \forall l & (36) \\ L\acute{Q}_l = \frac{\left(\frac{\acute{\lambda}_l}{\acute{\mu}_l}\right)^{\acute{S}_l} \acute{P}_l}{\acute{S}_l!(1-\acute{P}_l)^2}\acute{\pi}_l^0 \ \forall l & (37) \end{cases}$$

$$\begin{cases} WQ_i = \frac{LQ_i}{\lambda_i} \ \forall i & (38) \\ W\acute{Q}_\iota = \frac{L\acute{Q}_\iota}{\acute{\lambda}_\iota} \ \forall i & (39) \end{cases}$$

$$\begin{cases} WQ_j = \frac{LQ_j}{\lambda_j} \ \forall j & (40) \\ W\acute{Q}_J = \frac{L\acute{Q}_J}{\acute{\lambda}_J} \ \forall j & (41) \end{cases}$$

$$WQ_k = \frac{LQ_k}{\lambda_k} \ \forall k \quad (42)$$

$$\begin{cases} WQ_l = \frac{LQ_{i,j,l}}{\lambda_{i,j,l}} \ \forall l & (43) \\ W\acute{Q}_l = \frac{L\acute{Q}_l}{\acute{\lambda}_l} \ \forall l & (44) \end{cases}$$

$$\begin{cases} W_i = WQ_i + \frac{1}{\mu_i} \ \forall i & (45) \\ \acute{W}_\iota = W\acute{Q}_\iota + \frac{1}{\acute{\mu}_\iota} \ \forall i & (46) \end{cases}$$

$$\begin{cases} W_j = WQ_j + \frac{1}{\mu_j} \ \forall j & (47) \\ \acute{W}_J = W\acute{Q}_J + \frac{1}{\acute{\mu}_J} \ \forall j & (48) \end{cases}$$

$$W_k = WQ_k + \frac{1}{\mu_k} \forall k$$

(49)

(50)

$$\begin{cases} W_l = WQ_l + \frac{1}{\mu_l} \forall l \\ \acute{W}_l = \acute{W}Q_l + \frac{1}{\acute{\mu}_l} \forall l \end{cases}$$

(51)

NT, NV: Integer (52)

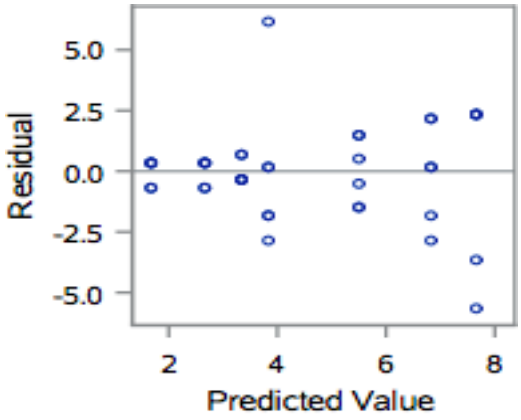
Now let us consider that we have the waiting time to be zero as we have considered that the process that are taking place are simultaneous and the waiting time that is present is present within the process and hence taken into account and is not considered in the calculation for the minimum time that will cause the lowest carbon emission. Hence the formula comes up as: -

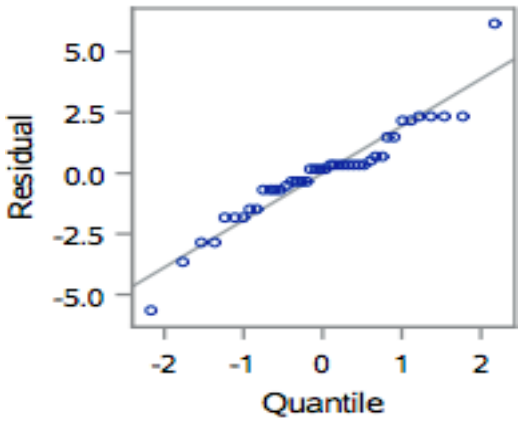
□i□j2TijDijNTij+□j□k2TjkDjkNTjk+□k□l2TklDklNTkl+□m□n2TmnDmnNTmn

Now if we consider that the value for the number of fleets is that is commuting between the centers is 1 at time then we have the formula as: -

□i□j2TijDij+□j□k2TjkDjk+□k□l2TklDkl+□m□n2TmnDmnTmn

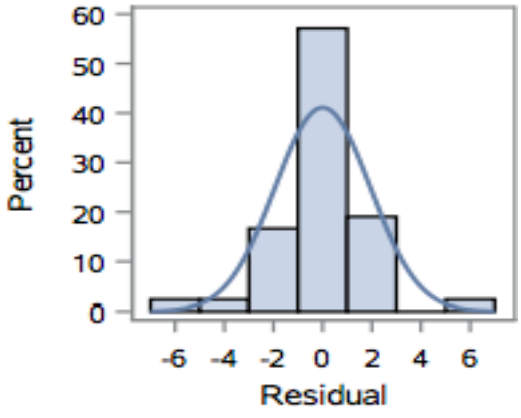
Therefore, the two factors on which the value is dependent are the time that is consumed per unit distance for the transportation time and the distance between the centers. The transportation time per unit distance takes in account distance travelled within the company as well. Now if we take the value of D to be 2, 3, 1 and 1 respectively as an assumption then we have the time for the entire process that will minimize the carbon emission. Which comes up as





56x2+29x3+55x1 +29x 1 = 283.

This is the estimated value of min C that we are taking into consideration and thisis



the definite amount of carbon that should be present within the supply chain

Circular Economy [29]:

Circular economy takes into account of the reduce, reuse and recycle processes within a supply chain. In order to have the circular economy in place we need to find spots within the supply chain where we can imbibe the process of circular economy so that we can have a sustainable process as well as a green supply chain. Here, we will optimize the supply chain while we propose to use the Cashew nut shells to produce bio fuel which has properties similar to that of petroleum and can be used to suffice the energy requirements inthe supply chain.

Now, we will use this supply chain and we will then distribute the biodiesel produced in the entire supply chain including the parts of it. However, first we will require to know the basics of how biodiesel is produced from the Cashew. The process inlisted below.

Detailed process of how to make biodiesel from Cashew may be summarized in following steps [30].

1. Firstly, the Cashew grounds are collected and dried at a temperature of 105degree C to remove the moisture. Then the oil was extracted applying a Soxhlet process, organic solvent n-hexane was used, the Soxhlet device temp is kept at 65-70degree C. Finally, at the end crude oil will be separated from the solvent using the rotatory vacuum evaporator to remove the moisture for 1 hr at 95-degree C.

   The yield crude oil = The weight of the extracted oil/ weight of the waste Cashew ground x 100

2. Then the crude oil obtained from the Step 1 passes through the esterification process, molar ratio of methanol to refined oil is maintained at 12:1 ratio.1% of H2so4 is added to the preheated oil at 60 degree C for 3 hrs. under 300rmp steering speed.
3. Then the product is poured into a separating tunnel to separate excess alcohol, H2SO4 AND the impurities present in the lower level. This lower level is separated and entered into a rotatory evaporator and heated at 95 degree C for 1 hr. to remove methanol and water from the esterified oil.
4. In the Transesterification process, crude waste Cashew oil is reacted with 25% of methanol and 1% of KOH at 60 degree C for 2 hrs. and 600 rpm steering speed. After this the produced biodiesel is deposited in a separation tunnel for 15 hrs. to separate glycerol from biodiesel. Therefore, the lower level which contain the impurities and glycerolwas drawn off.
5. Now the unrefined biodiesels is wasted to remove the impurities and glycerol. In this process 50% of distilled water at 60 degree C is sprayed over the surface of ester stirred gently.
6. This process was repeated several times until the pH of the distilled water became neutral. The lower layer was discarded, and the upper layer was entered into a flask and dried using Na2SO4 and then further dried using a rotary evaporator to make sure that biodiesel is free from methanol and water.

The schematic diagram for the production of biodiesel is provided below and can be as such shown in the diagram.σ^2= Variance σ = Standard DeviationTs=Scheduled Time

Figure 2. Steps used in the production of Biofuel from Cashew

We have taken into consideration of the important steps from the biodiesel production process from the Cashew grounds and we have constructed a simplified supply chain as provided in figure 2. From figure 2 we can say that the biodiesel supply chain as in the case V or part 5 and can be designed as follows: -

Simplified steps according to the supply chain provided in Case V.

Events	Descriptions
1	Cashew grounds are dried, Crude oil is extracted using n - hexane
2,3	Esterification process
4,5	Transesterification process
6	Washing

Unit V.

Here,
to= Optimistic
Timetp=Pessimistic
Time
tm= Most likely Time
Te= Expected Time (Time in whichprocess is to be executed)

Activities	to	tp	tm	Mean	σ2
A1	2	2	2	2	0
B1	1	3	2	2	0.66
C1	2	3	3	3	0.33
D1	4	6	4	5	1
E1	10	10	10	10	0
F1	1	2	2	2	0.33
R	7	7	7	7	0
Total					2.32

Critical path: A1, C1, F1, R.

Value of Optimistic time(to) along theCritical path: 12

Value of Pessimistic time(tp) along theCritical path: 14

Value of most likely time(tm)along theCritical path: 14

Te= (to+4tm)/6 +tp
Te= (12+4*14)/6 + 14 =25.33 ~26days

Total Variance (σ^2) = 2.32

Standard deviation (σ) = $\sqrt{2.32}$

=

Activity 1	Optimistic time (to)	Pessimistic time (tp)	Most likely (tm)	Immediate predecessor
A1	2	2	2	-
B1	1	3	2	-
C1	2	3	3	B1, A1
D1	4	6	4	A1
E1	10	10	10	C1
F1	1	2	2	D1, C1
R	7	7	7	E1,F1

P($Z \leq$ (Ts-Te)/ σ)=0.95

From Probability Distribution Chart,

Z(0.95) =1.64

(Ts-Te)/ $\sigma \geq$1.64

So, in order to have the minimum Scheduled Time for 95% accuracy, wehave

$$\frac{Ts-Te}{\sigma} = 1.64$$

We have Te= 26 days

So, on Calculating Ts = 28.4 ~29days

Therefore, with the help of CPM and PERT Technique, we can select the most optimal path and for 95% of time Paper cup will reach in 29 days.

Once we have calculated the supply chain till the distribution center for the bio diesel and from there the biodiesel is taken to different sub- supply chains and the process continues.

Another place where we have included the circular economy is in the supply chain of the paper cups and here, we recycle / reuse the paper cups or plastic cups to use the same in the process again.

Thus, we can say that circular economy has been attained in the process and the cost analysis of the entire process is required to be done which stands out to be a future prospect of the project.

Normal Distribution of Data:

It has been required that we distribute the entire data normally so that we can take into consideration of the rejection region of the time, which accounts to the uncertainty in the entire process. There can be accidents, there can be damages that might lead to uncertainty and the product may not reach in time and this is given a percentage of 5% which is the significance level of the project and the confidence level taken in the calculation is 95% which means that 95 percent of the time the product will reach in time to the consumer and before the expiration of the product.

For this, we have use Analysis of Variance and we have used SAS to form the ANOVA table and from here we have plotted the Q-Q curve which helps us to determine whether the data is normally distributed or not. The ANOVA Table andthe Q-Q plot has been provided below: -

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	178.0000000	29.6666667	6.72	<.0001
Error	35	154.5000000	4.4142857		
Corrected Total	41	332.5000000			

Fig 3. A. The figure shows the residual vs predicted values and we can see that the points are well distributed and the funneling effect is not prominent.

Fig 3. B. The Q-Q plot showing the residual vs quantile data.

Fig 3.C Plot for Percent vs residuals.

From here we can see that the data is normally distributed and hence we can consider the values that we have taken into consideration.

Results and Discussion:

Firstly we have designed a supply chain where we have estimated the time then we have taken the maximum time of an unit supply chain or sub-supply chain and from there we have calculated after how many days we should start the other supply chains so that we receive the products together which means that if all the product reaches together there will be no lapse of time for the supply chains that takes lesser time to complete. In this way we are reducing holding of expiration dated products. In our case we have taken a sample supply chain of Cashew and we have estimated the time using PERT and then estimated from when we should start the supply chain in order to have minimum holding (in our case holding is nullified). Once, we have the estimation we can use the time that we have estimated using PERT to calculate the minimum carbon content in the process. Then, we have proposed a way by which we can reduce the carbon emission in the process. By our extensive search in literature we have found out that petroleum-based products that is used to suffice the energy requirements in the process can be replaced using Bio- fuel which is manufactured from Cashew as they are almost equivalent to petroleum. Cashew is obtained as a waste product in the preparation of Cashew and this in turn builds a circular economy in the proposed supply chain. We have also proposed the use of Recyclable paper and plastic cups in the supply chain that also contributes to circular economy and hence reduces adverse environmental impacts that iscaused by plastic.

We have kept in our mind that every time it will be difficult to have the product within time always. So, we have kept a rejection region where we have mentioned that 5% of the cases the product will not reach within time and will contribute to expiration and in order to calculate the scheduled time and the expected time, we have used the Normal Distribution function curve. In order to fit the data in such a curve we need to know whether the residuals of the curve fall in a straight line in the Q-Q plot and we have designed an ANOVA and we have plotted the Q-Q plot and we have seen that the data that we have taken into consideration is normally distributed

For 2778 carbon per gallons of diesel used: -

Carbon footprint = 2,778 g x 3.66 x 0.99 = 10,084 g.

For 1 gallon of the biodiesel we used taking into consideration of 12 percent of reduced combustion efficiency: 2661 x 3.66 x 0.99 = 9641 g.

For our supply chain gallons of diesel used:

Vehicle average speed = 40 km/ hour
Time taken = 6792 hours
Distance covered = 271680 km
Mileage = 10 km / liter for diesel and 9.6 km / liter for biodiesel
Liters used = 27168 liter (7177 gallons)for diesel and 28300 (7476) liter for biodiesel
Carbon footprint = 72372 kg for diesel and 72076 kg for biodiesel

Hence, the carbon footprint in the process is reduced.

We have also calculated the amount of carbon footprint that will be produced with both diesel and the proposed biodiesel and we have come to the conclusion that bio diesel will yield lesser amount of carbon footprint keeping in mind all types of design parameters and optimizations. [31-33].

Acknowledgement: -

We are grateful for the help that we have received from Dr. Sara Behdad (University of Florida), Fatima Zara, Chinmay Modak and Sankalp Sangvi, Dr Binoy K Choudhury.

References:

[1] COVID-19:FoodWastage on theRise. https://www.downto earth. org.in/ news/health/covid-19- food-wastage - on-the-rise-70183. Accessed 28 Dec. 2020.

[2] Farahani, P., et al. "Advanced Planning Methodologies in Food Supply Chains." Undefined, 2011, https://www. semantics cholar.org/paper/ Advanced- planning-methodologies-in-food-supply-Farahani- Akkerman/2b3bbf6e464c381e2cd5b328eb37aa07187bca9e.

[3] M. A. S. CASQUILHO, "Transportation Problem."

[4] Fern, Jason and o. "Law of Supply and Demand Definition." Investopedia, https://www.investopedia.com/terms/l/la w-of-supply-demand.asp. Accessed 28 Dec. 2020.

[5] Li, Jin, et al. "Carbon Footprint Management of Road Freight Transport under the Carbon Emission Trading Mechanism." Mathematical Problems in Engineering, 7 Sept. 2015,

[6] "PERT - Program Evaluation and Review Technique." PM Study Circle, 29 Aug. 2013, https://pmstudy circle.com /2013/08 /pert-program-evaluation-and-review- technique/

[7] Vanhoucke, Mario. "The PERT/CPM Technique." Project Management with Dynamic Scheduling: Baseline Scheduling, Risk Analysis and Project Control, edited by Mario Vanhoucke, Springer, 2012, pp. 11– 35. Springer Link, doi:10.1007/978-3-642- 25175-7_2.

[8] Litskas, Vassilis D., et al. "Determining the Carbon Footprint of Indigenous and Introduced Grape Varieties through Life Cycle Assessment Using the Island of Cyprus as a Case Study." Journal of Cleaner Production, vol. 156, July 2017, pp. 418–
25. DOI.org (Crossref), doi:10.1016/j.jclepro.2017.04.057.

[9] Barrett, Thomas. "Circular Economy Key to Lowering Carbon Footprint, Report Says." Environment Journal, 21 Nov. 2018, https://environmentjournal .online/ article s/businesses-must-embrace-circular- economy- to-lower-carbon-footprint - report- says/.

[10] Pandian, Amith Kishore, et al. 'Emission and Performance Analysis of a Diesel Engine Burning Cashew Nut Shell Oil Bio Diesel Mixed with Hexanol'. *Petroleum*

Science, vol. 15, no. 1, Feb. 2018, pp. 176–84. *Springer Link*, https://doi.org/10.1007/s12182-017- 0208-8.

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Comparative Study & Structural Behavior of Telecommunication Monopole Towers with and withoutCamouflaged under the Influence of Wind load

[1]Syed. Ehtesham Ali, [2]Dr. Mir Iqbal Faheem

[1]Research Scholar, School of Engineering, Career Point University, Kota, India
[2]Research Supervisor, School of Engineering, Carrer Point University, Kota, India
Dar-us-Salam, Hyderabad, India
E-Mail: [1]s.asad84@yahoo.com, [2]mir.faheem@rediffmail.com

Abstract: The purpose of the proposed research is to study the structural behavior of monopole towers with and without camouflaged with different heights of towers 30m and 35m for the basic wind speed of 44.44m/s,39m/s as per latest current code ANSI/TIA 222-H.Most studies and research have shown only structural behavior of monopole towers with other type of lattice towers. Proposed research is very important due to the fact that the structural engineer faces the challenging job of designing and constructing telecommunication towers to support all loads in open weather with high degree of reliability. Free standing lattice towers are generally used in all over the world. As per the recent surveys, mobile towers in the world are likely to grow very fast due to the introduction of 5G technology which requires more antennas on the towers, with existing monopole towers already occupied with lot of antennas with no structural capacity to withstand extra load on initiated to seek improved design approaches to make communication towers more environmentally acceptable and cost effective. Since monopole structures have smaller dimension and require lesser space for installation, they can be used as a suitable alternate for lattice towers. Some researchers observed in their study that monopole towers have higher lateral displacements and lesser monopole structural capacity than self supporting towers. In this proposed research a new camouflaged technical design is developed to study the structural behavior of monopole towers. This research shall be helpful for determining lateral displacement(tilt)of monopole, monopole capacity and effect of wind speeds for different heights of monopole towers with and without camouflaged under the influence of wind load.

Keywords Staad Pro V8i, monopole tower, antenna loads, basic wind speed, lateral displacement (tilt), monopole capacity,

camouflaged cladding.

INTRODUCTION

With the sudden and exponential growth in cell phone use, the telecommunication industry and

telecommunication towers have received a lot of publicity in recent years. Nowadays, everybody has a cell phone, and the need for telecommunication services has risen. Telecommunication towers are the only way to increase network reach and reliability. The towers that protect the panel antennas, telecommunication devices, platforms, and their foundations are analyzed and designed by civil engineers. Many of the devices, such as mounts, antennas, and other components, are installed on the tower, which necessitates civil engineering experience. Applied loads such as wind load, dead load, and construction strength of structural steel members on superstructure, including ties and base, are used in tower structural estimates. Telecommunication towers are divided into various categories depending on their structural action, cross-section, section types utilized, and tower placement. Based on their structural action, they are known as Monopole, Self-Support, or Guyed Towers. Monopoles are the most cost- effective for heights under 55 meters and are a feasible alternative for room constraints. As a result, monopole towers are in high demand in the telecommunications industry.

Monopole towers will accommodate both antennas at heights of 30 to 50 meters, extending the structure's reach. Monopole towers are versatile among structures due to their multipurpose use in contact, lighting, and other fields. Structure research can help a structure work better and last longer. A thorough examination of a monopole using modern technologies will result in an improvement in its structural capability.

REVIEW ON PREVIOUS RESEARCH

There is currently a lack of studies available concerning the monopole structural behavior and capacity to withstand new loads with new camouflaged technology this subject requires more in-depth analysis which is to be researched upon. LITERATURE SURVEY

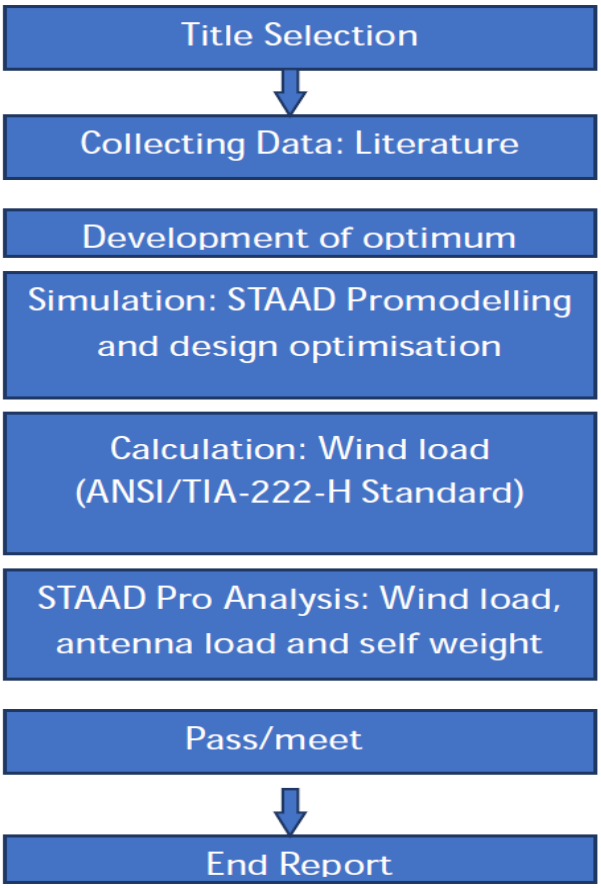
Following are some theories and researches carried out till now:

Riy Joseph ISSN2395-0095 & jobil vargese 2005 observed in their study that Telecommunication towers are tall structures installed at a specific height usually designed for supporting parabolic antennas. The structure engineer has the difficult task of planning and installing telecommunication towers that can reliably accommodate all

loads in open air. Lattice towers that stand alone are often seen all around the world. According to recent surveys, the number of cell towers will possibly exceed 5 lakh by 2020. Land for the construction of these traditional lattice towers is very challenging to come by in densely populated metropolitan areas. by civil engineers. Many of the devices, such as mounts, antennas, and other components, are installed on the tower, which necessitates civil engineering experience. Applied loads such as wind load, dead load, and construction strength of structural steel members on superstructure, including ties and base, are used in tower structural The steep rise in land valuation has necessitated the creation of an environmentally friendly alternative to traditional lattice towers. Environmental and economic stresses have prompted researchers to look for new ways to build contact towers that are both environmentally friendly and cost efficient. Monopole systems may be seen as a better other components, are installed on the tower, which necessitates civil engineering experience. Applied loads such as wind load, dead load, and construction strength of structural steel members on superstructure, including ties and base, are used in tower structural

M.Pavan kumar,P.Markhandrya Raju,M.Navyal and GT Naidu(2017): The two popular forms of telecommunication towers used in the building industry are monopole and self-supporting towers. For simple wind speeds of 33m/sec, 47m/sec, and 55m/sec, this paper compares Monopole and Self-

IV RESEARCH METHODLOGY



1. The second part studies are the analysis and design of camouflaged monopole structure which includes:

(a) To develop a finite element model for the analysis of monopole structure with and without camouflaged using staad pro v8i structural analysis software.

(b) Analysis and design of monopole are

going to performed for two different heights with two different wind speeds and compared.

(c) The problem is assumed to be a linear-static problem and analysis are going to performed for basic wind speeds of 44.44m/sec, 39m/sec and heights of 30m and 35m.

I. DESIGNStep 1: to conduct literature review on structural behavior of monopole with and without camouflaged after referring many journals and internet references.Step 2: to investigate the structural behavior of telecommunication monopole towers that have been camouflaged and those that have not. STAAD PRO V8I structural analysis software was used to create 3D computer models for each structure, and these models were used to analyze towers under wind loads.

II. Step 3: Following the preparation of two versions, wind analysis will be carried out using the most recent code for antenna towers, ANSI/TIA-222-H Structural Standard for Antenna Supporting Structures and Antennas, which is highly respected and widely utilized by both local and international tower designers for their designs and structural parameters.

1) Basic wind speed = 160 Km/hr. (3sec-Gust).

2) Limiting Monopole deflection to 1.0 degree under operational wind speed = 120 Km/hr.(3sec-Gust).

3) Structural class: II.

4) Topographic Category: I.

Load Combination

1) According to ANSI/TIA-222-H, Minimum design load combinations for structures

2) 1.2 D.L + 1.26 W.L (for section design)

3) 1.0 D.L + 1.0 W.L (for serviceability)

Wind load Wind load on the camouflaged monopole structure concealing the following Loads Loads: 1) 6 Nos. of Octaband antennas (2.769 x 0.369) at Top. 2) 3 Nos. 5 G Antennas (0.860 x 0.395x 0.190) at Top.

3) 24 Nos. RRUs as mentioned in STA.

4) 2 Nos. of 0.60 Dia MW antennas at Top. was used for the structural analysis and design of towers under wind loadings. And design of steel member as per LRFD.

V RESEARCH DESIGN

The aim of the proposed research is to review the comparative study & structural behavior of telecommunication monopole towers with and without camouflaged under the influence of wind load.

To achieve such aim the following objectives have been considered for the research work.

VI. IMPORTANCE OF THE PROPOSED RESEARCH

The proposed study is critical since structural

engineers face the difficult task of building and building telecommunication towers that can accommodate all loads under all environmental conditions with a high degree of durability. Lattice towers that stand alone are often seen all around the world. According to recent surveys, the world's mobile towers are expected to grow very quickly as a result of the introduction of 5G technology, which necessitates more antennas on the towers, with existing monopole towers already occupied with a large number of antennas and no structural capacity to withstand additional load on towers. VII. CONCLUSIONS Steel monopole systems are found in a variety of applications.This has a narrower plan dimension and is made up of a limited number of elements. In terms of property costs, they are more cost-effective. STAAD PROV8I was used to model the structure. The ANSI TIA/EIA 222-H code was used to calculate the load. Displacements and pressures may be investigated. Variation of findings with changes in model and the addition of camouflaged would be investigated. For the analysis, two different-height towers were used.

Analysis and design of new monopole with camouflaged is a challenge.

ACKNOWLEDGMENT

The authors wish to acknowledge the consulting & design engineering consultancy and my external and internal research guides for providing data which is used in this research. Also, anonymous review of this paper is gratefully thanked.

IV. REFERENCES

[1] CSC Siting Council of Connecticut. Facilities for Telecommunications. Version II, USA; 2017.
Saeed Alsamhi. Alsamhi. Service quality enhancement techniques in high altitude communication networks (HAP). Indian Technology Institute (Banaras Hindu University) Varanasi, India; 2015.
[2] Government of NSW. Telecommunications structure guidelines. Telco Authority, United States; 2015.Masts and Towers. Ulrik Støttrup-Andersen. Department Head of Market, Denmark, 2009. 2009.

Florea Dinu. Sustainable buildings amid natural hazards and disaster. European Erasmus [3] Universitatea Politechnica Timisoara, Master, Lecture 18: Towers, chimneys; 2014.

[4] The past, present and future of Smith BW and Støttrup-Andersen U. Tourers and masts. IASS Conference, Madrid, Spain; 1997. 1997.

[5] U. Masts and Towers for the UMTS network in Sweden, Støttrup-Andersen. Euro Steel, Netherlands Maastricht; 2005.

[6] Stott up-Andersen U. Masts and Tower Analysis and Design. Structural International Congress, San Francisco, USA; 1998. [7] IE 1991-1-4: 2007 [7] Eurocode 1: Structure activities General actions Part 1-4: wind measures (EC1-1-4). United States; 2010. 10.

[8] EN 1993-3-1: Eurocode 3 - Structures of steel - Part 3-1: Towers, masts and fireplaces - Towers and masts. United States;

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Analyzing and visualizing the data for prediction of the diabetics in the early stage using machine learning Tools and Microsoft Azure AI services

Chandrashekhar Kumbhar1, Dr. Abid Hussain 2,

Research Scholar School of Engineering and Technology, Career Point University Kota, Rajasthan India, mr.kshekhar@gmail.com

Dr. Abid Hussain School of Computer Applications, Career Point University Kota, Rajasthan, India, abid.hussain@cpur.edu.in

Abstract. In diabetes mellitus, the body's sugar levels are abnormally high over time. As a result, it damages a wide number of the body's systems, including the blood vessels and neurons. This illness has a high prognosis for early detection, which can help save human lives. Analysis of data involves obtaining and evaluating data in order to get insights that may be used for decision-making. Using charts, graphs, and other visualizations, huge data sets and metrics are visualized. In this paper we are going to see the Data visualization and analysis, on the basis that will Recommend some of algorithms and techniques to predict the diabetics in the early stage. To understand the data, we have used RapidMiner and Azure platform.

Keywords: RapidMiner, Azure, Diabetics, Machine learning, Analysis, Analytics.

1 Introduction

Around the world, numerous chronic illnesses are widespread, both in developing as well as industrialised countries. diabetes is a metabolic disease that affects blood sugar levels by increasing or decreasing the quantity of insulin produced. [2]Human bodily components such as the eyes, kidneys, heart and nerves are all affected by diabetes. So, we have collected the data through a google form from end user and from one of reputed pathology lab in pune. [3]Before actually implementation we have decided to perform data analysis and visualization to understand data in depth. When it comes to data analysis, it is described as the process of cleansing, converting, and modelling data to uncover usable information for corporate decision-making. As a result of the data analysis, a choice may be made. It is the graphic depiction of information and data that is known as data visualization. These tools make it easier to examine and comprehend data by making use of visual components such as charts, graphs, maps, and graphs.
We have used RapidMiner Studio and free Azure AI service to pre-process the data and visualize it.

2 Dataset Sample

We have collected a data through google form, the attributes we have considered those are whether person have diabetics, the HBA1C, family background, Type of diabetics (if any), symptoms, issues, Health problem, Weight changes.

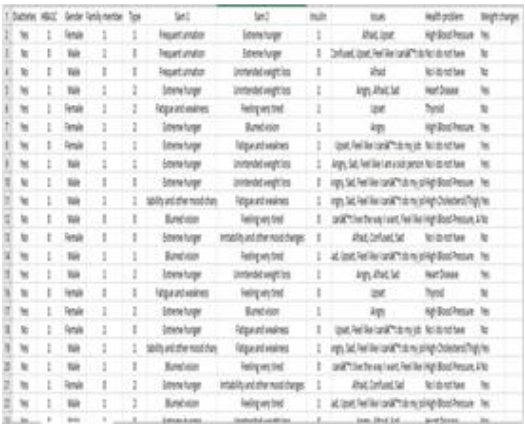


Figure 1: Dataset

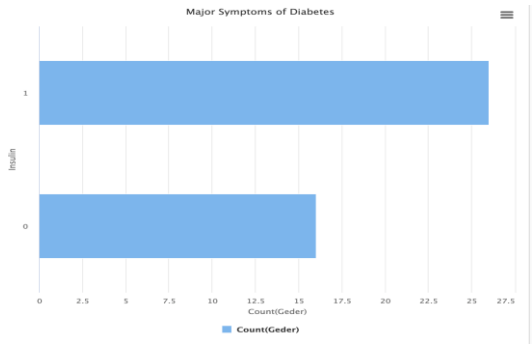


Figure 2: Bar Plot

We found that few attributes are polynominal, Integer (according to RapidMiner) or we can say categorical and numerical as per the dataset. So, we decided to use RapidMiner and examine it.

3 2D Scatterplot

One of the most common types of graphs, scatter plots, are typically used to visualize relationships between data. Dots are used to symbolise the values of variables. Hence, scatter plots employ Cartesian coordinates to represent the values of the variables in a data set by placing dots on the vertical and horizontal axes. Scatter plots are also known as scattergrams, scatter graphs, or scatter charts.

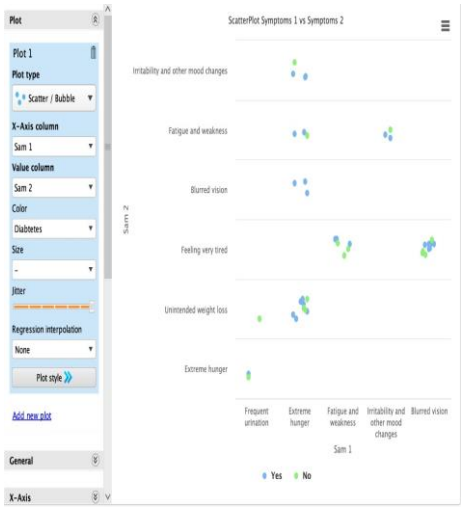


Figure 3: 2D Scatterplot

As we can see we have Symptoms 1 as X- Axis and Symptoms 2 as Y- Axis and come to know that Extreme hunger and Unintended weight loss are important and most affected parameters in diabetic's case. As well as blurred vision and feeling very tired are correlated with each other.

4 3D Scatter plot

To demonstrate the link between three variables, data points are plotted on three axis using 3D scatter plots. Data table rows are represented by markers whose location depends on the values of their columns on X, Y, and Z-axes. Each marker represents one row. You may build up a fourth variable based on the colour or size of your markers, which adds a whole new depth to your plot!

Here we have used again Symptoms 1, Symptoms 2 and Diabetics as X, Y and Z axis. We can find the person having diabetics and faced these kinds of symptoms.

5 Bar plot (Insulin)

In a bar plot or bar chart, rectangular bars with lengths and heights proportionate to the numbers they represent are used to depict a category of data. Vertical or horizontal bar graphs are available. Compare distinct categories with each other using a bar chart Plotting shows particular categories to compare, with measured values for each of those categories on one side.

As per the ratio of dietetics in India there are Males showed a prevalence of diabetes (12%) as females (11.7%), the survey said. So here we have shown the count of female and male attributes to understand in broad way.

6 Pie chart

In a pie chart, data is shown in a circular graph. All of the graph's components are in proportion to how much of each category there is. That is to say, the size of each piece of the pie depends on the size of the category in the group as a whole. Each slice symbolises a little piece of the pie as a whole.

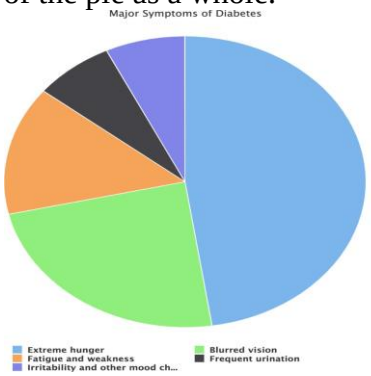


Figure 4: Pie chat

Here we come into the conclusion that from collected dataset Sometime Extreme hunger and Blurred vision are the most popular symptoms. If the person having the these above kind of symptoms and any of the symptoms may have chance of diabetics in future.

7 Proposed Algorithms

As per the analysis and visualization of dataset we come to conclusion that we do have labelled data and can go with the supervised machine learning algorithms. I.e., KNN, Random Forest. The implantation of this algorithm can be done in RapidMiner and Azure Machine learning Studio.

8 Conclusion

The data analysis and visualization are the key concept / terms of machine learning project. If you analyses and visualize the data, it tells you the truth behind it I.e. what type of data it is, how we can tackle with data, [4]how to pre-process it and which algorithm should we apply on it. So, we have proposed few algorithms on the basis our analysis and visualization. In the future will apply those algorithms and predict the result.

References

[1]. Ertek, G., Tapucu, D., & Arin, I. (2013). Text mining with rapidminer. RapidMiner: Data mining use cases and business analytics applications, 241.

[2]Han, J., Rodriguez, J. C., & Beheshti, M. (2008, December). Diabetes data analysis and prediction model discovery using rapidminer. In 2008 Second international conference on future

generation communication and networking (Vol. 3, pp. 96-99). IEEE.

[3]. Hofmann, M., & Klinkenberg, R. (Eds.). (2016). RapidMiner: Data mining use cases and business analytics applications. CRC Press

[4]. Indoria, P., & Rathore, Y. K. (2018). A survey: detection and prediction of diabetes using machine learning techniques. International Journal of Engineering Research & Technology (IJERT), 7(3), 287-291

[5]. Islam, M. A., & Jahan, N. (2017). Prediction of onset diabetes using machine learning techniques. International Journal of Computer Applications, 180(5), 7-11

[6]. Kaur, H., & Kumari, V. (2020). Predictive modelling and analytics for diabetes using a machine learning approach. Applied computing and informatics

[7]. Kotas, C., Naughton, T., & Imam, N. (2018, January). A comparison of Amazon Web Services and Microsoft Azure cloud platforms for high performance computing. In 2018 IEEE International Conference on Consumer Electronics (ICCE) (pp. 1-4). IEEE.

[8]. Kumar Dewangan, A., & Agrawal, P. (2015). Classification of diabetes mellitus using machine learning techniques. International Journal of Engineering and Applied Sciences, 2(5), 257905

[9]. Kumari, V. A., & Chitra, R. (2013). Classification of diabetes disease using support vector machine. International Journal of Engineering Research and Applications, 3(2), 1797-1801

[10]. Priya, R., & Aruna, P. (2013). Diagnosis of diabetic retinopathy using machine learning
techniques. ICTACT Journal on soft c

[11]. Malešev, M.; Radonjanin, V.; Marinkovi´c, S. Recycled concrete as aggregate for structural concrete production. Sustainability 2010, 2, 1204–1225.

[12]. Shin, M.; Kim, K.; Gwon, S.W.; Cha, S. Durability of sustainable sulfur concrete with fly ash and recycled aggregate against chemical and

weathering environments. Constr. Build. Mater. 2014, 69, 167–176.

[13]. Tam, V.W.Y.; Soomro, M.; Evangelista, A.C.J. A review of recycled aggregate in concrete applications (2000–2017). Constr. Build. Mater. 2018, 172, 272–292.

[14]. Wijayasundara, M.; Mendis, P.; Crawford, R.H. Methodology for the integrated assessment on the use of recycled concrete aggregate replacing natural aggregate in structural concrete. J. Clean. Prod. 2017, 166, 321–334.

[15]. Shin, M.; Kim, K.; Gwon, S.W.; Cha, S. Durability of sustainable sulfur concrete with fly ash and recycled aggregate against chemical and weathering environments. Constr. Build. Mater. 2014, 69, 167–176.

[16]. Tam, V.W.Y.; Soomro, M.; Evangelista, A.C.J. A review of recycled aggregate in concrete applications (2000–2017). Constr. Build. Mater. 2018, 172, 272–292.

[17]. Verian, K.P.; Ashraf, W.; Cao, Y. Properties of recycled concrete aggregate and their influence in new concrete production. Resour. Conserv. Recycl. 2018, 133, 30–49.

[18]. Wijayasundara, M.; Mendis, P.; Crawford, R.H. Methodology for the integrated assessment on the use of recycled concrete aggregate replacing natural aggregate in structural concrete. J. Clean. Prod. 2017, 166, 321–334.omputing, 3(4), 563-575.

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Evaluation On The Utilization Of Concrete: A Study On Recycled Concrete Aggregate

Rahul Kharatmal & Dasari Vijay kumar

sonyrahul123@gmail.com

Abstract A significant part of the planet's infrastructure is worked using concrete. Due to the complicated relationship between concrete and climate and the failure to maintain properly, many concrete buildings are in a state of disintegration. As demolition is progressively increasing, it is essential that demolition trash be effectively re-used to monitor non- renewable natural resources. The reuse of concrete demolition debris as a rough aggregate for fresh concrete might work with its extensive use. Reuse of concrete debris is a potential route to practical progress. The substitution of natural aggregates with recycled aggregates from concrete waste undoubtedly reduces the ecological impact of concrete projects and further enhances conservation of natural resources. The use of recycled concrete aggregates (RCAs) as half way concrete and as complete replacements of natural coarse aggregates increases interest in the development industry, while it decreases desire for virgin aggregates. The use of RCA also offers a possible solution to the environmental problem of concrete waste and diminishes the negative ecological impact of aggregate natural resource exploitation. This research investigates the use and characteristics of recycled concrete aggregates.

Keywords: Concrete, Natural Coarse Aggregate, Recycled Concrete Aggregate, Durability, etc.

