DEMYSTIFYING EMERGING TRENDS IN THE DIGITAL HORIZON

Editors:
Satya Prakash Yadav
D. Arul Pon Daniel
G.N.R. Prasad

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(Volume 4)

Demystifying Emerging Trends in the Digital Horizon

Edited by

Satya Prakash Yadav
Department of Computer Science and Engineering
Madan Mohan Malaviya University of Technology
Gorakhpur, U.P., India

D. Arul Pon Daniel
Department of Computer Science & Applications
Loyola College of Arts and Science
Mettala, Rasipuram Taluk, Namakkal
Tamil Nadu, India

&

G.N.R. Prasad
Department of Computer Applications
Chaitanya Bharathi Institute of Technology
Hyderabad, Telangana, India

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Editor: Satya Prakash Yadav, D. Arul Pon Daniel & G.N.R. Prasad

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PREFACE

An unparalleled rate of digital revolution is taking place in our world. Every technological advancement, from blockchain to quantum computing, artificial intelligence to the Internet of Things, creates a paradigm shift that affects how we communicate, work, and live. Even while these technologies seem promising, both experts and enthusiasts frequently find them mysterious. This book's main goal is to demystify these new developments by providing insights that close the knowledge gap between theory and real-world implementations.

The target audience for this book is broad, including scholars, researchers, business experts, and everyone with a strong interest in the digital revolution. Every chapter explores a particular technology, explaining its fundamental ideas, history of development, and possible applications across several industries. We have made an effort to communicate difficult concepts in an understandable way, backed by case studies, expert analysis, and examples from everyday life.

This book has been enhanced by the joint efforts of multiple specialists from various professions, offering a multifaceted view on each topic. Because of the depth of expertise and experience shown in their contributions, this book is an invaluable tool for comprehending current digital trends and becoming ready for new developments.

It is imperative that we maintain our curiosity and critical thinking as we set out on our adventure into the digital horizon. The rapid advancement of technology necessitates ongoing learning and adjustment. Our goal in deciphering the enigmas surrounding new digital trends is to enable our audience to confidently and strategically traverse this ever-changing terrain.

The authors would like to express their gratitude to all of the reviewers, writers, and sponsors who helped make this book possible. We really hope that the book, "**Demystifying Emerging Trends in the Digital Horizon**" will provide you with the inspiration, information, and tools you need to succeed in the digital era.

Satya Prakash Yadav
School of Computer Science
Engineering and Technology (SCSET)
Bennett University, Greater Noida
U.P., India

D. Arul Pon Daniel
Department of Computer Science & Applications
Loyola College of Arts and Science
Mettala, Rasipuram Taluk, Namakkal
Tamil Nadu, India

&

G.N.R. Prasad
Department of Computer Applications
Chaitanya Bharathi Institute of Technology
Hyderabad, Telangana, India

List of Contributors

A. Ashok Kumar	Department of Civil Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
A. Bullibabu	Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
A.R. Reshma	Department of Management Studies, Karpagam Academy of Higher Education, Coimbatore, Tamil Nadu, India
A. Kayalvizhi	Department of Commerce, Loyola College of Arts and Sciences, Mettala, Namakkal, Tamil Nadu, India
Afreen Fatima Mohammed	Department of Computer Science & Engineering (Data Science), CVR College of Engineering, Ibrahimpatnam, Hyderabad, Telangana, India
Aliyu Mohammed	Department of Management, Skyline University Nigeria, Kano, Nigeria
A. Senthilkumar	School of Science and Information Technology, Skyline University, Kano, Nigeria
B. Malleswari	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
B. Vijay Sekhar	Department of Civil Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
B. Venkateswarlu	Department of Science & Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
B. Ramesh	Department of Science & Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
B. Sai Nikhil	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Busupalli Madhu Sudhan Reddy	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
B. Rama Krishna	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
B. Poojitha	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
B. Kumar Babu	Department of Computer Science Engineering, GITAM School of Technology (SOT), GITAM University, Hyderabad, Telangana, India
B. Rajya Lakshmi	Department of Computer Science and Engineering, Chalapathi Institute of Engineering and Technology, Andhra Pradesh, India
B. Gayatry	Department of Computer Science and Engineering, G. Pulla Reddy Engineering College, Kurnool, Andhra Pradesh, India
Boppudi Lingarao	Department of Science and Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India

B. Sundaravadivazhagan	Department of Information Technology, University of Technology and Applied Sciences-Al Mussana, Muladdah, Oman
Basi Reddy Avula	Department of Computer Science and Engineering, School of Computing, Mohan Babu University, Tirupati, Andhra Pradesh, India
C Ravindra Murthy	Department of ECE, School of Engineering and Technology, Mohan Babu University (Erst while Sree Vidyanikethan Engineering College), Tirupati, Kotala, Andhra Pradesh, India
C. Chnadru Vignesh	School of Computer Science and Engineering, Vellore, Institute of Technology, Vellore, Tamil Nadu, India
Ch. Kiran Kumar	Department of Science & Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
C. Karthick	Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Ch. Mastan Chowdary	Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Chandani Joshi	Department of School Management, Sir Padampat Singhania University, Bhatewar, Rajasthan, India
Deepika Verma	Department of Computer Science and Engineering, School of Engineering and Technology, Om Sterling Global University, Hisar, Haryana, India
D. Ananda Babu	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
D. Hanuma Reddy	Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
D. BujjiBabu	Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
David Asirvatham	Department of Data Science and Artificial Intelligence & Machine Learning, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
D.S. Srinivas	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
D. Navya Kala Ranjani	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
D. Arul Pon Daniel	Department of Computer Science and Applications, Loyola College of Arts and Sciences, Mettala, Namakkal, Tamil Nadu, India
Disha Mathur	Department of School Management, Sir Padampat Singhania University, Bhatewar, Rajasthan, India
E. Karunakar	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India

Eedupalli Sai Kumar	Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
E. Vidhya	Department of Computer Science, Padmavani College of Arts and Science for Women, Salem, Tamil Nadu, India
G. Navaneethakrishnan	Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Galeeb Shaik	Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Gundlapally Swapna	Department of Computer Science and Engineering, Keshav Memorial College of Engineering, Ibrahimpatnam, Hyderabad, Telangana, India
G. Naga Rama Devi	Department of Computer Science (Data Science), Sreyas Institute of Engineering and Technology, Hyderabad, Telangana, India
G. Durvasi	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
G. Azim Bin Sulaiman Zakaria	School of Arch, Buildg. And Design, Faculty of Innovation and Technology, Taylor's University, Selangor, Malaysia
Harish Reddy Gantla	Department of Computer Science and Engineering, Vignan Institute of Technology and Science, Yadadri, Bhuvanagiri, Hyderabad, Telangana, India
I. Srinivasa Reddy	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
I. Kumar Reddy	Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
I. Laurence Aroquiaraj	Department of Computer Science, Periyar University, Periyar, Tamil Nadu, India
J. Guru Vardhan	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
J. Bhargav	Department of Computer Science and Engineering, Chalapathi Institute of Engineering and Technology, Andhra Pradesh, India
J. Mary Catherine	Department of Computer Science & Quality Assistance, Chevalier T. Thomas, Elizabeth College for Women, Chennai, Tamil Nadu, India
Janardhana Rao	Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
J. Jeya Ani	Department of Commerce, St. Xavier's College (Autonomous), Affiliated to Manonmaniam Sundaram University, Palayamkottai, Abishekapatti, Tirunelveli, Tamil Nadu, India
Jenyo Bola Olufunke	JEAP TechnoPreneur, JEAP TechnoPreneur, Ilorin, Nigeria
Kamal Dhanda	Department of Computer Science and Engineering, School of Engineering and Technology, Om Sterling Global University, Hisar, Haryana, India