I INTRODUCTION

The demolition of old and new buildings are common occurrences owing to changing purposes, structural deteriorations, urban rearrangements, traffic growth and natural catastrophes. The environmental effect of concrete buildings is enormous. Recycling of concrete building debris for the production of recycled concrete aggregates may thus reduce environmental degradation. Indeed, the use of C&DW as alternatives for the manufacture of fresh concrete increases conservation of natural resources, lowers waste disposal and supports the sustainability of building. The physical characteristics of recycled aggregates (RA) rely on the quality and quantity of cement mortar attached. In fact, the amount of attached morter rises as the RA size decreases. The crushing process also changes the quantity of mortar adhered to. Because of this mortar, RA has a greater absorption of water and lesser density than natural ones. The unhydrated cement on the RA surface may also change the propagation characteristics of concrete and fracture.

Most research on recycled aggregate concrete used nominal mixtures, while others emphasized the partial substitution of recycled aggregates. Many studies utilize recycled aggregates directly to

take different maximum aggregate sizes in the RAC compared to the

parent concrete. Maximum size of the aggregate in parent and RAC should be maintained the same for a reasonable comparison.

Sustainable development is now an important problem worldwide. The idea of sustainability was originally introduced at the Earth Summit in Rio de Janeiro, Brazil in 1992 and has now become a guiding principle for the global building sector. In the building industry, recycling and reuse of concrete debris may be an efficient method to achieve sustainability. In reality, several governments across the globe have lately adopted different policies to reduce the use of natural aggregates and increase waste recycling as aggregates wherever it is appropriate from a technical, economic or environmental point of view.

I. PURPOSE OF AGGREGATE

The aim of the aggregate is to increase the amount of a concrete mix while ensuring that minimal air is trapped within the buildings. The material in the aggregate has various shapes and sizes, enabling it to conform tightly. The bigger, grosser aggregates provide a skeletonal framework for the combination. Smaller particles fill the areas between these bigger particles and, in turn, particles fill the gaps between the fillers even less quickly. Finally, the tiniest spaces in the aggregate are filled with concrete particles, keeping the whole structure together. This characteristic demonstrates that the better the overall distribution, the stronger the concrete building will be; nevertheless, the optimal quantity of recycled material that should be added to the concrete mix must be kept in mind. Changes in the mix may lead to a total reduction in the structural strength, which is why recycled aggregates are still most suitable for bases and subsoils.

II. RECYCLED CONCRETE AGGREGATE

The removed concrete is frequently seen as useless and disposed of as demolition trash after the destruction of ancient roadways and structures. Recycled concrete aggregate (RCA) is produced by collecting and breaking up the old concrete.

Figure 1: Recycled concrete aggregates (RCA)

RCA is still a relatively new technology in new building applications. Buck (1977) From the beginning of the RCA to the conclusion of the Second World War, when buildings and roads were over demolished and the demand was great for both the disposal of trash and the restoration of Europe. "The usage of RCA decreased down after the urgent necessity to recycle concrete." In the 1970s, the United States reintroduced the use of RCA for non- structural applications like as filling material, foundations and base materials (Buck 1977). Since then, some study has been carried out on the

feasibility of RCA as an alternative to replace underutilized natural aggregates (NA) in structural concrete.

One of the major reasons for using RCA in building concrete is to make building greener and more ecologically friendly. Some significant environmental problems connected with building include that construction takes 50 percent of natural raw materials, uses 40 percent of total energy and generates 50 percent of total trash as stated by Oikonomou (2005). Using large-scale RCA may assist to minimize the impact of the building on these variables by recycling waste materials and avoiding the collection of additional NA.

The aggregate of recycled concrete is formed of used concrete from sites of demolition. The amount of old concrete from a site of demolition depends on the construction type. For example, the following list illustrates the proportion of concrete for different kinds of buildings.

- School 68%
- Housing 47%
- Leisure 50%

The Process to Produce Recycled Concrete Aggregate

- Remove the concrete elements such as the floors, frame and walls and move to one site for sorting.
- Remove as much material from the building before demolition that can cause contamination, asbestos for example.
- Crush the concrete with a jaw crusher, impactor or cone crusher. Small pieces of scrap metal often go through the concrete crusher. After processing, it can be removed using an electromagnet.
- Remove any glass, wood, plastic and metal. The use of an electromagnet can remove steel, including rebar.

The concrete may go through a jawbreaker first, then an impactor and finally sorted using a screener. The screener will stockpile the crushed concrete into aggregate size, for example, 25mm 12mm 5mm to dust.

In general, applications without any processing include:

- bank protection
- many types of general bulk fills
- noise barriers and embankments
- road construction
- base or fill for drainage structures.

Recycled concrete aggregate presents numerous benefits:

- Reduced costs, since it doesn't need to be mined
- Increased protection from seepage
- Reduced space wastage in landfills
- Preserves natural resources such as gravel, water, coal, and oil
- Reduced environmental impact, more appealing to governments and customers

As with everything, the aggregate also presents certain risks that constructors should be aware of:

- The aggregate must be refined. Otherwise, it could lead to various challenges. A prime example of that is the use of recycled concrete for Highway 427. The presence of deleterious materials, i.e., gypsum, wallboard, drywall, and plaster found in the final cast were due to unrefined concrete aggregate, leading to cracks in between lanes, as well as an uneven road surface.

- If a high concentration of aggregate is used, the structural integrity of the casts fails, leading to cracks and numerous faults within the structure.

- Visual inspection is necessary to ensure the mix is refined.

- Supplements need to be added to make the final cast as strong as it can be with natural aggregate.

- Brittle concrete might be mixed within the aggregate, leading to uneven grading.

Recycled concrete aggregates provide many different benefits, among which safety and durability are the most obvious. However, taking into account the difficulties of the use of the concrete aggregate in overlays, the use of recycled concrete for bases and sub-bases is strongly recommended.

III. UTILIZATION OF RECYCLED CONCRETE AGGREGATE

The increasing rate of urbanization in India is very rapid because of industrialisation. India's growth rate reaches 9 percent of GDP. Rapid growth of infrastructure needs huge quantities of building materials, land requirements and location. Beton is recommended for big buildings, because it has longer life, reduced maintenance costs and improved performance. Smaller buildings have been destroyed and new ones have been built to achieve the GDP rate. Environmental protection is a fundamental element that is closely linked to the survival of the human species. Parameters such as environmental awareness, natural resource preservation and sustainable development have a significant role to play in contemporary construction job requirements. The destroyed materials are thrown on the ground and not utilized for any purpose as a result of modernisation. Such conditions impact soil fertility. According to a March 2007 Hindu web article, India produces 23.75 million tons of demolition debris per year. According to the Central Pollution Control Board (CPCB) study, 48 million tons of solid waste are produced in India, of which 14.5 million tons of trash are manufactured from the construction waste industry, of which only 3% is deposited.

70-75 percent of aggregates are needed for concrete manufacturing. Of this 60-67% are aggregate, of course, and 33-40% are fine aggregate. According to recent study conducted by the group Fredonia, worldwide demand for building

aggregates is expected to reach 26 billion tons by 2012. The maximum user is responsible for this requirement China 25%, Europe 12% & USA 10%, India is also among the top 10 users. From an environmental point of view, emissions for the manufacture of natural aggregates of 1 ton are 0.0046 million tons of carbon, while only 0.0024 million tons of carbon is generated for the 1ton recycled aggregate. Taking account of the worldwide use of 10 billion tons/year of concrete aggregate, the carbon footprint can be measured for both the natural aggregate and the recycled aggregate. Of the entire trash destruction for the building, 40% consists of concrete, 30% of ceramics, 5% of plastics, 10% of timber, 5% of metal and 10% of various mixes. Global insight has shown the development of the global building industry forecasts a $4800 billion rise in construction expenditure in 2013. These statistics show a huge increase in the building industry, almost
1.5 times in 5 years.

In general, using recycled aggregates increases the drying shrinkage and porosity to water and reduces the compression strength of concrete in comparison to native aggregate concrete. It is around 10-30 percent per aggregate replacement. Recycling reduced costs for dumping in public/private disposal facilities by about 34-41 percent and CO2 emissions (LCCO2) by around 23-28 percent.

There are various reasons that encourages the use of crushed concrete which include:

- Crushed concrete aggregate makes projects sustainable
- It provides a low-cost alternate solution to crushing natural raw materials.
- Takes less energy than mining new.
- It reduces the of natural aggregate depletion
- Concrete produced with crushed concrete aggregate has smaller carbon footprint

Due to appropriate quality control and mixing and inclusion of pozzolanic additives RCA may be used in high performance and high resistance structural cement. It has been observed that poverty imposes certain restrictions which contribute to delays and occasionally a lack of programs. Cost problems are restricted by the difficulties of using safe alternatives such as aggregate recycling that are ecologically acceptable and adequate. The front-loading and top- hopping industries may in particular be utilized to minimize extra RCA expenses. However, the price and supply and demand elements of recycled materials seldom face different difficulties.

IV. CONCLUSION

Recovered damaged concrete offers a considerable value-added potential to optimize environmental and economic advantages. Major savings may be made by making RCA a useful resource in the new concrete production. The use of recycled aggregates in construction substantially saves energy and the cost of transport of natural materials and excavations. This in turn immediately lowers the environmental effect of waste

material. The concept of utilizing existing manufacturing facilities to manufacture recycled concrete aggregates is incorrect, because due to the particular requirements of the halls the construction manager may induce unnecessary extra expenses. Many studies show that concrete produced using such gross aggregates may have mechanical characteristics comparable to conventional concretes and even high-strength concrete is now feasible for this ecologically friendly technique. "The workingability of concrete using natural and recycled aggregates has been shown to be nearly same when water-saturated dry surface recycled aggregates are utilized." In addition, when dry recycled aggregates are utilized and extra amounts of water are supplied during mixing, after a specified period the same operability may be obtained. The bulk density of new concrete decreases somewhat, with the amount of recycled aggregate increasing.

V REFERENCES

[1]. Abdel-Hay, A.S. Properties of recycled concrete aggregate under different curing conditions. HBRC J. 2017, 13, 271–276.

[2]. Abdulmatin, A.; Tangchirapat, W.; Jaturapitakkul, C. Environmentally friendly interlocking concrete paving block containing new cementing material and recycled concrete aggregate. Eur. J. Environ. Civ. Eng. 2019, 23, 1467–1484.

[3]. Al-Bayati, H.K.A.; Tighe, S.L. Effect of Recycled Concrete Aggregate on Rutting and Stiffness Characteristics of Asphalt Mixtures. J. Mater. Civ. Eng. 2019, 31, 04019219.

[4]. Al-Bayati, H.K.A.; Tighe, S.L.; Achebe, J. Influence of recycled concrete aggregate on volumetric properties of hot mix asphalt. Resour. Conserv. Recycl. 2018, 130, 200–214.

[5]. Bui, N.K.; Satomi, T.; Takahashi, H. Mechanical properties of concrete containing 100% treated coarse recycled concrete aggregate. Constr. Build. Mater. 2018, 163, 496–507.

[6]. Cho, Y.H.; Yun, T.; Kim, I.T.; Choi, N.R. The application of Recycled Concrete Aggregate (RCA) for Hot Mix Asphalt (HMA) base layer aggregate. KSCE J. Civ. Eng. 2011, 15, 473–478.

[7]. Kenai, S. Recycled aggregates. In Waste and Supplementary Cementitious Materials in Concrete; Woodhead Publishing: Cambridge, UK, 2018.

[8]. Lee, C.H.; Du, J.C.; Shen, D.H. Evaluation of pre-coated recycled concrete aggregate for hot mix asphalt. Constr. Build. Mater. 2012, 28, 66–71.

[9]. Li, W.; Xiao, J.; Sun, Z.; Kawashima, S.; Shah, S.P. Interfacial transition zones in recycled aggregate concrete with different mixing approaches. Constr. Build. Mater. 2012, 35, 1045–1055.

[10]. Malešev, M.; Radonjanin, V.; Marinkovi´c, S. Recycled concrete as aggregate for structural concrete production. Sustainability 2010, 2, 1204–1225.

[11]. Shin, M.; Kim, K.; Gwon, S.W.; Cha, S. Durability of sustainable sulfur concrete with fly ash and recycled aggregate against chemical and weathering environments. Constr. Build. Mater. 2014, 69, 167–176.

[12]. Tam, V.W.Y.; Soomro, M.; Evangelista, A.C.J. A review of recycled aggregate in concrete applications (2000–2017). Constr. Build. Mater. 2018, 172, 272–292.

[13]. Verian, K.P.; Ashraf, W.; Cao, Y. Properties of recycled concrete aggregate and their influence in new concrete production. Resour. Conserv. Recycl. 2018, 133, 30–49.

[14]. Wijayasundara, M.; Mendis, P.; Crawford, R.H. Methodology for the integrated assessment on the use of recycled concrete aggregate replacing natural aggregate in structural concrete. J. Clean. Prod. 2017, 166, 321–334.

Career Point International Journal of Research(CPIJR)
©2022 CPIJR ISSN :2583-1895

Digital Marketing For Small Businesses

Sanjeev Suwalka Devendra Chaturvedi

[1]School of Computer Applications, Career Point University Kota,
Rajasthan

Abstract Whether you run an ecommerce enterprise or conventional brick-and-mortar store, virtual advertising and marketing has turn out to be crucial for any and all businesses. With the steady increase and recognition of various technologies, social media systems, and online-primarily based totally communication, it's extra critical than ever that enterprise proprietors make investments withinside the proper virtual advertising and marketing techniques to sell their manufacturers and stay aggressive withinside the marketplace.

Trying to craft a virtual advertising and marketing method may be difficult—after all, virtual advertising and marketing encompasses such a lot of extraordinary aspects of the net world. It's critical to bear in mind, however, that your enterprise doesn't want to attempt to cowl all the regions of virtual advertising and marketing. On the alternative hand, it's very in all likelihood you'll be extra a hit that specialize in some techniques (specially whilst you're simply beginning out) and seeing how they paintings to your enterprise.

With this in mind, whether or not you're a startup, installed enterprise, or virtually a virtual advertising and marketing beginner, you could confer with the subsequent virtual advertising and marketing recommendations to assist sell your enterprise online.

I Introduction

Optimize your internet site for cell. There's no question approximately it, cell advertising and marketing has turn out to be extra applicable than ever—with increasingly more customers surfing and making purchases the use of their smartphones or tablets. Although making an investment in cell-unique advertising and marketing can require a widespread investment, specially in case you're simply beginning out in virtual advertising and marketing, you could take step one via way of means of making sure that your enterprise's internet site is optimized for cell.

Luckily, maximum internet site builders, like Squarespace or Wix, in addition to committed ecommerce systems, like Shopify and BigCommerce, have achieved the tough

paintings for you.

These gear commonly provide topics and templates which might be already cell-friendly. Therefore, all you need to do is make certain that you're the use of this type of templates and as you upload or alternate your internet site, test to look how matters appearance and feature on a cell device.

Moreover, in case you've already paid for a internet site builder or ecommerce platform, this could be an incredibly low-value virtual advertising and marketing tip. You'll simplest want to spend extra cash in case you need to put money into a paid subject or make use of different non-blanketed gear.

1. Create a Google My Business list.

One of the handiest (and free) virtual advertising and marketing recommendations we will

percentage is to create a "Google My Business" list. If you're unusual with this list, virtually carry out a Google seek of a enterprise (as we've achieved in the instance below). As you could see, at the proper-hand side, there's a list with primary facts approximately the enterprise, which includes the address, hours, tele cell smartphone number, hyperlink to the internet site, and extra.

This list, referred to as a Google My Business list, is an incredibly beneficial manner to offer capacity or contemporary clients with crucial facts approximately your enterprise. To edit the list, all you need to do is declare your list (if one already exists) or create one to your enterprise.

Once you've finished your list, you've got got a long-lasting virtual advertising and marketing method at paintings via Google—don't forget, though, if any of this facts approximately your enterprise changes, you'll need to replace your list to mirror the ones changes.

In fact, you could confer with our manual to analyze extra approximately the way to optimize your Google My Business list.

2. Understand your clients and your audience for virtual advertising and marketing. As you in all likelihood know, a key to advertising and marketing, in general, is knowing your clients: Who are they? What are their likes, dislikes, preferences? What do they reply to?

This equal precept applies to virtual advertising and marketing. In order to have a a hit virtual advertising and marketing method, you now no longer simplest want to apprehend your clients,

however additionally who your clients are online. To this point, your audience for virtual advertising and marketing is probably a touch extraordinary than your audience for phrase of mouth or junk mail

advertising and marketing.

As an example, in case you run a nearby brewery that still ships and distributes across the country, your virtual advertising and marketing efforts is probably extra targeted at the target target market you don't generally attain together along with your brick-and-mortar location. In this case, you'll need to apprehend your non-nearby audience and what techniques could be much more likely to attain them and inspire them to engage and buy out of your enterprise.

Of course, your audiences would possibly overlap, relying for your man or woman enterprise, however it's critical to bear in mind that extraordinary clients are extra energetic on extraordinary systems as well—

the target target market you're seeking to attain on Instagram won't always be the equal one you're advertising and marketing to via email—so you'll need to investigate and put in force your procedures accordingly.

3. Invest in nearby advertising and marketing.

Jumping off our closing tip, in case your enterprise operates in a nearby market, you'll need to take gain of the virtual advertising and marketing techniques that especially attraction and relate to that target target market.

In addition to developing a Google My Business list, you could additionally declare and edit your enterprise list on different nearby seek directories, like Yelp or Bing locations for enterprise. Similarly, you could don't forget different nearby advertising and marketing techniques, such as:

Creating Google or social media advertisements concentrated on your geographic area. Implementing a junk mail marketing campaign for your nearby area. Hosting or taking part in a network event.

Although a number of those techniques fall a touch out of doors the area of virtual advertising and marketing, you could effortlessly tie them in via way of means of which includes your enterprise's internet site and social media handles on any substances or facts you provide out round your nearby network.

4. Start a weblog and comprise content material advertising and marketing into your search engine optimization method.

Content advertising and marketing is simply one aspect of virtual advertising and marketing as a whole—however if achieved proper, it may make a large effect for your capacity to draw clients and force sales. This being said, one of the handiest methods to get worried in content material advertising and marketing is to create a weblog for your enterprise's internet site.

On your weblog, you could write approximately subjects associated with your enterprise, displaying your understanding and presenting useful facts—each of with a view to force human beings on your internet site, in addition to assist your seek rankings

5. Find the social media channel that's pleasant desirable to your enterprise.

Just like content material advertising and marketing, social media advertising and marketing is some other offshoot of the bigger realm of virtual advertising and marketing—and an critical one at that. After all, small enterprise advertising and marketing facts display that 74% of customers rely upon social media to manual shopping decisions.

This being said, however, social media is complicated, continually changing, and might require lots extra attempt than you may think. Therefore, in preference to seeking to excel on all social media systems, you may do this low-value virtual advertising and marketing tip: Determine the social media channel that's pleasant to your enterprise and recognition your strength there.

As an example, in case you're beginning an internet boutique, you may discover that Instagram (with an emphasis on images) is the social media platform that's maximum in all likelihood to achieve success to your virtual advertising and marketing techniques, in preference to Facebook or LinkedIn. All in all, this doesn't imply you have to exclude different channels, however specially whilst you're beginning out, you may determine to recognition on a unmarried platform that appeals on your perfect consumer and take a look at extraordinary procedures.

6. Encourage clients to go away on line opinions.

One of the nice and absolutely loose virtual advertising hints? Encourage clients to go away on line opinions and slight your enterprise's profile on overview sites.

Similar to claiming your enterprise list on Google or any other nearby site, you could declare your enterprise profile on overview sites, together with Yelp, TrustPilot, and others. You can use signage on your area and hyperlinks in your internet site or on your emails to inspire your clients to put in writing opinions of your enterprise.

Then, you'll need to display your opinions and fast reply to any opinions which can be negative. Ideally, you'll need to attempt to hold a score of 4 stars or above.

All of this being said, ultimately, the wins you

could advantage from this tactic are twofold. First, you could preserve to construct a rapport and engage with current clients, and second, you could use their opinions to draw and have an impact on different cappotential clients to traveling or shopping out of your enterprise.

7. Create a dependable e-mail listing and leverage e-mail advertising.

Email is one of the only virtual advertising methods out there. Whether they're customers or
enterprise buyers, and irrespective of what their age, pretty much all and sundry tests their e-mail.

Therefore, to take benefit of the opportunities of e-mail, the primary component you'll need to do is construct a dependable e-mail listing. Email advertising is wonderful, however isn't really well worth almost as a whole lot in case you don't have the proper human beings to e-mail. If you don't presently have an e-mail listing, there are quite a few lead era techniques that you could hire to begin accumulating records (together with e-mail addresses) approximately current and cappotential clients.

After you've got got a stable e-mail listing, then you could begin the use of it on your benefit. You may start via way of means of developing a month-to-month e-mail e-newsletter or sending out normal messages with unique offers, news, and discounts.

Depending at the manner you collect your e-mail listing and the platform you operate to ship emails, that is any other extraordinarily low-value virtual advertising tip—and one with the intention to stay
beneficial as you construct on it.

Consult our manual to examine extra approximately constructing an powerful e-mail advertising method.

8. Use virtual marketing and marketing to marketplace on your goal audience.

Although a number of the virtual advertising hints we've reviewed up to now contain natural search engine optimization and social media techniques, it's vital to keep in mind that those methods have limits. Most notably, the opposition and inflow of promotions and posts could make status out withinside the virtual sphere hard, particularly for startups or beginners.

Therefore, in case you're inclined to spend a bit cash, it's really well worth searching into virtual marketing and marketing—whether or not on social media, on Google, or on different websites—to make sure that your enterprise is moving into the front of the proper audience. With any of those virtual marketing and marketing options, you'll have the capacity to pick out the proper keywords, goal your precise audience, and hone in on the ones

potential clients who're maximum in all likelihood to need what you sell.

Along those lines, you could use virtual marketing and marketing to goal clients on your nearby area, in a selected age range, in a gap marketplace, and extra. As an example, if making a decision to promote it on Facebook, you'll be capable of use the Facebook Ads platform—which permits you to get very granular approximately in which you area your advertisements and who sees them.

Plus, once you get began out marketing and marketing via special virtual channels, you'll then be capable of take benefit of the retargeting equipment supplied via way of means of lots of those platforms. With retargeting equipment, you'll have the ability to expose your advertisements
especially to customers who've already interacted with or bought out of your enterprise—in addition to growth the personalization that's concerned together along with your virtual advertising and marketing and marketing techniques.

9. Spend wisely.

As we've cited all through this manual, it may be beneficial to put money into low-value and loose virtual advertising hints, particularly whilst you're simply beginning out. To this point, even though
advertising is important to drawing in and attracting clients, it may be hard to dedicate a big finances to those efforts.

Therefore, developing a advertising and marketing and marketing finances is important—and as you draft this finances, you'll need to suppose cautiously approximately in which you dedicate your
funds. For example, as we cited above, virtual marketing and marketing may be a wonderful manner to attain your goal audience, however, this form of small enterprise marketing and marketing
expenses cash and it may effortlessly turn out to be expensive, particularly in case you don't cross approximately it withinside the proper manner.

This being said, as you try and determine in which to allot spend in your virtual advertising efforts, it could be useful to begin with the fundamentals and cross from there. The "fundamentals" may encompass such things as launching and optimizing your enterprise internet site, putting in place your social media profiles, and constructing an e-mail listing.

Once you've finished the essential responsibilities to set up your virtual presence—and spent cash (if essential) to do so—then you could begin branching out and investigating different methods that could require extra finances.

10. Don't overlook approximately customer support—reply to on line comments fast.

When you're running withinside the virtual world, it may be smooth to experience disconnected from others and overlook the customer support practices which you might adhere to in case you have been interacting with customers in-person. Customer service, however, is a important a part of virtual advertising—and may be a figuring out component in attracting (and possibly extra importantly) keeping clients.

So, in case you're trying to put in force notable customer support via your virtual platforms, you may begin via way of means of developing a touch web page in your internet site in which clients can discover the way to touch you. Then, you'll need to make certain to reply very well and directly to any requests, questions, or remarks you get hold of from clients.

Additionally, you may determine to put money into a chatbot service, which may be a mainly beneficial customer support device for ecommerce businesses, in addition to large set up
businesses.

Moreover, as soon as you've decided how you're going to put in force customer support digitally, then you could encompass those services as a part of your price proposition. When you marketplace your agency on line, you could offer records approximately your customer support—making your enterprise extra approachable and proper for cappotential clients.

11. Monitor your campaigns and alter your method primarily based totally in your learnings.

Finally, the remaining of our pinnacle virtual advertising hints is possibly one of the maximum significant: Don't be frightened of trial and error—display your virtual advertising techniques and alternate or adapt them as essential. It's vital to keep in mind that now no longer all your methods can be successful, however that doesn't imply you've failed—it truly way you've observed what doesn't work.

A big a part of your on line advertising efforts will contain trying out and attempting new matters for you to decide what works in your enterprise.

As an example, you may release a Facebook advertisements marketing campaign for a brand new product you're launching and locate that it doesn't do almost in addition to you hoped. With those learnings, you could determine how you could edit or alternate the marketing campaign subsequent time, or, you may locate that Facebook isn't the nice platform for that form of marketing campaign.

Reference

1. Y. Ampatzidis, L. De Bellis, and A.

Luvisi, "iPathology: robotic applications and management of plants and plant diseases," Sustainability, vol. 9, no. 6, p. 1010, 2017.

2. A. Breukers, D. L. Kettenis, M. Mourits, W. V. D. Werf, and A. O. Lansink, "Individual-based models in the analysis of disease transmission in plant production chains: an application to potato brown rot," Academy of Sciences, vol. 90, no. 1–3, pp. 112–131, 2006.
3. S. Ghosal, D. Blystone, A. K. Singh, B. Ganapathysubramanian, A. Singh, and S. Sarkar, "An explainable deep machine vision framework for plant stress phenotyping," Proceedings of the National Academy of Sciences, vol. 115, no. 18, pp. 4613–4618, 2018.
4. E.-C. Oerke, "Crop losses to pests," The Journal of Agricultural Science, vol. 144, no. 1, pp. 31– 43, 2006.
5. X. E. Pantazi, D. Moshou, and A. A. Tamouridou, "Automated leaf disease detection in different crop species through image features analysis and One Class Classifiers," Computers and Electronics in Agriculture, vol. 156, pp. 96–104, 2019.
6. J. G. A. Barbedo, "Factors influencing the use of deep learning for plant disease recognition," Biosystems Engineering, vol. 172, pp. 84–91, 2018.
7. G. Geetharamani and J. Arun Pandian, "Identification of plant leaf diseases using a nine-layer deep convolutional neural network," Computers & Electrical Engineering, vol. 76, pp. 323–338, 2019.
8. P. F. Konstantinos, "Deep learning models for plant disease detection and diagnosis," Computers & Electrical Engineering, vol. 145, pp. 311–318, 2018.
9. V. Singh and A. K. Misra, "Detection of plant leaf diseases using image segmentation and soft computing techniques," Information Processing in Agriculture, vol. 4, no. 1, pp. 41–49, 2017.
10. S. P. Mohanty, D. P. Hughes, and S. Marcel, "Using deep learning for image-based plant disease detection," Frontiers in Plant Science, vol. 7, p. 1419, 2016.
11. Y. Guo, X. Hu, Y. Zou et al., "Maximizing E-tailers' sales volume through the shipping-fee discount and product recommendation system," Discrete Dynamics in Nature and Society, vol. 2020, pp. 1–14, 2020.

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Optimization Process for Better Performance Implementation on Data Mining Algorithms and Proposed Hybrid Machine Learning Classifier

Madhvi Soni[1]Sarita Naruka[2]and Dr. Amit Sharma[3]

M.Tech. Scholar, Computer Science & Engineering, Vedant College of Engineering & Technology, Bundi, Rajasthan, India. Email: madhvisoni1996@gmail.com

Professor, Computer Science & Engineering, Vedant College of Engineering & Technology, Bundi, Rajasthan, India. Email:saritanaruka01@gmail.com

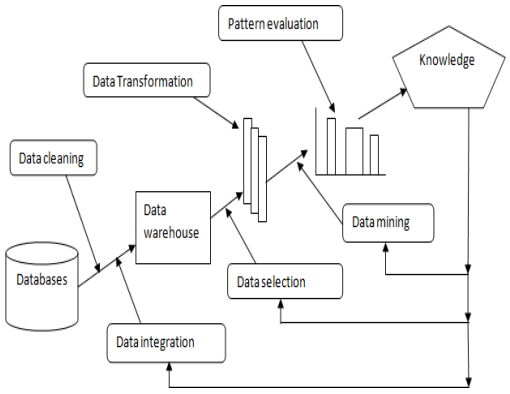
Professor, Computer Science & Engineering, Vedant College of Engineering & Technology, Bundi, Rajasthan, India. Email:amittechnosoft@gmail.com

I. ABSTRACT

Information mining, which has various uses, for example, text mining and web mining, is particularly utilized for bunching and characterization purposes. Detection and prediction of the liver disease is one of the most common issues in medical domain.In my proposal work the hybrid troupe model in utilized as a more solid group than any arrangement strategy. In the proposed outfit models the better presentation is appeared on liver illness. To assess the presentation of proposed model, a dataset containing 666 examples from UCI-Repository data set is utilized. The planned proficient mixture grouping model was mix of various arrangement strategies yield as info and produce the last characterized result. The presentation of the proposed model regarding precision and execution time is higher when contrasted with existing method.

Information mining, the extraction of stowed away sharp data from goliath enlightening records, is a dazzling new movement with phenomenal potential to help affiliations base on the standard data in their information stockroom.The innovation which points of concentrate information and examples from tremendous datasets is known as information mining. For the examination of different sorts of information, a few information mining apparatuses have been planned throughout the time. Not many of the most widely recognized applications which have been utilizing information mining with the end goal that the gathered data can be investigated are creation control, dynamic, client maintenance and market bin examination. A portion of the normally utilized information bases for considering information mining are social, information product house, object social and sight and sound data sets. The total stepwise information mining measure is exhibited in the figure 1.1 given underneath

1.1 INTRODUCTION TO DATA MINING



1.2 **The Scope of Data Mining** :. Given enlightening records of good size and quality, information mining movement can make new business openings by giving these cutoff centers:

1.**Automated prediction of trends and behaviors.**

2 Automated discovery of previously unknown patterns

Information bases can be bigger in both profundity and expansiveness

1. **More columns**.Specialists should a huge piece of the time tie the proportion of segments they investigate while doing dynamic evaluation due to time prerequisites.
2. **More rows**. More noteworthy models yield lower assessment blunders and change, and permit clients to make interpreting about little yet gigantic pieces of an overall public.

1.3 Algorithms in data mining

1. **Decision trees**: Tree-outlined improvements that address sets of choices. These choices make rules for the solicitation for a dataset. Unequivocal decision tree frameworks join Classification and Regression Trees (CA and RT) and Chi Square and Automatic Interaction Detection (CHAID) .

2. **Genetic algorithms**: Optimization frameworks that utilization cycles like intrinsic blend, change, and brand name affirmation in a game plan dependent upon the musings of movement.

II. LITERATURE SURVEY

2.1 Information Mining

Consistently people are producing huge information and this information comes from various sources, be it on the web or disconnected. It could be as records, might be in graphical configurations, might

2.2 Machine Learning

AI was evolved frompattern recognition where the data can be structured for the understanding of theusers. Recently, many applications have been developed using Machine Learning invarious fields such as healthcare, banking, military equipment, space etc. Currently,Machine Learning is a rapidly evolving and continuously developing field be the video or might be the records (shifting exhibit).

2.3 Machine learning classifiers for medical applications

inside the medical services frameworks and especially for clinical choice emotionally supportive networks (CDSS), which are normally utilized in assisting doctors with making more exact determination.

2.4 Literature Study

K. Srinivas and B. Kavitha Rani Heart infection (HD) is perhaps the most well-known sicknesses, and early determination of this illness is a crucial action for some, medical services suppliers to maintain a strategic distance from and save lives for their

patients. Coronary illness records to be the main source of death across the globe.

III. METHODOLOGY

3.1 Research Methodology:

The motivation of research work is to identify the minority class, with inherent characteristics of tArrangement is the data mining strategy which is most customarily utilized, which utilizes a great deal of pre-accumulated consultants for build up a model that can mastermind the amount of tenants in records running freehe imbalanced problem classification.

3.2 Problem in existingmethodology:

The issue with LR is that it can't tackle non-direct issues Another inconvenience is its high dependence on a legitimate show of information. This implies that strategic relapse is anything but a helpful device except if you have effectively recognized every one of the significant free factors.

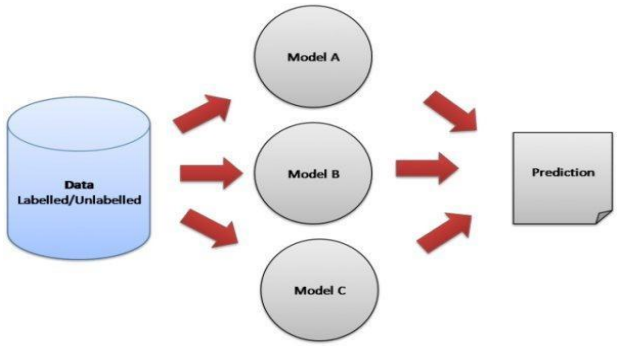
3.3 Proposed Hybrid ClassifierMethod:

Class irregularity is the main issue in the AI applications. Practically every one of the answers for class imbalanced issues are proposed for parallel classes. In the event that the classes are higher than two that is, for multi class their class awkwardness issue will be more noteworthy than the paired case..

3.4 Proposed Model:

Crossover grouping models can be amazing AI devices fit for accomplishing great execution and summing up well to new, concealed datasets.The worth of a troupe classifier is that, in consolidating the expectations of various classifiers, it can address for mistakes made by any individual classifier, prompting better precision in general. A cream Classifier is an AI model that trains on an outfit of various models and predicts a yield as class subject to their most basic likelihood of picked class as the yield. It essentially amounts to the exposures of every classifier passed into Hybrid Classifier and predicts the yield class dependent upon the most indispensable lion's offer. The pondering is instead of making separate gave models and discovering the accuracy for every them, we make a solitary model which trains by these models and predicts yield dependent upon their joined greater piece of administering for each yield class.

Hard Hybrid: In this normal yield class is a class with the main bigger part i.e the class which had the most indispensable likelihood of being normal by the entirety of the classifiers. Expect three classifiers expected the yield class(A, A, B), so here the overall part anticipated An as yield. Thusly A will be the last presumption.



Delicate Hybrid: In this yield class is the supposition dependent upon the normal of likelihood given to that class. Acknowledge given some obligation to three models, the presumption likelihood for class A = (0.30, 0.47, 0.53) and B = (0.20, 0.32, 0.40). So the regular for class An is 0.4333 and B is 0.3067, the victor is undeniably class A considering the way that it had the most raised likelihood found the middle worth of by every classifier.

3.5 System Architecture:

The proposed hybrid system architecture .The work commences with collection of data set from UCI repository. Thedata set is chosen and verified for Imbalance data set. Data pre-processing isexecuted to separate majority and minority class and stored in a database.Stored data set is trained to apply the learning algorithms. RF,LR with SVM filterclass toproduce final classification output.

3.6 Proposed Hybrid Algorithm

Step 1: Dataset D = $\{(x_1,_1),(x_2,y_2), ,\ldots,(x_m,y_m)\}$;

Step 2: Initialization Base classifier (RF,LR,SVM) $C_1,\ldots,C_T$

Step 3:Bifurcate Train dataset for classifier

for$t$=1,…,K:

$r_t=C_k(D)$

end;

Step 4: Generating new dataset of predictions

for$i$=1,…,Q:

$D_h=\{x'_i,y_i\}$

$x'_i=\{c_1(x_i),\ldots,c_k(x_i)\}$

end;

Step 5: Apply train dataset on Hybrid classifier

$h'=C(D_h)$

Step 6: $C(x)=c'(c_1(x),\ldots,c_k(x))$

Step 7: Optimize value displayed

IV. RESULTS AND DISCUSSION:

We propose a novel methodology for coronary illness forecast. The informational collection from true informational collection (UCI) is utilized. The informational collection is preprocessed and the resultant dataset is then applied element determination strategy. Just the chose credits are utilized for precise forecast and to diminish intricacy. Bunching is utilized to bunch the information

4.1 Python

Python is an undeniable level and powerful broad use programming language. It upholds multi-ideal models.Python has a large standard library which provide tools suited to perform various tasks.

4.2 AnacondaNavigator: Is the establishment program utilized byFedora, Red Hat Enterprise Linux

4.3 Spyder

Spyder is an astounding consistent environment written in Python, for Python, and arranged by and for specialists, originators and data specialists. It is composed in Anaconda pilot

4.4 Confusion Matrix

A disarray grid (or mistake lattice) is a particular table that is utilized to gauge the presentation of a calculation. It is for the most part utilized in regulated learning; in unaided learning.

4.5 Result Output

4.5.1 Logistic regression report

Training score = 0.7030075187969925

Test score = 0.7443609022556391

	Precision	Recall	f1 - Score	Support
0	0.70	0.99	0.82	89
1	0.67	0.05	0.10	39

Accuracy			0.70	128
macro avg	0.69	0.52	0.46	128
weighted avg	0.69	0.70	0.60	128

Table 4.5Logistic regression report

AUC score: 0.5200230481129358

4.5.2 Random Forest Report

Training score = 0.7603143418467584

Test score = 0.703125

	Precision	**Recall**	**f1 - Score**	**Support**
0	0.70	0.99	0.82	98
1	0.67	0.05	0.10	39
Accuracy			0.70	128
macro avg	0.69	0.52	0.46	128
weighted avg	0.69	0.70	0.60	128

Table 4.6Random Forest report

AUC score: 0.5200230481129358

4.5.3 SVMClassifier Report

Training score = 0.7072691552062869

Test score = 0.6953125

	Precision	**Recall**	**f1 - Score**	**Support**
0	0.70	1.00	0.82	89
1	0.00	0.00	0.00	39
Accuracy			0.70	128
macro avg	0.35	0.50	0.41	128
weighted avg	0.48	0.70	0.57	128

Table 4.7SVM classifier report

AUC score: 0.5

4.5.4 Hybrid Classifier Report

	Training score	Test score
Hard Hybrid	0.7151277013752456	0.7109375
Soft Hybrid	0.7288801571709234	0.7109375

Table 4.8Hybrid Stages report

	Precision	**Recall**	**f1 - Score**	**Support**
0	0.71	1.00	0.83	89
1	1.00	0.05	0.10	39
Accuracy			0.71	128
macro avg	0.85	0.53	0.46	128
weighted avg	0.80	0.71	0.61	128

Table 4.9Hybrid classifier report

AUC score: 0.5256410256410257

known as the coordinating with matrix.

V. CONCLUSION AND FUTURE PROSPECTS:

5.1 Conclusion

This research work specifies the approach of combine of classifier to make it hybrid in respect toensemble size. Based on review, conclusion it found that hybrid regularly discovered illness in grown-ups these days

5.2 Future Prospects

Later on, this precision might be upgraded by utilizing diverse profound learning models. It seen that solitary a choosing three classifier to make half breed on one dataset isn't viable with all.