K.C. Kullayappa Naik	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
K. Hanumanthu	Department of Civil Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
K. Naveen	Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
K. Sreenath	Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
K. Navaz	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
K. SaiTeja	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Kurakula Hima Bindu	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Kondepudi Sujitha	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
K. Kiran Kumar	Department of Computer Science and Engineering, Chalapathi Institute of Technology, Andhra Pradesh, India
K. Vijay Babu	Department of Computer Science and Engineering, CMR Engineering College, Hyderabad, Telangana, India
K.V.J. Bhargav	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
K. Anitha	Department of Computer Science and Engineering, Loyola Academy, Alwal, Secunderabad, Telangana, India
K. Srinivas	Department of Computer Science and Engineering, Koneru Lakshmaiah Education Foundation, Hyderabad, Telangana, India
K. Tanveer Ahmed	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
L. Mastanamma	Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
L. Bharathi	Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
L. Santhi	Department of Mathematics, PSGR Krishnammal College for Women, Coimbatore, Tamil Nadu, India
Madhu Valavala	Department of EEE, Swarnandhra College of Engineering and Technology (A), Narsapur, Andhra Pradesh, India
M. Venkat Naga Sai Krishna	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India

Munish Kumar	Department of Computer Science and Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Andhra Pradesh, India
MaheshBabu Kedhari	Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
M. Haritha	Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
M. Selvam	Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
M. Suresh	Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
M. Srilakshmi Vani	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Mohammad Shaheen	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
M.L. Chayadevi	Department of Computer Science & Engineering, BNM Institute of Technology, Bengaluru, Karnataka, India
Manish Dadhich	Department of School Management, Sir Padampat Singhania University, Bhatewar, Rajasthan, India
M. Ashok Kumar	Department of Computer Science and Software Engineering, Skyline University Nigeria, Kano, Nigeria
Mohammad Nazeeruddin	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Nikhil Nalluri	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
N. Sangeetha Priya	Department of Civil Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
N. Yaswanth	Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
P. Dhanasri Navya Satyasri	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
P. Vasudeva	Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
P. Giriasree	Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
P. Venkata Siva	Department of Computer Science and Engineering, Chalapathi Institute of Engineering and Technology, Andhra Pradesh, India
P. Kusuma	Department of Computer Science & Engineering, BNM Institute of Technology, Bengaluru, Karnataka, India

P. Narendra	Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
P. Chandrakanth	Department of Computer Science and Engineering, School of Computing, Mohan Babu University, Tirupati, Andhra Pradesh, India
R. Maheswararao	Department of Civil Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Raihana Parveen R.	Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Ramesh Babu	Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
R. Manju Shree	Department of Management Studies, Karpagam Academy of Higher Education, Coimbatore, Tamil Nadu, India
R. Senthamil Selvan	Department of Electronics and Communication Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, Andhra Pradesh, India
S. Lakshmi	Department of Mathematics, PSGR Krishnammal College for Women, Coimbatore, Tamil Nadu, India
S. Saranya	Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
S. Kishore Babu	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Sd. Sahadha	Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
S. Geetha	Department of Computer Science & Engineering, BNM Institute of Technology, Bengaluru, Karnataka, India
Sivaraman Gurusamy	M.G.R. College (Arts and Science), Hosur, Tamil Nadu, India
Sreejith Vignesh	Department of Information Technology, Sri Krishna Adithya College of Arts & Science, Coimbatore, Tamil Nadu, India
S. Babu	Jayagovind Harigopal Agarwal Agarsen College, Chennai, Tamil Nadu, India
Syed Naimatullah Hussain	Department of Computer Science and Engineering (Data Science), Nagarjuna College of Engineering and Technology, Bengaluru, Karnataka, India
Sanjay Kumar Gouda	Corporate Relations, GIET University, Gunupur, Odisha, India
Sarbesh Mishra	National Institute of Construction Management and Research (NICMAR), NICMAR, Hyderabad, Aliabad, Telangana, India
Syed Gouse Basha	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India

S. Suresh Kumar	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Saurav Das	Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
S.K. Efran	Department of Science & Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
S. Suresh Kumar	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
S. Prasad Jones Christydass	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
S. R. Srikanth Nandanavanam	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Silpa Ch	Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Sk. Shamshad Ahamed	Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
S. Jafar Ali Ibrhaim	Department of IoT, School of Computer Science and Engineering, Vellore Institute of Technology, Vellore, Tamil Nadu, India
Shaik Rahamathunnisa	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Thella Sunitha	Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Thiruma A. Valavan	Department of Training, Indian Institute of Banking and Finance, Cuffe Parade, Mumbai, India
T. Bindu	Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
T. Dharani	Department of Computer Science and Computer Applications, Padmavati Arts & Science College for Women (Autonomous), Salem, Tamil Nadu, India
Thanapal Pandi	School of Computer Science and Engineering and Information Systems, Vellore Institute of Technology, Vellore, Tamil Nadu, India
T. Meeradevi	Department of Electronics and Communication Engineering, Kongu Engineering College, Perundurai, Tamil Nadu, India
U. Hari Babu	Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
V. Jaikumar	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India

Vamsi Ommi	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
V. Vidya Sagar	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Vijayan Sugumaran	Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Veeramreddy Sony	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
Y. Nandakishore	Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Y. Kalyana Krishna	Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
U. Madhurima	Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India
V. Poornima	School of Computing Sciences, Vels Institute of Science, Technology and Advanced Studies, Chennai, Tamil Nadu, India
V. Praveen Kumar	Department of Commerce, St. Xavier's College (Autonomous), Affiliated to Manonmaniam Sundaram University, Palayamkottai, Abishekapatti, Tirunelveli, Tamil Nadu, India
Waseema Masood	Department of Computer Science and Engineering, Deccan College of Engineering and Technology, Nampally, Hyderabad, Telangana, India
Y. Kalyana Krishna	Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India
Y.S.S. Patro	School of Management Studies, GIET University, Gunupur, Odisha, India

CHAPTER 1

Crop Recommendation System Using Machine Learning

G. Durvasi[1,*], M. Sai Ruthwik[1], I. Srinivasa Reddy[1], K. Tanveer Ahmed[1] and **Vamsi Ommi[1]**

[1] *Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India*

Abstract: A large portion of the Gross Domestic Product (GDP) of emerging nations like India comes from agriculture, which is why the sector is so important to these countries' economies. An increase in food demand has resulted from the population's rapid growth. Crop quality, yield, and profitability can all take a hit when farmers choose their crops, fertilizers, and pesticides without taking into account factors like soil type, water needs, temperature, and crop profitability analysis for a specific area. In addition to advising on fertilizers, diseases, and pesticides, researchers are using computational tools to provide crop recommendations based on soil conditions, water needs, and market profitability. This study presents AgriRec, a crop and fertilizer recommendation method based on machine learning. The machine learning algorithm takes into account information about the soil, the size of the farm, the water table, and the minimal provision price of the crop to provide seasonal crop predictions. In addition, they provide a method that takes into account the specifics of the soil, the crop, and the fertilizer to visualize a possible mix of fertilizers for a certain soil and crop combination. Using 4500 land samples from Tamil Nadu and 25 distinct crops, the system outperforms current benchmark recommendation algorithms by a factor of five while successfully recommending crops with an accuracy of 96.86% and fertilizer with an accuracy of 93.12%.

Keywords: Crop predictions, Crop quality, Fertilizers, Gross domestic product, Machine learning.

INTRODUCTION

The agricultural sector is fundamental to the economy of every nation [1]. Farmers have always relied on first-hand accounts and criticism from their peers to improve their crop-growing practices, but this method isn't always effective and might result in financial losses [2]. Conventional farming practices do not provide

* **Corresponding author G. Durvasi:** Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India; E-mail: Kiran.durvasi@gmail.com