VI. REFERENCE

[1] K. Srinivas and B. Kavitha Rani et. al. "Expectation Of Heart Disease Using Hybrid Linear Regression"European Journal of Molecular and Clinical Medicine ISSN 2515-8260 Volume 07, Issue 05, 2020

[2] ManpreetKaur and Shailja "A Review Study on Data Mining Algorithms for Prediction Diseases" International Journal for Research in Engineering Application and Management (IJREAM) ISSN : 2454-9150 Vol-06, Issue-01, Apr 2020

[3] P. TamijeSelvyandM.Ragul "Ongoing Efficient Accident Predictor System utilizing Machine Learning Techniques (kNN, RF, LR, DT)" International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249-8958, Volume-10 Issue-2, December 2020

[4] JitranjanSahoo and Manoranjan "Diabetes Prediction Using Machine Learning Classification Algorithms" International Research Journal of Engineering and Technology (IRJET) , e-ISSN: 2395-0056 , p-ISSN: 2395-0072 Volume: 07 Issue: 08, Aug 2020

[5] Samiksha H. Zaveri, KaminiSolanki"Prediction of Liver Disease utilizing Machine Learning Algorithms" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-9, July 2020

[6] EuJinPhua And NowshathKadharBatcha "Similar Analysis Of Ensemble Algorithms' expectation Accuracies In Education Data Mining" Journal of Critical Reviews ISSN-2394-5125 Vol 7, Issue 3, 2020

[7] K. Dharmarajan and K. Balasreeet. al. "Thyroid Disease Classification Using Decision Tree and SVM" Indian Journal of Public Health Research and Development, March 2020, Vol. 11, No. 03

[8] EymanAlyahyan and DilekDustegor "Anticipating scholastic accomplishment in advanced education: writing audit and best practices" International Journal of Educational Technology in Higher Education (2020) 17:3 https://doi.org/10.1186/s41239-020-0177-7

[9] S. Banumathi and Dr. A. Aloysius "An Enhanced Preprocessing Algorithms AndAccuracy Prediction Of Machine Learning Algorithms" International Journal Of Scientific and Technology Research Volume 8, Issue 08, August 2019 Issn 2277-8616

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Innovative approach to detect image forgery with implementation in real world applications

Dhanishtha Patil[1], Kajal Patil[2] and Vaibhav Narawade[3],

[1] Ramrao Adik Institute of Technology, Nerul, India.
dhanishthapatil1804@gmail.com
[2] Ramrao Adik Institute of Technology, Nerul, India.
2906kajal@gmail.com
[3] Ramrao Adik Institute of Technology, Nerul, India.
vaibhav.narawade@rait.ac.in

Abstract. Image integrity is threatened because of the usage of modern techniques in order to manipulate the images to gain personal or monetary benefits. Image forgery has been adversely affecting the fields concerned with the usage of image as a prime source of data such as medicine and healthcare, social media, journalism and newspapers, criminal investigation, art and paintings, deep fake industry. Passive forgery is generally carried out to a greater extent in order to tamper and circulate the manipulated images. A novel design is presented which uses several Convolutional Neural Network Architectures including EfficientNetB0, VGG-16, and VGG-19 to detect copy-move forging. It was trained and verified on MICC F2000 dataset and tested on MICC220 and CoMoFoD. After comparative analysis of these architectures it was found that EfficientNetB0 has the best accuracy of above 98 percent.

Keywords: Image forgery, Copy-move forgery, Real time applications, EfficientNetB0.

Introduction

In the past decades, the era of digitalization has made it easier to use a variety of data sources, including images, to conduct scientific experiments, derive valuable insights for business and technology, identify repetitive patterns of data to develop the machine learning models, a popular field in today's world [1]. Among all the varied sources of data available, digital image seems to be one of an emerging category of producing a high impact which will accelerate the research of the particular domain [2]. Visual images can be generated by the researcher or by the participants in a research project, and they can be classified into a number of different categories.

Pictures can also be discovered, which means they exist in the form of images that were not generated by the researcher or participants. Moving images (e.g., cinematic films, television shows, or home videos) and still visuals (e.g., digital or film photography, paintings, graphic design drawings, advertising) are two forms of visual images. Photographs have been used as a visual record of events, people, and places for more than a century. Over time this modest beginning developed into a technological revolution in photography technology—digital imaging. This may also be intended to make some machine learning models forecast incorrectly or to introduce flaws into the diagnostics.

Significant advancements in computer engineering have culminated in very high-resolution capture equipment and substantial breakthroughs in imag processing, making picture tampering and forgeries more accessible and straightforward. Some people distort the contents of a picture by modifying parts of it, resulting in image forgery, which is becoming more hard to trace using modern image processing tools[3][4]. With the aid of advanced computer graphics algorithms and picture editing softwares like Photoscape and Acorn, photographs may now be manipulated without leaving any imprints

[5]. To modify picture characteristics such as pixels, size, and resolution, a variety of applications is available [6].

Given the accessibility of powerful media editing, analysis, and production tools, as well as the increasing processing capability of contemporary computers, image altering and generation is now straightforward even for unskilled users. This trend is only likely to continue, resulting in more automated and precise processes becoming available to the general public [1] [7]. Image forgery can be defined as "erroneously and maliciously altering a picture." The concept of image forgery dates back to 1840. The earliest altered image was created by Hippolyte Bayard, a French photographer, in which Bayard admitted to attempting himself.[8]. The certainty that the picture has not been altered or accessed is known as image integrity. When the integrity of an associated sensitive picture is breached in particularly applications that are critical, such as radioactive and military,a critical procedure might be jeopardised, as a consequence. [9].

To counter the issue, digital forensics emerged as a crucial and trending field with a motive of ensuring the detection of digital tampering and manipulation. Because of their capacity to recreate the evidence left by cyber assaults, forensic tools have become a critical tool for Information Assurance [10]. As a result, pictures no longer have the status of being the only definitive record of events. In the lack of an authentication or watermark, digital forensics describes numerous statistical approaches for identifying evidence of digital manipulation [11].

Active and blind or passive image validation methods are available. Digital watermarking and digital signatures, for example, to detect active counterfeiting, include a valid authentication feature in the picture content before delivering it over an unprotected public channel. [5]. The active forging approach uses a digital icon and requires pre-processing to create a watermark and embedded or signatures before compiling the picture. Although watermarking is a live intruding disclosure approach in which a certification shape is implanted into the image, most imaging devices lack a watermarking or check module [12]. This data might be added throughout the picture collection process, or afterwards with the help of an appropriate tool.

Passive image forgery detection strategies, on the other hand, to detect fabrication, no previous information of the input image is required. Alternatively, these approaches recognize forgeries by looking for changes in the image's fundamental characteristics that may have been introduced during the modification process [13]. Copy-move forgery is copying a piece or region from one position in a photo and transferring it to another site inside the same image in order to conceal or imitate an item or a collection of items and create a fictitious perspective. [10]. To hide an existing item in a picture, make a replica of the entity, or entirely modify the image's implications, copy-move forgery is used [2].

Based on the study of pre-existing literature, it was discovered that there are numerous domains in which image manipulation malpractices are carried out, each with a varied immoral, unethical motive. Some of them are briefly explained as follows:

Medical Diagnosis forgery:

Image falsification is a major problem in the healthcare industry. The diagnosis will be incorrect, and the patient will be in life-threatening danger if a visual diagnostic report is manipulated and the attacker employs any kind of forgeries to expand the cancerous region. If a healthcare framework includes an image forgery detection system, it can identify the counterfeit before the diagnostic process begins if medical data is stolen or changed, for example, the patient may experience social humiliation or be let down, while others may gain an unfair advantage. As a result, in a smart healthcare architecture, there should be a system that can verify whether medical data is corrupted during transmission by hackers or intruders [11].

Deepfake:

DeepFakes are artificial intelligence systems that utilise deep learning to replace the likeness of one person in video and other digital media with that of another. Deepfake technology has raised worries that it may be used to produce fake news and deceptive films. The most challenging challenge in the realm of picture forgery detection is detecting fake faces. Phony face pictures may be used to construct fake identities on social networking sites, allowing for the illicit theft of personal information. The false picture generator, for example, may be used to create photos of celebrities with improper material, which might be dangerous.

Social media image manipulation:

In today's digital world, social media platforms play a critical role in news dissemination. They have, however, been disseminating false pictures. On social media platforms like Twitter, forged photos cause deception and negative user sentiments. As a result, identifying fraudulent photos on social media sites has become a pressing requirement.[17]Not every material shared on social media is exactly what it claims to be. People upload and disseminate incorrect information for a variety of reasons. These might include a) personal goals (to acquire recognition or celebrity) or b) intents to sway public opinion or promote specific points of view (marketing, propaganda, etc.)[13]. Image forgery can now be done with a variety of technological tools, computer software, and web applications. As a result, the usage of modified photographs in news portals and, more specifically, social media has proliferated [14].

Criminal investigation evidence forgery:

The reliability of photos is critical in a variety of fields, including forensics, criminal investigations, surveillance systems, and intelligence agencies. Image manipulation is quite prevalent [18]. Manipulating the images is very much possible using the software accessible to the criminals. Because digital photographs contain vital information and are used in various sectors such as authenticating digital photographs is becoming increasingly important in legal issues of investigation and serve as a crucial source of proofs [19]. Image tampering, which is a critical component of a criminal investigation, can lead to legal authorities making defective or improper judgment [15].

Art forgery:

Even for veteran art historians, authenticating paintings may be challenging. It might be difficult to determine the authenticity of an artwork. Forgery detection has traditionally relied on the discriminating talents of "connoisseurs," who can determine credibility based on a prominent art piece, lifestyle, and circumstances [20]. There has been a lot of development in utilizing digital feature extraction techniques to characterize an artist's style. Studies have been able to categorize test paintings as originals or forgeries based on these findings [16].

Literature Survey

Forgery detection is a crucial issue in visual forensics, with a large body of literature on the subject and numerous deep learning techniques have dominated in recent years. General-purpose extremely deep architectures produce similar good outcomes in favourable circumstances when given a sufficiently big training set. The goal is to detect patterns that identify transitional zones that are out of the ordinary in comparison to the backdrop in order to locate probable forgeries. This concept is also explored in [21], which uses a hybrid CNN- LSTM architecture to train a binary mask for forgery localisation. However, to train the net, these approaches require comprehensive ground truth maps, which may not be available or exact. Researchers demonstrated and developed numerous methods for verifying picture integrity and detecting various types of image fraud.

Shen et al. [22] proposed a technique for detecting forgeries based on textural characteristics extracted from Grayscale Co-Occurrence Matrices (GCOM) and DCT. The CASIA-V1 dataset had a detection rate

of 98 percent, whereas the CASIA-V2 dataset had a detection rate of 97 percent. In the quaternion DCT (QDCT) domain, Li et al. [23] proposed a forgery detection method based on Markov. For the CASIA-V1 dataset, the detection rate was 95.217 percent, while for the CASIA-V2 dataset, it was
92.38 percent. The CASIA-V1 dataset had a detection accuracy of 97 percent, whereas the CASIA-V2 dataset had a detection accuracy of 97.5 percent. The CASIA-V1 dataset had a detection accuracy of 99.16 percent, whereas the CASIA-V2 dataset had a detection accuracy of 97.52 percent [24]. The CASIA-V1 dataset had a detection accuracy of 98.3 percent, whereas the CASIA-V2 dataset had a detection accuracy of 99.5 percent [25]. The Curvelet transform and the LBP were employed by Al Hammidi et al. [26] to identify forgeries, and the findings were 93.4 percent accurate. For the CoMoFoD dataset, the findings obtained a detection accuracy of
92.22 percent [27]. He et al. [28] developed a technique for detecting forgeries in both the DCT and DWT domains based on extracting Markov characteristics. For the CASIA-V1 dataset, the findings obtained a detection rate of 93.33 percent.
Kakar et al. [29] proposed a forgery detection technique based on DCT and DWT domain Markov characteristics. For the CASIA-V2 dataset, the findings obtained a
95.5 percent detection rate. Using a pyramid model and Zernike moments, Ouyang et al. [30] proposed a Copy Move Forgery Detection (CMFD) method. The findings revealed that for scaling ranges of 50 to 200 percent, the given technique had the best influence on the arbitrary rotation angle. A new block-based CMFD matching method was proposed by Lai et al. [31]. The findings revealed that the proposed technique is more resistant to JPEG picture compression assaults and the addition of Gaussian or salt pepper noises than the traditional algorithm. Saleh et al. [32] proposed a multiscale weber local descriptor-based forgery detection technique. Vaishnavi and Subashini utilised the Random Sampling Consensus method and local symmetry characteristics (RANSAC). For MICC-F600 datasets, the findings reached 90.2 percent detection accuracy [33]. Rao and Ni used CNN to achieve a detection rate of
98.04 percent for the CASIA-V1 dataset and 97.83 percent for the CASIA-V2 dataset. The findings obtained 95 percent identification accuracy for the MICC-F600 dataset when Agarwal and Verma used the pretrained Visual Geometry Group-net (VGGNet) deep learning model [34].

2 Proposed Methodology

Recent research in computer vision, however, has revealed that CNNs are taking advantage of the rapid rise in the amount of annotated data and significant advances, topics have been made. Convolutional Neural Networks shown in Fig 1 are scaled up for increased accuracy if more resources are available [35]. The CNN accumulates hierarchical visual characteristics from training dataset, that are subsequently utilised to differentiate between tainted and genuine pictures.. Extensive testing has shown that the proposed algorithm outperforms existing technologies [36]. In this paper we have investigated model scaling in depth and attempted to find a model that carefully balances network depth, width, and resolution to improve performance for Image Forgery.

2.1 Dataset:

Deep learning-based approaches beat other technologies and solutions for the MICC group dataset, the most well-known and practical datasets for testing copy- move forgery detection methods [10] developed by Amerini et al. MICC data include pictures that have a visible manipulation impact. In MICC F220 there are 220 images, 110 of which have been tampered with and 110 have not. The image's size ranges from 722x480 to 800x600 pixels, with the forged region accounting for about 1.2 percent of the whole image area. In MICC F2000

picture's tampered regions are randomly picked regions from the that data itself and level of forgery for particular image in MICC F2000 is around 1.12% of the whole image of 2048 × 1536 pixels which 700 are tampered and 1300 are original images.[36][37]. For model training and validation, MICC F2000 is utilized, also there are 260 forged picture sets in the CMFD. Each image collection contains a forged image, two masks, and the original image. The five categories are dependent on the alteration used: translation, rotation, scaling, combination, and distortion. Post-processing techniques such as JPEG compression, blurring, noise addition, colour reduction, and so on are used to all forged

and original photographs [38]. The CoMoFod and MICC F220 datasets are used for testing. The input images are converted to RGB and scaled to a predetermined size without cropping any sections during the data pre-processing step. Fig. 2 shows some images from the training dataset that is MICC F2000

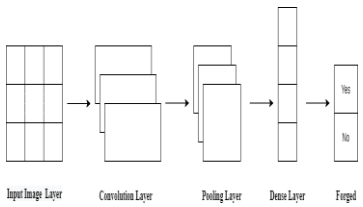


Fig. 1. Basic CNN Architecture

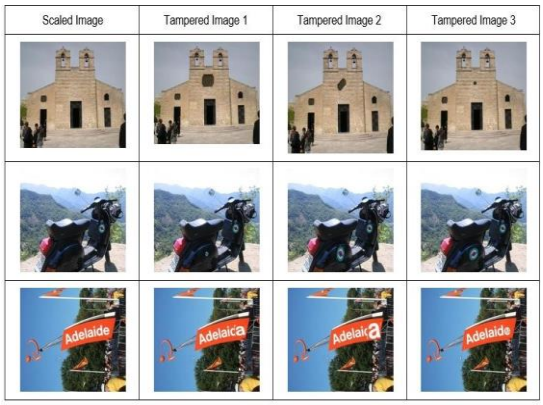


Fig. 2. Images from dataset MICC F2000

2.2 **VGG-19 architecture**:
The VGG-19 model is a convolutional model with a wide range of image classification success. Its design consists of three small convolutional filters (3x3), , the convolution stride is fixed at 1 pixel, and the padding is similarly fixed at 1. Max-pooling is conducted across a 2x2 pixel window in spatial pooling, which comprises five layers. The soft-max layer is the last output layer, and it assesses the desired output. On the supplied dataset, a batch size of 16 is used to train the network. Validation is done with the same batch size. The activation function of the ReLU is implemented. A dropout of 0.5 is used. The RMSprop optimizer is used with a learning rate of 1e-4. Only vertical variations are allowed by the RMSprop optimizer. When training the model, the Adam optimiser was also utilised to get to the global minima. When training, if you get stuck in local minima, the Adam optimiser will help you get out and attain global minima. For training, we utilised 15 epochs. Validation accuracy of 97.50 percent is achieved with only 15 epochs.

2.3

2.4 **VGG-16 architecture:**
Instead of a wide range of hyper-parameters, VGG16 concentrated on 3x3 filter convolution layers with a stride 1 and always retained the same padding and maxpool layer of 2x2 filter stride 2. Throughout the design, the convolution and max pool layers are positioned in the same way. It has two completely linked layers in the end [39]. The network is trained with a batch size of 30 on the provided dataset. ReLU's activation function has been implemented. A dropout of 0.5 is used. The RMSprop optimizer is used with a learning rate of 1e-3 and a decay factor of 0.75. The Adam optimizer to attain global minima. We used 15 epochs for training. The accuracy of validation is 97.75 percent.

2.5 **EfficientNet :**
EfficientNet is a convolutional neural network design that performs better on ImageNet than existing CNNs in terms of

effectiveness and precision, while lowering parameter size and FLOPS by an order of magnitude and scaling approach that uses a compound coefficient to evenly scale all depth, breadth, and resolution parameters. The EfficientNet scaling approach evenly scales network width, depth, and resolution with a set of predefined scaling coefficients, in contrast to current practise, which adjusts these parameters arbitrarily [40].

The drop connect rate is set for better regularisation and rebuilt top layers after loading EfficientNetB0. 0.2 dropout rate is chosen. Also the GlobalAveragePooling2D layer is added, since by imposing correspondences between feature maps and categories, convolution structure is created. In addition, the batch normalisation layer is used in the initial training and dropout to set the input unit to 0 at a frequency of at each step throughout the training time, which helps avoid overfitting, and the dense layer with softmax activation is used in the final training and dropout. We used Adam Optimizer to train the model with a learning rate of 1e-3 and a decay of 0.75. The batch size of 16 and the number of epoch 15 are the same. Validation accuracy of 96 percent is achieved after 15 epochs. In the second training phase top 20 layers are unfreezed except the batch normalization layers and further the model is trained on 15 epochs and adam optimizer with learning rate of 1e-4 which in final obtained accuracy of 98.2 percent. The training was done on Google Colab with NVIDIA Tesla P100 GPU and 12 GB RAM

	Predicted Forged(1)	Predicted Unforged(0)
Forged(1)	TP	FN
Unforged(0)	FP	TN

3 Results

3.1 Evaluation Metrics

A confusion matrix is a table that describes the results of categorisation problem prediction. Count values are used to sum and break down the number of successful and failed projections by class. The importance to the confusion matrix is that it shows the different ways in which your classification model gets confused while making predictions

3.1.1 General Confusion matrix

True positive (TP): The model's estimated value corresponds to the origanality of the image. It can be deduced it is identified that the image as forged.

False negative (FN): The expected output is a false negative, in which the image in input is wrongly labelled negative, despite the fact that the image is unforged.

True negative (TN): The anticipated outcome is a genuine negative when the model-predicted value matches to the reality that the picture is unforged. It may be inferred that the machine classified properly.

False positive (FP): Image is incorrectly categorized as an unforged image, despite the fact that it is a forged image.

3.1.2 Confusion matrix for EfficientNetB0

	Predicted Forged(1)	Predicted Unforged(0)
Forged(1)	249	7
Unforged(0)	0	144

3.1.3 Confusion matrix for VGG 16

	Predicted Forged(1)	Predicted Unforged(0)
Forged(1)	248	8
Unforged(0)	1	143

3.1.4 Confusion matrix for VGG 19

	Predicted Forged(1)	Predicted Unforged(0)
Forged(1)	247	9
Unforged(0)	1	143

From above observations, TNR, TPR is high and FNR, FPR is low. So our model is not in overfit or underfit.
In a comparison research, the performance of data classification algorithms is evaluated using metrics such as classification accuracy, sensitivity or recall, precision, and Matthew Correlation Coefficient after the confusion matrix is constructed (MCC).

Table 1. Rate Comparison

	TPR %	FPR %	FNR %	TNR%	4
EfficientNetB0	100.00	4.64	0.00	95.36	
VGG 16	99.59	5.30	0.40	94.70	
VGG 19	99.59		5.92	0.40	94.07

Table 2. Performance Comparison

	Accuracy	Recall	Precision	F1 Score	MCC
EfficientNetB0	0.9825	1.00	0.9727	0.9861	0.9631
VGG 16	0.9775	0.9960	0.9688	0.9822	0.9524
VGG 19	0.9750	0.9960	0.9648	0.9802	0.9473

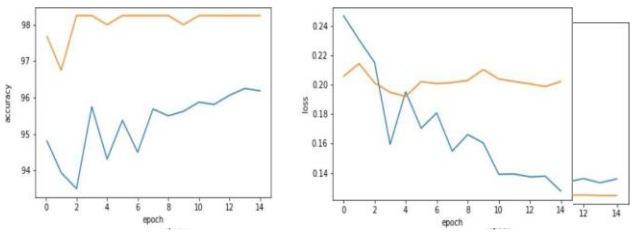


Fig. 3. Final results for most of real time based applications of Image Forgery in fields of Art, Social Media, Criminal Investigation etc.

Conclusion

The focus of this research is to show how picture data counterfeiting methodologies may be employed to perform image tampering and falsification. One of the most rapidly developing fields of research is forgery detection utilising passive forgery detection approaches. Various fields being affected by image forgery have also been scrutinized. Analysis of the performance studies on forged images from various realistic domains where image forgery is done to depict the usefulness of this method. The main objective was was to identify the fabrication using copy move technique avariety of CNN architectures and compare them in terms of how accurate their results are. Amongst the Convolutional Neural Network architectures, EfficientNetB0 achieved the highest validation accuracy of over 98 percent. The study can further be expanded to develop various methodologies to detect audio anforgery and an efficient system can be established.

References

1. Sencar, H. T., & Memon, N. (Eds.). (2013). “Digital Image Forensics.”,Springer doi:10.1007/978-1-4614-0757-7
2. Walia, S., & Kumar, K. (2018). “Digital image forgery detection: a systematic scrutiny”.Australian Journal of Forensic Sciences, 1–39. doi:10.1080/00450618.2018.1424241
3. Kasban, H., & Nassar, S. (2020). “An efficient approach for forgery detection in digital images using Hilbert Huang transform. Applied Soft Computing”, Elsevier,106728. doi:10.1016/j.asoc.2020.106728
4. The 2015 IEEE RIVF International Conference on Computing; “Communication Technologies Research, Innovation, and Vision for Future (RIVF)”
5. Bharti, C. N., & Tandel, P. (2016). “A survey of image forgery detection techniques.”2016 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET),IEEE doi:10.1109/wispnet.2016.7566257
6. Meena K.B., Tyagi V. (2019) “Image Forgery Detection: Survey and Future Directions.” Shukla R.K., Agrawal J., Sharma S., Singh Tomer G. (eds) Data, Engineering and Applications. Springer, Singapore. https://doi.org/10.1007/978-981-13-6351-1_14
7. Garfinkel, S. L. (2010). Digital forensics research: The next 10 years. Digital Investigation, 7, S64–S73. doi:10.1016/j.diin.2010.05.009
8. Taylor J.R.B., Baradarani A., Maev R.G. (2015) “Art Forgery Detection via Craquelure Pattern Matching”. In: Garain U., Shafait F. (eds) Computational Forensics. IWCF 2012, IWCF 2014. Lecture Notes in Computer Science, vol 8915. Springer, Cham. https://doi.org/10.1007/978-3-319-20125-2_15
9. Meena, K. B., & Tyagi, V. (2020). “A copy-move image forgery detection technique based on tetrolet transform”. Journal of Information Security and Applications, 52,102481. doi:10.1016/j.jisa.2020.102481 [10]
10. Elaskily, M.A., Elnemr, H.A., Sedik, A. et al. “A novel deep learning framework for copy-move forgery detection in images.” Multimed Tools Appl 79, 19167–19192 (2020).https://doi.org/10.1007/s11042-020-08751-7
11. A. Ghoneim, G. Muhammad, S. U. Amin and B. Gupta, “Medical Image Forgery Detection for Smart Healthcare” IEEE Communications Magazine, vol. 56, no.4, pp.33- 37, April 2018, doi: 10.1109/MCOM.2018.1700817.
12. Hsu, C.-C.; Zhuang, Y.-X.; Lee, C.-Y. “Deep Fake Image Detection Based on Pairwise Learning.” Appl. Sci. 2020, 10, 370. https://doi.org/10.3390/app10010370
13. Zampoglou, Markos. (2016). “Web and Social Media Image Forensics for News Professionals.”
14. M. M. Rahman, J. Tajrin, A. Hasnat, N. Uzzaman and G. M. Atiqur Rahaman,"SMIFD “Novel Social Media Image Forgery Detection Database”; 2019 22nd International Conference on Computer and Information Technology (ICCIT), 2019, pp.1-6, doi: 10.1109/ICCIT48885.2019.9038557.
15. Sadeghi, S., Dadkhah, S., Jalab, H.A. et al. “State of the art in passive digital image forgery detection: copy-move image forgery.” Pattern Anal Applic (2018).https://doi.org/10.1007/s10044-017 0678-8
16. P. Buchana, I. Cazan, M. Diaz-Granados, F. Juefei-Xu and M Savvides “Simultaneous forgery identification and localization in paintings using advanced correlation filters” 2016 IEEE International Conference on Image Processing (ICIP), 2016, pp. 146-150, doi: 10.1109/ICIP.2016.7532336
17. Thakur, Abhishek; Jindal, Neeru. “Machine Learning Based Saliency Algorithm For Image Forgery Classification And Localization”.10.1109/ICSCCC.2018.8703287.
18. Kumar, Dr & R., Cristin.“A Systematic Study of Image Forgery Detection. Journal of Computational and Theoretical

Nanoscience.” 15. 10.1166/jctn.2018.7498.
19. S. Duan, S. Yu and J. C. Príncipe, "Modularizing Deep Learning via Pairwise Learning With Kernels," in IEEE Transactions on Neural Networks and Learning Systems, doi: 10.1109/TNNLS.2020.3042346.
20. G. Polatkan, S. Jafarpour, A. Brasoveanu, S. Hughes and I. Daubechies, “Detection of forgery in paintings using supervised learning”16th IEEE International Conference on Image Processing (ICIP), 2009. cosine transform,KSII Trans. Internet Inf. Syst. 14 (7) (2020) 2981–2996, http://dx.doi.org/10.3837/tiis.2020.07.014
21. A.K. Jaiswal, R. Srivastava, “A technique for image splicing detection using hybrid feature set, Multimedia Tools Appl.”(2020) \, http://dx.doi.org/10.1007/s11042-019-08480-6.
22. X. Shen, H. Chen, “Splicing, image forgery detection using textural features based on the grey level co-occurrence matrices, IET Image Process.” *http://dx.doi.org/10.1049/iet- ipr.2016.0238*
23. C. Li, Q. Ma, L. Xiao, A. Zhang, “Image splicing detection based on Markov in QDCT domain”, Neurocomputing 228 (2017) 29–36, http://dx.doi.org/10.1016/j.neucom.2016.04.068.
24. J. Wang, R. Liu, H. Wang, B. Wu, Y.Q. Shi, Quaternion Markov “splicing detection for color images based on quaternion discrete . cosine transform,KSII Trans. Internet Inf. Syst. 14 (7) (2020) 2981– 2996, http://dx.doi.org/10.3837/tiis.2020.07.014.
25. A.K. Jaiswal, R. Srivastava, “A technique for image splicing detection using hybrid feature set, Multimedia Tools Appl.”(2020) , http://dx.doi.org/10.1007/s11042-019-08480-6.
26. M.H. Al-Hammadi, G. Muhammad, M. Hussain, G. Bebis, “Curvelet transform and local texture-based image forgery detection”, http://dx.doi.org/10.1007/978-3-642-41939-3_49.
27. N.K. Rathore, N.K. Jain, P.K. Shukla, U.S. Rawat, R. Dubey, “Image forgery detection using singular value decomposition with some attacks”, Natl.Acad. Sci. Lett. (2020) http://dx.doi.org/10.1007/s40009-020-00998-w.
28. Z. He, W. Lu, W. Sun, J. Huang, “Digital image splicing detection based on Markov in DCT and DWT domain, Pattern Recognit.” http://dx.doi.org/10.1016/j.patcog.2012.05.014.
29. P. Kakar, N. Sudha, W. Ser, “Exposing digital image forgeries in motion blur”,IEEE Trans. Multimedia 13 (3) (2011) http://dx.doi.org/10.1109/TMM.2011.2121056.
30. J. Ouyang, Y. Liu, M. Liao, “Robust copy-move forgery detection method using pyramid model and Zernike moments, Multimedia Tools Appl.” http://dx.doi.org/10.1007/s11042-018-6605-
31. Y. Lai, T. Huang, J. Lin, H. Lu, “An improved block-based matching algorithm of copy-move forgery detection, Multimedia Tools Appl.”, http://dx.doi.org/10.1007/s11042-017-5094-y.
32. S.Q. Saleh, M. Hussain, G. Muhammad, G. Bebis, “Evaluation of image forgery detection using multi scale weber local descriptors, in: Symposium on Advances in Visual Computing”, vol. 8034, Springer, Rethymnon, Crete,Greece.
33. D. Vaishnavi, T.S. Subashini, “Application of local invariant symmetry features to detect and localize image copy move forgeries”, http://dx.doi.org/10.1016/j.jisa.2018.11.001.
34. J.H. Bappy, C. Simons, L. Nataraj, B.S. Manjunath, A.K. Roy-Chowdhury,Hybrid. “LSTM and encoder–decoder architecture for detection of image forgeries”, IEEE Trans. Image Process. 28 (7) (2019) 3286–3300, http://dx.doi.org/10.1109/TIP.2019.2895466.
35. Gu J, Wang Z, Kuen J, Ma L, Shahroudy A, Shuai B, Liu T, Wang X, Wang G, Cai J, Chen T “Recent advances in convolutional neural networks. Pattern Recognition”
36. Z. J. Barad and M. M. Goswami, "Image Forgery Detection using Deep Learning: A Survey," 2020 6th International Conference on Advanced Computing and

Communication Systems (ICACCS), 2020, pp. doi: 10.1109/ICACCS48705.2020.9074408.

37. Soni, Badal & Das, Pradip & Thounaojam, Dalton. 'CMFD:A detailed review of block based and key feature based techniques in image copy-move forgery detection. IET Image Processing.' 12. 10.1049/iet-ipr.2017.0441.
38. D. Tralic, I. Zupancic, S. Grgic and M. Grgic, "CoMoFoD — New database for copy-move forgery detection," Proceedings ELMAR- 2013, 2013, pp. 49-54.

Striving to Get Modified Section 66a of IT To Get a Cyber Secure World

Pooja Saxena and Dr Kshipra Gupta
School of Legal Studies and Governance, Career Point University,Kota, (Raj.), India

Abstract. Persons sending "grossly offensive" or "menacing" material via the Internet are in violation of the Information Technology Act of 2000, which makes it a criminal crime. Consistently sending false information was also illegal if it caused irritation, discomfort, danger, obstruction or harm to another person. It was also illegal to incite animosity or hatred by sending false information repeatedly. Sending a "electronic mail message" with the intent to cause inconvenience, or to deceive or mislead the receiver about the communication's origin was also prohibited under Section 66A. a conviction can fetch a maximum of three years of imprisonment and a fine .Individuals (Shreya Singhal), NGOs (People's Union for Civil Liberties, Common Cause), and corporations challenged the restrictions in the Supreme Court through a series of writ petitions (Mouthshut.com). The numerous petitions were grouped together and heard by the Supreme Court. Still this unconstitutional law is implemented, that makes it clear that its modified version is needed.

Keywords: grossly offensive, menacing, electronic mail message

I Introduction

An explosion in India's Information Technology sector has occurred in the last decade. On top of that, criminals have learned to utilize the internet to perpetrate crimes. One of the most important laws that has been approved by the Legislative Council to combat cybercrime is the Information Technology Act. Following revisions to the original Act in 2000, other sections were added that dealt with new kinds of crimes. It's been criticized for its flaws and misuse by the police ever since the law was passed. Shreya Singhal filed a petition challenging the validity of section 66A, which was perhaps the most abused section.[1] The Supreme Court of India invalidated it on March 24, 2015 to preserve the Right to Freedom of Speech and Expression. As a result of

the Supreme Court's ruling, this study will examine the flaws of this provision. Discussed in this article are a number of factors that led the Supreme Court to rule that Section 66A is unconstitutional.

Initial draught law was produced by the Indian government and was titled "E Commerce Act of 1998." To complete the law later, a Ministry of Information and Technology was created. The Information Technology Act of 1999 was the name of the new law. In December 1999, a draught law was introduced in Parliament for consideration, and it was enacted in May 2000. After the President's approval on June 9, 2000, the legislation was announced. A primary

focus of the Act of 2000 was electronic commerce. Digital signatures, electronic filing, and the security of electronic data were all discussed. We wanted to make internet trading transparent and secure. The law was also enacted to protect electronic data from being abused.

1 Shreya Singhal vs. Union of India WP.(criminal) no.167 of 2012

India's IT sector was only beginning to take off in 2000, when the act was passed. In only five years, it exploded over the country, affecting towns, villages, and cities. It's understandable that the issue of cybercrime wasn't fully explored in the 2000 Act. Cybercrime was just briefly mentioned. In 2008, a substantial modification was introduced to the Cybercrime Act to encompass a wide range of cybercrimes, which was met with a great deal of outrage. As a result of a terrorist assault in Mumbai on November 26, 2008, the 2008 amendment was enacted.

The amendment's contents were, to put it mildly, poorly thought out and poorly discussed. When it came to execution and interpretation, the act's provisions were ambiguous. Experts also think that the act is insufficient in combating cybercrime, according to experts.

A few months after the modification, Section 66A was criticized for its ambiguous language and abuse. Some terms like ‘grossly offensive, ‘insult’, etc. were loosely used in the Section. It is the purpose of laws to protect the general public from wrongdoers and to give justice in the event of a violation of the law. This sector, on the other hand, had a higher number of complaints from the government regarding criticisms of its policies or judgments. Speech rights were severely restricted. The number of lawsuits filed under this clause for the incorrect reasons has skyrocketed in recent years.

According to Section 66A, a computer resource or communication device is

used to send offensive communications. A person who communicates excessively offensive, menacing, or false information with the intent to irritate, inconvenience, incite enmity or hatred, or to cause ill-will, among other things, is subject to incarceration and/or a fine. When a communication is insulting or frightening, there is no need to demonstrate a motive in order to be guilty of the conduct. It's enough for an action to be taken just because a person's remarks are perceived as insulting or menacing by the enforcement agency. An additional purpose or aim must be established when the information is incorrect, such as the sender's intent to promote ill will, hostility, and animosity. To broaden the scope of the IT Act, which was previously limited to E-commerce-related offences, section 66A was added to the code in 1996. Standing Committee Report[2] on Amendment to IT Act of 2000 reveals that the legislature aimed to create a law that was user-friendly, easily understood by the average person, and had a minimal reliance on other legislation. The legislative aim cannot be questioned.

There has been an urgent need for major changes in cyber law since the terrorist incident on November 26, 2008. Due to a disruption in Parliament, there was lesslikelihood of discussing this particular amendment proposal. Therefore, it is not surprising that an amendment with several flaws has been adopted. Internet hate speech, defamation, criminal intimidation, etc. were all addressed in this area. A new set of laws was needed for new methods of committing crimes, even if identical provisions are present in the IPC. As a result of this provision, police personnel or a cyber cell might deal with internet material more quickly than the IPC.

If we are going to comprehend the necessity of Section 66A, we must first grasp the difference

in action that would be conducted in the absence of Section 66A. Freedom of expression was abused in public gatherings prior to the advent of digital technology by delivering provocative statements. Because of this, the IPC was created to deal with huge gatherings that devolve into violence. As a result, the proposed action in the IPC is not immediate. Due of the technology's wide and simple reach, the damage is already done by the time the IPC's recommendations are implemented.[3]

Although there were a few anomalies, this section proved beneficial in dealing with delicate circumstances, such as those involving religious and community feelings. Students from Bangalore's North-East fled the state

of Karnataka after videos and comments encouraging violence against them appeared on WhatsApp and other forms of social media in Bangalore. In order to prevent the spread of misinformation generated by inflammatory comments and films distributed in order to instigate violence against a particular population, police officials utilized Section 66A.

[3] Juhi P. Pathak, IOSR Journal of Humanities and Social Sciences, Role of social media in reference to North-East ethnic violence (2012)

Since the repeal of Section 66A, legitimate victims of cyber bullying are no longer able to get quick relief from content that may be offensive or harmful in character. Also, we must remember that section 66A also provided legal remedies against a variety of other cybercrimes including sexting and spamming and other forms of stalking and bullying as well as threats through SMS and email. In addition to section 66A, additional provisions of the IT Act or IPC may be used. Aside from that, the other acts do not have to provide a quick response, which is usually required in these situations involving the internet.

Degrading, defamatory, or provocative information that takes a long time to delete will have a more negative impact on the user experience. 66A addressed offences such as cyber bullying, cyber stalking, and spam that could not be dealt with effectively under any other section of the IPC, such as cyber bullying and cyber stalking.

A significant element of this part is that it addresses bullying directly. Cyber bullying, cyber stalking, cyber bullying acting as another person to send nasty messages, etc., have become more prevalent.[4] All of these examples fall under the umbrella concept of cyberbullying, which refers to online harassment. Such situations are on the rise. McAfee's online survey shows some troubling statistics. 50 percent of Indian children between the ages of 8 and 17 have been bullied online, which means that out of every 10 Indian children, more than half have been tormented online.

As a result of a survey[5] by Microsoft, India is the world's leader in terms of cyberbullying. Some incidences of cyberbullying have led to depression. As a result of the poll, India is ranked 32nd in the world for cyberbullying. 66A might have been beneficial in these situations. It's also vital to be aware of the existence of such legislation. Without Section 66A, it is safe to say that no one is going to be able to get away with any wrongdoing. For their actions, they would be punished. In the absence of Section

66A, however, the judicial system would be less severe and less efficient.

4 SammerHinduja& Justin W. Patchin, Bullying, Archives of Suicide Research, Cyberbullying, and Suicide.

5 India ranks third in cyber bullying, T.E. RAJA SIMHAN, The Hindu

Nothing in nature is flawless and may be used to one's advantage. The mere potential that a law may be abused shouldn't be the basis for

its removal from the books. Legislators have the best interests of their constituents in mind while drafting a legislation. If the authorities or the ordinary man misuse the law, then it is not made into law. There has been blatant abuse of the Section 498A of IPC. The petition to overturn it, on the other hand, cannot be considered since the legislature's aim was to assure that no woman would be subjected to domestic abuse for whatever reason. Both the judiciary and the administration have helped to enhance the application of Section 498A over a long period of time.

A challenge to its constitutionality, on the other hand, was not brought against it. Section 66A is no exception. There was also a problem with police discretion which was regularly exploited because of a lack of guidelines in the sector.

According to the court's decision in Section 498A, it might have provided specific directions for police arrests in order to guarantee efficient execution of the legislation. Normalerweise, the Courts are required to consider the legislative purpose and interpret a law in accordance with it.

In this way, jurisprudence develops, and the law can adapt without substantial changes to the changing circumstances. To assess if an action has the element of crime or not, it is the judiciary's job to lay down the principles. The absence of this provision has resulted in a lack of security in the digital world. 66A had become a monster, no question. However, a clear and unambiguous Section 66A is required. It would be great if the newly drafted Section 66A could be used to combat horrible crimes such as online bullying and harassment. In order to safeguard citizens, it is the obligation of both the judiciary and the government.

Proposed Method

Our main intention is to safeguard human progress that is a Digital World by strong and stringent Cyber Laws .

Cyber World is intruding ,quintessential emerging technologically and insecure . So main focus is to make it secure and safeguard human progress ,cyber security

industry ,which is suffering severely with cyber threats in many forms like phishing ,spoofing , Trojan attack ,cyber bullying ,spam ,call ber stalking et cetera

The volume of security attacks skyrocketed Amid COVID-19 pandemic including ransomware . What should be done to combat such attacks ,maybe some online hubs to be created for industries attacked , to ensure victims can trace the source . Ransomware is only the tip of the iceberg there are more serious and heinous cyber -attacks targeted . Such attacks have increased in scales and magnitude.

Sadly IT department are generally ill prepared to properly mitigate such attacks or by the damage caused by them and our laws need to tighten up to make cyber world more secure when there are many holes to plug.

The day to day today demand of technology are a big threat as they mercilessly exploit or negligence negligence. However there are mitigation measures that can be accessible and can be considered in order to become reasonably secure against such cyber -attacks . These attacks are menace to the business and are hindrance in the smooth functioning of cyber progress.

The cyber -attacks which came into light recently are ,in past 12 months alone globally more than one third of all organisations have faced some kind of ransomware amid resurgence of Covid 19 pandemic .A successful defence strategy have to be framed which must include prevention ,detection and recovery measures.

Since past few years it is observed India is consistently on radar as a soft target by cyber security breach and cyber criminals . So new strategies should be designed or must be in pipeline to contain such crimes and by being mindful ofits legal ramifications.