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accurate information about soil properties, crop water requirements, potential crop profits, or which crops and fertilisers work best on a particular plot of land, making it impossible to meet any nation's food demands. Agriculture research and development breakthroughs are like technology [3]. Agricultural research benefits from machine learning, neural networks, digital image processing, and big data [4]. Digital image processing, machine learning algorithms, and recommendation systems are available for data collecting and analysis. E-commerce, movie proposal, health care, etc [5, 6] use recommendation system technology. Machine learning creates a self-learning model that predicts new things [7]. Machine learning evolves quickly and can be used in medicine, agriculture, e-commerce, robotics and automation, climatology, and more. ML can improve recommendation system efficiency and accuracy [8, 9]. Digital image processing can acquire, regenerate, and analyse agricultural data, including land and crop photographs, to detect crop diseases, assess soil minerals, calculate crop area, *etc*. By suggesting the most appropriate crops, fertilisers, and pesticides, these technologies have the potential to boost agricultural development [10].

Research on agricultural technology's potential was rather limited before the 20th century [11]. Data mining, big data, and machine learning are just a few examples of new technologies that have attracted scholars interested in applying their skills to the agricultural sector [12]. Implementing current technology can effectively handle and interpret enormous amounts of data to optimise agricultural production, identify crops, and prescribe fertilizers [13]. The research found three key issues with traditional agriculture: 1) Selecting crops for optimal production and profit; 2) Selecting fertilizer depending on plant and soil variables, and correct quantities; 3) Trouble diagnosing and treating crop illnesses [14]. Many academics are creating algorithms for traditional farm systems [15]. Selecting the best crop for a particular land relies on soil, weather, climate, water, land acreage, market demand, *etc*. The authors use a neural network to forecast maize crop production and assess climate change's impact. Built on marketplace data, an Apriori algorithm recommends crops to farmers. Another logistic regression-based demand-based approach is suggested. Decision Trees, Support Vector Machines (SVM), and logistic regression classifiers improve agricultural production. Most researchers propose crops based on soil qualities and kinds, according to the study. Additionally, soil type, characteristics, water and temperature needs, land area, and crop market value must be considered when estimating crop yields for a specific site to maximise agricultural productivity. Furthermore, all dietary nutrients originate from the soil. Ensure all soil nutrients are accessible for healthy crops. A multitude of factors may degrade soil quality, requiring fertilisers to provide minerals. Fertilizer selection depends on soil and crop. Researchers created a classification-based system to assess soil fertility and prescribe fertilisers. Further, farming is challenging and requires constant plant

development monitoring since pests and diseases may decrease crop growth. Crop pests and diseases vary. Crops must be treated daily for pests and diseases. The authors advise crop therapy by diagnosing illness and comparing treatment to it. Decision Trees, Support Vector Machines (SVM), and logistic regression are used to categorize agricultural pests and suggest appropriate treatments. In a similar vein, researchers have developed a foundational ontological method for pest identification and management. Specifically, SVM is also utilized to classify crop ailments and propose effective solutions.

Researchers have made significant progress in automating farming, but there may be a need for even more sophisticated mechanisms to help farmers save time and energy while increasing crop yields and profits through the use of various standards for crop recommendation. In the aforementioned survey, deep learning, machine learning, and digital image processing failed to forecast fertilizer and pesticides. Machine learning has advanced in several fields, including agriculture. It reformed farming by making smart resource-saving suggestions to boost crop productivity. Machine learning is used to construct an agricultural recommendation system in the study. The method aims to improve agricultural output, quality, resource efficiency, and farmer profit. The prior research included the development of an algorithm to select crops and sites based on soil attributes. They propose AgriRec, a new machine learning-based recommendation system, to automate farming by suggesting a crop for both the autumn and spring seasons, as well as the appropriate amounts of fertilisers based on multiple criteria. The following part describes the AgriRec algorithm and its components.

AGRIREC PROTOCOL

The adoption of modern technology in significant economic areas is an important event for all research. AgriRec, a machine learning-based recommendation organization, automates fertilizer and crop choices. The AgriRec procedure has two parts: 1) a Multi-criteria Crop Recommendation System, and 2) a Fertilizer Recommendation System. The suggested method includes numerous crop quality and quantity parameters. Soil types, pH, Sulphur (S), Manganese (Mn), Boron (B), Phosphorous (P), Organic Carbon (OC), zinc (Zn), iron (Fe), Nitrogen (N), Electrical Conductivity (EC), and Copper (Cu), water level, land area, crop market value, and soil type are used to recommend crops and fertilisers.

Tables **1** and **2** illustrate a sample soil health card, which describes the landowner, farm size, and soil type. These data were used for the multi-criteria crop recommendation system. They first suggested the CRS method in a work titled ‘State-of-the-art study’ on recommendation systems, then potential allowances. Phase 1 of AgriRec is an expansion of that approach. The crop recommendation

CHAPTER 2

Development of Forecasting Models to Predict the Power Consumption of Charging Stations: IoT

Madhu Valavala[1,*], Thiruma Valavan A.[2] and **C Ravindra Murthy[3]**

[1] Department of EEE, Swarnandhra College of Engineering and Technology (A), Narsapur, Andhra Pradesh, India

[2] Department of Training, Indian Institute of Banking and Finance, Cuffe Parade, Mumbai, India

[3] Department of ECE, School of Engineering and Technology, Mohan Babu University (Erst while Sree Vidyanikethan Engineering College), Tirupati, Kotala, Andhra Pradesh, India

Abstract: The owners of electric vehicles are confronted with the challenge of having a restricted number of charging station alternatives. A feasible solution to this issue might be the installation of individual charging stations in close proximity to residential areas. It will be easier for owners of charging stations to have a clear picture of how much energy they need to generate if they have access to a forecasting model that is capable of accurately predicting the amount of power that charging stations will use. This paper's objective is to lay forth a plan for a charging station technology that would allow electric cars to be plugged in using the Internet of Things (IoT). The study goes on to provide an ARIMA-based model that, to improve sales prediction overall, may have its learners fit to the station's subgroups using optimum parameters. With an average MAPE, RMSE, and R2 value of 13.89%, 6.68%, and 1.80%, respectively, the suggested model also forecasted the amount of electricity that would be used by seven charging stations.

Keywords: Charging station, Electric vehicles, IoT, MAPE, RMSE.

INTRODUCTION

The automotive industry is undergoing rapid transformation due to the increasing popularity of electric cars. Electric charging stations must be built in large numbers to accommodate this [1 - 5]. The average cost to establish a charging station for electric vehicles is 24,00,000 INR. Getting land cover and keeping the power on consistently account for most of the expenses. Installing electric vehicle charging stations in neighbourhoods might be a practical way to provide more affordable land. Electricity prices may be reduced by generating power from renewable sources [6 - 8].

[*] **Corresponding author Madhu Valavala:** Department of EEE, Swarnandhra College of Engineering and Technology (A), Narsapur, Andhra Pradesh, India; E-mail: vmadhu.eee@swarnandhra.ac.in

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Smart charging stations, which are internet-connected, enable users to reserve a charging spot in advance *via* a web interface or a mobile app. Smart charging stations may be useful here, but it would be a pain to automate the charging process and predict how many users would be using them on any particular day. A solution to these problems is a networked system of Internet of Things (IoT)-based electrical charging stations that can be booked online [9, 10]. Using an approach derived from the ARIMA model, they predict daily revenue associated with the charging station [11 - 13]. This helps us manage the station's energy supply properly [14, 15].

SUGGESTED APPROACH

Charging stations connected to the Internet of Things (IoT) are being set up and can be reserved online. There is a connection between the cloud and the charging stations. Charging stations make use of a relay module and a current sensor. Regular uploads to the cloud are made of the data collected from the sensors.

Every customer's details who reserved a charging station are recorded. An authentication token will be provided to customers, allowing them to access the charging station. The consumer can choose the charging percentage online, and the current sensor controls the charging process accordingly. The power supply of the charging station may be turned on and off using the relay module. The cloud is where it is updated after the charging procedure is finished.