Sooner a country should come up with dedicated cyber security laws . Already our country is little behind the curve ,as other nations have already started coming up with dedicated laws on cyber security . This is a need of an hour, as it is quintessential as it will serve as an important tool to protect our country and its cyber security in cyber sovereign interest.

This would be an interregnum step to strategize our cyber security laws for our nation as difficult sort of cyber-crimes like phishing ,identity theft ,cyber bullying and fraud have widespread in last couple of years . Anyhow its coverage under existing law is neither comprehension nor adequate, so would stress on coming up with more effective deterrent legal framework and more stringent

provisions to combat such crimes.

Most importantly modification of section 66 a of IT act is needed. Though this act 66 a of IT act has been scrapped out by our judiciary but still it's been used as it had addressed most prevalent cyber-crimes like SPAM, cyber bullying, cyber stalking, online harassment . Such crimes has been more active since past 5-6 years. Section 66 a of it act had covered these crimes but after it's scrapped out by Supreme Court there is a vacuum and such crimes are unattended . So sec 66 a of IT act should come again with modifications . New set of laws for new type of cyber-crimes ,which should address hate speech ,defamation, criminal intimidation etc

Conclusion

Section 66 a provided punishment for sending offensive messages through communication device .Its conviction can fetch a maximum of three years punishment and a fine or both .In march 2015,this section 66a of IT act ,200 had been stuck out by supreme court of India .In a landmark case of Shreya Singhal vs Union of India ,the judgement had passed ,stating that this act infringe the fundamental right of speech , its vague and wide . But later in our country many people were alleged and booked under this act .This section was invoked in manyother cases .

Though supreme court made it unconstitutional ,as it doesn't comply with the constitutional power, still police has arrested and booked a case under this sec 66a.So this points a serious concern of implementation of a verdict which isn't ina serious spirit .

This made it clear that there is a tendency of some laws to inhibit the Indian legal system even after they are stuck out .This is happening because there is lack of compliance ,coordination and notification ,absence of formal system for information sharing , cause steps aren't been taken to amend the statue or to remove it ,lack of formal system for sharing information , cause of these many reason still this unconstitutional law is implemented . Now is the time to modify this act and bring it back in action with some modifications to combat newly emerging cyber -crimes and make it a cyber secure nation .

References

Shreya Singhal vs. Union of India WP.(criminal) no.167 of 2012

Standing Committee on Information Technology (2007-2008)

Juhi P. Pathak, IOSR Journal of Humanities and Social Sciences, Role of social media in reference to North-East ethnic violence (2012)

Sammer Hinduja & Justin W. Patchin, Bullying, Archives of Suicide Research, Cyberbullying, and Suicide.

India ranks third in cyber bullying, T.E. RAJA SIMHAN, The Hindu

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Application of Deep Learning to detect Alzheimer's disease from Magnetic Resonance Imaging: A Comprehensive Review

Neha Rajawat*, Soniya Lalwani Department of Mathematics, Career Point University, Kota,
*neharajawat1909@gmail.com

Abstract Medical and Neuroimaging have become effective and efficient ways to diagnose life- threatening non-communicable diseases like Cancer, Cardiovascular disorders, Alzheimer's disease (AD) *etc*. As per World Health Organization (WHO), AD is a type of dementia that is covered by its 60-70% of total cases reported annually. Recent advancement in Deep Learning (DL) methodologies has increased the possibility of efficient detection of AD which has improved and reduced the manual efforts of medical professionals. Magnetic Resonance Imaging (MRI) of brain tissues can be preprocessed and analyzed using DL architectures effectively to find the hidden and complex features. In this paper, prior works done in the domain of detecting AD using DL algorithms design using MRI image datasets, are comprehensively reviewed and analyzed. It highlights the technical specifications of each of the works and presents a comparative analysis in a tabulated form. Paper represents the details about the datasets, preprocessing steps and models, classification algorithms, and important aspects of each work. It is expected that after going through the literature presented in this work, researchers and developers will gain meaningful insight to develop an AD detection model.

Keywords: Alzheimer's disease; Deep Learning; Magnetic Resonance Imaging; Classification algorithms.

Abbreviations

AD	Alzheimer's disease
MCI	Mild Cognitive Impairment
CN	Cognitive Normal
DNN	Deep Neural Network
CNN	Convolution Neural Network
LSTM	Long Short Term Memory
DBN	Deep Belief Network
SVM	Support Vector Machine
KNN	K-Nearest Neighbor
PET	Positron Emission Tomography
ADNI	Alzheimer's disease Neuroimaging Initiative
OASIS	Open Access Series of Imaging Studies
AAL	Automated Anatomical Labeling
RNN	Recurrent Neural Network

1. Introduction

Advancement in healthcare facilities has increased the average life expectancy and people are living a healthier life. At the same time, a longer lifespan has increased the risk of Non- Communicable Diseases (NCD) including dementia [1]. Dementia usually affects the elderly population but this is not a normal part of ageing. It progressively reduces the general mental and physical capabilities which are needed to perform day to day tasks. Cognitive memory loss is an obvious outcome of dementia, due to this a person eventually become dependent and mentally disabled. AD is a type of dementia that contributes to 60-70% of total cases found [2]. AD is a progressive

disorder for which detection in the early stages is difficult and crucial. MCI is the prodromal stage of AD and is serious enough to be noticed by close caregivers and family members but the day to day capabilities of a person is not yet affected [3]. If a person has been diagnosed with MCI then immediate medical attention is required to stop the conversion into AD or other forms of dementia. Thus, it can be concluded that early-stage identification of AD is a crucial step towards the cure of AD.

AD affects the structure of brain tissues due to which the geometrical and biological changes can be observed in the parts of the brain. For example, during the progression of AD, the volume of the Hippocampus is kept on reducing which can work as a significant biomarker to

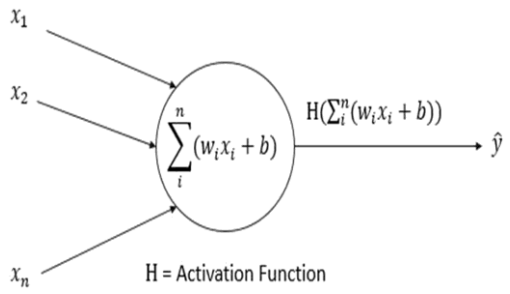


Figure 1. Computation of features at a single neuron

diagnose AD [4]. Medical imaging of the human brain can be utilized to observe these structural changes such as MRI scans of the brain. By comparing the MRI scans taken over time, professionals can conclude whether a person is suffering from AD or not and also the progression stage of AD. In MRI scans, some changes are quite evident and some changes are classified as hidden biomarkers which can only be found using computer software and intelligent algorithms [5].

Recent developments in CV and DL technologies has made it possible to handle complex and large amount of image data efficiently. That's why AD detection using DL models trained of MRI datasets has become a widely discussed topic among researchers. DL algorithms have found their applications in various majors like Computer vision, Security software design, Medicine [6], Game development Weather prediction, Data mining, Object detection [7], Internet of Things (IOT) *etc*. Out of all these domains, Medicine is a field where DL is helping a lot to cure diseases like breast cancer, lung cancer, pneumonia, COVID-19, skin cancer *etc*. One of the advantages of DL is that it can handle a large amount of data very efficiently and it is one of the requirements of DL networks to get enough amount of training data to identify the complex pattern easily. Medical imaging helps significantly to detect and diagnose diseases but a manual inspection can be time-consuming and not efficient sometimes. Intelligence models are proved to be cost-effective and easy to deploy solutions that can help medical staff working at a remote location. Researchers have been actively working to develop more and more advance and effective solutions for the early diagnosis of disease based on DL algorithms using medical imaging datasets.

2. Overview of DL architectures

Feature engineering is an important stage towards designing a well-accepted model. In statistical machine learning, it is the model developer's responsibility to design efficient and generalized features which can be easily

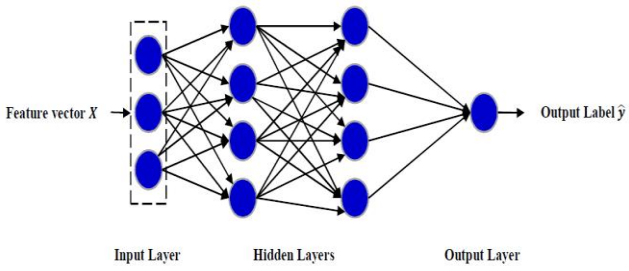


Figure 2. DL architecture illustration

learnt and separate by the hyperplane introduced by the model. Such manual feature processing

becomes a time-consuming process, needs a high level of expertise and deep understanding of datasets. These efforts become even more difficult and sometimes

near to impossible for high dimensional datasets and the number of samples are also huge [8]. Image datasets are generally big and also the images are a good example of high dimensional datasets. Feature engineering for images is the real challenge because features are not defined and hidden in nature. One obvious answer to these problems is to design a DL model which almost eliminates the process of manual feature engineering for image datasets and even the large image datasets can be handled easily.

DL algorithms form a subset of the ML domain which is inspired by the working of the human nervous system. Similar to the human nervous system DL architecture forms a NN in which neurons are interconnected to each other to learn the hidden and complex patterns of multi-dimensional data [9].

$[(x_1, x_2, \ldots x_n)]$ is an *n*-dimensional feature vector, fed as input to the model and y is the actual output label at the input layer and model predicts label $\hat{y}$. Every node of the NN model performs a computation shown in figure 2 to learn the hidden features. This learning process starts from very basic features and as the feature computation progresses deep into network features become more advance and complex. Here w and b are weight vectors and bias terms respectively and tunable parameters of the network to minimize the loss or error between the target label y and output label y. DL is also a set of derived model architectures which are used according to the nature of the problem, type of the datasets, expected outcome type, time and resource constraints *etc*. In the coming subsections some famous DL architectures are discussed along with their applications.

- Convolution Neural Networks (CNN): CNN model design is inspired by human brain connectivity patterns and the working principle is the same as the organization of Visual Cortex. Every neuron of the human eye responds to a restricted region and the collection of such regions form a complete object. The learning process of CNN is also the same as the human visual learning system where every object is learnt based upon its features which can divide the entire object into smaller sub-objects containing those features [10]. CNN models are provided with some predefined feature kernels which convolve with a specific subsection of input volume to find the presence of the feature defined by that kernel.

- RNN: While working with sequential data types such as text and speech, it is observed that data at any particular time instance has a dependency on data processed on $T - n$ or data to be processed on time $T + n$ instance. Such temporal dependencies of sequential data can easily be handled by RNN models. These models can be assumed as a connection sequence of NN blocks, each of them maintaining a piece of memory processed step by step [11]. Once all the blocks provide and pass the information provided, the final block outputs the desired outcome entity.

- LSTM: Natural Language Processing deals with text and text entities has a lot of inter-relation among the data samples as well as attributes of a data sample. LSTM models a more advanced version of simple RNN models and efficiently handle the temporal dependencies present in datasets. The layered architecture of LSTM contains hidden memory cells to handle the long- range dependencies which are not present in simple RNN models [12]. These memory cells also help to eliminate the problem of vanishing error by providing a gradient-based error propagation [13]. This problem was observed in simple RNN models as backpropagation steps either increase or decrease the error signals and RNN cannot hold the error values for more than 5-10 steps.

- AE: Curse of Dimensionality [14] is a well-known problem while handling the high dimensional datasets and DL models are often used for high dimensions. AE models are specially designed DL models for which input and output data is the same. It maps the input sample space to a lower-dimensional space and tries to reconstruct the input as output in a reduced or compressed form [15]. AE architecture is consists of two models: Encoder to compress the input and generates the compressed code and Decoder regenerate the input from the compressed code. AE are data specific unsupervised lossy-compression models which can only construct the output for the type of input they are trained on and output will be the close but degraded presentation of input.

3. Literature survey: tables and briefing

As another example of image processing application for medicinal purposes, AD detection is one of the well-discussed topics among researchers. Anitha et al.-2016 [16] used a segmentation technique based upon the Watershed algorithm to identify the hidden biomarkers of AD in the HC part of the human brain. HC is one of the parts of the human brain whose functionality will be affected if a person is suffering from AD. The MRI scan image of the brain was first converted to binary format using two approaches namely: Block means, mask and labelling and Top hat, mask and labelling. Some parts of the image are holes that were filled using the hole filling technique based upon connected components. Patro et al.-2019 [17] proposed an image processing technique for brain MRI scans from a sagittal plane, coronal plane, and axial plane. The preprocessing phase includes Bicubic interpolation for image smoothening, image segmentation is used to analyze the progressive brain entropy when brain structure is distorted by AD, and Image thresholding technique to better assist the segmentation process. By comparing the ratio of black and white pixels in different segments, one can predict whether it belongs to AD or not.

Brain MRI images are another example of medical imaging which is used to identify the structural changes that happened in brain tissues because of dementia. AD is also a type of dementia that accounts for 60-70% of total cases reported. Early detection of AD using advanced ML approaches can be done using MRI images is a useful development in the domain of intelligent medical applications. Islam et al.-2017 [18] proposed a multi-class classification model of the AD trained and tested on OASIS database containing brain MRI images. The model is inspired by the architecture of the Inception-V4 model. Data augmentation methods were used to generate synthetic data so that overfitting can be eliminated during the training phase. The layered architecture includes stem layer, Inception-A, Inception-B, Inception-C, Average Pooling, Drop out and SOFTMAX output layer. The 5-fold cross-validation accuracy after 10 epochs was 73.75% compared to 64.25% for the traditional Inception model. Early-stage diagnosis of any disease is a very significant step to cure that disease and to stop further progression. Mild Cognitive Impairment (MCI) is the stage where a person starts showing the signs of dementia. Liu et al.-2014 [19] designed a DL architecture to diagnose the AD against MCI which contains stacked auto-encoders and a SOFTMAX output layer. The stacked auto- encoders learns the hidden features of the original input and the SOFTMAX regression layer performs the output classification by assigning the highest predicted probabilities from all the target classes. Experiments were carried through neuroimaging data procured from ADNI database. The performance of the proposed model was compared with single kernel SVM and multi-kernel SVM where SVM was implemented using LIBSVM library using the Radial Basis Function kernel. SVM parameters were fine-tuned using Grid Search and the

proposed model architecture was evaluated using 10-fold cross-validation. Chitradevi and Prabha-2019 [20] used optimization technique like Genetic algorithm (GA), Particle swarm optimization (PSO), Grey wolf Optimization (GWO) and Cuckoo search (CS) to analysis of brain sub regions such as white matter, corpus callosum, grey matter and hippocampus. Authors used real time dataset of Chettinand Health City and find that HC region is important factor to diagnose AD and performance of GWO shows better result in HC region with 95% accuracy.

As already discussed, early stage detection of AD is very significant steps towards its cure. Sposov et al.-2019 [21] presented a novel DL model based on dual learning and an ad-hoc layer to separate 3D data to predict whether a MCI patient converts to AD within 3 years. Dual learning refers to simultaneous prediction for conversion of MCI to AD and classification of AD against a healthy individual. Adding more dimensions to input dataset increases the information as well as the working efficiency of the DL models. Li et al.-2020 [22] used 4D functional MRI (fMRI) dataset which covers both spatial and temporal variation of the brain structure. A 4D DL model (C3d-LSTM) was proposed which combines a series of CNN architecture to generate spatial features from 3D volume of fMRI images and to capture temporal information, these features are fed into LSTM machine. AD-86 and AD-126 are another examples of brain MRI datasets, used by Tran et al.-2020 [23] to develop a binary classifier to diagnose AD. The approach is combination of two phases: 1) Segmentation: using CNN in which an additional input of Gaussian Mixture Model (GMM) is provided 2) Classification: a novel approach combining Extreme Gradient Boosting (XGBoost) and SVM. Sometimes modelling of problems gives interesting facts about input data. Sarraf and Tifighi-2016 [24] claimed that shift and scale invariant features present in MRI images are the most important attributes to diagnose AD against a healthy individual. In the experiments, famous CNN model LeNet was trained using fMRI samples obtained from ADNI dataset. Using multiple types of data sources can surely increase the robustness of a model, thus Venugopalan et al.-2021 [25] developed multi-model AD detection mechanism. AE architectures were used to extract features from clinical test and genetic (single nucleotide polymorphisms) and CNN models were used to analyze the MRI samples of ADNI dataset. Authors had claimed that multi-modelling outperformed the shallow models like SVM, DT, RF and KNN. Another example of AE based AD classification is presented by Hu et al-2017 [26] where model is trained on numerical features generated using fMRI. Firstly, raw fMRI images were converted to a 2D matrix representing the activity of 90 brain regions. Secondly, to show the functional connectivity between the brain regions, a correlation matrix was formed. Finally this correlation matrix was classified using proposed AE models.

Efficiently designed image processing pipeline helps the feed the exact and required information to the ML models and also removes the background noise from the image samples. Kapoor et al.- 2021 [27] developed a disease diagnosis system based upon analysis of optical images. Image processing pipeline composed of image resize, grayscale to RGB conversion, smoothening, edge detector and reduced dimensional representation of input using Principal Component Analysis (PCA). Pathological behavior related to particular disease was analyzed using facial landmarks analysis by OpenCV library. These pathological patterns can help to identify the presence of Breast Cancer, Parkinson's disease, AD *etc*. Bi et al.-2019 [28] used an unsupervised CNN model to get the automatic prediction of Alzhimer'patients by using MRI images. Model is based on PCANet and k-mean clustering. This has done dual classification of AD *vs*. MCI and

NC *vs*. MCI and got the best accuracy 97% and 92.6% respectively. Dolph et al.-2017 [29] designed their learning models using a combination of stacked AE and DNN which is trained on ADNI dataset. Subcortical area specific features were extracted addition to the features like WM volumes, cortical surface area, cortical thickness, Fractal Brownian Motion co-occurrence matrices for texture, GM volumes for AD-MCI-CN classification. Designed models were evaluated using 10-fold cross validation on an in-house dataset and CADDementia dataset. When the models are self-designed fine tuning and manual efforts take more time and getting a good sets of results becomes lengthy process.

Sometimes many hit and trails are needed to select a good working model. Such efforts can be minimized using the TL approach where pretrained model of similar data samples are utilized to perform desired tasks. Pretrained models have already fine-tuned hyper parameters which needs minor updates during the training process thus reduces the training time with a great margin. Castro et al.-2020 [30] used TL technique for early detection of AD in sagittal MRIs obtained from OASIS and ADNI datasets. Authors has used ResNet model for feature extraction process and these features along with sex and age were fed into binary SVM classifier. Authors have claimed that the result of using sagittal MRIs were superior than the work done in horizontal MRI planes. Ortiz et al.-2016 [31] has developed a different approach where MRI scan of GM found in brain tissues is used along with PET scan image of brain. It was a unsupervised learning technique where brain regions were labeling has come from AAL atlas. An ensemble of DBNs were trained on brain partition done using AAL and the final outcome is fused using a SVM classifier so that a weighted ensemble output fusion can be done. dMRI is a variant of conventional MRI which are the most capable in identifying the changes happened in brain structure due to AD. McCrackin et al.-2018 [32] used dMRI dataset and developed a 3D multi-channel CNN architecture to diagnose AD. dMRI can effectively measure the Brownian motion of water molecules which can be used to develop diffusion equation at Voxal location. These equation provided a great amount of information to extract meaning features like Fractional Anisotropy and Mean Diffusivity. Addition to this, authors has explained a data augmentation technique using additive white Gaussian noise and flipping input along the sagittal plane. As we have already discussed that AD is progressive disease which starts from MCI stage in which symptoms are not evidently visible and ends on a complete mental disability. Multi-class classification of AD is a challenging task and includes in outcome labels as AD, MCI, Late MCI, and NC. Farooq et al. -2017 [33] has used MRI images to train a DCNN network for multi-class AD classification for GM slice. These GM slices were extracted during feature extraction process by converting the 3D MRI scan to 2D planes.

Table 1.Brief discussion about works done for AD diagnosis

S. No.	Authors	Year	Aspect Addressed	Dataset/Source	Classifier
1	Anitha et al.	2016	Shape analysis of hippocampus structure	Controls and schizophrenics	Modified watershed algorithm
2	Patro et al.	2019	Axial plane, Coronal plane and sagittal plane	neuroimaging data	Watershed algorithm
3	Islam et al.	2017	Major stages of AD	OASIS	Multiclass classification (Novel Deep CNN model)
4	Liu et al.	2014	AD and its Prodromal stage	ADNI	Multiclass and semi supervised novelearly diagnosis method based on DL architecture

5	Spasov et al.	2019	Tracking AD and MCI, AD vs. Health control	ADNI	Dual learning approach , Multitask classificatio n
6	Li et al.	2020	Detecting brain's metabolic activities by measuring the changes in blood flow and blood oxygen concentratio n	Public dataset ADNI	ıg model (C3d-LSTM model)
7	Chitradevi and Prabha	2019	sis of brain subregions-GM,CC,W M,HC	Real time data from Chettinad Health City	GA , SI and Cuckoo Search
8	Taran et al.	2020	Brain tissues (WM, GM, HC, CSF) segmentatio n	AD-86, AD-126 from OASIS	Combinatio n of Extreme gradient boosting(XG Boost) and SVM
9	Sharma et al.	2020	Sensory movement data collected in IoH ecosystem.	Multiple dataset	RNN, CNN and IoT based mechanism
10	Sarraf and Tifighi	2016	Difference Between Healthy brain and Alzheimers brain	ADNI	CNN and LeNet-5
11	Venugopala m et al.	2021	Classify patients in AD, MCI and Controls(C N)	ADNI	3D-CNNs
21	Dolph et al.	2017	ssification od AD, MCI andCN accuracy	ADNI	iclass AD classificatio nMethod
22	Bi et al.	2019	AD vs MCI and MCI vs NC	ADNI	Unsupervise d CNN model based on PCA Net
23	Castro et al.	2020	Sagittal MRI images	ADNI and OASIS dataset	Transfer learning techniques

24	Sarraf and Tifighi	2016	Classify Alzhemier's brain from normal healthy brain	ADNI	CNN and LeNet-5
14	Ortiz et al.	2016	Brain region defined by AAL	ADNI	Deep belief network
16	McCrackin	2018	ween Alzheimier's patient andnormal controls	ADNI	3D multichannel CNN
18	Luo et al.	2017	3-dimentional topology of brain considered	ADNI and DOD	Automatic AD recognition algorithm
				ADNI dataset	based on DL
19	Hu et al.	2016	Diagnosis of brain functions	ADNI	Based on ADNI brain functions
20	Farooq et al.	2017	Classify AD, MCI, LMCI and healthy person	ADNI	4-way classifier

4. Conclusion

Alzheimer's disease mainly affects older people, it is not a normal part of ageing. Alzheimer's disease is a syndrome, usually of a progressive nature that affects cognitive behavior and ability to perform daily activities. It is overwhelming not only for the people who have it, but also for their care takers and closed ones. In 2008, the WHO declared dementia as a priority medical condition and Alzheimer's contributes around 60-70% cases. In the prodromal stage called as MCI, symptoms are not visible but hidden structural changes in brain can be observed using medical diagnosis. With a good care provided in MCI stage, it is not necessary that patients will develop Alzheimer's that's why the early stage detection is very crucial and important. This review paper has presented in comprehensive survey about the methods and algorithms to diagnose Alzheimer's disease using brain MRI data. Major aspects and key points of the prior works have been described in the literature and a comparative analysis has been presented in tabularized form. It is expected that after going through the literature presented in this work, researchers and developers will gain meaningful insight to develop an AD detection model.

References

1. A report on "Alzheimer Disease and other Dementias" https://www.who.int/medicines/areas/priority_medicines/BP6_11Alzheimer.pdf
2. Dementia https://www.who.int/news-room/fact-sheets/detail/dementia
3. Cuingnet, Rémi, et al. "Automatic classification of patients with Alzheimer's disease from structural MRI: a comparison of ten methods

using the ADNI database." neuroimage 56.2 (2011): 766-781.
4. Gunawardena, K.A.N.N.P., R.N. Rajapakse, and N.D. Kodikara. "Applying convolutional neural networks for pre-detection of alzheimer's disease from structural MRI data." 2017 24th International Conference on Mechatronics and Machine Vision in Practice (M2VIP). IEEE, 2017.
5. Herrera, Luis Javier, et al. "Classification of MRI images for Alzheimer's disease detection." 2013 International Conference on Social Computing. IEEE, 2013.
6. Jang, Hyun-Jong, and Kyung-Ok Cho. "Applications of deep learning for the analysis of medical data." Archives of Pharmacal Research 42.6 (2019): 492-504.
7. Zhou, Xinyi, et al. "Application of deep learning in object detection." 2017 IEEE/ACIS 16th International Conference on Computer and Information Science (ICIS).
8. Lauzon, Francis Quintal. "An introduction to deep learning." 2012 11th IEEE International Conference on Information Science, Signal Processing and their Applications (ISSPA).
9. An Introduction to Deep Learning https://towardsdatascience.com/an-introduction-to-deep-learning-af63448c122c
10. A Comprehensive Guide to Convolutional Neural Networks https://towardsdatascience. com/ a-comprehensive-guide-to-convolutional-neural-networks-the-eli5-way-3bd2b1164a53
11. Ming, Yao, et al. "Understanding hidden memories of recurrent neural networks." 2017 IEEEConference on Visual Analytics Science and Technology (VAST).
12. Yao, Kaisheng, et al. "Spoken language understanding using long short-term memory neural networks." 2014 IEEE Spoken Language Technology Workshop (SLT). IEEE, 2014.
13. Staudemeyer, Ralf C., and Eric Rothstein Morris. "Understanding LSTM--a tutorial into Long Short-Term Memory Recurrent Neural Networks." arXiv preprint arXiv:1909.09586 (2019).
14. Bengio, Samy, and Yoshua Bengio. "Taking on the curse of dimensionality in joint distributions using neural networks." IEEE Transactions on Neural Networks 11.3 (2000): 550-557.
15. Applied Deep Learning Part-3: Autoencoders https://towardsdatascience.com/applied-deep-learning-part-3-autoencoders-1c083af4d798
16. Anitha, R., and S. Jyothi. "A segmentation technique to detect the Alzheimer's disease using image processing." 2016 International Conference on Electrical, Electronics, and Optimization Techniques (ICEEOT). IEEE, 2016.
17. Patro, Shrikant, and V. M. Nisha. "Early Detection of Alzheimer's Disease using Image Processing." (2019).
18. Islam, Jyoti, and Yanqing Zhang. "A novel deep learning based multi-class classification method for Alzheimer's disease detection using brain MRI data." International Conference on Brain Informatics. Springer, Cham, 2017.
19. Liu, Siqi, et al. "Early diagnosis of Alzheimer's disease with deep learning." 2014 IEEE 11th International Symposium on Biomedical Imaging (ISBI). IEEE, 2014.
20. Chitradevi, D., and S. Prabha. "Analysis of brain sub regions using optimization techniques and deep learning method in Alzheimer disease." Applied Soft Computing 86 (2020): 105857.
21. Spasov, Simeon, et al. "A parameter-efficient deep learning approach to predict conversion from mild cognitive impairment to Alzheimer's disease." Neuroimage 189 (2019): 276-287.
22. Li, Wei, Xuefeng Lin, and Xi Chen. "Detecting Alzheimer's disease Based on 4D fMRI: An exploration under deep learning framework." Neurocomputing 388 (2020): 280-287.
23. Tuan, Tran Anh, et al. "Alzheimer's diagnosis using deep learning in segmenting and classifying 3D brain MR images." International Journal of Neuroscience (2020): 1-10.
24. Sarraf, Saman, and Ghassem Tofighi.

"Classification of alzheimer's disease using FMRI data and deep learning convolutional neural networks." arXiv preprint arXiv:1603.08631 (2016).

25. Venugopalan, Janani, et al. "Multimodal deep learning models for early detection of Alzheimer's disease stage." Scientific Reports 11.1 (2021): 1-13.
26. Hu, Chenhui, et al. "Clinical decision support for Alzheimer's disease based on deep learning and brain network." 2016 IEEE International Conference on Communications (ICC). IEEE, 2016.
27. Kapoor, Akshay. "Disease Identification System using Image Analysis." Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12.1S (2021): 115-123.
28. Bi, Xiuli, et al. "Computer aided Alzheimer's disease diagnosis by an unsupervised deep learning technology." Neurocomputing 392 (2020): 296-304.
29. Dolph, Chester V., et al. "Deep learning of texture and structural features for multiclass Alzheimer's disease classification." 2017 International Joint Conference on Neural Networks (IJCNN). IEEE, 2017.
30. Puente-Castro, Alejandro, et al. "Automatic assessment of Alzheimer's disease diagnosis based on deep learning techniques." Computers in Biology and Medicine 120 (2020): 103764.
31. Ortiz, Andres, et al. "Ensembles of deep learning architectures for the early diagnosis of the Alzheimer's disease." International Journal of Neural Systems 26.07 (2016): 1650025.
32. McCrackin, Laura. "Early detection of Alzheimer's disease using deep learning." Canadian Conference on Artificial Intelligence. Springer, Cham, 2018.
33. Farooq, Ammarah, et al. "A deep CNN based multi-class classification of Alzheimer's disease using MRI." 2017 IEEE International Conference on Imaging Systems and Techniques (IST).

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Neural Network-based Architectures in Predicting Protein-Protein interaction: A Comprehensive Survey

Gunjan Sahni [1], Soniya Lalwani [2],

Career Point University, Kota, Rajasthan, INDIA
1 gunjan22aug@gmail.com, 2 slalwani.math@gmail.com

Abstract. Protein-Protein interaction (PPI) is the heart of all biological and ge- netic processes. Therefore PPI prediction is forever a challenging problem for researchers. Machine learning (ML) and Deep Learning (DL) based approaches are applied by researchers to achieve better performance in prediction. Graph neural network (GNN) acknowledged considerable response due to its remarka- ble performance in investigating graph structural data. Having the same as- sumption current work inspects the working of existing and newly offered GNNs models applied in predicting protein-protein interaction. As PPI network can be represented as a graph where protein and links can be assumed as nodes and edges respectively. Now the task is to predict the weight or existence of a link between any nodes pair based on each node's neighbor and their features. In the current survey paper, the basic GNN model and its drawback are dis- cussed in brief. Afterward, the latest work on GNN based PPI prediction using different customized models are reviewed in respect of their scope, approach, and performance.
.

Keywords: PPI prediction, GNN, GCN, DNN.

1 Introduction:

Interaction between proteins is the crucial process of living organisms which in- volves in most of the biological processes. It consists of significant importance in research related to drug discoveries, disease detection, and a lot of health sector and biological applications [1]. Therefore researches have been taking place repeatedly to boost the model of prediction or detection of PPI. Till now proposed PPI prediction models are based on the following techniques:

(A) Experimental methods, including

- yeast two-hybrid [2, 3]
- protein chips [4, 5]
- coimmunoprecipitation [6]
- Surface Plasmon Resonance (SPR) [7, 8]

(B) Computational methods (based on protein's information), including

- Protein primary sequence information [9]
- Spatial structure information of protein secondary structure [10–12]

Computational methods are comparatively faster and more accurate and required fewer resources using structural, sequence, or physiochemical properties of the pro- tein in prediction tasks. The basic technique used in machine learning methods is to generate features of protein and then they are combined, therefore final features to process become double in size. With continuous, technology growth AI-based models are introduced that leverage the prediction of proteins interaction, as machine learning and deep learning-based models. Now researchers start to map protein-protein interac- tion prediction problems with graph link prediction problems and proposed network representation approaches that provide automated feature engineering.

The repetitive accomplishment of deep neural networks in prediction models has en- hanced researches related to the advancement of deep neural networks. As it replaces feature engineering tasks with various end-to-end concepts of deep learning like a convolutional neural network, recurrent neural network, and auto-encoders. Simulta- neously need for architecture arises to solve complex problems where data is repre- sented in a form of a graph as a protein-protein interaction network.

Although graphs have the following limitation when deep learning is applied to them

- Heterogeneity and diversity of graphs.
- Unordered nodes
- Different numbers of neighbors for a node

Due to these challenges space and computation costs become increased [13], which can be

handled by variation in architecture as using supervised and unsupervised both and use convolution to recursive approaches.

To overcome deep learning with graph-related issues graph embedding is introduced that solves graph analytical issues [14]. Basically Graph embedding converts a graph in a form of low dimension vectors without disturbing graph structure. The basic chal- lenge behind Graph embedding is how to set problems by deciding input and output. Whereas graph representation learning deals with the clever representation of data so that easily extract information for classification purposes.

Graph auto-encoder framework supports in resolving network embedding problems [14]. In this paper, the predicting PPI using GNN related knowledge gap is tried to fill by reviewing different GNN based terminology, the Basic architecture of GNN, and discussing working and performance of various GNN based PPI models.

The rest of the survey is organized as follows. Section 2 discussed the background of GNNs in brief. Section 3 provides the Basic knowledge of GNNs. Section 4 simplifies

the taxonomy of GNN. Section 5 explains how the PPI prediction problem can be a map in GNNs. Section 6 reviews different models of PPI prediction using GNNs. Section 7 discusses current challenges, future scope, and summarizes the paper.

2 A brief background of GNNs

Firstly Sperduti et al. (1997) [15] applied a neural network to directed graphs and initiate the progress path of GNN. Afterward, Gori et al. (2005) [16] and Scarselli et al. (2009) [17], and Gallicchio et al. (2010) [18] introduced an in-depth mathematical view of recurrent GNN. Bruna et al. (2013) [19] developed spectral-based Con- vGNNs based on spectral graph theory. Many spatial-based ConvGNNs were also introduced in the hybrid form [20-26]. Apart from GNN models are being revised regularly by introducing RecGNN and ConvGNN and other GNN architectures.

Since the PPI prediction model is a link prediction problem and from 2018 to now multiple benchmark models have been evolved as GAATs, Star, Inverse model, AutoKGE, ComplEx-DURA, PEAGAT, RASCAL, S-VGAE, Graph InfoClust, and ARGE, *etc*. [33]. These evolutionary models are hybrid models using different taxon- omy and architecture, some of them are dedicatedly developed for PPI prediction application [29-32], which are discussed in section 6.

3 Basic GNN

The root of GNN is a deep neural network that is applied to graph data. Structure of graph and feature's information (if exist) require to elect representation of nodes. A new deep learning architecture is needed to introduce in GNN since CNN can work proficiently on grid-structured inputs by taking subparts of images and generate new pixels after processing and RNN can work only over sequences [13]. Hence neural message passing is used in GNN to pass vector messages among nodes and also up- date frequently.

Node embedding is introduced to implement DNN (Deep Neural Network) in graphs. It means mapping nodes to a lower-dimensional space than the actual dimension of the graph [13]. The greater part of this paper will the discuss graph G = (V; E), and also features of nodes represented as a set $X \in R^{d\times|V|}$ and generate node embedding

$z_{u,} \forall u \in V$

Now the challenge for the GNN system is to define this encoder function having the following features.

- Locality (local network neighborhoods)
- Aggregate information
- Stacking multiple layers (computation)

3.1 Basic frameworks of GNN

Message Passing

Message passing is the basic building block of GNN, which also comprises updating in hidden embedding associated with each node $u \in$, where V represents the list of the vertex in a graph. n the message passing between nodes in GNN, the information aggregated from $f's$ graph neighborhood $N(f)$ update a hidden embedding represent-

ed as $h^{(i)}$. Mathematically this information exchange and related updates can be rep-resented by the following eq. 1 [27].

$$h_f^{(i+1)} = UPDATE^{(i)}(h_f^{(i)}, AGGREGATE^{(i)}(\{h_u^{(i)}, \forall\, u \in N(f)\}))$$
$$h_f^{(i+1)} = UPDATE^{(k)}(h_f^{(i)}, m_{N(f)}^{(i)}) \quad (1)$$

where two random differential functions are introduced that are UPDATE and AGGREGATE (*i.e*., Neural Networks) and the aggregate information from $f's$ graph neighbor

is represented by $m_{N(f)}$ [27]. In every i^{th} repetition all set of embedding from $f's$ graph neighbors taken and feed into AGGREGATE function and generate output message(m^{i-1}), which is combined with the previous embedding of f $(h^{(i-1)})$, afterward, the UPDATE function applied to them to generate current embedding of f $(h^{(i)})$ as in Figure 1. Initially or at i=0, $h^{(0)} = x_f \ (\forall f \in V)$ where x_f represent initial features of f. After I repetition final embedding of f can be achievedas in eq. 3 [27].

$$z_{f=} h^{(i)}, \forall u \in V \quad (3)$$

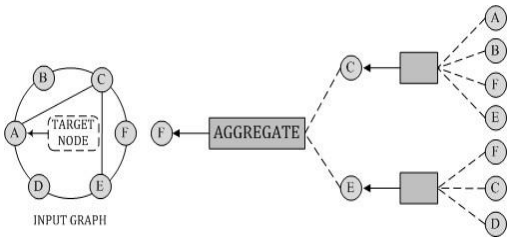
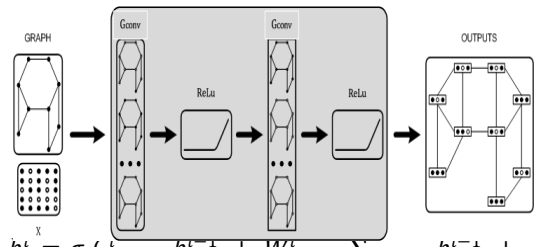


Fig. 1. Represent how a single node aggregates messages with its neighbor's node. Here targetnode is F, whose neighbor are C and E. Right-hand figure present two-layer version of message /information passing model. Here rectangle structure consists of NN (Neural Network) logicinside Basic GNN

Once understanding node embedding through message passing, a final mathematicalmodel of GNN to represent message passing can be represented by eq. 4 [27].



$$h_f^{i} = \sigma\left(h_f^{i-1} W_{self}^{i} + \sum_{v=N(f)} h_f^{i-1} W_{neigh}^{i} + b^{i}\right) \quad (4)$$

where σ represent element-wise non-linearity function (ReLU or tenh) and $W_{self}^{i}, W_{neigh}^{i} \in R^{d^i \times d^{i-1}}$ also known as trainable parameter matrix [27].

so from equation 2 and eq 4,

$$UPDAT(h_f, m_{N(f)}) = \sigma\left(W_{self}\, h_f + W_{neigh}\, m_{N(f)}\right) \quad (5)$$

Self-Loop based messages passing

In GNN self-loop is introduced to remove the UPDATE function as the Aggregatefunction now contains it tacitly so now eq 1 can be represented as eq 6 [27].

$$h_f^{(i+1)} = AGGREGATE^{(i)}(\{h_u^{(i)}, \forall u \in N(f) \cup \{f\}\})$$

Set Pooling

As with the CNN, model pooling reduces the number of parameters, In GNN also pooling layer used to make it more generalized. So nodes are assigned to the next layer using the following equation [27].

$$m_{(f)} = MLP_{\emptyset}\left(\sum_{v \in N(f)} MLP_{\emptyset}(h_v)\right)$$

GCN (Graph Convolutional Network)

It provides not only symmetric-normalized aggregation but also the self-loop update approach [27].

$$h_f^{i} = \sigma\left(\frac{h_f}{\sqrt{|N(f)||N(v)|}} \sum_{v=N(f)\cup\{f\}}\right)$$

4 Taxonomy of GNNs

4.1 Recurrent GNNs (RecGNNs)

RecGNNs follow recurrent neural architectures. Assuming that till stable equilibrium, nodes in a graph constantly exchange information with their neighbors. Spatial-based also followed message passing [13].

4.2 Convolutional GNNs (ConvGNNs)

Each node aggregates its features with neighbors' features. It stacks multiple graph convolution layers and achieves a high-level representation of nodes as shown in figure 2 [13].

Fig. 2. The simplest model of ConvGNN with multiple graph convolutional layers. For each node aggregate feature information from its neighbors, then non-linear transformation is ap- plied to the resulting output using stacking multiple layers. Here X represents the feature ma-trix.

4.3 Graph autoencoders (GAEs)

GAE is an unsupervised framework having the task of encoding and decoding. Node encoding is performed into latent vector space and decodes data from encoded infor- mation. GAEs perform graph generative distributions after learning network embed- ding by recreating graph structural information in a

form of a matrix known as graph adjacency matrix [13].

4.4 Spatial-temporal GNNs (STGNNs)

STGNN's task is to study hidden patterns from spatial-temporal graphs, and apply them in various fields like traffic speed forecasting, human action recognition, and others. STGNN can handle spatial dependency and temporal dependency [13].