Customers may reserve a charging station by selecting their desired location and consulting the website. The website automatically updates the list of charging stations according to the user's current location. When the consumer arrives at the assigned charging station location, they can use the station by entering an authentication token that was sent to them when their booking was confirmed. Based on the availability, the website updates the list of charging stations in a place hourly, as illustrated in Fig. (**1**).

The booking details are saved in the cloud, and the authentication tokens are sent to the designated charging stations. The next step is to approve consumers using the authentication token. After every successful order, the status of the charging station is updated, which in turn updates the list of readily accessible stations. In an ideal world, customers would have access to charging stations like those in Fig. (**2**).

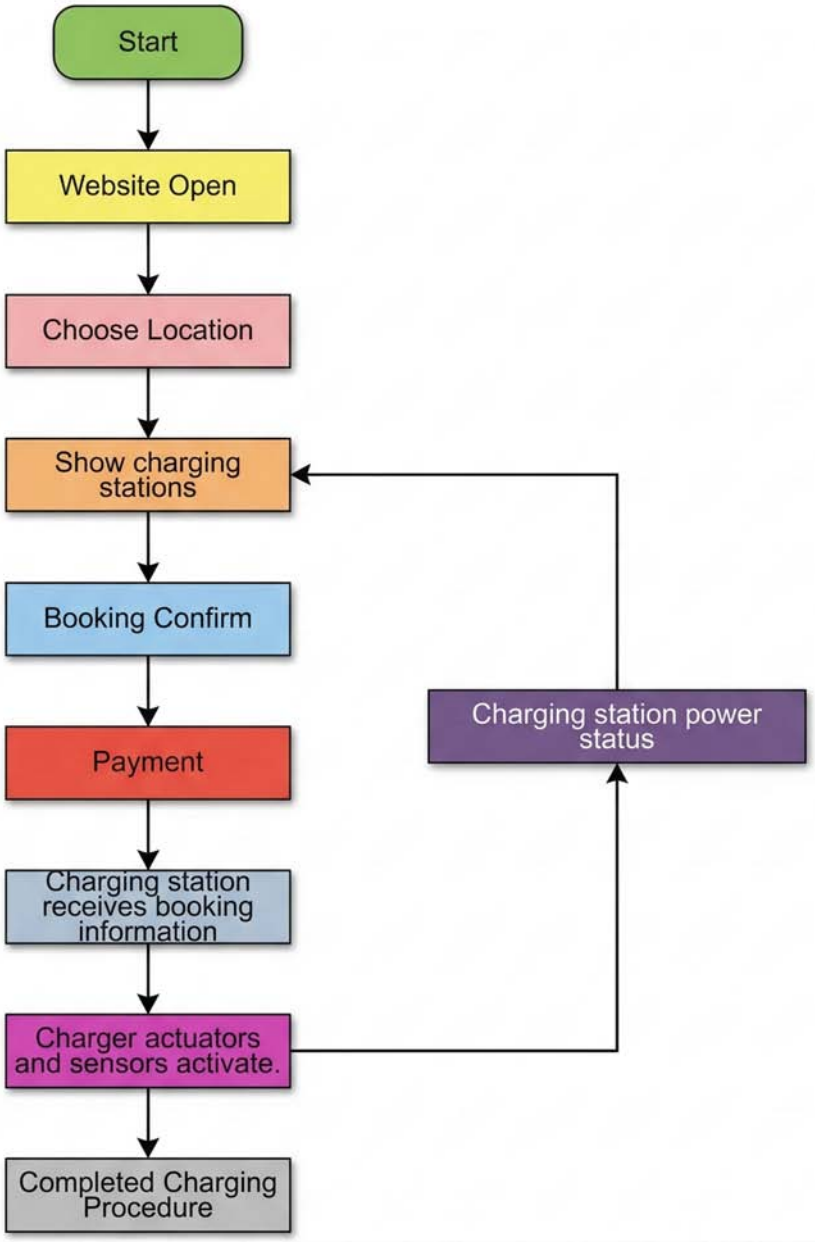

Fig. (1). Website updates the list of charging stations.