5 PPI prediction *vs*. Link prediction using GNN

Current development on GNN proves it the most favorable approach to explain the link prediction. However, In GNN models each node learns embedding through a neighborhood approach where the information lies about two or three steps away. In PPI prediction, the network can be assumed as a graph where each node map with a protein and edge represented a link between them. Based on the possibility of interac- tion weight can be assigned to edge or weightless edge also possible if an edge exists

between interacted nodes only. The link prediction tasks can be achieved through the graphs
Those are cut from a larger one otherwise the nodes can also choose from node pool [28]. The basic idea behind classification is the value of similarity score of two-node embedding, which is responsible to decide whether two nodes should be connected or whether two proteins can interact or not. Still, there are some drawbacks related to GNN as graph structure, GNN's architecture, and high-level node features [28].

6 GNN based PPI prediction models

6.1 HO-VGAE

Xion et al. [29] proposed a new GNN based model that is based on high-order GCN variational auto-encoder architecture. They are dealing with the issues of limited neighborhood aggregation schemes, specifically aimed at incomplete and sparse graphs [29].

The proposed idea was to combine GCN and the page break to resolve the issue of limited aggregation of GCN. Variation auto-encoder was helping to explore only network topology, associatively protein attributes, or any other related information of protein features avoided to reduce network complexity [29]. The baseline paradigm of the HO-VAGE model involves the following [29].

A co-training technique that trains GCN using more positive samples so some highly legitimate links were also involved in object function afterward in the optimization phase [29].
End-to-end optimization boosts the performance of the approach, by initializing weights using the initialization procedure followed by calculated updated parameters by backpropagation. [29].

Accuracy and efficiency analysis estimated the nonlinear convolution functions connected to a regular random walk. The use of upgrade approaches attains linear computational complexity [29].

Dataset source-Lit-BM-13 and Bio grid
Performance- 2.5%-8.1% in terms of AUPR on six human PPI networks

6.2 SkipGNN

Huang et al. [30] proposed a reformed form of GNN, which is named SkipGNN. The task is to find different types of secondary similarity among nodes that do not have a direct link of interaction [30].

The proposed model constructs a skip graph that is a second-order network represen- tation seizing the skip similarity and provide a fusion form of original and a new graph can also predict high order of prediction [30]. The basic paradigm of SkipGNN are following:-

Iterative fusion is motivated by the task to set evenness among skip and base similar- ity. To achieve the idea of iterative fusion the node embedding is initial updated with previous layers node embedding and skip graph embedding followed by skip graph embedding updating using current node embedding [30].

SkipGNN decoder is operated to perform as a neural network by Appling combined function on two node's embedding and then apply to classify parameters to calculate the probability to decide whether these nodes will interact or not [30].

Dataset source: HI-III network (yeast two-hybrid)

Performance: 92.8% in terms of AUPR on six human PPI networks

6.3 S-VGAE

Yang et al. [31] introduced signed variational graph auto-encoder that spontaneously encode graph as low dimensional embedding.

They worked on multiple challenges as deployment network information in the pre-diction of PPI, the decision of protein's feature input that diminishes load on machine learning classifier, and to optimize graph mapping to minimize such that can reflect graph structure efficiently [31].
S-VGAE model generates protein features using CT methods, and inference model is an encoder and the generative model is a decoder. Nonetheless, some enhancements in the basic VGAE model improve [31]. Performance is following:-

The cost function is improved by including only high confidence edges whether they are high confidence positive edges or high confidence negative edges [31].

Signed adjacency matrix have values of either 1, 0, or -1. Here 1 and -1 represented interaction and non-interaction links respectively and 0 is categorized as an uncertain group [31].

Dataset source: HPRD, 2007(Human Protein) [31]

Performance: Accuracy score 97.16%

6.4 SN-GGAT

Xiang et al. [32] proposed gated graph attention for signed networks (SN-GGT) that associates the idea of signed networks, balance theory, and accessibility matrix.

They worked on multiple issues of GAT (Graph Attention networks) and GCN. Since negative edges can't be processed by GAT so only unsigned networks participate in aggregate and update and performance of GCN in the correlation between node fea- tures is inadequate [32].

SN-GGT model applies attention mechanism to GAT to mine polarity of edges more accurately, Nonetheless, balance theory was applied on the sign propagation. Follow- ing are some important building blocks of SN-GGT models [32].

The gating mechanism is inspired by Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU). The input of the gating mechanism is the adjacency matrix, memory accessibility matrix, and attention accessibility matrix of the previous gating unit's output [32].

Node update rule updates embedding calculation for neighbor's node as per their order. These rules define that the effect of neighbors on the target node can differ based on their order of relation [32].

Attention Mechanism in SN-GGAT instantaneously processes and distributes atten-tion coefficient to both low- and high-order neighbors. Due to this practical and ap-propriate approach model achieved better performance [32].

Dataset source: DIP (S.cerevisiae) [32]

Performance: Accuracy score 96.57%

7 Conclusion and Future scope

GNN is an advanced form of DNN applied on graph data. All three architecture of GNN models is resolving related issues in predicting PPI. Since the cost and space complexity of GNN can't be avoided, HO-VGAE concentrated on reducing process complexity. Though the Involvement of protein's attributes in interaction can't be avoided, S-VGAE [31] is the only model till now that is using features-related details of protein. Whereas Skip-GNN [30] performs remarkable work on the prediction of second-level interaction or molecules interaction all together in a given PPI network. GNN in PPI is in its preliminary stage nevertheless it seems to be a very promising approach in link prediction application. GNN consist lot of challenges so there is a prerequisite of research for such type of models that will use protein attribute and provide good performance without facing issues associated with space and time.

Comparatively informal techniques can be evolved to map PPI prediction problemwith GNN exhausting new assumption and hypothesis.

References

1. Rao, V. S., Srinivas, K., Sujini, G. N., & Kumar, G. N. (2014). Protein-protein interaction detection:

methods and analysis. International Journal of Proteomics, 2014.
2. P. Uetz, L. Giot, G. Cagney et al., “A comprehensive analysis of protein-protein interac- tions in Saccharomyces cerevisiae,” Nature, vol. 403, no. 6770, pp. 623–627, 2000.
3. T. Ito, T. Chiba, R. Ozawa, M. Yoshida, M. Hattori, and Y. Sakaki, “A comprehensive two-hybrid analysis to explore the yeast protein interactome,” Proceedings of the National Academy of Sciences, vol. 98, no. 8, pp. 4569–4574, 2001.
4. H. Zhu, M. Bilgin, R. Bangham et al., “Global analysis of protein activities using proteome chips,” Science, vol. 293, no. 5537, pp. 2101–2105, 2001.
5. A. H. Y. Tong, B. Drees, G. Nardelli et al., “A combined experimental and computational strategy to define protein interaction networks for peptide recognition modules,” Science, vol. 295, no. 5553, pp. 321–324, 2001.
6. E. Harlow, P. Whyte, B. R. Franza Jr., and C. Schley, “Association of adenovirus early- region 1A proteins with cellular polypeptides,” Molecular and Cellular Biology, vol. 6, no.5, pp. 1579–1589, 1986.
7. C. Williams and T. A. Addona, “The integration of SPR biosensors with mass spectrome- try: possible applications for proteome analysis,” Trends in Biotechnology, vol. 18, no. 2, pp. 45–48, 2000.
8. G. Multhaup, D. Strausak, K. D. Bissig, and M. Solioz, “Interaction of the CopZ copper chaperone with the CopA copper ATPase of Enterococcus hirae assessed by surface plas- mon resonance,” Biochemical and Biophysical Research Communications, vol. 288, no. 1, pp. 172–177, 2001.
9. R. Yang, C. Zhang, R. Gao, and L. Zhang, “An ensemble method with hybrid features to identify extracellular matrix proteins,” PLoS One, vol. 10, no. 2, article e0117804, 2015.
10. J. Wang, Y. Li, X. Liu, Q. Dai, Y. Yao, and P. He, “High-accuracy prediction of protein structural classes using PseAA structural properties and secondary structural patterns,” Bi- ochimie, vol. 101, no. 1, pp. 104–112, 2014.
11. S. Zhang, Y. Liang, and X. Yuan, “Improving the prediction accuracy of protein structural class: approached with alternating word frequency and normalized Lempel-Ziv complexi- ty,” Journal of Theoretical Biology, vol. 341, no. 1, pp. 71–77, 2014.
12. P. N. Palma, L. Krippahl, J. E. Wampler, and J. J. G. Moura, “BiGGER: a new (soft) dock- ing algorithm for predicting protein interactions,” Proteins, vol. 39, no. 4, pp. 372–384, 2000.
13. Wu, Z., Pan, S., Chen, F., Long, G., Zhang, C., & Philip, S. Y. (2020). A comprehensive survey on GNNs. IEEE transactions on neural networks and learning systems, 32(1), 4-24.
14. Cai, H., Zheng, V. W., & Chang, K. C. C. (2018). A comprehensive survey of graph em- bedding: Problems, techniques, and applications. IEEE Transactions on Knowledge and Data Engineering, 30(9), 1616-1637.
15. Sperduti and A. Starita, “Supervised neural networks for the classification of structures,” IEEE Transactions on Neural Networks, vol. 8, no. 3, pp. 714–735, 1997.
16. M. Gori, G. Monfardini, and F. Scarselli, “A new model for learning in graph domains,” in Proc. of IJCNN, vol. 2. IEEE, 2005, pp. 729–734.
17. F. Scarselli, M. Gori, A. C. Tsoi, M. Hagenbuchner, and G. Monfardini, “The GNN mod- el,” IEEE Transactions on Neural Networks, vol. 20, no. 1, pp. 61–80, 2009.
18. C. Gallicchio and A. Micheli, “Graph echo state networks,” in IJCNN.IEEE, 2010, pp. 1– 8.
19. J. Bruna, W. Zaremba, A. Szlam, and Y. LeCun, “Spectral networks and locally connected networks on graphs,” in Proc. of ICLR, 2014.
20. M. Henaff, J. Bruna, and Y. LeCun, “Deep convolutional networks on graph-structured da- ta,” arXiv preprint arXiv:1506.05163, 2015.
21. M. Defferrard, X. Bresson, and P. Vandergheynst, “Convolutional neural networks on graphs with fast localized spectral filtering,” in Proc. of NIPS, 2016, pp. 3844–3852.
22. T. N. Kipf and M. Welling, “Semi-supervised classification with graph convolutional net- works,” in Proc. of ICLR, 2017.
23. R. Levie, F. Monti, X. Bresson, and M. M. Bronstein, “Cayleynets: Graph convolutional neural networks with complex rational spectral filters,” IEEE Transactions on Signal Pro- cessing, vol. 67, no. 1, pp.97–109, 2017.
24. J. Atwood and D. Towsley, “Diffusion-convolutional neural networks,” in Proc. of NIPS, 2016, pp. 1993–2001.
25. M. Niepert, M. Ahmed, and K. Kutzkov, “Learning convolutional neural networks for graphs,” in Proc. of ICML, 2016, pp. 2014–2023.
26. J. Gilmer, S. S. Schoenholz, P. F. Riley, O. Vinyals, and G. E. Dahl, “Neural message passing for quantum chemistry,” in Proc. of ICML,2017, pp. 1263–1272.
27. Hamilton, W. L. (2020). Graph representation learning. Synthesis Lectures on Artifical Intelligence and Machine Learning, 14(3), 1-159.
28. Zhang, Z., Ma, D., & Li, X. Link Prediction with GNNs and Knowledge Extraction.
29. Xiao, Z., & Deng, Y. (2020). Graph embedding-based novel protein interaction prediction via higher-order graph convolutional network. PloS one, 15(9), e0238915.
30. Huang, K., Xiao, C., Glass, L. M., Zitnik, M., & Sun, J. (2020). SkipGNN: predicting mo- lecular interactions with skip-graph networks. Scientific reports, 10(1), 1-16.
31. Yang, F., Fan, K., Song, D., & Lin, H. (2020). Graph-based prediction of Protein-protein interactions with attributed signed graph embedding. BMC bioinformatics, 21(1), 1-16.
32. Xiang, Z., Gong, W., Li, Z., Yang, X., Wang, J., & Wang, H. (2021). Predicting Protein– Protein Interactions via Gated Graph Attention Signed Network. Biomolecules, 11(6), 799.

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Implementation Of Retrofit Data Acquisition System Using Lora For Industry 4.0

Anurag Nagar 1 ,Vijendra K Maurya 2 , Tina Bhati 3
M.Tech Scholar Rajasthan Technical University Kota, Rajasthan anuraag7775@gmail.com
Department of ECE GITS, Udaipur, Rajasthan maurya.vijendra@gmail.com
Department of ECE GITS, Udaipur, Rajasthan tina10bhati@gmail.com

Abstract- In the technological ocean of Industry 4.0, depending on individual's feasibility, industries are adopting various wireless communication methods for data monitoring, logging and controlling like WAN, Wifi, Zigbee, Mash, LoRa etc. This research paper present wireless de-facto Physical layer communication Medium i.e., LoRa with respect to cost optimization over long range communication, for machines/devices located in big plant. It includes brief finding of popular wireless technologies in Industry and details of Physical as well Lab demonstration on proposed implementation of LoRa with the objective of existing replacement of RS485. Although this experiment collects data in real time from slaves, but it can be logged in any data storage medium like on flash memory, SD card depends on individual requirements as well on cloud with internet connection. The laboratory work involves the implementation of most recent embedded hardware as well as embedded software to evaluate Temperature and Humidity parameters (most common parameter in industry).

Keywords—Industry 4.0, LoRa, BOM, POC, Industrial Automation

I. INTRODUCTION

Devices and Machines play a very vital role in industrial environment to monitor their smooth operation and control over them, needs some communication with them without human intervention.[1] Devices and machine usually have different kind of sensors [1], actuators etc that collects information about operating parameters.

Wireless communications are responsible for transmission and collection of information devices so that operational assessments and real-time adjustments can be done. Such as, a big Generator backing Oven process contains the number of Temperature and Humidity sensors, RPM etc. The relevant data need to continuously monitor and transmit via a wired or wireless network for analysis of quality production and intelligent controls on process. [2]

Line drivers and receivers are generally used to swap data between two or more points (nodes) on a network. Different manufacturers developed and provide standards to ensure compatibility between units for reasonable accomplishment of transferring data over specific distances and/or data rates.

A. LoRa - A Wireless Communication

To handle practical problems that is encounter in a usual communication network. The main disadvantage of cable cost and maintenance in RS-485 over long distance can be overcome by wireless technologies. [3] There are several wireless technologies available in market that can be use as a substitute of RS-485 mechanism. Every technology has their pros and cons.

The most optimise replacement of RS-485 can be achieved by LoRa Wireless technology. Since this technology have capability to meet the requirement over long range like RS-485, it widely accepted in industry and becoming de-facto standard for industrial devices and machine communication. One more additional advantage the LoRa technology is, along with data collection from sensor nodes it also transmits the data to cloud with the help of LoRa Gateway and plays a significant component of IIOT/ Industry 4.0 revolution. [4]

B. Introduction to LoRa

LoRa (short form of Long Range) is an RF modulation technique for low power and wide area networks (LPWANs). It is design by Cycleo of Grenoble, France and acquired by Semtech and get patent on it. LoRa is an extremely long-range data links. The range of LoRa communications in urban area is upto 3 miles (5 Km), and in rural area is upto 10 miles (15 Km) or more with the constraints of line of sight.

The Modulation technique used in LoRa is spread spectrum, which is based on chirp spread spectrum (CSS) technology. LoRa uses license-free sub-gigahertz radio frequency bands. The range of frequencies is different for different regions are shown in table I. [8]

TABLE I. RANGE OF FREQUENCIES FOR DIFFERENT REGIONS

Regions	Range of frequencies
Europe	433 MHz, 868 MHz
Australia and North America	915 MHz
India	865 MHz to 867 MHz

Asia	923 MHz

LoRa enables long range transmissions with ultra-low power consumption. It can be best suitable for of battery powered devices. The devices can use for 10 years. LoRa basically is physical layer and LoRaWAN (Long Range Wide Area Network) is protocols and covers the upper layers. [5] The data rate can be achieved between 0.3 Kbit/s and 27 Kbit/s and depends on SF. LoRa becomes the de facto wireless technology for Internet of Things (IoT) networks worldwide.

C. LoRaWAN-A Protocol

LoRaWAN protocol is an open-source protocol which enables smart IoT applications. The long-range communication link is enabled by the LoRa physical layer. While system architecture and communication protocol for the network are defined by LoRaWAN. It is a cloud-based MAC (Medium Access Control) layer protocol that behaves as network layer protocol which managed communication between end-node devices such as a routing protocol and LPWAN gateways. [6]

II. LoRa BASED IMPLEMENTATION

A New De-facto standard is evolved in Industry 4.0 that connect the industrial devices wirelessly. In this experiment the connection between machines is like RS485 Master-Slave architecture i.e., but devices/machines are connected wirelessly. The technology used here is LoRa, based on advantages above, which is most suitable to replace the RS485 connection Mechanism. Here philosophy of implementation is like RS485. Instead of the RS485 Modules (which support the communication mechanism) the LoRa Module is used for Master and Slave end. Details are as follows.

A. System Block Diagram of LoRa implementation in Industry 4.0

This setup of LoRa implementation is similar RS-485 Implementation in laboratory which is shown in figure 1. As the devices or industrial machines are connected in Master-Slave Architecture in RS-485 mode here for comparative study we made as it is but there is no physical Bus between them as these are communicating in wireless mode. One Device act as a Master i.e., LoRa enabled Master device it may be PC, or any Embedded System based device.

The other connected devices are act as slaves. Each slave has their own slave-ID. Slave may be located remotely and connected with master wireless mode. The Master is used to control the communication, collect information from slave device, and control the slave device/machine.

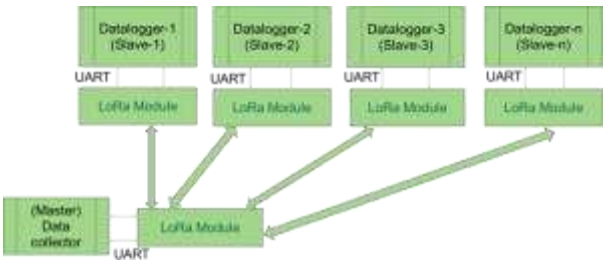


Fig. 1 System implementation of LoRa based communication interface

B. POC implementation of Circuit LoRa in Laboratory

To connect devices over LoRa, the devices should have basic hardware components so that it becomes LoRa enable devices. Figure 2 shows the essential components requirement for both Master and Slave. These are

- Microcontroller (May be PC or PCL)
- LoRa Module
- Power Source
- Any Sensor/Relays/Actuators/ Solenoids
- Any Display or Keypad (optional)

In block diagram sensor is not connected in master module.

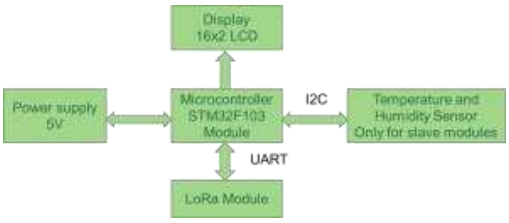


Fig. 2 Fundamental hardware block diagram for LoRa based Laboratory setup

C. Schematic of LoRa Enable Device

The schematic of LoRa enable device is shown in figure 3. For POC purpose following components is taken

- Microcontroller (STM32F103 Bluepill Board)
- LoRa Module
- Display (16x2 LCD)
- Temperature and Humidity Sensor (DHT112 for slave only)
- Keypad (optional)
- Power source (any 5V Adaptor)

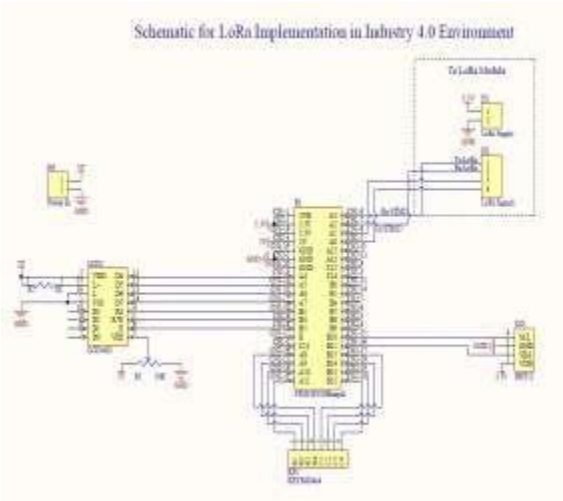


Fig.3 Schematic of LoRa enable device

D. Board Bring Up and System Set Up in Laboratory for of POC LoRa

For POC purpose one master without sensor and two slaves with Temperature and Humidity sensor with 16x2 LCD display are used. LoRa system setup with all the components is shown in figure 4.

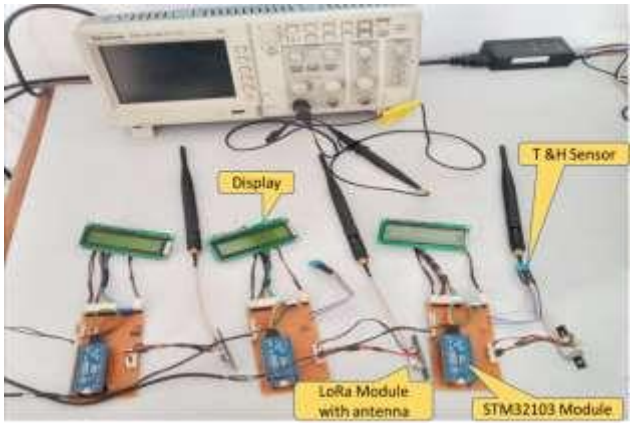


Fig. 4 LoRa system setup in lab

E. BOM (Bill of Material)

Bill of Material of for master module which includes all the components required for implementation of LoRa system is tabulated in table II.

TABLE II. MASTER MODULE LoRa

Component	Qty	Costing in INR
STM32F103Bluepill	1	350
LoRa Module	1	950
HEADER 2 Pin	1	8
Power Supply 5V	1	100
HEADER 4 Pin	3	36
LCD1602	1	150
Resistance 1K	1	1
Pot 10K	1	10
Master Module Cost		1650

Bill of Material of for Slave-1 Module which includes all the components required for implementation of LoRa is tabulated in table III.

TABLE III. SLAVE-1 MODULE-LoRa

Component	Qty	Costing in INR
STM32F103Bluepill	1	350
LoRa Module	1	950
HEADER 2 Pin	1	8
Power Supply 5V	1	100
HEADER 4 Pin	3	36
LCD1602	1	150
Resistance 1K	1	1
Pot 10K	1	10
Temp and Humidity Sensor DHT12	1	100
Slave-1 Module Cost		1705

Bill of Material of for Slave-2 Module which includes all the components required for implementation of LoRa is tabulated in table IV.

Table IV. SLAVE-2 MODULE-LoRa

Component	Qty	Costing in INR
STM32F103Bluepill	1	350
LoRa Module	1	950
HEADER 2 Pin	1	8
Power Supply 5V	1	100
HEADER 4 Pin	3	36
LCD1602	1	150
Resistance 1K	1	1
Pot 10K	1	10
Temp and Humidity Sensor DHT12	1	100
Slave-2 Module Cost		1705

The cumulative system cost of implementation of LoRa for data acquisition is tabulated in table V.

TABLE V. TOTAL POC COST LoRa

Module	Qty	Costing in INR
Master	1	1650
Slave-1	1	1705
Slave-2	1	1705
Total Set UP Cost		5015

F. Embedded Software Flow

The embedded software is written in C-Language for STM32F103 controller in Keil-IDE. For POC implementation two type of embedded software is written one for Master as shown in figure 5 and One for Slave as shown in figure 6. In Master software the flow of program is sequential. After power up hardware, program initialize microcontroller system through system initialize function then, program initialize relevant microcontroller inner hardware through program like: UART, GPIO for Display. After that program enters in continuous loop where, program continuously fetch Slave-1 and Slave-2 in defined interval over UART and collect their parameter of temperature and humidity and shows collected information on 16x2 LCD display.

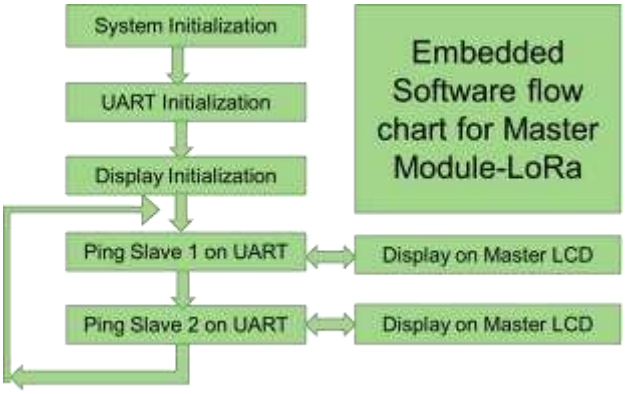


Fig.5 Master Module software flow diagram

In Slave software the flow of program is sequential. The initialization process is like the Master software only

some additional microcontroller hardware initialization, since it has additional temperature and humidity sensor.

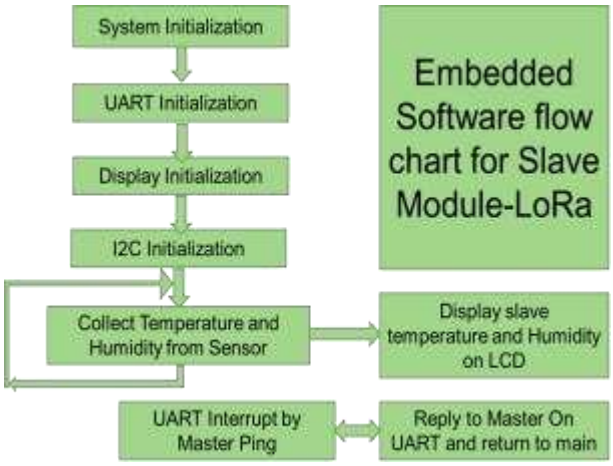


Fig.6 Slave module software flow diagram

After power up hardware, program initialize microcontroller system through system initialize function then, program initialize relevant microcontroller inner hardware through program like: UART, GPIO for Display and I2C for Sensor.

After that program enters in continuous loop where, program continuously fetch the temperature and humidity sensor and collect the parameter in defined interval over I2C and shown these on its own 16x2 LCD display the modules also keeps the last read parameter in RAM so that whenever the UART interrupt raise the Slave module share these parameters with Master module.

III. RESULT AND DISCUSSION

Testing is conducted in point to multidrop mechanism in that the master will send command to one of the slaves and gather the temperature and humidity data and shows the acquired data in masters display similarly master send command to another slave and gather the data and display it in parallel the slave is showing it own parameters but wireless. The setup functioning is shown in figure 7.

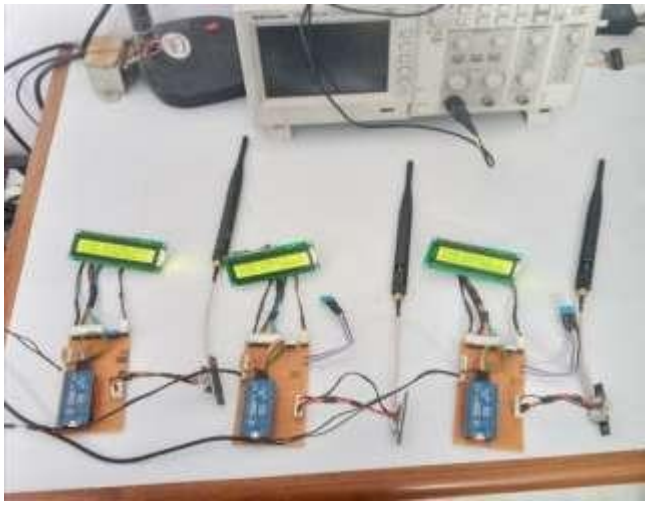
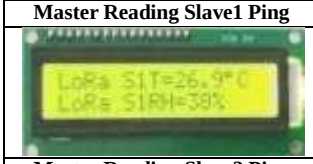
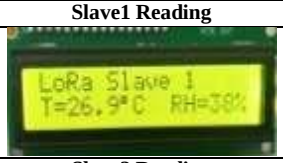
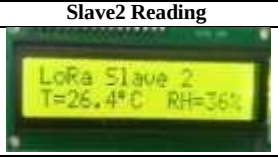


Fig.7 System testing results of lab setup (LoRa)

The live System shows the result on display as per algorithm is tabulated in table VI.

TABLE VI. LoRa SYSTEM LAB SETUP TESTING RESULT

Master Reading Slave1 Ping	Slave1 Reading
	
Master Reading Slave2 Ping	**Slave2 Reading**
	

IV. CONCLUSION

We have implemented data acquisition system using LoRa for industry 4.0. It is a wireless communication method for data monitoring, logging and controlling over long range for machines/devices. The BOM cost for POC is also mention. The system is able to record data and displayed the result directly on LCD display. This system works well in adverse industrial environment without any problem.

REFERENCES

[1] Kondamudi Siva Sai Ram, A.N.P.S.Gupta (2016), IoT based Data Logger System for weather monitoring using Wireless sensor networks, International Journal of Engineering Trends and Technology 32(2):71-75, DOI: 10.14445/22315381/IJETT-V32P213

[2] Khutsoane, O., Isong, B., & Abu-Mahfouz, A. M. (2017), IoT devices and applications based on LoRa/LoRaWAN, IECON 2017 - 43rd Annual Conference of the IEEE Industrial Electronics Society. doi:10.1109/iecon.2017.8217061

[3] Noreen, U., Bounceur, A., & Clavier, L. (2017), A study of LoRa low power and wide area network technology, 2017 International Conference on Advanced Technologies for Signal and Image Processing (ATSIP). doi:10.1109/atsip.2017.8075570

[4] Devalal, S., & Karthikeyan, A. (2018). LoRa Technology - An Overview, 2018 Second International Conference on Electronics, Communication and Aerospace Technology (ICECA). doi:10.1109/iceca.2018.8474715

[5] The Internet of Things-Enabling Technologies, Platforms, and Use Cases-Pethuru Raj and Anupama C. Raman-CRC Press, Taylor & Francis Group-International Standard Book Number-13: 978-1-4987-6128-4 (Hardback)

[6] Jitendra Rajendra Rana, Dr. S. A. Naveed (2019), Review of LoRa WAN and its Application, International Journal of Engineering Research & Technology, IJERT, Volume 08, Issue 12 (December 2019), ISSN (Online) : 2278-0181

[7] https://www.maximintegrated.com/en/design/technical-documents/appnotes/3/3884.html

[8] https://www.semtech.com/lora/what-is-lora

[9] https://www.altium.com/documentation//altium-designer/?version=18.1

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

A Hybrid Deep-Learning Approach for Recommendation System to Overcome Issues in Content-based & Collaborative-based filtering Approaches

Nirupma Singh[1] and Dr. Abid Hussain[2]

[1] Research Scholar, School of Engineering, Career Point University, Kota, India
[2] Associate Professor, School of Computer Applications, Career Point University, Kota, India

[1] nirupmachauhan27@gmail.com, [2]abid.hussain@cpur.edu.in

Abstract. The recommendation system is widely used in ecommerce and plays an important role in helping customers make smart decisions. Although many algorithms are available in the proposal system, collaborative filtering is still one of the most efficient and effective proposed technologies used. With collaborative filtering, computing is the biggest problem. To improve the accuracy and quality of the recommendations, we proposed an improved similarity model that incorporates three factors that affect similarity to minimize the similarity calculation gap. Compared to the traditional similarity measure, the advantages of our proposed model are that it makes full use of the evaluation data and solves the problem of the elements evaluated too. To validate the effectiveness of the proposed algorithm, experiments with four datasets were performed. The results show that the proposed method can effectively improve the recommendations of the recommendation system and is suitable for simple data. As the digital economy grows and becomes more complex, the role of recommendation systems in delivering personalized and relevant content to all users is more important than ever. Ecommerce sites with ever-growing product catalogs can show customized displays to millions of users at the same time. Digital content providers can help users browse more books, articles, songs, movies, and more. For example, Netflix reported in 2015 that its recommendation system affects around 80% of the site's streaming hours and estimates the system to be worth over $ 1 billion annually. In this article, we propose a collaborative content suggestion system for a hybrid deep learning system. We try to show the advantages and disadvantages of the contents and methods of cooperation and overcome their limitations.

Keywords: Collaborative filtering, data sparsity, cold-start problem, Artificial Neural Networks, Autoencoders, Multi-layer perceptron

Recommendation system is a general term for infrastructure that provides personalized recommendations based on input data. Every web service that provides personalized recommendations has a basic recommendation system. To name a few, Netflix, Pandora, Amazon and YouTube all use recommendation systems to recommend users the most prominent purchases and content. Reco systems are the primary driving force for sales and personalization and play a critical role in any business that is customer-oriented. Personalized recommendations can include various factors and provide insights into user preferences based on behaviour of customer usage pattern. For example, if a user usually orders pizza from Dominoes via food ordering apps, other restaurants of specialised in pizza are also primarily recommended to the user. However, if the user unexpectedly types "burger" into the search bar during a visit of a food ordering app, the system learns about this new interest & curiosity, and then also proposes the suggestions about the restaurants selling burger, either alternately with pizza restaurants, or organized according to the type of the dish.

These lifesaving systems are improving the user experience in the growing ocean of e-commerce, especially after the COVID-19 pandemic scenario. The reco engine aims to eradicate the difficulty of choice restrictions, paves the straightforward way for decision making and incredibly nurture the sales in online mode. Furthermore, the AI technology which is omnipresent nowadays is also infiltrating e-commerce using these recommendations systems, which can not only solve the not-so problems with recommendations, but also helps in anticipating the next moves of the potential customers.

1 Introduction

Fig. 1.1 Screenshot showcasing the recommendation given by Amazon when you searched for a book "Rich Dad Poor Dad"

Due to the affects & the situations caused by the COVID-19 pandemic, online sales have been doubled and are expected to rise exponentially in the upcoming three years. In this case, the companies needs to provide a perfect user experience and accurate recommendations to stand out. In this paper, you would read about how the recommendation system works, the advantages and disadvantages of these suggestions, and the approaches that support them. The figure 1.1 shows sentence types 1 to 3 of users who recently searched about pizza. For the food industry, it makes sense to set up a suitable table. However, it is also important to introduce alternative dishes. In addition, since users are interested in noodles when they have not ordered pasta in the past, it is also recommended to remember it or recommend the customers about the other restaurants that provide noodles.

Using a recommendation system, the answers to these questions can be accurately predicted, i.e. the unknown possibilities of the items can still be determined. The following goals have been achieved, among others by the number of algorithms. The large Sparse datasets, make it difficult to use tools such as Panda and Sklearn and other classic Python machine learning tools. The situations when the typical local computer does not have enough memory to store or process huge data are not peculiar. The processing time can significantly be extended with abundant amount of memory too.

The recommendation system essentially has the roles with the following three main aspects: Conversion of visitors into customers of the website, the horizontal capabilities of e-commerce sites to be improved & increased, and to focus on the building of the customer loyalty. With the development of e-commerce and the COVID-19 pandemic situations, more products are observed to be sold & bought online. The challenge caused by data sparsity issue, which is namely the lack of user preferences and preferred data is becoming extremely serious and a matter of concern.

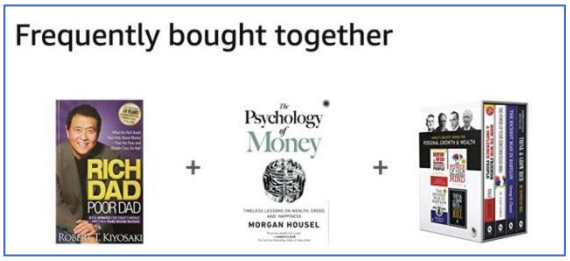


Fig. 1.2 Screenshot showcasing the recommendation given by Amazon when you searched for a book "Kellogg's Muesli Fruit, Nuts & seeds"

Collaborative Review (CF) is a technique which is widely used for providing the recommendations. Suggestions can usually be made based on the comments of people with similar choices and likes. However, CF faces two serious problems inherently, namely these issues are the main subject of this research.Lack of data means that it is arduous to find similar reliable ample users, because active users usually only estimate, review and rate a small fraction of the products.

- Cold start means that it is challenging to provide accurate recommendations to the users rating a limitednumber of items or we can say cold users.

Collaborative filtering systems will be prevented from adequately modelling user preferences due to the lack of correct and appropriate ratings and therefore in finding reliable users with similar likings. To be precise, recommendation system ratings are rarely 99%, and cold users typically rate less than five products. One of the corollary problems that arises is the development of a measure of similarity to better embark the relationships among users, typically in cold, unobtrusive conditions where the number of ratings present are very few or less. In order to address such problems, two general schemes have been reported in the literature. To begin with, include additional & supportive information (like the users or products) that can be of great help when modelling inclinations of the users, and in addition to this scheme, develop new measures to find the similarity among products and existing user ratings can be used in an exceptional way.

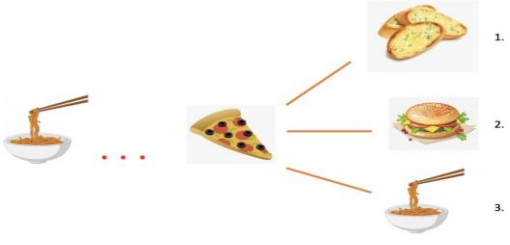


Fig. 1.3 Recommendation types for a User who last viewed a pizza.

1.1 Pros & Cons of Collaborative-based filtering & Content-based filtering

1.1.1 Content based filtering Advantages

The model does not require data on other users because the recommendations are specific to that user. This makes it easy to accommodate a large number of users. A template can capture the special interests of users and suggest certain items that other users are rarely interested in. Unlike a collaborative review, if an article has enough description, we can "avoid new design issues". The presentation of the material varies and allows the use of different methods, such as word processing technology, the use of semantic information, conclusions, etc. Creating a more transparent system is very simple: we use the same material to explain the tips. Unlike a collaboration filter, posts can be recommended before being viewed by a large number of users.

1.1.2 Content based filtering disadvantages

Since the display of the characteristics of the elements is done manually, this technique requires a lot of expert knowledge. Therefore the model can be as good as the hand-designed function.

This model can only be recommended based on existing user interests. In other words, the model's ability to expand existing user interests is limited. Content-based RecSys are often too specialized: they are similar to already-spent items and tend to create "filter bubbles". Limited content analysis:If the content does not contain enough information to accurately differentiate items, the recommendation is not fully finalized.

Specialization: A content approach provides limited innovation because it must match the characteristics of profiles and elements. Absolutely perfect content filtering can't imply any "amazing". If there is not enough information to create a strong profile for the user, they may not beable to give recommendations properly.

1.1.3 Collaborative based filtering Advantages

We do not need domain knowledge because integration is learned automatically. The model can help users discover new interests. The ML system itself may not know that the user is interested in this element, but the model can suggest this because similar users are interested in this element. To some extent, the system only needs a feedback matrix to enable the matrix factoring model. In particular, the system does not require contextual functionality. In practice, this can be used as one of several candidate generators. Collaborative filtering requires that other users be evaluated to find similarities among users and then make a recommendation. Instead, the content-based method should only analyze user data and profile to get a recommendation.

The collaboration method is commendable because some unknown users have the same taste as you, but the content-based method can tell you what features your article recommends.

1.1.4 Collaborative based filtering disadvantages

The model that predicts a given match (user, element) is the final product that has been properly integrated. Therefore, if the problem does not appear in the training, it cannot create an integration system for it, nor can it use it as an example. This problem is often referred to as the cold start problem. All secondary attributes are attributes other than query or element ID. For films recommendations, secondary notes may include status or age. By doing so, you can improve the quality of the page's quality for example.

Think about how most of your sentences are delivered to users: like a list of one or more logged items. Understandably, the real goal should be to correctly classify the data for all users. This allows us to generate recommendations where each article is ranked according to each user, with the most relevant articles at the top of each user's recommended articles list. To overcome these limitations, we need a moregeneral model structure that can extend the latent factor approach to include auxiliary features and specialized loss functions that maximize site ranking directly through feedback.

2 Literature review

[1] Qian Zhang et. Al. in this paper explained that the recommendation system is a very important tool in e- commerce. With the advent of the internet and more and more social platforms, the design of the recommendationsystem has become complex. Collaborative technology recommendation systems are easy to use, operational and reliable. Recommendation procedures are also updated over time, making articles or users more relevant. This article examines cutting-edge collaborative filtering techniques to provide quality advice. It is obvious that this area of research is still open, as the discussion section highlighted a number of limitations that can be addressed as future directions of research.

[2] In this paper , Lichun Zhou proposed a method to implement proposals to promote e-commerce products based on deep learning and

distributed demonstration based on an analysis of user interests and behaviors. Due to the specificity of the assembly algorithm, this paper improved the traditional iterative neural network. At the semantic level of advertising, the ad similarity network was created based on the thematic distribution of the ads and a time window was introduced to control the data transmission of the hidden layer of the repetitive neural network. This article compares traditional algorithms and traditional bidding algorithms in the actual data set of an e-commerce website. The experimental results show that the propositional neural network-based proposal algorithm and distribution expression proposed in this paper have a strong ability to achieve time characteristics and are clearly superior to the comparison algorithms mentioned in the evaluation index. The W-Rnn model proposed in this paper was found to be actually superior to the Rnn model (repeating neural network model). The proposed W-Rnn model has higher accuracy than Rnn in short- term predictions and a faster convergence rate. The difference between a modified repetitive neural network and a conventional repetitive neural network is that the improved repetitive neural network model introduces the time window concept so that it can actively resize a range of consumer behavior products. In this paper, the enhanced model is called the w-rnn model.

[3] Kai Wang et. al. in this paper proposed a personalized e-commerce product recommendation system based on knowing how teams are presented. The traditional kNN method has limitations in selecting a set of adjacent objects. Therefore, the neighborhood coefficient and time function and the lever of the dynamic selection model for selecting a set of adjacent objects are introduced. During implementation, RNN was combined with a attention mechanism to design an e-commerce product reference system. Extensive trials have shown the effectiveness of this method. The entry level mostly included user comments, such as ratings, likes or dislikes, click behavior data, and user profiles. At the model level, different models of deep learning can be used, such as an automatic encoder, a limited Boltzmann machine, a convergent neural network. At the output level, the algorithms use a hidden view that users and data have learned and a similarity calculation, the Softmax function, to create a list of recommendations.

[4] Shristi Shakya Khanal et al. described that the main contribution of this article is the classification of RS systems with ML algorithms, applied scoring metrics and information on challenges and problems that will need to be addressed in future research. This research has shown that HR is a popular reference technique in e-learning, and most studies aim to improve the quality of recommendations and suggestions. Of the four techniques, hybrid techniques have a competitive advantage, but their popularity is low. ML algorithms cannot be classified in this article due to the numerous algorithms used in unique systems. Clustering has been a common machine learning technique with future research showing that SVN and neural networks improve outcomes. Although SRs in e-learning are student-based, the system evaluation focused on measuring the accuracy of the algorithm through averaging, measuring memory, and F, instead of estimating the algorithm, its impact on user satisfaction, and propensity level. The main issues not yet resolved in the RS are scalability and lagging behind with new privacy issues and Schilling attacks. The results showed that hybrid technology can solve the most common problems that today's systems face. However, more research is needed to improve user confidence and aspects of user interaction with systems.

[5] Stefani et. al. in this paper about the recommendation system introduced their proposal about the collaborative fashion recommendation system. This paper proposes a new measurement intensity estimate, which is critical for system operation. The spring trend is calculated using a subsystem for calculating trend results, in order to display products in each category from popular options to classic ones, and to suggest trendy products from different clothing styles. As mentioned above, this system of recommendations depends on the assessment of the trend of each product from the computer rating system (only experienced and experienced users). When added to the system, the estimated initial voltage is calculated for each product. The trend estimate is calculated when the manager adds the following clothing characteristics: color, material, and shape. These attributes were chosen because they are related to the categories included in the speech system. The values of these features are then compared with the voltage values. When a trend value of a theme, color, or shape matches, the trend value of that value is calculated by adding individual ratings. The rating of the votes obtained by experts is calculated separately from normal users. Then they are added. Here's how the name of each pen counts. It should be noted that skilled voices are 50% heavier than normal users. Finally, the highest trend rating of each product is the highest color, material and design.

[6] In this paper, Ruihui Mu suggested that the suggestion system can not only recommend articles with similar user preferences based on user

preferences, but also recommend interesting articles that the user does not know. without them. Recommendation systems can alleviate these problems by effectively identifying the needs of potential beneficiaries and selecting desired items from a large amount of candidate data. Deep learning is a new area of research in machine learning. The goal is to explore how feature views can be automatically retrieved at different levels of data. In-depth analysis has changed the supply architecture and opened up many opportunities to improve supply performance. Recent advances in Deep Learning Recommendation Systems (DLRS) have gained significant attention by breaking down barriers to traditional models and having high-quality recommendations. In-depth analysis can capture linear, non-trivial interactions between users and elements and encode more complex abstractions than higher-level data representations. Compared to traditional reco systems, the deep learning-based recommendation approach can use the deep learning approach to automatically learn the user's hidden properties and components by integrating different types of diverse data. Settings and improve the accuracy of recommendations.

[7] Libo Zhang et. al. This paper discusses the effectiveness and details of implementing a DNN model applied to non-content-based recommendation systems. The authors first presented a method of using the QPR model to obtain latent user properties and data, and then combined them with the DNN model. Experimental results show that the proposed model achieves good prognostic performance, which showed that the application of the deep learning model in the reference system is a successful attempt. The context in this article is simple and general, so it is not limited to the method presented in this article. The framework can be considered as a guide for the development of in-depth learning methods for reference systems. This article is a preliminary attempt to apply deep learning methods to reference systems, so there are many areas for improvement, such as building more complex models or using other learning methods.

[8] Debanjan Paul et.al. in this paper addressed the challenge of using different natural language expressions in different review articles by the user in order to refer to similar products. This paper, uses vector representations to find references to similar aspects and map them to aspects listed in the product specification. A critical rating can be of a great benefit as it can be used as an indicator of quality for a criterion, but new reviews do not have any such beneficial ratings. In this paper, the problem of cold start is solved with the help of a dynamic convolutional neural network for the assessment of quality factors according to the content of the journal. The system is evaluated on Amazon and Flipkart datasets and is more efficient than competing methods.

[9] As one of the most important recommendation challenges, the lack of information on the quality of the recommendation can be described as: Because the history is not enough, it is difficult to find the target user's neighbors in the scattered data frame. Or even if a neighbor is found, the results are terrible and the accuracy is poor. For user specific, inappropriate comments on the neighborhood, it will restore the coverage of the reviews and the recommendation algorithm's ability to generate an accurate and brand new recommendation list. We have provided some useful information, such as: B. Relationships with neighbor and user close to target. A cold start problem is an extreme scarcity of information, including new information and new problems affecting users' suggestions. We have proposed new algorithms to improve the accuracy and quality of the ProbS algorithm recommendations, and we have proposed using bidirectional data to manage nodes among users in the network. The reliable data input algorithm includes data sets and users sets, such as users in data or data sets. Ignore the specific value step. To rate users articles, we will estimate the user's links with articles.

3 Existing Approaches

3.1 Collaborative filtering

Collaborative screening (CF) method in which recommendations are made based on the evaluation of user data. Users with similar ratings are given the nearest neighbors. When the nearest neighbor is found, the unrealized neighbors score the user's items, and then RS recommends the item with the highest predicted score to the user. Collaborative filtering algorithms are divided into two categories: memory-based algorithms and model-based algorithms. The main difference is the editing of the comments. Memory-based algorithms include user-based filtering algorithms (UBCF) and data-based filtering algorithms (IBCF). UBCF's algorithm focuses on finding the neighbors closest to the target user and predicting the date when it is underestimated; on the contrary, the goal of the IBCF algorithm is data. This article uses UBCF to illustrate the enhanced similarity method. Model-based algorithms need to build models that reflect user behavior based on aggregated evaluations, so that ratings can be predicted without evaluation. Metrics like cosine similarity can then be used to determine the similarity between user vectors. Through collaborative screening, we cannot judge personal

tastes and meal preferences. We only have the total score that the individual gives for each car. As usual, the data is scarce, suggesting that the person is unfamiliar with cars, is not on the car purchase list, or has forgotten to leave a review.

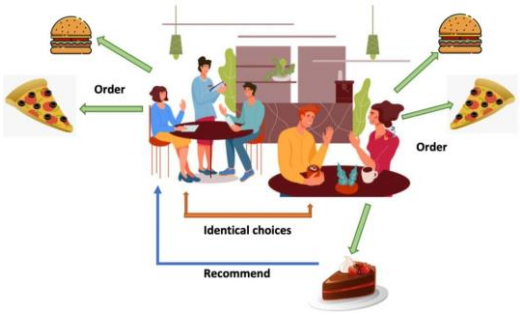


Fig. 3.1 Collaborative filtering (CF) approach

3.2 Content filtering

Content-based advisors assess the behavior of previous users and the content elements themselves to make recommendations. Works with data provided by the user explicitly (assessment) or implicitly (expressing interest by clicking on a link). This data is used to create a user profile that helps the system provide more customized suggestions to the user. The engine becomes more accurate as the user enters more or responds to recommendations. Pandora is an example of a content-based recommendation. Your suggestion system evaluates user preferences and song characteristics, such as length, instruments, harmony, genre, and so on. Use all this information to suggest new songs to that user. The content-based receommendation tool works with data provided by users, either explicitly (assessment) or tacitly (by clicking on the link). From this data, a user profile is created on the basis of which suggestions are given to the user. As the user becomes more involved or responsive to recommendations, the engine becomes more accurate. The concepts of term frequency (TF) and reverse document frequency (IDF) are used in information retrieval systems and content- based filtering mechanisms (e.g., content reference system). They are used to determine the relative importance of a document / article / message / film, etc. The content-based suggestion system suggests articles that the user has liked in the past. Thus, user preferences can be modeled based on the history of what the user liked.

3.3 Factorization models based on machine learning

Factorization Machines (FM) are supervised general learning models that map arbitrary characteristics of real-world value into a three-dimensional latent factor and can obviously be applied to a wide variety of tasks, including regression, sorting, and sorting. FMs can accurately estimate model parameters between very thin data and train with linear complexity, allowing them to accommodate very large data sets. These features make FM the best solution to the terrible problems of the world. Unlike the classic MF model discussed above, which fits into a user data interaction matrix, FM models represent user data interactions as a set of real value attribute vectors and target numeric variables: this data format should be familiar to anyone with a typical regression experience. or a classification model. Collaborative filtering features are key features of user bits and element flags, so each instruction example has exactly two non-zero elements that match the specific user / element combination. However, these indexes / user articles can be supplemented with arbitrary auxiliary functions, e.g. day-of-week, add-to-cart order, etc.

3.4 Artificial neural networks

ANNs are effective data-driven modeling tools and are widely used for dynamic modeling and nonlinear system recognition due to their universal approximation capabilities and flexible structure that enables nonlinear behavior detection. The perceptron-type direct acting multilayer RNA is often used in engineering applications. Due to the enormous need for information processing, KNN can be used to improve and promote the development of reporting systems. Recently, some synthesis methods have been developed based on artificial neural networks. This includes using integrations originally designed for text data that generate a latent representation, similar to the factorization models described above. These can be integrated into other neural networks and are also suitable for mapping certain characteristics of client behavior, but are often more complex to train. There are also other methods based on deep learning, such as RNN approaches with closed iterations. A common use of such methods is session-based recommendations. A range of collaborative content and capabilities enables the development of a neural network model to minimize log loss and evaluate classification errors using a stochastic gradient optimization algorithm. We show empirically that the hybrid approach is a promising solution compared to the memory-based autonomous collaborative filtering method.

4 Proposed Hybrid Model

In this article, we propose a new hybrid system of deep learning recommendations to bridge the gaps in collaborative filtering and content filtering systems and leverage deep learning to achieve state-of-the-art predictive accuracy. While

innovative collaborative filtering systems with many innovative results are popular in reference systems, they suffer from the problem of lack of data when there is no history of users and data. To fill these gaps, we describe a new hybrid system of deep learning recommendations. The solution uses embeds to represent users and data to learn factors. This approach uses deep learning models to create a hybrid suggestion system that uses collaborative content and data. It first deals with common content and data separately and then combines efforts to create a system with the best of both worlds.

To create the hybrid model, the results of encoder machine learning content based data integration from tags and neural network data are consolidated which incorporates deep entity learning ecommerce based integration. Integration into various areas of machine learning, such as natural language processing, predictive models with categorical capabilities, and reference systems, are popular topics. There are many ways to calculate integration, but the ultimate goal is to map "objects" into a latent space of complex and essential dimensions. In a custom recommendation tool, you can imagine latent dimensions that measure things like "electronics" and "family" and other concepts like "interchangeable with non-refundable". Users and products are assigned to this domain based on their relevance to each feature.

We decided to use an automatic encoder to do the compression. Automatic encoders are neural networks where the outputs are identical to the inputs. In our architecture (shown in the image below), the high-dimensional TF- IDF input is gradually compressed into a 100-dimensional central hidden layer. This first half of the network is the "encoder". The second half of the network, the "decoder", tries to reconstruct the original input. To study deep neural networks for collaborative filtering, a multilevel perceptron model (MLP) is used to learn the function of user-object interaction. Finally, we present the neural network matrix factorization model, which is an amalgamation of MF and MLP models. This model uses the linearity of MF and the nonlinearity of MLP to model latent user data structures.

In the next phase, we will take the last step of two network-based neural models - GMF, in which linear and MLP cores, which use non-linear cores, receive encoders from themselves and will know the commercial function of the data. Next, we will present a hybrid model by combining GMF and MLP to encourage complex and mutually beneficial user interactions and learn from the components. An open approach to these models is to share the same level of integration with GMF and MLP and then link the outputs of commercial applications.However, the performance and flexibility of coal models may be limited by the integration of GMF and MLP integration. Therefore, we had GMFs and MLPs identify individual companies and associate these patterns withtheir lowest hidden layers, as shown in Figure 4.1. We may provide a copy in the following manner:

$$\hat{z} = (\phi.(MLP.GMF))$$

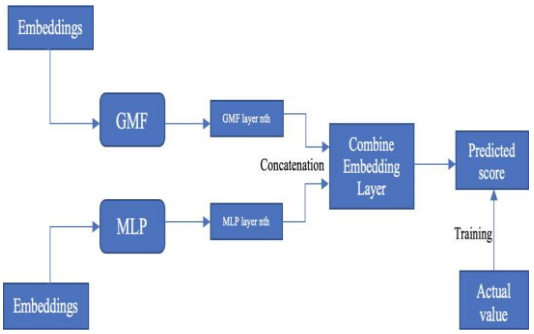


Fig. 4.1 Architecture of proposed model

To model the interaction between the user and the element, we used a multilevel view in which the output from one level acts as input to the next level. The entry level is followed by the integration level. This layer is a fully connected layer showing the scattered representation in a dense vector. The resulting user/element integration can be considered as a latent vector for the user/element within the latent factor model. These integration levels are then introduced into a multi-layered neural architecture to map latent vectors into predictive estimates. We can also customize each hidden layer to detect new latent structures of interactions with custom components. The last layer gives the expected result and the size of the last layer determines the capacity of the model. We have provided training to reduce the loss of points between the expected figure and the actual value.

The proposed solution can be compared to existing methods in terms of predicted accuracy and execution time. Predictive accuracy is measured by mean square error (MSE), mean square error (RMSE), mean absolute error (MAE), and square R. Pass time is measured by mean and standard deviation in seven phases. Extensive experiments are performed on a variety of datasets, such as ecommerce (Amazon).

5 Conclusion

In this paper we have proposed a collaborative

content suggestions system in a hybrid deep learning system. We strive to demonstrate the advantages and disadvantages of collaborative content and methods. According to our observations, the collaboration filter was effective in crossing the cut-off between categories and consistently rated the top recommended restaurants. Content's content is effective at understanding similar styles and
smaller-known and probably secret restaurants. The purpose of the hybrid approach is to resolve the forces of both systems. Our proposed architecture is designed to overcome the limitations of the filter model for the cooperative matrix factorization and savings problem. Through careful model design, we believe that our model surpasses the best models that exist in the data itself. This example is simple and general and can be applied or extended to different types of problems with recommendations.
We believe that custom reference system development is a multiple direction, that includes efficiency, diversity, efficiency and IT explanation. and this will ultimately overload the information problem-solving.

References

[1] Zhang, Q., Lu, J., & Jin, Y. (2021). Artificial intelligence in recommender systems. *Complex & IntelligentSystems*, *7*(1), 439-457.

[2] Zhou, L. (2020). Product advertising recommendation in e-commerce based on deep learning and distributed expression. *Electronic Commerce Research*, *20*(2), 321-342.

[3] Wang, K., Zhang, T., Xue, T., Lu, Y., & Na, S. G. (2020). E-commerce personalized recommendation analysis by deeply-learned clustering. *Journal of Visual Communication and Image Representation*, *71*,102735.

[4] Khanal, S. S., Prasad, P. W. C., Alsadoon, A., & Maag, A. (2020). A systematic review: machine learning based recommendation systems for e-learning. *Education and Information Technologies*, *25*(4), 2635- 2664.

[5] Stefani, M. A., Stefanis, V., & Garofalakis, J. (2019, July). CFRS: A Trends-Driven Collaborative Fashion Recommendation System. In *2019 10th International Conference on Information, Intelligence, Systems and Applications (IISA)* (pp. 1-4). IEEE.

[6] Mu, R. (2018). A survey of recommender systems based on deep learning. *Ieee Access*, *6*, 69009-69022.

[7] Zhang, L., Luo, T., Zhang, F., & Wu, Y. (2018). A recommendation model based on deep neuralnetwork. *IEEE Access*, *6*, 9454-9463.

[8] Paul, D., Sarkar, S., Chelliah, M., Kalyan, C., & Sinai Nadkarni, P. P. (2017, August). Recommendation of high quality representative reviews in e-commerce. In *Proceedings of the eleventh ACM conference on recommender systems*(pp. 311-315).

[9] Zhang, F., Qi, S., Liu, Q., Mao, M., & Zeng, A. (2020). Alleviating the data sparsity problem of recommender systems by clustering nodes in bipartite networks. *Expert Systems with Applications*, *149*,113346.

[10] Guo, G. (2013, June). Improving the performance of recommender systems by alleviating the data sparsity and cold start problems. In *Twenty-Third International Joint Conference on Artificial Intelligence*.

[11] C. Gomez-Uribe, N. Hunt. The Netflix Recommender System: Algorithms, Business Value, and Innovation (2015), ACM Transactions on Management Information Systems

[12] Y. Koren, R. Bell, C. Volinsky. Matrix Factorization Techniques for Recommender Systems

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Contact Detecting Digital Technology in theContext of COVID-19

Deepak Kumar[1], Tabish Mufti[2], Shahabsaquibsohail[3], Bulbul Gupta[4]

[1]Amity Institute of Information Technology, Amity University, Noida, India

[2]Department of Computer Science and System Studies, Mewar University, Chittorgarh, Rajasthan, India

[3,4]Department of Computer Science and Engineering, Jamia Hamdard, New Delhi

Abstract: In the recent, Corona Virus epidemic (COVID-19) increases day- to-day from one individual to another because of contact transmission and COVID-19 is caused by the SARS-CoV-2 virus. Identifying and stopping the spreading of contagious diseases such as COVID-19 is important to handling epidemics. One major part taken to find and trace their previous connections so as to then carefully dissociate any persons likely to have been infected and accommodate dispersion is to find out or explore more transmissible persons. These previous connections can be traced using smart machine such as smart watches and smart phones, which can frequently find and collect the connections and location of their infected ones through their embedded transmissions and localization methodologies or technologies, such as Global Positioning System (GPS) space-based navigation system, Wi-Fi, biological connections, and Bluetooth. Contact Detecting is the one of the best technologies in which we use a methodology for stopping and controlling the COVID-19. This review paper focuses on the methodology and effectiveness of these smart technologies and determines the model of contact detecting accuracy on the spread of the COVID-19, working of contact detecting, algorithms and control of the COVID-19. In this paper, we have determined the role of contact detecting in COVID-19, effective impacts of Contact Detecting and designed a COVID-19 epidemic model that we createdto

evaluate the number of people quarantined and effectiveness of the steps to be taken, through the smart watches and smart phone contact detecting technique used. In this review paper, our result shows that in order to be accurate and effective for the COVID-19 pandemic, the contact detecting technique must be traced speedily, a valuation ratio of the population must use the smart devices, contact detecting application and this technology must be correct. All these rigid needs make smart device-based contact detecting rather inefficient at accommodating the spread of the virus during the COVID-19.

However, in this phase smart machine-based Contact Detecting could be immensely and enormously useful and recognizing a second

section, where a segment of the community will have increased immunity.

Keywords: Contact Detecting, COVID-19, Methodology, Smart Technology, Model, Impact and Roles.

1. Introduction

In 2019, Corona Virus epidemic (COVID-19) increases day-to-day from one person to another because of contact transmission and COVID-19 is caused by the SARS-CoV-2 virus. To stop and control the spread of COVID-19, protecting that the total number of current cases generated by each accepted case is continued under powerful reproduction number < 1, doctors and health specialist need to control and break the chains of human-to-human transmission [1]. As section of a case recognition, segregation, encyclopedic approach, care and check-ups, quarantine, detention and contact detecting, are fragile and critical activities to control the epidemic and stop the transmission [2].

A new methodology has found that is "Contact Detecting" [3]. Contact detecting is the handling people who have been exposed to a COVID-19 to prevent onward connection, finding infected ones and, estimating. When methodically applied, only contact detecting will break the chains of transmission of the COVID-19 and contact detecting is the one of the crucial communal health technique for preventing contagious disease outbreaks. Smart technology is very helpful in contact detecting for COVID-19 finding individuals who may have been unprotected and exposed to COVID-19 [4].

Important aspects of the execution of contact detecting in COVID-19 are common support, accurate method, a structure to modulate and arrange, analyze information in real-time, local contexts of COVID-19, cultures and public, a labor pool of qualified or trained connection tracers and task masters and engineers support to contact detecting teams [5]. In contact detecting smart technology, multi-hop mesh networking technology is very useful to trace and connect with the infected individuals and connected ones. Mesh networking plays vital role in the contact detecting technique and effective in the working [6].

For effective impact of contact detecting on COVID-19, all countries must have acceptable efficiency to test major and suspect cases appropriate time. In this, where this is not achievable, examining and testing in contact detecting actions may not target on main risk contexts with exposed people, like home quarantine, hospitals and other closed dormitories
[7] [8]. Because persons may spread COVID-19 while asymptomatic or pre-symptomatic, this instruction also indicates the effect of quarantining connections to further decrease the hope for secondary communication [9].

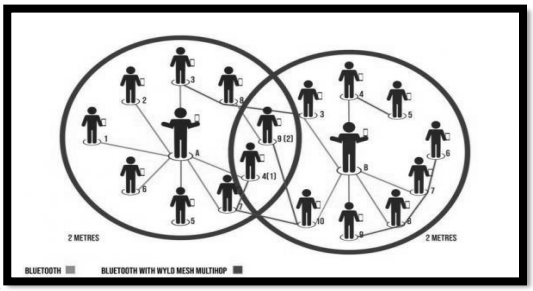


Fig. 1. Multi- Hop Mesh Network Technology
Source: eenewseurope

2. Literature Review

X. Wang et al. Mentioned main teams of COVID-19 pandemic infection, evaluate the involvement of various connection ways and analyze needs for isolation and detecting contact required to control the COVID-19 pandemic. Even through SARS-CoV-2 virus

is growing day-by-day to be consists of organized contacts detecting. COVID-19 could be stopped if this procedure were faster, more effective, and appeared at scale. A contact detecting app that set up a memory of accurately connections and contacts and instantly informs connections of positive cases of COVID-19 can resolve pandemic lead and control if used by enough people [10].

Katina Michael et al. The researcher provides examining the role of Google and Apple in the proposed smart phone-centric detecting contact effectiveness in the response to the novel COVID-19. Governments involving Australia and Singapore have to date achieved their results, named Trace Together and COVID-19 Safe respectively. Trace Together was evolved by Singapore's Ministry of GovTech. The app makes on the Blue Trace Protocol for contact detecting. The Singaporean Government was the first in the world to launch a national Bluetooth contact detecting app, using their OpenTrace code to appliance the Blue Trace protocol [11].

Juan-Carlos Cano et al. Mentioned How Smartphone Contact Detecting Technology Can Reduce the Spread of COVID-19. They focused on evaluating how smart phone contact detecting can be effect the lead the spread ofCOVID-19 epidemic. He introduced a stochastic structure that gets changed into a deterministic structure, while taking into examining the impact of detecting contacts and the ratio of quarantine. On the basis of stochastic structure and deterministic structure, he assessed many achievable scenarios for smart devices-based contact detecting. Although the stochastic structure and deterministic structure, are universal for COVID-19, he has studied the matter of COVID-19 particularly [12].

Roba Abbas et al. Mentioned COVID-19 Contact Trace App Deployments: Learnings from Australia and Singapore paper. As the COVID-19 epidemic has spread all over the world, high- tech fixes based on smart phone results have been introduced as a means to stop further financial loss, reduce the risk posed to humans, and overcome communal and work challenges. If health jurisdiction and ministry can record and trace the action of the people at the grainiest stages, then they can answer instantly by setting confirmed matter and connected contacts in detention. Through this, it is analytically convenient to decrease the level COVID-19 epidemic [13].

Matt J Keeling1, T Déirdre Hollingsworth2 and Jonathan M Read et al. proposed the efficacy of contact detecting for the containment of the 2019 novel COVID-19. Detecting contacts are a basic people healthcare to contagious disease outbreaks, mainly in the early levels of an outbreak when main treatments are limited. Controls to the solutions of a close connection can decrease, but with the enhancement in risk of untraced matter of COVID-19 individuals; they measure that any solution where close connections require more than four hours of connections is expected to lead to infected ones and uncontrolled spread [14].

3. Model of Contact Detecting

For COVID-19 pandemic contact detecting is a crucial part of the condition to take up the economy without bringing a tack in COVID-19 cases and the medical structure [15-16]. In this model the impact of the detecting contacts of critical cases, quarantining all infected ones, control the expansion of the COVID-19 by decreasing the total number of connections and transmissions from both critical infected persons and their contacts (not infected) while decreasing the effect on the population [17-19]. The accomplishment

rate of the model determines the large-term change of the pandemic. If the accomplishment rates are immense sufficient, then the detecting contacts and quarantining become more effectively control the COVID-19 pandemic [20-25].

Day- 1

Contact detecting technology uses Bluetooth to trace contacts within certain limits. For Example: Closer than 2m for more than 15 minutes [26] [27].

- Has COVID-19 but is unaware as has no symptoms.

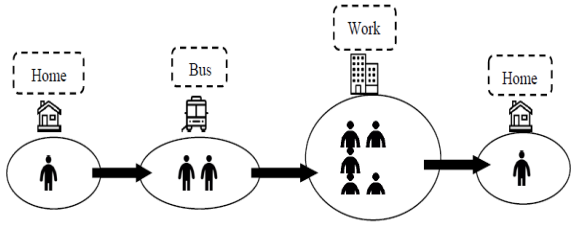


Fig. 2. Model of Contact Detecting

4. Role of Contact Detecting

Contact Detecting plays important role in COVID-19 pandemic [28]. Societies must trace contacts personnel and private department to control the spread of COVID-19 pandemic. As the community health department and the main essentials for STLT health agency on controlling COVID-19 outbreaks, contact detecting role in COVID-19 is to maintain management and solutions to support State, Tribal, Local, and Territorial (STLT) health care agency update new effective features for detecting contacts programs for their connections (not infected) [29-33]. The eventual main objective is for State, Tribal, Local, and Territorial organization have powerful, robust for communal health systems that involves a positively evolved contact detecting smart technology [34] [35]. Through this aspect, Centers for Disease Control (CDC) is offering support State, Tribal, Local, and Territorial with information, support, and digital service on detecting contact in COVID-19 [36]. Centers for Disease Control (CDC) also arrange COVID-19 support straightly to State, Tribal, Local, and Territorial health care agency over 300 Centers for Disease Control departments stand in a fixed in a health care agency across the community [37]. Contact Detecting is very helpful and supportable to control the COVID-19 pandemic, a through is technique we trace infected individuals and their connections [38].

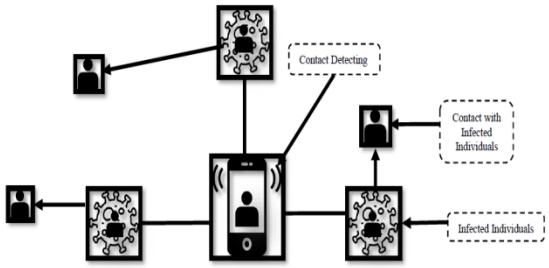


Fig. 3. Contact Detecting Working

Conclusion

COVID-19 pandemic spreads human-to-human and this virus is very dangerous. In this review paper, we determined contact detecting smart technology in the context of COVID- 19, role of contact detecting in COVID-19, impacts those controls and stop the spread of COVID-19. We have designed a COVID-19 epidemic model that we created to evaluate the number of people quarantined and effectiveness of the steps to be taken, through the smart watches and smart phone contact detecting technique used. On the basis of contact detecting model, we evaluated how contact detecting technique works. Although the contact detecting model is very effective for contagious diseases. With regard to

detecting contact technology in the context of COVID-19, our results of this paper show that the smart devices used for detecting connections has a strong impact on the economic and social cost of people quarantined. A Systematic technique, such as Wi-Fi, GPS and Bluetooth, permit for higher judiciously when it comes to quarantining people. In contact detecting technique effective results also shows, smart-phone detecting contacts requires the connection be traced and also mesh-hop networking technology is very helpful to trace contacts. Lastly, humans fight with this virus through smart technology "WE CAN WE WILL".

References

[1] S. Rimpiläinen, "Rapid Review of Contact Tracing Methods for COVID-19," 2020.

[2] WHO, "Contact tracing in the context of COVID-19," *WHO Guidel.*, vol. 2019, no. May, 10, pp. 1–7, 2020.

[3] E. Hernandez-Orallo, P. Manzoni, C. T. Calafate, and J.-C. Cano, "Evaluating How Smartphone Contact Tracing Technology Can Reduce the Spread of Infectious Diseases: The Case of COVID-19," *IEEE Access*, vol. 8, pp. 99083–99097, 2020, doi: 10.1109/access.2020.2998042.

[4] A. Aggarwal *et al.*, "Clinical & immunological erythematosus patients characteristics in systemic lupus Maryam," *J. Dent. Educ.*, vol. 76, no. 11, pp. 1532–9, 2012, doi: 10.4103/ijmr.IJMR.

[5] K. Michael, "Getting Behind COVID-19 Contact Trace Apps : The Google- Apple Partnership," vol. 2248, no. c, 2020, doi: 10.1109/MCE.2020.3002492.

[6] K. Michael, "COVID-19 Contact Trace App Deployments : Learnings from," vol. 2248, no. c, 2020, doi: 10.1109/MCE.2020.3002490.

[7] A. K. Tripathy, A. G. Mohapatra, S. P. Mohanty, E. Kougianos, A. M. Joshi, and G. Das, "EasyBand: A Wearable for Safety-Aware Mobility during Pandemic Outbreak," *IEEE Consum. Electron. Mag.*, vol. 2248, no. c, pp. 10–14, 2020, doi: 10.1109/MCE.2020.2992034.

[8] D. Kumar, "Corona Virus: A Review of COVID-19," *Eurasian J. Med. Oncol.*, vol. 4, no. 2, pp. 8–25, 2020, doi: 10.14744/ejmo.2020.51418.

[9] H. Harapan *et al.*, "Coronavirus disease 2019 (COVID-19): A literature review," *J. Infect. Public Health*, vol. 13, no. 5, pp. 667–673, 2020, doi: 10.1016/j.jiph.2020.03.019.

[10] T. Singhal, "A Review of Coronavirus Disease-2019 (COVID-19)," *Indian J. Pediatr.*, vol. 87, no. 4, pp. 281–286, 2020, doi: 10.1007/s12098-020-03263-6.

[11] I. Ekong, E. Chukwu, and M. Chukwu, "COVID-19 mobile positioning data contact tracing and patient privacy regulations: Exploratory search of global response strategies and the use of digital tools in Nigeria," *JMIR mHealth uHealth*, vol. 8, no.4, pp. 1–7, 2020, doi: 10.2196/19139.

[12] Adam Vaughan, 17 April 2020, "There are many reasons why covid-19 contact tracing apps may not work", New Scientist, Last Accessed: 9 May 2020.

[13] Jen Ralls, 14 April 2020, Fit bit Collaborates with Scripps Research and Stanford Medicine to Study the Role of Wearable to Detect, Track and Contain Infectious Diseases like COVID-19.

[14] Ajaya K. Tripathy, Ambarish G Mohapatra, Saraju P. Mohanty, Elias Kougianos, Amit M. Joshi, Gautam Das, "EasyBand: A Wearable for Safety-Aware Mobility during Pandemic Outbreak," IEEE Consumer Electronics Magazine [Early Access Article].

[15] TraceTogether, 9 April 2020, How does TraceTogether work?", Team Trace Together, Last Accessed: 9 May 2020.

[16] Aradhana Aravindan, Sankalp Phartiyal, 21 April 2020, "Bluetooth phone apps for tracking COVID-19 show modest early results", Reuters, Last Accessed: 9 May 2020

[17] Denham Sadler, 1 April 2020, "Contact tracing tech is a mixed bag", InnovationAus, Last Accessed: 9 May 2020.
[18] David Crowe, 14 April 2020, "Mobile tracing is next step in virus battle in bid to stop outbreaks", Sydney Morning Herald, Last Accessed: 9 May 2020.
[19] Andrew Probyn, 25 April 2020, "Coronavirus lockdowns could end in months if Australians are willing to have their movements monitored", ABC, Last Accessed:9 May 2020.
[20] SBS, 17 April 2020, "Coronavirus mobile tracking app may be mandatory if not enough people sign up, Scott Morrison says".
[21] Jordan Hayne and Georgia Hitch, 18 April 2020, "Coronavirus app will not be forced upon Australians, Scott Morrison says".
[22] Mary Hui, 21 April 2020, "Singapore wants all its citizens to download contact tracing apps to fight the coronavirus", Quartz, Last Accessed: 9 May 2020.
[23] Jack Gramenz, 1 May 2020, "Reasons we're not downloading app", The Queensland Times.
[24] Aloudat, A., & Michael, K. (2011). The Socio-Ethical Considerations Surrounding Government Mandated Location-Based Services during Emergencies: An Australian Case Study. In M. Quigley (Ed.), ICT Ethics and Security in the 21st Century: New Developments and Applications.
[25] Jennifer Dudley-Nicholson, 6 May 2020, "Experts call for government to upgrade COVIDSafe app due to software issues", The Daily Telegraph.
[26] Jennifer Dudley-Nicholson and Clare Armstrong, 5 May 2020, "COVID Safe app: Issues preventing registrations as Federal Government calls for more downloads", The Daily Telegraph.
[27] Tim Biggs, 1 May 2020, "COVIDSafe may interfere with diabetes-monitoring apps", Sydney Morning Herald.
[28] John Boyd, 6 May 2020, "Australia's ContactTracing COVIDSafe App Off to a Fast Start", IEEE Spectrum.
[29] Bruce Schneier, 15 April 2020, "Contact Tracing COVID-19 Infections viaSmartphone Apps".
[30] Michael, K, Stroh, B, Berry, O, Muhlhauber, A & Nicholls, T, "The AVIAN Flu Tracker – a Location Service Proof of Concept", Recent Advances in Security Technology: Proceedings of the 2006 RNSA Security Technology Conference, Australian Homeland Security Research Centre, Canberra, 19-21 September 2006.
[31] Aaron Holmes, 12 April 2020, "Fauci says the government is considering giving out COVID-19 'immunity cards' as part of push to reopen the economy", Business Insider, Last Accessed: 9 May 2020, Anas Aloudat, Katina Michael, Xi Chen, Mutaz M.AlDebei, "Social acceptance of location-based mobile government services for emergency management", Telematics and Informatics, Vol. 31, No. 1, February 2014.
[32] M.G. Michael, Sarah Jean Fusco, Katina Michael, 2008, "A research note on ethics in the emerging age of uberveillance", Computer Communications, 31, 1192–1199.

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

A comprehensive review of security issues of micro-services on cloud

Dr. Salini Suresh [1] , Srinivas Keerti P S [2] , Harsha BV [3] ,Prof Suneetha V

Dayananda Sagar College of Arts, Science and Commerce ,Bangaloe[1,2,3,4]

salinisuresh-bu@dayanadsagar.edu[1], srinivaskeerthi200@gmail.com[2] ,
bvharsha.venkat@gmail.com ,hod-mcabu@dayanandasagar.edu[1]

Abstract

Micro-service is a modern approach which is used to build a small, self-contained, and ready- to-run application with greater flexibility and resilience of code. It has a great feature on maintenance and productivity of the product with better business alignments. The applications run on distributed complex architecture are affected by many attacks. To reduce the complexity of the attacks, the organizations are shifting from traditional to micro-service architecture such that there is no deadlocks or errors at the time of isolation of the model. This architecture is based on virtualization where containers are used handle different tasks at isolation for quicker resolution of issues and faster end-to-end automation of the environment where it is deployed and reduces the risks of future possible attacks. This paper discusses a detailed review of security aspects in Microservice architectures present in literature in comparison to monolithicapplications .

Key words:

Micro -service, Security , Monolithic , Containers, Virtualization

1 Introduction

The cloud is on demand online resource such as storage, computation, without actually deploying them on the user's machine and provides services associated with the cloud and manages the resource. Many organizations establishments are looking to off-load their workloads to the cloud. The cloud can manage storage computation has demand without active management by the end user [8]. Recent trends show that cloud services have shifted to micro- services, with many loosely-coupled micro-services consisting of end-to-end application [5].A micro-service is a software unit whose creation, initialization, and duplication is becoming a boom in the cloud industry [2]. It allows the user to achieve rapid delivery of reliable data allowing the establishment to evolve the cloud technology. Micro-services allow services such as maintenance, testing, and independent deployment etc., controlled by a small team [2].Micro-services is an approach in which a single large application contains a number of loosely coupled components [7]. Micro-services is mostly a monolithic or a service oriented architecture (SOA) [7].Micro-services architecture is app builder that is suite of a small app with own code. They have specific capability to be deployed independently across different platforms over the cloud and allows

large scale flexibility over a distributed platform [2].

Attacks and threats are being reported by the cloud adopted companies. Hence there is need to address these security breaches within the micro-services.

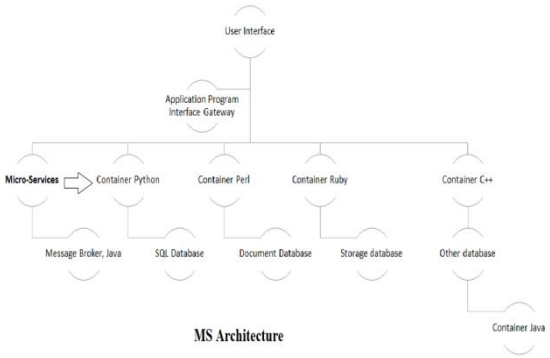


Figure 1: Micro-Service Architecture

1.1 Monolithic v/s Micro-services

Monolithic architecture is a large coded and cheaper to develop system. They are easy to launch as they are single coded base systems. **Micro-service architecture** are used without the actual deployment of the rest of the services built along them for searching, logging in a function or a web function. It is like an app built with specific capabilities which is independently deployable with a unique code base [6].

Monolithic Architecture	**Micro-services Architecture**
Fewer Cross-cutting Concerns: There isno cross cutting tension as the whole application is running on a single large platform.	**Better Organization:** They are better organised as micro-services have a single specific task to perform.
Less Operational Overhead: There is lessoverhead involved for logging, monitoring,testing as there is a single application running.	**Decoupled:** Decoupled services provide faster delivery of individual parts as they areeasy to reconfigure for different purposes.
Performance: Inter process communication helps in achieving faster memory access.	**Performance:** Isolating hot services makesthe execution speed faster as there is less load on the processor.
Tightly Coupled: Monolithic services are tightly coupled application and is hard to isolate the services for different purposes like scaling and maintenance.	**Cross-cutting:** It has a incurring the overhead of separate modules, or encapsulate traffic between different layers.
Harder To Understand: Larger dependencies are involved in a particular service or controller.	**Costly Overhead:** Automated fleet management tools are deployed on containers causing wrangling on virtual machine.

Table 1:Monolithic v/s Micro-service architecture

VM's are referred to as a container. They provide services such as kernel security which are responsible for prevention of attacks. These containers host kernel sharing ordinary processes installed in the container provides an isolated environment

for its execution. Micro-services and containers are strongly connected and can be deployed easily. These issues can be solved either by software or hardware-based solutions [1].

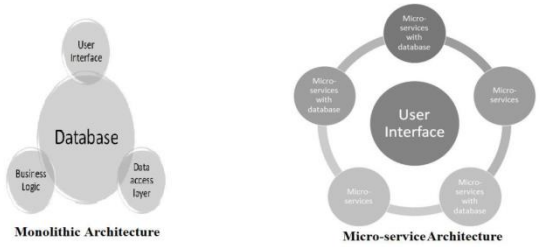


Figure 2: Monolithic v/s MS Architecture

2 Security issues

According to a survey conducted, by 2030 about 95% of data traffic will be based on the services offered by the cloud. Hence, the cloud security such as application, OS and network security are essential for web users as well as the companies deploying their services on the cloud. These service providers provide us with default configurations which do not allow the end user to deal with poor security. Focusing on the problems faced by the existing users will enable the developers to mitigate the future potential attacks on the shared systems.

2.1 Need for security on cloud based micro-services

Most of the cloud micro-services are based in the containers. Its security includes protection of the container from the threats. Security is dependent on the OS security, which are in turn dependent on the hardware which they work upon. The application which runs these micro-services also require security tests. Now there are inter-connected cloud services as well. Hence there can be security threats from the inter-connected cloud layers as well [8]. Micro-services are deployed on different platforms and enables high scalability and flexibility to the users. There is high number of attacks which are taking place on the companies adapting cloud services. These threats are diverse and are continually increasing [2]. Hence there is a greater need for secure cloud micro-service perspectives. Attacks are common in the internet. It is due to the user-configuration vulnerabilities. It is usually caused due to old packages, cryptographic methods in a web application or database. An outdated package creates a sweet spot for the hackers due to less security factor involved. Multiple VM's attack and affect a machine by attacking its performance and are easy to attack than any conventional physical machine.

Virtualization is able to achieve efficiency in deployment of micro-services without security issues.

Problems faced due to security lapses in micro-services include exploitation of the kernel, Denial of Service Attacks (DoS), container breakouts, poisoned services, compromising secrets and unauthorized access and network based intrusion. Attacks may target the VM, instead of targeting the entire resource by side-channel escape to access the private keys which are used by another VM on the same machine. Micro-services based application designs should allow to quick and consistent assertion of authenticated request by the formation of an application. They are remotely accessible by exposed API's. There is a larger need for secure cloud services when compared to the monolithic counterpart. Micro-services uses HTTPs, resource API and other means of message brokers to communicate

with other micro-services [2].

2.2 Mitigation of security issues

All elements must be analyzed properly. An application must be tested on the cloud with proper test cases and datasets before actual deployment of these services. The service providers must include risks involved and mechanism against it. Labelling the data based on its nature is essential as it helps to provide maximum security to sensitive data and provide maximum efficiency of micro-services. SLA's made by the service providers must provide the service levels, duties and responsibilities of the end users, solution to a specific arising problems, and a proper protocol for the metrics. As there are no global frameworks. There is a need for providing a common security tools and standards. There can also be an increased security cover based on the customer's requirements.

3 Literature Survey

According to Sathya Priya , Dr. Shashikumar D.R., Virtualization allows multiple VM's on a single machine, which are network based. These VM's re based on containers which are lightweight application. OS level containers can be more efficient in deploying these services which has network based security challenges. These containers has security features such as kernel namespace and control groups, and can be attacked with attacks like DoS and other exploits [1].

According to Hannousse, MSA is trending software development that aims to address scalability and online service maintenance. This paper aims to identify potential research, provides systematic mapping on threads and gives detail solution of security patterns on MSA. By mapping the external attacks and auditing these accesses control on this techniques to validate security proposals [2].The cloud infrastructure has emerged more on converging cloud computing with SOA. This style of approach develops a running single application with MSA principles which has greater flexibility and modularity. The systematic approach implements MicroART systems and prototypes [3].

According to Aaron Epstein, Big tech companies offering cloud services with built-n reliable and faster applications which are deployed on server. As the growth of these services, there is

a need for security. These MS applications which run on cloud containers are based on VM, and are porn to attacks. Hence there is a need to identify the flaws in the architecture and rectifythem as soon as possible to stop future attacks [4].

Recently cloud services has shifted from the traditional approach to microservices applications which present both optimizing quality of services and great demand. This paper explores implementation of end to end application on online services for high performance and scalability on hardware datacenter as usage of cloud on upcoming models is becoming more [5].

According to Hamzehloui, Mohammad Sadegh, The modularity and flexibility in MS has gained prominence in the industry. There are a few issues which are to be addressed. The most efficient services on this platform discusses on DevOps and cloud virtualizations which decides the

implementation of MS to overcome the limitations caused by the hardware [8].

Multi-cloud computing with microservice architecture is increasing in present situation as optimize reliability, performance and reduces vendor dependency. Each microservice has its own functionality and individual requirements, scalability. This paper reviews selection and configuration automated approach on user domain and requirements with systematic configuration of application [9].

Cloud application container based on microservice becoming challenging with QOS requirements with customized scaling approach. This paper, approach of agnostic auto scaling of Google engine, kubernetes paradigm on resource requirements. Testing and enhancement of microservice algorithms increases comparatively more now [10].

MS has changed the way how we build and evolve architecture based on VM's. These services are built on PaaS level technology. This paper aims to compare the existing architecture to characterize the frameworks involved in styling, development and bridging the gaps in the cloud container technology [11].

The evolving new architecture demands interactive rich platforms for satisfying the needs of cloud services. There is a need for constant updating needed which are not possible in monolithic architecture. Thus a new method is needed which can deploy multiple services independently. MS provides agility to these applications [12].

Conclusion

With increasing cloud and IoT applications, there is a need to revisit them to manage them effectively. A micro-services are based on virtualization and are dependent on containers. They are more susceptible to attacks. Ensuring the security is more and more important as there is a shift from traditional approach to architectural approach. Independent, reliable and fast delivery of larger applications make up a micro-service. As these services are offered on the cloud, there is a chance of attacks such as exploitation of the kernel, Denial of Service Attacks (DoS), container breakouts, etc. This survey is to understand the MS architecture and thus be able to prevent future attacks.

References

[1] A Comprehensive Review on Security Issues and Challenges in Lightweight Container Communication Sathya Priya , Dr. Shashikumar D.R. ,International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056, Volume: 07 Issue: 02 | Feb 2020

[2] Hannousse, Abdelhakim, and SalimaYahiouche. "Securing microservices and microservice architectures: A systematic mapping study." *Computer Science Review* 41 (2021): 100415.

[1] Di Francesco, Paolo. "Architecting microservices." *2017 IEEE International Conference on Software Architecture Workshops (ICSAW)*. IEEE, 2017.

[2] Security Concerns for Micro-services on the Cloud:An evaluation of the current state of security on public and private cloud providersin relation to hosted microservices- based architectures. Aaron Epstein, Fall 2019, Tufts University

[3] Gan, Yu, and Christina Delimitrou. "The architectural implications of cloud microservices." *IEEE Computer Architecture Letters* 17.2 (2018): 155-158.

[4] https://www.webdesignerdepot.com/2018/05/monolith-vs-microservices-which-is-the-best-option-for-you/

[5] https://www.ibm.com/cloud/learn/microservices.

[6] Hamzehloui, Mohammad Sadegh, Shamsul Sahibuddin, and Ardavan Ashabi. "A study on the most prominent areas of research in microservices." *International Journal of Machine Learning and Computing* 9.2 (2019).

[7] G. Sousa, W. Rudametkin and L. Duchien, "Automated Setup of Multi-cloud Environments for Microservices Applications," *2016 IEEE 9th International Conference on Cloud Computing (CLOUD)*, 2016, pp. 327-334, doi: 10.1109/CLOUD.2016.0051.

[8] Abdel Khaleq and I. Ra, "Agnostic Approach for Microservices Autoscaling in Cloud Applications," *2019 International Conference on Computational Science and Computational Intelligence (CSCI)*, 2019, pp. 1411-1415, doi: 10.1109/CSCI49370.2019.00264

[9] Pahl, Claus, and Pooyan Jamshidi. "Microservices: A Systematic Mapping Study." *CLOSER (1)*. 2016.

[10] Pachghare, Vinod Keshaorao. "Microservices Architecture for Cloud Computing." *architecture* 3 (2016): 4.

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

SYSTEMATIC REVIEW OF SECURITY CHALLENGES INDEVSECOPS FOR CLOUD

Suneetha V[1] , Deepika G[2], Desmond Dev Chaander[3] ,Salini Suresh[4]

Dayananda Sagar College of Arts, Commerce and Science [1,2,3,4]

Abstract

Cloud computing has become a boon in the current century where most companies use cloud services to support their demands. Cloud computing on the other hand will allow you to pay how much you use its services. Once upon a time storing data on a regular basis tooka lot of time and also a huge space to maintain files or data and accessing this stored data was also a hectic process. A huge maintenance cost is involved to safeguard your data, but cloud storage provider saves both money and space with a hassle-free service anytime within a few taps on your mobile phone. This paper discusses why such security is important and what all challenges are faced while providing security for cloud storage through a new concept called as DevSecOps.

1 Introduction

Security in simple terms means the quality or a state of being secure [1]. The safety measures that are taken by an individual or is given to a person or a place so that one is not exposed to any attacks or is in harm's way [1]. To be much more precise there are four types of security and they are listed as debt, derivative, equity, and hybrid security, whereas in IT security they are network security, internet security, endpoint security, cloud security, and application security [2].IT security or information technology security or cybersecurity protectscomputers, programs, networks, files, or data from unauthorized access or from malicious attacks which are intended for exploitation. Similarly, Cloud security will help to secure the usage of software-as-a-service (SaaS) applications and also the publiccloud [2]. For cloud security purposes cloud access security broker (CASB), cloud-based unified threat management (cUTM) and secure internet gateway (SIG) can be used. **Cloud security** is defined as a set of policies or controls or procedures that have to be followed and technologies that work together to protect cloud-based systems, infrastructure and data. These security protocols or measures are set up to safeguard cloud data, protect customer'sprivacy, support regulatory compliance and also setting up authentication rules for individual users and their devices [1].

2 Importance of cloud security

Cloud security is one of the main aspects which has to be prioritized when a cloud computing application is created and is made available to the users[1]. If it is done it enhances the dependability of the application provided and the customer relationship trust will be well maintained which acts as a boon for the organization and also the IT professionals. From a business perspective, if the customers are satisfied and are highly reliant on your application, your organization will turn out to be one of the safest and top most trustworthy organizations in the current market [1].

Being a world-class cloud service provider, which offers best in class security which has its own personalized customization for your clients, one can easily boast its security offers with these benefitslisted below: -

- **Centralized security:** As in cloud computing how applications centralize their data, cloud security also has its own centralization for increased protection of data. In a cloud-based business or an organization we can see a lot of networks and a huge number of devices

connected to these networks, it becomes very difficult to manage and deal with this kind of network. We cannot manage endpoints especially while dealing with BYOD (Bring Your Own Device) or Shadow IT (projects managed outside IT department).

- **Reliability:** In association with the above benefit discussed by offering an amazing cloud service with a top-notch security measure we can gain results in ultimate cloud service dependability. With these security measures in place, the customer and also the security provider can access data and its applications present in the cloud on any device whatsoever and at any place present [2]. Nowadays more n more organizations have realized and are moving from their traditional data storage methods to modernized cloud services. Due to this, there is a race between organizations that provide such cloud services and the urge to provide the safest andmost reliable technology usability by the agile systematic approach giving them the competitive edge. It is essential for such organizations that they must have confidence in the security provided by them and all systems, applications and their data are protected from data leaks, theft, deletion and corruption.

- **Reduced administration:** From a business perspective lesser the number of expenses the greater fruits of profit can be reaped. This means no more manual security configurations no more warehouses with guards, and that being replaced by 24/7 security updates in any part of the world which is much more cost-effective and a massive drain on resources can be averted easily. Thanks to cloud services all security administrations are managed, maintained and updated all in one place with the least cost and are highly time-efficient.

As cloud reception develops, an ever-increasing number of basic applications move to the cloud too, requiring cloud security apparatuses. We already know that Cloud security is the act of ensuring cloud-based information, applications, and framework from cyberattacks. Cloud specialist organizations don't generally give sufficient inclusion, so extra devices, as CWPPs (Cloud Workload Protection Platforms), CASBs (Cloud Access Security Brokers), CSPM (Cloud Security Posture Management), SASE (Secure Access Service Edge), or ZTNA (Zero Trust Network Access) may beimportant.

3 DevSecops

DevSecOps is the combination of security in data processing and DevOps [4]. It is One of the latest innovations in the advancement of current programming is DevOps technology. This well-known philosophy involves hosting the turn of events and operational movement on a table. DevOps is frequently associated with a skillful organization. the techniques of the executive, since both systems are equipped with quick and efficient means of transport. DevOps is a promotional system to overcome any barriers between development (Dev) and operations, highlighting correspondence and coordination, integration, quality confirmation and mechanized shipping with an evolution group [5].

From the above definition, it would be possible to separate that the fundamental target of theDevOps practice is to improve the link between the turn of events and the task office and for these offices to occur in cooperation for the achievement of a product item Since the methodology is like the practical procedure, where the different partners of a company are strongly associated [5].
Example: Amazon Web Services (AWS) created tremendous DevOps skills.

4 DevSecOps

DevSecOps is a combination of security in information technology development and DevOps [3]. Preferably, this is handled without reducing the confidence or speed of the designers or expecting them to let their toolchain development environment [4].If you want a simple definition of DevSecOps, "it is short for development, functioning. With the growth of the Sec(security) towards DevOps, a reflection on the coordination of security is

manufactured. The rather clear purpose of introducing an expanded security center into DevOps mechanisms is to ensure that any product or data handled in its course of events is secure as well as exercise.

Advantage of DevSecOps

- Security teams will be able to distinguish themselves by their increased speed andagility.
- The ability to respond rapidly to changes and wants.
- Teamwork and communication are more well-coordinated.
- Detection and rectification of code flaws at an earlier stage Early detection of code flaws.

Disadvantages of DevSecOps

- Because DevSecOps cannot pinpoint the specific location of a problem in the source code, developers must hunt for errors themselves [4].
- DevSecOps might not be the answer to your problem.
- Companies should rely on DevSecOps for any and all minor issues

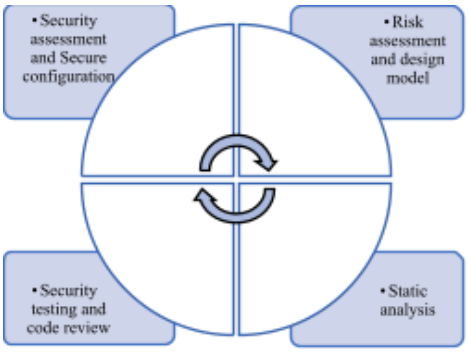


Fig (1.0) DevSecOps – SSDLC

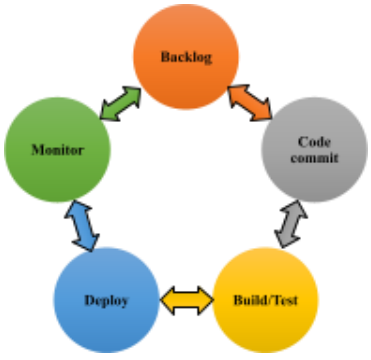


Fig (1.1) Security and developers shifting

4 Challenges faced while providing security

A functioning group of experts, planners, designers and C-level staff distinguished a list of around 25 security threats, which were then investigated by security experts who positioned them and limited them down further to the 11 most important cloud security challenges: -

4.1 Data breaches: Content security policies have increased the security layer which helps to identify and the types of attacks that carry out data breaches in the cloud. Through these attacks data theft, defacements of websites were done for the distribution of malware. To tackle this issue precise definition of the data that is stored was done and data encryption was implemented.

4.2 Service misconfigurations and inadequate control change: When the service providers offer us several features that help us meet our requirements in the application and adjust these services to suit our needs, recently in march 2020 google cloud had a similar issue in their cloud service, through research experts found out the bug where if a socket connection was used to escalate their access in cloud services a misconfiguration of data type was found as the root cause of this potential bug. This enabled the attacker to gain access to a limited scope deployment server which enabled the attacker to access the data and modify the data that was stored.

4.3 Lack of cloud security architecture and strategies: There are numerous organizations currently jump in to produce their cloud services in the market. Most of these low-level organizations have used open-source codes and platforms in building out their cloud services. This provides a poor security architecture since most of these open-source codes wouldn't have tackled their security issues and have passed on providing cloudservices with a weak security firewall.

4.4 Unsatisfactory identities, credentials, accesses and key management: One of the common cybersecurity threats are

linked to **IAM (Identity and Access Management)**. Authentic credential safety, IAM scalability modifications and weak passwords/access keys without a multifactor authentication leads to poor data protection and permits easy access to attackers to steal or manipulatevaluable data.

4.5 Account hijacking/seizing/block: As discussed in the previous challenge account seizing occurs due to the leakage or disclosure of valuable information. This compromises the cloud service which is provided and impacts maintaining the security of the cloud serviceprovided. Phishing is also another attack that causes one's account to be blocked or seized and the root of this attack to occur is the use of open-source code with a poor security architecture. We must remember that here the login details entered by the user are already with the attacker and a simple password reset to the cloud account won't solve this issue.

4.6 Insider threats: This is a risk that is found within the cloud service provider's organization when an official or an employee decides to leak or disclose the data that is stored by the customer to another peer or an organization. This causes the customer to lose the trust he/she has in the organization thus leading to the downfall of the cloud service organization. The customer whose data is leaked without his/her consent can legally take action by filing a lawsuit on this particular cloud service organization.

4.7 Insecure interfaces and APIs: The user interface through which the customers use the cloud services is the most exposed component since it is easier for attackers to steal authentication access of this particular customer. If a secured network connection is provided for all the users accessing the cloud services this issue/challenge can be tackled since firewalls will protect the users.

4.8 Weak control plane: This challenge is seen from the cloud service provider when they have a weak cloud administrative consoles to save the data from the user. This causes loss of data that is stored and this leads to loss of organization reputation and revenue.

4.9 Meta-structure and Appli-structure failures: When the protocols and mechanisms used to develop the security platform and all the other layers are not followed by the programmers while creating the application for cloud services leads to a poorer response can be seen in finding out the loopholes in the application and all the issues that affect in thesmooth functioning of the application

4.10 Limitations on cloud usage visibility: When un-authentic login is performed using an unauthorized application which is not permitted by the technical support of the organization and such login access was left unchecked individuals who have been granted access have stolen the data and credentials which is nothing but another cyber-attack. This unauthorized access must be shown clearly before being granted access to the organization's security authorities and should be able to trace out the login and block this particular attack from this and any other source in the future.

4.11 Abuse and evil/wrong use of cloud services: When an attacker disguises as a customer and wants a cloud service and has been granted access to the cloud service, this is a huge threat for the cloud service provider as well as all the other customers who are currently using these services. If this ever happens to an organization it is considered as a compromised state of the cloud service provider I. e this organization is unfit to provide cloud services.

5 Security measurements to be taken

The primary test of a survey of safety is its quantify ability. While this point has been talked about for more than 20 years now. The underlying issue of measuring security is as yet troublesome. Similarly, as with any estimation approach, a bunch of measures or measurements, just as scales, are required. The measurement of security is hard based on nine reasons: -

1. We can't test all security requirements - since customer requirements at times will be absurd and will compromise the organization's efficiency.
2. Environment, abstraction, and context affect security - simple is safe and complexity reducesthe security integrity of the service.
3. Measurement and security interact - security standards have to be met on time.
4. Security is multidimensional, emergent, and irreducible - no matter how many folds of security we add on the threat to it is inevitable.
5. The adversary changes the environment - since an attack is eminent integrity of the services must be maintained at all cost.
6. Measurement is both an expectation and an organizational objective - expectations must bemet only if it is in a measurable context.
7. We're overoptimistic - common traits of being human makes us to be optimistic but toomuch of something is good for nothing.

Considering these listed measurements, we have to be able to analyze the source of the security issue that has caused an issue to the cloud service which is provided. We must alsobear the fact that we must be able to improvise and improve our security on future challenges that are yet to be faced by the cloud service organization.

6 Security review criteria

A security estimation needs to explore an execution dependent on a predefined set of standards. The examination objective of this investigation is to extricate pertinent models that could be utilized for an audit of a DevSecOps execution. As recently examined, the survey of safety execution is certainly not a minor undertaking, and in this manner, a pattern and cycle for the extraction of estimation rules should have been created and continued in the extraction cycle.

6.1 Benefits of providing security to cloud services

- Cost – Reduction – The lesser the cost of cloud services the more it will be benefitted for the customer as well as the organization.
- Data security and integrity – It makes an organization be more reliant and trustworthy.
- Reliability – Efficiency of the Cloud Service makes the user or the customer to rely and relax while an organization will take care of its services.
- Efficiency – Efficiency comes only when there is a reliability on the organization that provides a hassle-free service.
- Risk and Threat management – An organization will be held responsible and will also look after all the threat management and the customer will not be blamed in any matter.
- Protection against DDoS attack – High security of the DevSecOps structure will ensure the security of the cloud services provided.
- Regulatory compliance - Organization adherence to laws, guidelines, rules and particulars applicable to its business measures. Infringement of administrative consistence frequently bring about lawful discipline, including government fines.
- Flexibility – Ease of access and crystal-clear terms and conditions makes this service much more flexible to be used on all platforms and all occasions.

6.2 Demerits or disadvantages of cloud security

- Server Downtime or loss of access to data - Occurs when there are hardware issues or internet issues.
- Migration of cloud vendor - Happens when we select a poor organization that is not able to handle its own expenses.
- Costly services for storage space - If one needs a hassle-free service one has to choose a costly service provider but chances are less if an organization charges more than we use its services.
- Vulnerability in the case of an attack - DevSecOps guarantees the safety of data but still an attack might be right around the corner and human negligence is the cause of vulnerability.
- Internal technical problems - As discussed earlier hardware issues or power shortage or ill maintained power lines are the causes of technical problems.
- A strong internet connection is a must - Faster the internet connection faster will be the services

we are opting for both the ends must not compromise on this factor.

7 Conclusion

Currently, we have discussed providing security which is very much required for cloud computation and all the risks or challenges that we are facing and yet to face we must focus on the advantages of cloud security since most of the demerits are nullable unless there is a hardware issue, we must strive forward for the betterment of the services which we are providing and all the promises which are made to customers and to the organization to whichhave professed our faith too. Providing security to this huge platform is a never-ending cycle of the betterment of our services and also a challenging task where one has to undertake optimistically and there is a huge opportunity to upgrade and grow as an organization and also in person. In this year 2021 majority of the security issues are resolved within an hour and only the cyber-attacks which are happening currently are taking time within one to sevenworking days to be completely resolved. All the data that is lost if an occurrence of a cyber- attack the customer or the user can reclaim all the data that was stored on the cloud. Almost all the data which was restored will be uncorrupted and no traces or paths of the attacker will remain in the digital footprint of these data. Even though there are over 300 million hacking attempts per day we can still trust the cloud services due to the amount of firewall and security which are present in the DevSecOps.

References

[1] Munir, Kashif & Palaniappan, Sellapan. [9] 016/j.future.2010.12.006. (2013). Secure Cloud Architecture. Advanced Computing: An International Journal. 4. 9-22. 10.5121/acij.2013.4102.

[2] Mathisen, “Security Challenges and Solutions in Cloud Computing” 5th IEEE International Conference on Digital Ecosystems and Technologies (IEEE DEST2011) , Daejeon, Korea, May -3 June 2011.

[3] Priyanshu Srivastava and Rizwan Khan. “A review paper on Cloud computing”. Srivastava, Priyanshu, and Rizwan Khan. "A review paper on cloud computing." International Journal of Advanced Research in Computer Science and Software Engineering 8, no. 6 (2018): 17- 20.

[4] Mr. Pavan B, Mr. Kishore H, Prof. Sunitha M “IOT-BASED BIG DATA STORAGE SYSTEMS IN CLOUD COMPUTING” E-ISSN: 2347-2693 A Research paper on Cloud Computing Vol.-6, Issue-9, Sep 2019 published on September 2019

[5] Havard Myrbakken, Ricardo Colomo-Palacios “DevSecOps: A Multivocal Literature Review” A review paper on DevSecOps published by www.researchgate.com in 2017.

[6] Adrian Lane “Enterprise DevSecOps” A research paper published on December 10, 2019.

[7] Zaydi, Mounia & Bouchaib, Nassereddine. (2020). DevSecOps PRACTICES FORAN AGILE AND SECURE IT SERVICE MANAGEMENT. International Journal of Information and Decision Sciences. 23. 134-149.

[8] Zissis, Dimitris & Lekkas, Dimitrios. (2012). Addressing cloud computing security issues. Future Generation Comp. Syst.. 28. 583-592. 10.1

Career Point International Journal of Research(CPIJR)
©2022 CPIJR | ISSN :2583-1895

Cyber Crime In Modern Era Of Cyber Space Against Women And Children: Prevention & Measures

Kunal Rohira, Research Scholar, Career Point University, Kota, Rajasthan, India
Dr. Nitu Nawal, Professor, Career Point University, Kota, Rajasthan, India

Abstract: Women's crime is up in many areas, and becoming a victim of cybercrime may be a particularly miserable experience for a woman. Particularly in India, where women are marginalized in society and the law fails to acknowledge cybercriminals. Throughout this work, it will intend to describe the numerous forms of cybercrimes that may be perpetrated against a woman, as well as how they affect her. It will also cover some of the laws in place to safeguard women in such situations, such as the Information Technology Act of 2000 and constitutional responsibility. We're also doing a thorough examination of the current rise in cybercrime against women and its different reasons. Article 21 of the Indian constitution has been expanded to include the right to privacy. So, anytime a cybercrime involves a person's privately owned land or personal belongings, the accused can be charged with violating Article 21 of the Indian constitution, and the appropriate penalty can be utilized against them. It also addresses some solution to address India's growing cybercrime against women. In Cybercrime activity done by using computer and Internet. This paper shall focus on the choices open to cybercrime victims in our conclusions.

Keywords: Cybercrime, Indian Constitution, Information Technology, Computer, Internet.

1. Introduction

Computer, mobiles and other same digital devices now define a new way of living life by using social media, user friendly apps etc. All this technology is good for life when its use is helpful and not harming others but if this type of technology is using for criminal intention, then it becomes curse.

Cybercrime is a well-known truth that occurs all around the world. Because of the emergence of technology in the modern period, cyber-related crimes and the enslavement of women and children are

not only at an all-time high, but also pose a severe threat to society as a whole. Also, despite India being one of the few countries to pass the Information Technology Act of 2000 to prevent cyber-crime against women, the objective of protecting women in our society from such crimes remains a goal. That statute in issue has clearly defined some crimes as criminal offences, such as tampering with private information, however it does not adequately address the

safety of women and young children. [1] Women are held in high respect in old Indian society; the Vedas praised women as the mother, the creator, and the one who brings life, and venerated her as a 'Devi' or Goddess. Women played an important role, and their subjection and abuse were seen as humiliating not only to the lady, but to the entire society. In modern times, however, women are viewed and depicted as sex objects, and they are treated as second-class citizens in a variety of societal spheres and functions; this has resulted in a significant gender bias between men and women, with even men believing that their wrongdoings against women will not be punished. Cybercrime and cyber bullying are similar in that the perpetrators are not scared of repercussions.

Cybercrime is a criminal act which is defined as an offence from or against a computer or network. It is an unlawful act by using computer as a tool. It includes crimes like cheating, financial frauds, child pornography, cyber stalking, unauthorised access etc.

2. Objective

To highlight the prevention and measure relating to cybercrime against the women and children

3. Literature review

According to J.W.C. Turner Mens Rea and Actus Reus are the two most fundamental factors in traditional crime. "That outcome of human activity as the law aims to avert," says Actus Reus. To be considered a crime, there must be a commission or omission. "A guilty frame of consciousness," as far as mens rea is concerned. The other key component of crime is the mental component. The deed stays the same, but the state of mind transforms it into actus 'reus' act, and therefore an offence. Almost every crime necessitates the presence of a mental element of some kind. In the case of cybercrime, determining the mens rea is extremely challenging [2].

According to Talat Fatima, cybercrime against women was rampant**.** As can be seen, the number of cybercrime complaints against women in 2020 spiked in April and

continued to rise in May, June, and July, when India was hit hard by the covid-19 epidemic, the pandemic was at its apex, and the entire country was under lockdown. After the pandemic subsided and lockdown limitations were relaxed in August, the number of cybercrime cases began to reduce. They continued to diminish in September and October after the lockdown limits were restored. [3]

Cybercrime against women has become a critical issue challenging the privacy and security, however after criminal amendment act 2013 various section have been added for the security of women as like stalking in Indian Penal Code 1860 but still the cybercrime against women is increasing day by day.

During the epidemic, cybercrime against minors was rampant. Children, particularly those who have been abandoned because both of their parents have died from the COVID-19 virus or who have been temporarily separated from their parents because one of them has contracted the sickness, have been the most susceptible and easiest targets for these cybercrimes. When families are hospitalised and children are left in the care of someone else and are left alone, youngsters are more vulnerable to cyber abuse since no one is watching over their online activity. Owing to the closure of schools due to the COVID-19 epidemic, children have spent more time on virtual platforms, exposing them to the danger of online abuse and cyberbullying. Due to the lockout and the shutdown of the airport

According to cyber pornography law report the actus because the entire conduct is performed in intangible surroundings, reus in cybercrime has become a hurdle [4]. The

culprit may leave some footprints in the system itself, but proving it in court will be a monumental endeavour for police officers, since it must be in physical form or at the very minimum in a format that is acceptable in evidence.

Indian Penal Code and Information technology act provides laws related to cybercrime; however, these laws are inadequate to handle many cyber violence. Creating awareness and education are the way to protect women and children from cyber crimes

When children are separated from their parents or have no one to look after them, they are more vulnerable. Children are considerably more susceptible as a result of the epidemic since they are defenceless victims.

Cybercrimes against women contain in Cyber stalking, sexually abusive and

pornographic content Cybersex trafficking and other Cybercrime against children contain in Sexual abuse of children, Child grooming and other

3. Legal position

The IT Act, which was approved in India, cleared the path for all electronic communications transactions and conversations. The laws govern digital contracts and properties, and any infringement of the law will result in a criminal charge. In the event that the act is violated, the statute stipulates those severe penalties would be imposed. The legislation has gone to great lengths to solve commercial and economic challenges, but it still has a long way to go in terms of ensuring the protection of women and children.

India is considered to be one of the few countries to have passed a dedicated IT legislation to combat cybercrime; some of the important provisions are given –

3.1 The Information Technology Act 2000

The Information technology Act's section 65, Chapter XI, deals with offences like tampering with computer source material.

Hacking a computer system (section 66)

Section 67 prohibits the electronic publication of obscene content

Access to the protected system (Section 70)

Section 72 Invasion of privacy and confidentiality

Section 74: Publication with the intent to defraud Information technology act 2000 still needs to be amended.

Information technology act 2000, Section 67, dealt with the dissemination of obscene material on the internet.

Indian Penal Code, 1860 contain Section 354A, Section 354C, Section 354D, Section 503, and Section 509

The Indecent Representation of Women (Prohibition) Act, 1986 contain in Section 4

Protection of Children from Sexual Offences Act, 2012 contain in Section 11, Section 13.

4. Case law

State of Tamil Nadu v. Suhas Katti

In November of 2004, a Chennai court ruled on this matter. The first conviction in India for sending obscene words on the internet under the contentious section 67 of the Information Technology Act, 2000. In one advertising, the accused made defamatory claims about the victim and depicted her as a sex worker. This was one of the first cases in India where cyber-crime against women was addressed [5].

Manish kathuria vs Ritu Kohli

This is India's first case of cyber stalking. Manish, the stalker in this instance, was following Ritu Kohli and created a phoney

profile of her on the website http://www.mirc.com using her photos and personal information. Manish, posing as Ritu Kohli, was stalking multiple people and sending filthy texts and offensive language on a regular basis. Ritu Kohli's phone number was being bombarded with obscene calls and texts from all across India and the world as a result of this. She also filed a lawsuit under section 509 of the Indian Penal Code; however, it was discovered that this clause only refers to words, gestures, or acts intended to offend a woman's modesty [6]

5. Measures to protect women and children from cybercrimes

The Ministry of Home Affairs has created a website, www.cybercrime.gov.in, where individuals may submit cybercrime complaints.

The administration has distributed a computer security policy containing instructions to all departments in order to mitigate, detect, and prevent intrusions.

On the 6th of June, 2016, the Ministry of Electronics and Information Technology issued an advisory on the functioning of matrimonial websites under the IT Act, 2000 and Rules made thereunder, directing matrimonial websites to implement safeguards to ensure that people using these websites are not deceived by fake profiles or misuse/wrong information posted on the website.[7]

The measures can be taken to protect the children from cybercrimes by the way

Keeping digital gadgets out of their reach

Avoid distracting youngster with a smartphone game or a YouTube video. From an early age, they will be accustomed to a digital lifestyle, and nothing traditional will function after that. Toys or crayons might be given to child to play with, or you can just take them to the park to play. This manner, he or she is aware that there is a parallel universe that is as entertaining.

Begin early and teach them everything you know.

They will eventually be exposed to the digital world. As a result, begin teaching kids about the advantages and disadvantages of the internet and make them aware of all aspects. It is always preferable for them to learn from you rather than from others.

Keep an eye on their online behaviour, but do so as a friend.

If we place too many limits on your children, they will be drawn to that activity by their curiosity. We can't tell kids that social media is bad for them since they're young. We can observe who is communicating with them and how they are utilising the medium this way.

Assist them in learning the fundamentals of the internet.

Swarnprastha, a premier CBSE school in Sonipat, has introduced internet usage in its curriculum. Your youngster may be aware of the negative aspects of surfing the internet, but once they grasp the fundamentals, they will become genuinely conscious. They will think twice before sharing a photo or typing a phrase if they are aware that it will eventually be preserved in a public location. [8]

6. Conclusion

Since of a lack of awareness and information about cybercrime and cyberspace, most occurrences of

It is the victims' highest obligation and right to disclose the incidents so that required steps may be performed in a timely manner and the crime rate can be minimised in general. It is past time for victims to stop being afraid and file complaints with the appropriate authorities.

There is no specific crime which specific mention any crime against women. The other problem in the cybercrime are the issues of jurisdiction, Lack of evidence, not proper investigation in these types of crime. like stalking in Indian Penal Code 1860 but still the cybercrime against women are increasing day by day.

Some of the most prevalent and common cyber-crimes against women, such as morphing, are given little consideration in women and children. After criminal amendment act 2013 various section have been added for the security of women as the act. Because these topics are not expressly addressed in the act.

they may quickly leave the ambit of cyberspace. The legislation in question does not address concerns concerning cybercrime and cyberspace go unreported, which is beneficial to criminals because

Criminals take advantage of the gaps and endanger the safety and security of women and children.

References

1. Veresha,R. (2018), Preventive measures against computer related crimes: Approaching an individual. Informatologia, 51(3-4), 189-199. https://hrcak.srce.hr/217569

2. Turner, J. C. (2013). Kenny's outlines of criminal law. Cambridge University Press. J.W.C. Turner, Kenney's Outlines of criminal law (19th Edition University Press, Cambridge 1966) 17. also at Talat Fatima, Cyber Crime (1st Edition, Eastern Book Company, Lucknow (2011) p. 64-68

3. Saha, T., & Srivastava, A. (2014). Indian women at risk in the cyber space: A conceptual model of reasons of victimization.

International Journal of Cyber Criminology, 8(1). https://www.researchgate.net/profile/ Akancha- Srivastava/publication/287411436_ Indian_ women_at _risk_in_the_cyber_space_ A_ conceptual_ model_of_ reasons_ of_victimization/links /5fc392 2f2 99bf1 04cf90441d/Indian-women-at-risk-in-the-cyber-space-A- conceptual-model-of-reasons-of-victimization.pdf

4. Schell, B. H., Martin, M. V., Hung, P. C., & Rueda, L. (2007). Cyber child pornography: A review paper of the social and legal issues and remedies—and a proposed technological solution. *Aggression and violent behavior*, *12*(1), 45-63 https://www. science direct. com/science /article/abs/ pii/S135917 89 06000401

5. Indian Cyber Security - India's Largest Cyber Security Solutions. Www. Indian cyber security.com http://www. indiancyber security. com/case_study_state_of_tamil_nadu_%20suh as_katti.php

6. Sapna, S., & Deo. (2013). CYBERSTALKING AND ONLINE HARASSMENT: A NEW CHALLENGE FOR LAW ENFORCEMENT. In Bharati Law Review. http://docs.manupatra.in/ newsline/ articles/Upload/FDF5EB3E-2BB1-44BB-8F 1D- 9CA06D965AA9.pdf

7. Kethineni, S. (2020). Cybercrime in India: Laws, Regulations, and Enforcement Mechanisms. *The Palgrave Handbook of International Cybercrime and Cyberdeviance*, 305-326. https://link.springer. com/content/ pdf/10.1007 /978-3-319-78440-3_7.pdf

8.Halder, D., & Jaishankar, K. (2016). Cyber Crimes against Women in India. In Google Books. SAGE Publications India. https://books.google.com/books?hl=en&lr=&id=uztwDQAAQBAJ&oi=fnd&pg=PT8&dq=Measures+to+protect+women+and+children+from+cybercrimes&ots=pvQcFZYisR&sig=QKE5yolD0iI6eu67MEwOCe-e_x0

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Circularity indicator for a product in Circular Economy: A review

Virendra Kumar Nagar[1], Dr. Manish Kumar[2]

Research Scholar, Career Point University Kota, Rajasthan, India

Assistant Professor, Bhartiya Skill Development University Jaipur, Rajasthan, India

Abstract: The important materials required for production of a product are delectable in nature. Further, the other synthetic materials are difficult to dispose off. Current or linear economy of "take-make use-dispose" is not sustainable. A measurement system or an indicator is necessary to develop for a product. A circular indicator does not in them achieve a changeover to a circular economy (CE), although an important tool for progress towards CE. Many existing tools, available are available for measuring the product circularity but only some studies have been focusing on efficiently or effectively measurement of the circularity of a product there is no universally accepted approach for measuring the circularity of product. Many tools have been developed till now but only some tools are popular like Circular Economy Toolkit (CET), Circular Economy Indicator Prototype (CEIP), Circularity Potential Indicator (CPI) and Material Circularity Indicator (MCI) but still no one indicator are accepted universally still so many gaps are available for the development of the circularity measurement indicator in circular economy.

Keywords: Circular Economy (CE), Circularity Indicator (CI), Circularity index, Material and Circularity Indicator (MCI).

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Review on Smart Grid Control and Reliability in the presence of Renewable Energies

Ekta Bhardwaj[1] , Sarfaraz Nawaz[2]

Department of Electrical Engineering, SKIT, Jaipur (Raj.), India

Abstract: The development and implementation of an intelligent energy supply network is one of the urgent problems of the modern energy economy. This paper deals with smart grid concept and its reliability in presence of renewable energies. The smart grid is modified version of power grid infrastructure. The smart grid provides electricity from manufacturers to consumers using bi-directional digital technology and enables home appliances to be controlled in consumer homes and factory machinery to save energy, reduce costs and increase reliability and transparency due to application of smart meter and control automation technics.

Around the globe an adjustment of electric energy is required to limit CO2 gas emission, preserve the greenhouse, limit pollution, fight climate change an increase energy security. Subsequently renewable energy expansion is the real test for designers and experts of smart grid system. This initiative has made significant progress toward the modernization and growth of the electric utility infrastructure and aims to integrate it into today's advanced communication era, both in function and in architecture. The study is focused on the difference between a conventional grid and a smart grid concept and the integration of renewable energy in a smart grid system where grid control is a must for energy management. Challenges and issues associated with this development in India are also described in this paper.

Keywords: Energy, grid, renewable, automation and network.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

ICT management During COVID-19

Priyanka Arora[1] , Research Scholar,

G.J.U, Hisar, Hariyana

Dr. Hemant Verma[2], Assistant Professor,

Ch. Bansi Lal University, Bhiwani, Hariyana

Abstract: The whole world fight against the pandemic of the covid-19 virus, a newly explored virus as a contagious disease. Some countries of the globe enforced a complete lockdown situation to control and stop the escalation of the number of cases. Because of this situation to continue with an academic calendar and continue with the teaching and learning process, online education or ICT-enabled education is the perfect solution to continue with the teaching and learning process. By using these ICT tools in education, we add value to teaching and learning process and increase the performance of learning. Through its advisory, the university grant commission (UGC) advised all the institutes to continue classes in online mode as per utility and engage ICT (Information and Communication Technology) tools available for use in academic discourse. The conclusion of the research indicated that online education can be alternative means of conventional education. Thus, if the blended approach is implemented, the education process would be more practical and successful.

Keywords: ICT (Information and Communication Technology); Covid-19; Online education; Digital Transformation

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Hybrid Rough Set- Data Envelopment Analysis & Artificial Neural Networking approach to analyze feedback attributes for patient's satisfaction in healthcare organization

Minakshi Panchal[1], Hemlata Saxena[2], Leena Sharma[3]

Research Scholar, Department of Mathematics[1],

Department of Mathematics, Career Point University, Kota (Rajasthan)[2]

Pimpri Chinchwad College of Engineering, Nigdi Pradhikarn Pune (Maharashtra)[3]

Abstract: Rough set theory can be considered as a new mathematical tool for imperfect data analysis. The proposed approach is based on integrating Rough set theory, data envelopment analysis (DEA) and artificial neural network (ANN). Reduction of data which is one of the important features of Rough Set Theory (RST) is used to remove less associated attributes from datasets. The Data Envelopment Analysis (DEA) is the leading approach to measuring the efficiency of the healthcare system and other economic areas also it is used to find dependency of output variables on input variables. This effective tools RST and DEA are used to find the efficiency of reducts through Artificial Neural Network (ANN) result. Based on cross validation of ANN accuracy of forecasting is determined. Health care organizations understand that maximizing patient satisfaction is an important goal. Patient's feedback helps them to identify the ways to improve their working methods which transforms into better care and happier patients. In this paper Rough Set Theory is applied on patient's satisfaction survey to identify sets of critical attributes which are responsible for the patient's satisfaction. DEA & ANN give best set of critical attributes based on their efficiency.

Keywords: Rough Set Theory(RST), Data Envelopment Analysis(DEA), Artificial Neural Networking, Reduct, Core, Feature reduction

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Big Data Analytics for Intrusion Detection and Prevention Method in Cloud Environment

Renu Yadav (Research Scholar)[1],

School of Computer Application & Technology, Career Point University, Kota, Rajasthan

Dr. Abid Hussain (Associate Professor)[2],

School of Computer Applications, Career Point University, Kota, Rajasthan

Abstract: New data sources, such as linked devices, smart home appliances, smart cities, sensors, 5G communication media, Smartphone, mobile cloud, multimedia, and virtual reality, have increased the rate of data production. Cloud enables services to manage, deliver, and store, large amounts of data by providing the necessary computing, networking, and storage capacity and functionality. On the other hand big data analytics has become a popular way of extracting usable information from enormous volumes of data. Because of its scalability, flexibility, and relatively low cost, the cloud is ideal for big data analytics. But organizations are hesitant to outsource their data to the cloud because of its distributed nature, and they are always concerned about data security and privacy. As a result, a security solution is needed that covers everything from threat prevention to detection, which may be implemented by adopting a more comprehensive approach for monitoring and analysing security events in the cloud. To safeguard data and network Intrusion detection and prevention method is used to monitors network events, analyses incidents and violations of security, as well as to identify and prevent intrusions from various attacks. With the use of appropriate data analytics, pattern and anomalous behaviours that imply fraud, theft, or other security breaches can be identified. The paper addressed the big data analytics that incorporates intrusion detection and prevention methods to prevent malicious attacks in cloud computing. We also covered the many forms of intrusion detection and prevention, such as signature-based, anomaly-based, and hybridbased, which can only contribute to a more secure environment.

Keywords: Big data analytics, Machine learning, cloud computing, Networkbased intrusion, Host-based Intrusion, anomaly-based detection, predictive analytics.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Theft Intimation and Knock off the vehicle by GSM modem

Sarfaraz Nawaz[1], Sweha Rajora[2], Sumit Saini[3]

Department of Electrical Engineering,

Swami Keshvanand Institute of Technology Management and Gramothan, Rajasthan, India

Abstract: This project is about a GSM based vehicle security system using Arduino, which can lock and unlock a vehicle's ignition system by sending a password SMS to the vehicle from a cell phone. Old vehicles and low tier vehicles may get stolen often because they offer less security features. The proposed project can add another layer of security to the vehicle at cheap cost, which might save one's vehicle from getting stolen. The proposed project consists of GSM modem (SIM 800/900) which is the heart of the project, an Arduino board which acts as the brain of the project. Few relay sinter faced with the Arduino board enabled and disabled the ignition. A valid SIM card with a working SMS plan is required to operate this project. The main motto of the project is to use the wireless technology effectively for the automotive environments by using the GSM Modem used in sending SMS in case of theft intimation. The main scope of this project is to stop the engine of an automobile automatically; this can be done whenever a person trying to steal, it orders

GSM Modem to send the SMS, the owner receives a SMS that his car is being stolen then the owner sends back the SMS to the GSM modem to 'stop the engine', while the vehicle will be stopped; The control instruction is given to the arduino, the output from which activates relay driver to trip the relay that disconnects the ignition of the automobile resulting in knocking off the vehicle.

Keywords: GSM, ignition, arduino, SMS and Modem.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Permission based Distributed Group Mutual Exclusion Algorithm having Quality of Service

Dr. Pawan K Thakur1 and Vivek Chaudhary2

Associate Professor, Department of Computer science and Engineering[1],

Govt. College Dharamshala, H.P. (India) pawansarkaghat@gmail.com

Research Scholar , Career Point University, Kota , Rajasthan; viveksalil@gmail.com[2]

Abstract: In large distributed systems which are based on cloud computing, the resources are shared to the clients. In these systems, there must be some service level agreement between the clients and the provider of the service. In Quality of Service, some constraints such as priority, response time and fault tolerance must be taken into consideration. In this paper , we present a permission based group mutual distributed algorithm. The group mutual distributed algorithm is a generalization of mutual exclusion problem. In group mutual exclusion algorithm, processes in the same group can enter the critical section simultaneously.

Keywords: Cloud computing, Quality of Service, Group mutual exclusion.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Pathway Fractional Integral Operator Involving Srivastava Polynomial and Generalized Struve Function

Danishwar Farooq[1], Dr. Hemlata Saxena[2]

Department of Mathematics,

Career Point University, Kota, Rajasthan(India)

Abstract: The aim of this paper is to establish four theorems using pathway fractional integral operator involving product of Srivastava polynomial and generalized Struve function. Our results are quite general in nature. We obtain our results in term of hypergeometric function. Some special cases are also obtained here. We also point out their Riemann-Liouville fractional integral operator results in special cases. Our results will help to extend some classical statistical distribution to wider classes of distribution, these are useful in practical applications.

Keywords: Pathway fractional integral operator/Srivastava polynomial/Struve function/ generalized Struve function

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Cloudbc-To Ensure Data Integrity in Cloud Computing Environments

Amrutha S[1], Mahesh A S[2]

Department of Computer Science and IT

Amrita School of Arts and Sciences, Kochi

Amrita Vishwa Vidyapeetham, India

Abstract: COVID-19 is the disease caused by a novel virus called SARS-CoV-2. Cases stared reporting at the end of year 2019. The global spread of this disease, which shows the weakness of current global healthcare to addressing the issues due to the COVID19 for public. Here we are suggest a solution for securing the data of COVID-19 patients.

During this pandemic the government is week to securing, Storage and Managing COVID-19 patients data. This becomes the most promising task to government during this pandemic situation.we are using cloud storage to save the COVID19 patients' data. As usual when using cloud computing the normal questions arrives related to the data security. We Proposed a scheme to protect the COVID-19 patient data saved over the cloud centres, by combining the blockchain technology over cloud computing. Attribute Based Encryption is using to encrypt the data stored in cloud environment. Decentralized attribute authority in our work. To reduces the computation of users, while uploading and downloading, divide to offline and online phase in encryption. Most of the computation is done during the offline phase. We reduce the overhead on decryption side by introducing a proxy, partial decryption is done by this proxy server. When we came to the block chains technology, a hash blocks are generated and which is maintained in each block which is present in the cloud storage. This hash is generated using SHA256. This is to verify the data integrity of the data stored on the cloud environment.

Keywords: cloud computing, attribute based encryption, online/offline, COVID19, Blockchain

Career Point International Journal of Research (CPIJR)
 | ISSN: 2583-1895

Dual-Beam Leaky-Wave Antenna (Lwa) Based on Second-Order Higher Mode (Eh2)

Abhay Kumar Singh[1], Paras P[2]

Govind Ballabh Pant University of Agriculture and Technology, Pantnagar,

, Udham Singh Nagar, Uttarakhand, India

Abstract: Second-order higher mode periodic leaky-wave antennas (LWAs) are proposed. The distributed circuit model is used to balance the impudence matching and open stop-band suppression. By loading the longitudinal slots in the unit cell, the leaky-wave antenna produces a dual symmetrical beam that scans from backward to forward. The LWA shows good radiation performance and gain in the scanning region of -500 (backward region) to +500 (forward region).

Keywords: Beam scanning, higher-order modes, open stop-band suppression, LWA

Career Point International Journal of Research (CPIJR)
 | ISSN: 2583-1895

IoT Based Home Security through Digital Image Processing

Sachin Goel[1], Mr. Vinod Kumar[2]

School of Computer Application, Career Point University Kota, Rajasthan

Abstract: The paper gives an outline to control and secure the home, based on digital image processing with the help of IoT (Internet of Things). The security of the door of sensitive locations by using face detection and recognition. The framework consists of a sensor, computerized camera, database and a cell phone. The door edges are set with sensors which alarms camera and capture a picture who get into the house and mean-while the picture is saved to database. The picture is examined to identify and perceive and coordinate with the dataset of the confirmed individuals. After examination, if the picture caught does not coordinate with the dataset, the owner will receive an alarm message. This is high security for sensitive locations and that too without any human intervention.

Keywords: Internet of things (IoT), Home Security, Digital Image Processing

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Financial Management of Rajasthan Rajya Vidhyut Prasaran Nigam Limited, a Dynamic Electricity Company In Rajasthan

Dr. Pratima Rawal[1], Laxmi Saxena[2]

Assistant Professor, Research Scholar

Career Point University, Kota Career Point University, Kota

Abstract: RVPN owns, construct, maintains and operates the high-voltage electric transmission system which keeps the lights on, industries/institutions running and make a strong community. RVPN also work as a representative of erstwhile RSEB and owns the shared generating projects. RVPN deliver power from the location of generation to inter-phase point of Discoms so as to enable them to supply where it is needed either in the homes or in businesses they serve. Transparency, accountability and integrity in principle and in practice are promised by RVPN. RVPN is committed to acquire, incorporate and adopt reliable, efficient and cost effective technologies.

Keywords: Interest Rates, Financial Management, Financial Analysis, Time Value of Money.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Applications of Sumudu Transform to Mechanics and Electrical Circuits Problems

Chander Prakash Samar[1], Dr. Hemlata Saxena[2]

Department of Mathematics, Career Point University, Kota (Rajasthan), India

Abstract: In this paper we will discuss mechanics and electrical circuit problems in term of a differential equation in the field of engineering. The solutions of these differential equations are obtained by Sumudu transform. Sumudu transform is a very useful and powerful mathematical tool for solving many advanced problems of engineering and applied sciences. The Sumudu Transform was applied to solve differential equations. These equations are concerned with a damping mechanical force system and an inductive capacitive electric circuit.

Keyword: Differential equation, Sumudu Transform, Inverse Sumudu Transform, Kirchhoff's law.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Fractional Calculus Operators of The Generalized Extended Mittag-Leffler Function and Related Jacobi Transforms

Shilpa Kumawar[1], Dr. Hemlata Saxena[2]

Department of Mathematics, Career Point University, Kota (Rajasthan)

Abstract: Our aim is to obtain certain image formulas of the p–extended Mittag-Leffler function Eγα,β,p(z) by using Saigo's hypergeometric fractional integral and differential operators.Corresponding assertions for the classical Riemann-Liouville(R-L) and Erd´elyi-Kober(E-K) fractional integral and differential operators are established. All the results are represented in termsof the Hadamard product of the p–extended Mittag-Leffler function E γλ,μ,p(z) and Fox-Wright function rΨs(z). We also established Jacobi and its particular assertions for the Gegenbauer and Legendre transforms of the p–extended Mittag-Leffler function E γ α,β,p(z).

Keyword: Gegenbauer, Legendre, Mittag-Leffler, hypergeometric and Fox-Wright function.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Systematic Literature Review of Integration of Blockchain and Medical Science

Minal Suryavanshi[1], Research Scholar, IIS (deemed to be) University, Jaipur, India

Dr. Amita Sharma2, Senior Assistant Professor, IIS (deemed to be) University, Jaipur, India

Abstract: Blockchain Technology is considered to be an extremely secure, transparent, and immune to hackers. This study intentions to presents a Systematic literature review (SLR) of research on applications of blockchain in the Medical Science domain. The superficial review was conducted on 75 research articles and the systematic selection process identified 15 relevant research articles focusing on three Areas: 1. The application of blockchain in Medical science. 2. Gaps pertaining and current implications to the use of blockchain technology for refining Medical processes. 3. Review papers specifically from block chain and Medical Science Context particularly of the year, 2019 and 2020. The databases such as IEEE, Springer, Elsevier, Web of Science and ScienceDirect were explored using a combination of terms related to blockchain, Medical Science, benefits and limitations. Blockchain also plays a prominent role in reducing the intermediate fees as it is entirely decentralized. The SLR outcomes indicate that blockchain is being used to develop novel and advanced interventions to increase the traditional standards of handling, sharing, and processing of Electronic health records. We scrutinized the potential of the blockchain technology and it is undergoing a conceptual evolution in the Medical Science industry with a special focuses on problems, findings, and limitations of reviewed papers.

Keywords: Blockchain · Medical Science · Electronic Health Records· Cyber security · Patient privacy.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

COVID-19 Segmentation and Classification from CT scan images

Sridevi Ramachandra Rathod[1]

Department of Computer Engineering

MMCOE Pune,India

Harmeet Kaur Khanuja[2]

Department of Computer Engineering MMCOE Pune,India

Abstract: The pandemic coronavirus disease-2019 (COVID19) has infected millions of people in over 200 countries and territories as of 2021. It is very necessary to detect COVID-19 in the initial stage to provide appropriate medical treatment to patients and also to protect the uninfected people. For this reason, we develop a framework to automatically segment COVID-19 CT images using K-means Clustering and use them to train proposed Convolutional Neural Network to classify COVID-19 from normal CT images. Rapid growth in machine learning and deep learning has been doing great work to reduce time of radiologists by assisting them in the diagnosis of COVID-19. Our framework is evaluated upon 349 positive & 397 negative CT scans to detect COVID-19 & help in taking appropriate diagnostic decisions. To evaluate the performance of proposed approach we compared our results with pre-trained models such as VGG19, InceptionV3 and ResNet50.

Keywords: COVID-19, Segmentation, K-means, Convolutional neural network, Pneumonia.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Game Changer AI Applications to Handle this Environment Challenges

M.Leelavathi[1], Dr.P.K.Manoj Kumar[2]

1 Assistant Professor, Department of Information Technology, Nehru Arts and Science College, Coimbatore, Tamilnadu, India

2 Head, Department of Information Technology, Nehru Arts and Science College, Coimbatore, Tamilnadu, India

Abstract: For Artificial Intelligence, this is a significant moment. Big data, advancements in hardware, increasingly sophisticated AI algorithms, and an opensource ecosystem for tools that lowers restrictions for business and beginning alike are all combining together. As a result, AI is making its way out of research laboratories and into our daily lives, from city navigation to ride-sharing services, renewable energy, and the virtual world. In 2020, everyone is beginning to recognise AI's business usefulness. Every year, it's being integrated to more and more objects, and it's getting more and smarter, speeding up human creativity.

However, as AI gets more efficient, unsupervised, and widespread in its application and effect, the unaddressed challenge of AI protection becomes increasingly important. Bias, bad decision, lack of clarity, employment losses, and malicious usage of AI, such as unmanned armament, are all risks. The problem, however, is to ensure "Earth friendly AI" in addition to leading "Environment friendly AI." We have an opportunity to look at how AI can help transform traditional sectors and systems to address climate change, deliver food and water security, build sustainable cities, and protect biodiversity and human wellbeing as the scale and urgency of the economic and human health impacts from our deteriorating natural environment grows. This paper shows at AI and its Applications effective in Environmental sustainability.

Keywords: Artificial Intelligence, AI Algorithms and Applications, Environmental issues

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Data Analytics and Visualization of Air Pollution in India using Tableau

Aanchal Saxena[1], Charu Mathur[2]

Department of Computer Science and Engineering

Mody University, Lakshmangarh (Raj.)

Abstract: Air Pollution is the presence of substances in the air or atmosphere that are harmful or poisonous to human health. The list of these substances commonly called as air pollutants includes SO_2 (Sulphur Dioxide), NO_2 (Nitrogen Dioxide) and Particulates known as atmospheric aerosol particles, atmospheric particulate matter, particulate matter (PM) or suspended particulate matter (SPM). Particulates can be considered as microscopic solid or liquid matter suspended in the atmosphere. Because of air pollution being a significant issue in India, we have analyzed India's air quality data to provide insights into how to make this problem sustainable. In this scenario, Tableau plays a vital role, as Tableau is an extremely powerful tool for visualizing massive sets of data very easily and quickly. The best thing about this software is that there is no need of any programming skill as it has a simple drag and drop interface. Data created via Tableau can be understood by professionals at any level in an organization. Tableau also allows non-technical users to create customized dashboards. It can be used by the people from all sectors such as business, researchers, different industries etc. This paper gives the clear picture of what the current situation of air pollution is in India while also predicting future pollution levels to highlight the need for sustainable air pollution levels.

Keywords: Air Pollution; Pollutants; Data Analytics; Tableau; Visualization; Dashboards; Visual Analytics.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Literature Review of Data Mining Techniques Used in Health Care Systems

Kiran Kanwar[1], Research Scholar,

Career Point University, Kota,

Prof. Surendra Yadav[2]

Professor, Career Point University, Kota

Abstract: The medical services climate is by and large apparent as being 'data rich' yet 'information poor'. There is a abundance of information accessible inside the medical care frameworks. In any case, there is an absence of successful investigation instruments to find secret connections and patterns in information. Information revelation also, information mining have discovered various applications in business what's more, logical area. Important information can be found from utilization of information mining strategies in medical care framework. In this examination, we momentarily inspect the possible utilization of arrangement based information mining procedures, for example, Rule based, Choice tree, Naïve Bayes and Artificial Neural Network to huge volume of medical care information. The medical care industry gathers tremendous measures of medical services information which, sadly, are not "mined" to find covered up data. For information preprocessing and compelling dynamic One Dependency Expanded Naïve Bayes classifier (ODANB) and gullible credal classifier 2 (NCC2) are utilized. This is an augmentation of gullible Bayes to loose probabilities that targets conveying powerful groupings likewise when managing little or deficient information sets. Disclosure of covered up examples and connections regularly goes unexploited. Utilizing clinical profiles like age, sex, blood pressing factor and glucose it can foresee the probability of patients getting a coronary illness. It empowers huge information, for example designs, connections between clinical variables identified with coronary illness, to be set up.

Keywords: Data mining, ANN, Naives bayes, Rule based, NCC2, Health care.

Career Point International Journal of Research (CPIJR)
 | ISSN: 2583-1895

Augmented Reality - An Overview

Archana Kumari[1], Dr. Abid Hussain[2]

School of Computer Applications

Career Point University, Kota, Rajasthan, India

Abstract: Augmented Reality (AR) is defined as real-time direct or indirect view of a physical real-world environment that has been augmented by adding virtual computer-generated information to it. Augmented Reality mixes virtual and actual reality, making available to the user new tools to ensure efficiency in the transfer of knowledge for several processes and in several environments. Augmented Reality tools have offered new perspectives and have promised dramatic improvements. On the other side Augmented Reality is an extremely demanding technology and, at the present day, it is still affected by serious flaws that undermine its implementations in the industrial context.

Keywords: Augmented reality, Virtual reality, computer vision, virtual objects, human factors, mixed reality.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Sensorless Control Techniques for Permanent Magnet Brushless DCMotor Drives: A Review

Shivam Sharma[1], M.Tech scholar, Carer Point University

Kamal Arora[2], Associate Professor, Career Point University

Aditya Sharma[3], Research Scholar, Rajasthan Technical University

Abstract: Electric motor drive has been the work horses of the industries for several decades now. Due to the advent of power electronics AC motors have become tough competition for DC motors especially in variables speed applications. Some of the special machines like Switched Reluctance Motor (SRM) and Permanent Magnet Brushless DC Motor (PMBLDC) are being used. The recent developments of permanent magnet materials, solidstate devices and microelectronics have contributed to new energy efficient, high performance electronics drives which use modern PMBLDC motors. Owing to rare earth permanent magnets (PM), these, motors have higher efficiency, power factor, output power per unit mass and unit volume, and better dynamic performance then cage induction motors without sacrificing reliability. Permanent Magnet Brushless DC (PMBLDC) Drives are gaining the popularity in the areas of domestic appliances, HVAC industry, railways and automotive applications in recent years because of their high power density, ease of control, high efficiency, silent operation compact form, reliability, low maintained and long life. To achieve desired level of performance, the PMBLDC motor requires suitable controllers. So, this paper presents an analysis of sensor based control of PMBLDC drives, their limitations and issues and a review of sensorless based techniques for PMBLDC drive control.

Keywords: Sensor-less controls, PMBLDC drives, Back EMF control, ANN control, Fuzzy logic control.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Review Paper on 5G TECHNOLOGY

Suleiman Mohammad Ismail[1], Isah Alhassan Muhammad[2]

Department of Computer Applications, Mewar University, Rajasthan, India.

Department of Computer Applications, P.P. Savani University, India.

Abstract: 5G stands for fifth generation wireless technology. It is the latest iteration of cellular technology that has three main features: greater speed, lower latency, and the ability to connect a lot of devices simultaneously. A commercial 5G wireless network was first deployed in the year 2019 in developed countries. This report provides a brief introduction to 5G wireless technology.

Keywords: 5G, Wireless, Generation and Noise Conjuction.

Career Point International Journal of Research (CPIJR)
 | ISSN: 2583-1895

An LSTM-Autoencoder based Deep Learning Framework for the Prediction of Protein-Protein Interaction using Different Encoding Schemes

Bhawna Mewara[1], Dr. Soniya Lalwani[2]

Department of Computer Science and Engineering,

Career Point University, Kota, Rajasthan, India

Abstract: Predicting protein–protein interactions (PPIs) using Machine Learning technology possibly provide treasured visions to functioning of protein functions and occurrence of disease. But, this requires feature engineering to make the favourable prediction which is more tricky and tedious. The advancements in deep learning technology is achieving great success in numerous applications by extracting feature automatically by the network itself. This article present a Long Short Term Memory networks autoencoder (LSTM-AE) based deep learning framework for PPIs prediction using automatic features engineering from the protein sequence. The main contributions are: three different encoding schemes are used to numerically represent the protein sequence, LSTM-AE to embed the protein to low-dimensional, generate a unique impression for the interaction and finally used a CNN model to make the prediction. The model is performing well with all the encoding scheme, achieving 97.41% of accuracy and prove the effectiveness of the proposed approach in the proteomic world.

Keywords: Deep Learning, LSTM-AE, CNN, PPI, Encoding scheme, Fingerprint representation.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A New Approach to Control of Induction Motor Drive

Bharat Gothania[1] , R. K. Kumawat[2]

Career Point University, Kota, Rajasthan, India

Abstract: A new speed and current estimation techniques are proposed in this paper. This paper present comprehensive mathematical modeling of vector-controlled induction motor drive (VCIMD) system. VCIMD has been implemented using both Fuzzy and pi controllers. The dynamic response of VCIMD under various operating conditions such as starting and speed reversal is simulated and examined in MATLAB environment using Simulink and power system block set toolboxes.

Keywords: Induction Motor Drive, Current Estimation, Flux and Torque Estimator, Artificial Neural Networks (ANN).

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Application of Linear Programming in Nurse (Female) Scheduling Problem

Amit Kumar Jain[1], Ramakant Bhardwaj[2], Dr. Hemlata Saxena[3]

Research Scholar, School of Science, Career Point University, Kota, Rajasthan, India

Professor, Department of MathematicsAmity University Kolkata W. B. India

Department of Mathematics, Career Point University, Kota, Rajasthan, India

Abstract: The main object of this paper is to find application of linear programming in Nurse (Female) Scheduling Problem and for this to find minimum number of nurses for a number of shifts (Morning, Evening and Night) for a particular hospital to minimize the overall hospital cost and fulfil its daily nursing staff demand.

Keywords: Linear Programming Model, Nurse Scheduling, Cost Minimization, Objective Function, Constraints, Lingo Software.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Some Application of Banach Contraction Principle

Suparna Ghosh[1], Ramakant Bhardwaj[2], Panakaj Kumar Jha[3]

Department of Mathematics, Amity University Kolkata, Kolkata, India

Department of Mathematics, Amity University Kolkata, Kolkata, India

Department of Statistic, AMITY University Kolkata WB

Abstract: In this paper we have discussed some applications of Banach Contraction Principle in solving differential equations and integral equations. We also studied the application of fixed point and Banach's theorem for existence of solution of different equations. Further we reviewed on digital image processing techniques using the concept of fixed point.

Keywords: fixed point, Banach contraction principle, Volterra equation, Fredholm equation, digital image processing.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Noise Reduction in Doppler Weather Radar Received Signal to Optimize Reflectivity Parameter using Singular Value Decomposition (SVD) Method

Chetan Kumar Asnani

Department f Electrial Engineering,Career Point University, Kota(Rajasthan), India

Abstract: Noise reduction in radar receiver is very important for improving efficiency and radar parameter Reflectivity. It also help to maximize the signal to noise ratio of Doppler weather radar. In this review by applying Singular Value Decomposition (SVD) Noise reduction is done to for better Received Signals to optimize Reflectivity. The major observation in Doppler weather radar are all weathers like Precipitation Drizzle, Light to Moderate Rain, Moderate to heavy rain, Hail, melting snow particle, Thunderstorm by using Reflectivity. The different Matched Filters are designed for Doppler weather radar at receiver end to reduce noise. Singular Value Decomposition (SVD) method can be applied to suppress noise and unwanted signals. This review introduces the SVD method of signal separation into signal component and noise component and then receiving the signal components separately and suppressing noise we can get better received signal with better Reflectivity.

Keywords: Doppler Weather Radar,Reflectivity ,Singular value Decomposition.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Novel Framework for Data Security in LAN using MATLAB and Distributed Firewall

Harjeet Singh[1], Dr. Abid Hussain[2]

School of Computer Science and Engineering, Career Point University, Kota (Rajasthan), India

Abstract: Nowadays, most companies use LAN as their primary network. These companies work at a high level and require their network to be secure from outside interference and malicious users. Such organizations have a need for a secure Local Area Network. The LAN is the primary focus of a cyber-attack when it comes to companies and businesses. This is why it is important to secure the Local Area Network. Regulating the ways in which users access the Internet and similar networks will help keep your LAN secure. As a result of its inclusion in the hypervisor kernel, the distributed firewall has the ability to serve many clients at the same time. It is directly associated with the duties and follows them around wherever they go. Every packet transmitted or received passes through a stateful "Firewall," and the security policy is carried over from one hypervisor to another when the virtual machine is moved. Because it is directly linked to each virtual machine in a distributed firewall, traffic steering is entirely eliminated from the process of applying security policy when using a distributed firewall. In other words, security is always there, from the very beginning to the very end of the journey.

Keyword: Distributed Firewall, Local Area Network, MATLAB.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Retrospective study using Machine learning approach on Protein Function Prediction

Anushri Vijay[1], Research Scholar, IIS (deemed to be) University, Jaipur, India

Neha Tiwari[2], Associate Professor, IIS (deemed to be) University, Jaipur, India

Abstract: Proteomic data play a vital role in all living organisms. Over the past decades, the number of protein sequences of microorganisms is increasing so fast but their function is not known. To fill this gap, computational methods have been introduced to endeavor protein function prediction. Now, computational tools and methods are used to discover function prediction instead of going ahead for wet labs where consumption of time and cost is reduced by machine learning techniques. Through protein function prediction helps in solving many biological problems and aid in understanding diseases and drug discovery. In this review paper, we have made analysis based on training models and datasets taken for predicting the protein function of eukaryotes and prokaryotes.

Keywords: Machine learning, prokaryotes, protein function, eukaryotes, drug discovery, pathogens.

Career Point International Journal of Research (CPIJR)
 | ISSN: 2583-1895

Internet of Things (IoT) For Smart Cities

Aditi Acharya[1], Mr. Devendra Charutvedi[2]

School of Computer Applications, Career Point University, Kota (Rajasthan), India

Abstract: The massive deployment of Intent of Thing (IOT) is allowing Smart City projects and initiatives. IOT is a system that integrates different devices and technologies, removing the necessity of human intervention. This enables the capacity of human smart (or smarter) cities around the World. Over the past few decades, the rate of urbanization has increased enormously. More enhanced services and applications are needed in urban areas to provide a better lifestyle. "Smart City" which is a concept of interconnecting in order digital technologies in the context of a city is a potential solution to enhance the quality and performance of urban services. With the introduction of IOT in the Smart City, new opportunities have emerged to develop new services and integrate different application domains with each other using information and communication technologies.However to ensures seamless services in a IOT enabled Smart City environment, all the application have to be maintained with limited energy resources and also to convergence of Information and Communication Technologies (ICT) through the implementation of the concept of smart cities and IOT to provide solutions in diverse filed like infrastructure, transportation and surveillance etc.

Keywords: Internet of Things (IOT); Smart Cities; Urbanization and services; Internet; Smart city challenges, Sensing technologies; Security issues.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Review Paper on AI In Drones And Uavs For Military Defence

Mridul Bhatia[1], Dr. Amit Sharma[2]

School of Computer Applications, Career Point University, Kota (Rajasthan), India

Abstract: The use of drones or Unmanned Aerial Vehicles (UAVs), both for military and civilian purposes, witnessed phenomenon growth in past decade. The recent war between Azerbaijan and Armenia, witnessed use of drones in the new warfare. Also, the recent conflicts or wars in Syria, Afghanistan, Israel-Palestine, have also highlighted drone's emerging capabilities to influence the wars at the attacker's disposal. The drone's capability of low altitude and velocity of flying, and exposing of very small radar cross-section (RCS), makes it extremely difficult to distinguish noise or clutter from the actual target and therefore is foreseen as an interesting technology for the future warfare. This paper aims to provide a detailed perspective about the latest and emerging trends with respect to integration of AI with drones, which will enhance the functionality and future capabilities of drone's reach, intelligence gathering and target acquisition. The paper brings out the aspects related to supervised learning process, flight pattern, manoeuvres and detection of targets through artificial intelligence using crowdsource machine vision learning, resulting in its autonomous functioning. It also brings out advantages of AI in drone technology for its usage for Military defence, latest trends and applications of AI in drones.

Keyword: Drone, UAV, RCS,AI and Flight Pattern.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Study Analysis for Air Quality Index Using Image

Ajay Kumar[1], Garima Tyagi[2]

School of Computer Applications, Career Point University, Kota (Rajasthan), India

Abstract: In recent years, Consistency of air pollution has been a matter of public concern. Air Pollution is increasing day by day, especially in urban areas affected by an increasing migration rate. This Review paper provides a better understanding of study analysis for air pollution index using image analysis and Section 1 contains the introduction, in the section 2, we will focus on the paper analysis, section 3 contains the discussion and limitation, We conclude the paper on section 4 along with references.

Keywords: Air Quality Index (AQI), classification Algorithm, Image Recognition, back-propagation neural network, Convolution Neural Network

Career Point International Journal of Research (CPIJR)
 | ISSN: 2583-1895

Deep Learning Techniques for Super-Resolution in Video Games

Pratyush Giri[1], Garima Tyagi[2]

School of Computer Applications, Career Point University, Kota, Rajasthan, India

Abstract: The price of processors is rising and computer hardware manufacturers are struggling to keep up with the lack of cpu. This means that computer scientists need to develop new ways to improve the performance of graphical processing hardware. In-depth video learning strategies for large-scale video resolution aim to have high-quality graphics while eliminating high computer costs. The emerging technologies allow consumers to improve performance and enjoyment from video games and have the potential to become an internal level in the game development industry..

Keywords: Deep learning, super resolution, video games, neural networks

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Defence Mechanism for Data Security in Social Media Using Cryptography

Rupal Khandelwal[1], Dr. Abid Hussain[2]

School of Computer Applications, Career Point University, Kota, Rajasthan, India

Abstract: When comes to security in applications on internet whether it be related to secure commerce and payments or private communication and protecting passwords, nothing is possible without encryption and cryptography. With internet reaching new level and merging with our lives data security has become main concern for anyone who is connected with the web and data security ensures that the data is only accessible to the intended receiver without any kind of modification or alterations in the data. For achieving this level of security, various algorithms and methods are developed like cryptography. Cryptography can be defined as techniques that cipher data, depending on specific algorithms that make the data unreadable to the human eye unless decrypted by algorithms that are predefined by the sender.

Keywords: Cryptography, Security, Algorithm, Cipher, Decryption, Data Security

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Study and Analysis of Applications in Data Science: Issues and Challenges

Laxmi Narayan Banerjee[1], Garima Tyagi[2]

School of Computer Applications, Career Point University, Kota, Rajasthan, India

Abstract: Data science is a multidisciplinary approach to extracting actionable insights from the large and ever-increasing volumes of data collected and created by today's organizations. Data science encompasses preparing data for analysis and processing, performing advanced data analysis, and presenting the results to reveal patterns and enable stakeholders to draw informed conclusions. Data science combines the scientific method, math and statistics, specialized programming, advanced analytics, AI, and even storytelling to uncover and explain the business insights buried in data. This paper illustrates what is Data Science, how it processes, and also its Applications.

Keywords: Information, Data Science, investigation, management, cloud computing.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

An Architectural Approach of Search Engine Optimization for the Website

Prateek Dhaman[1], Arshad Hussain[2]

School of Computer Applications, Career Point University, Kota (Rajasthan), India

Abstract: A web search engine is a software that is created to search the desired content in web (Internet search),that means to find something in the World Wide Web in a proper way for particular information specified by the user in the web search query. They are referred as search engine results pages results pages (SERPs) that are generally represented as lines of results. The information may be a combination of web pages, images, videos, infographics, articles, research papers and other types of files. In the databases or open directories search engines try to mine the data available. Some web directories which are updated and enhanced only by human editors, search engines also sustain real-time information by running a particular algorithm on a web crawler.

Keyword: SERP, SEO, Query,Website and Crawler.

Career Point International Journal of Research (CPIJR)
 | ISSN: 2583-1895

Li-Fi and its Applications

Abhilash Krishna Sharma[1], Dr. Amit Sharma[2]

School of Computer Applications, Career Point University, Kota (Rajasthan), India

Abstract. Light Fidelity (LiFi) is a Visible Light Communication (VLC) based technology that making a light as a media of communication replacing the cable wire communication. LiFi is evolve to overcome the rate speed in WiFi, while using LiFi the rate speed can reach until 14 Gbps. This paper presents an introduction of the LiFi technology including the architecture, modulation, performance, and the challenges. The result of this paper can be used as a reference and knowledge to develop some of the LiFi technology.

Keyword: VLC, Photo detectors, Amplification

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Impact of Adaptation of Virtual Reality In Medical Science

Vini Jain[1], Garima Tyagi[2]

School of Computer Applications, Career Point University, Kota (Rajasthan), India

Abstract: We are living in the modern era of science and technology which is growing rapidly in the world with the increasing need and demand of people. One of the huge areas of need of technology is the medical science. Comparing to the usual methods, technologies in medical field is very necessary to relieve the pain of people. This paper describes about Virtual Reality. Although Virtual Reality is facilitating IT industry but the research and their results are yet satisfactory. This review paper throws a light on virtual reality technique and the advantages and research issues of it in the medical science. It covers the overview of virtual reality including the benefits of it in medical field by further focusing on adoption of VR in medical science. The paper deepens the article by further focusing on the cons of VR and meets the conclusion.

Keyword: AR, VR, Medical Sciece, Bioinformatics and AI with Machine Learning.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

A Review Paper on Cyber Security

Hemant Singh Rathore[1], Arshad Hussain[2]

School of Computer Applications, Career Point University, Kota (Rajasthan), India

Abstract: We will be analysing a variety of cyber-attacks and different security methods. We aspire to create research into the subject area. This paper explores how cybercrime has become a serious threat in our lives and we are going to look at a few of the different security methods that are being used in this arena and their various weaknesses.

Keywords: Threat, Attacks, Cybercrime, Malware and Worms etc.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Abjection of Child Pornography

Mithilesh Malviya[1], Dr. Kshipra Gupta[2]

School of Legal Studies & Governance, Career Point University, Kota (Rajasthan), India

Abstract: Child pornography on the internet is becoming a more noticeable concern in today's culture. In today's world of online dependency, a great amount of information is accessible via the internet, making it vulnerable to cyber assaults. This study examines cyber pornography as a new type of crime that falls under the umbrella of cybercrime, which is defined as crime committed using information and communication technology. This paper discusses the most divisive aspect of child pornography. In addition, the article addresses the legal status of cyber pornography in order to determine the current situation in India and other developed countries. The dark side of online pornography is a paper that looks at the ban on cyber pornography in India, as well as the involvement of service providers. It also takes into account the revisions to the Information Technology Act of 2000, which provide for more stringent laws and regulations, as well as the fair prosecution and conviction of offenders who have committed cyber pornography offences. This paper discusses the steps taken by law enforcement to conduct more effective and thorough investigations; the importance of raising awareness and educating parents about the need to exercise strict control over their children's use of the Internet and other forms of communication technology; and the need for cyber cafes to implement preventive measures to combat cyber pornography. Certain recommendations are included in the report to aid in the battle against cyber pornographic offences.

Keywords: Technology education cyber pornographic offences, Internet and IT Act 2000.

Career Point International Journal of Research (CPIJR)
©2022 CPIJR | ISSN: 2583-1895

Women's empowerment protection of legal right through ICT

Ms. Shailesh Sharma[1], Dr. Sonu Agarwal[2]

School of Legal Studies and Governance, Career Point University, Kota, Rajasthan, India

Abstract: The role of Information and Communication Technologies (ICT) as a tool for growth has attracted the sustained attention of the United Nations over recent years. In 2000, the Economic and Social Council adopted a Ministerial Declaration on the role of information technology in the context of a knowledge based economy. The Millennium Declaration adopted in 2000 underscored the urgency of ensuring that the benefits of new technologies, especially ICT, are made available to all.

While there is recognition of the potential of ICT as a tool for the promotion of gender equality and the empowerment of women, a "gender divide" has also been identified, reflected in the lower numbers of women accessing and using ICT compared with men. Unless this gender divide is specifically addressed, there is a risk that ICT may exacerbate existing inequalities between women and men and create new forms of inequality.

If, however, the gender dimensions of ICT—in terms of access and use, capacity-building opportunities, employment and potential for empowerment—are explicitly identified and addressed, ICT can be a powerful catalyst for political and social empowerment of women, and the promotion of gender equality. This report provides a summary of critical gender equality issues related to ICT and development and outlines potential opportunities for women's economic, social and political empowerment. Key strategies and tools to address the gender digital divide in national and insternational contexts are presented. Examples of good practice on gender equality and ICT are elaborated throughout the report.

The report focuses on the two fold need to address the gender divide and reduce inequalities related to ICT and to identify ways to use ICT proactively and effectively to promote gender equality and the empowerment of women.

Keywords: Education, Women Empowerment, Social- change, Awareness, ICT.