CHAPTER 3

Night-Time Pedestrian Detection Using Millimetre-Wave Radar and Visual Data

V. Vidya Sagar[1,*], M. Venkat Naga Sai Krishna[1], P. Dhanasri Navya Satyasri[1], Veeramreddy Sony[1] and **Nikhil Nalluri[1]**

[1] *Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India*

Abstract: The perception system of autonomous cars and the Advanced Drive Assistance System relies heavily on pedestrian protection systems. Perceptual systems of such intelligence systems employ several sensors to get additional information about their surrounding, hence the fusion of heterogeneous sensor data is crucial. This research offered a unique technique to integrate radar and video data to identify pedestrians and get dynamic information. The paper contributes to the following steps: The first step in obtaining usable target signals from noisy original radar data is to propose a novel inter-frame track technique and an intra-frame cluster method. Secondly, a coordinate transformation matrix is obtained using the least square approach to achieve the alignment of the radar-vision data space. The next step is to provide a versatile technique for generating Regions Of Interest (ROI) using radar point projections. In addition, a faster object estimation approach is suggested to generate a more precise possible target area using ROI, which would further speed up detection. Finally, the Histogram Of Gradient (HOG) properties of the prospective region is retrieved, and a support vector machine is utilized to determine pedestrian status. Real experiments demonstrate the feasibility and efficacy of the suggested procedure.

Keywords: Histogram of gradient, Inter-frame track technique, Perceptual systems, Radar-vision data, Region of interest.

INTRODUCTION

Researchers are increasingly studying pedestrian detection [1, 2]. The author allows free digital or print reproduction of this work for private or educational use [3, 4]. Commercially copying or distributing this work is illegal. Copies must have this and the notification citation on the front side [5, 6]. Respect the copy-

* **Corresponding author V. Vidya Sagar:** Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India; E-mail: sagar@aliet.ac.in

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rights of non-ACM owners of this work. Abstracting with credit is ok. Copying, republishing, posting on servers, or sending to lists requires permission or a fee. For permission, ask the person or pedestrian identification researchers who have advanced deep learning methods using static photo sets [7, 8]. Artificial features are less abstract and robust than convolution. However, significant breakthroughs created intelligence systems such as autonomous cars, autonomous mobile robots, and increased driving assistance. In this approach, data about an object's type and coordinates or distance are needed to comprehend its surroundings [9, 10]. Vision or radar-only sensing systems may suffer [11, 12]. Researchers use eyesight and laser radar separately to identify pedestrians [13, 14]. They also employ cameras and multi-line laser sonar [15]. Laser radar-vision fused perceptual systems combine the greatest elements of radar and vision systems to identify barriers more precisely and assess object dynamics faster. Laser radar is too expensive and prone to interference. Stereo cameras and Millimetre Wave Radar (MMW) may recognise pedestrians within buildings. In addition to being smaller and cheaper than laser radar, MMW radar can function in all kinds of weather and has great detecting capabilities; nevertheless, the addition of stereo vision makes the system more complicated. Even though they use MMR radar and vision to identify roadside impediments rather than humans, they nevertheless manage to differentiate themselves when it comes to fusing MMW radar and vision. MMW radar and a monocular view replace stereo vision for pedestrian detection in this work. This research outlines a system that can make use of MMW radar's advantages and is simpler than the suggested technique, in comparison to laser radar-vision systems. The procedure of the suggested approach is shown in Fig. (**1**).

The cluster and tracking techniques are used to cite the valid target centre from the raw radar data. The transformation matrices for space alignments are generated using the least-squares fitting approach. Then, a Region Of Interest (ROI) is selected from the original picture and considered a candidate area built on the item's radar point projections and its distance to the radar. Applying a faster objectless detection technique to the ROI reduces the possible target region, which speeds up the detection process. The program then uses the HOG attribute and SVM to determine whether the object is a pedestrian.

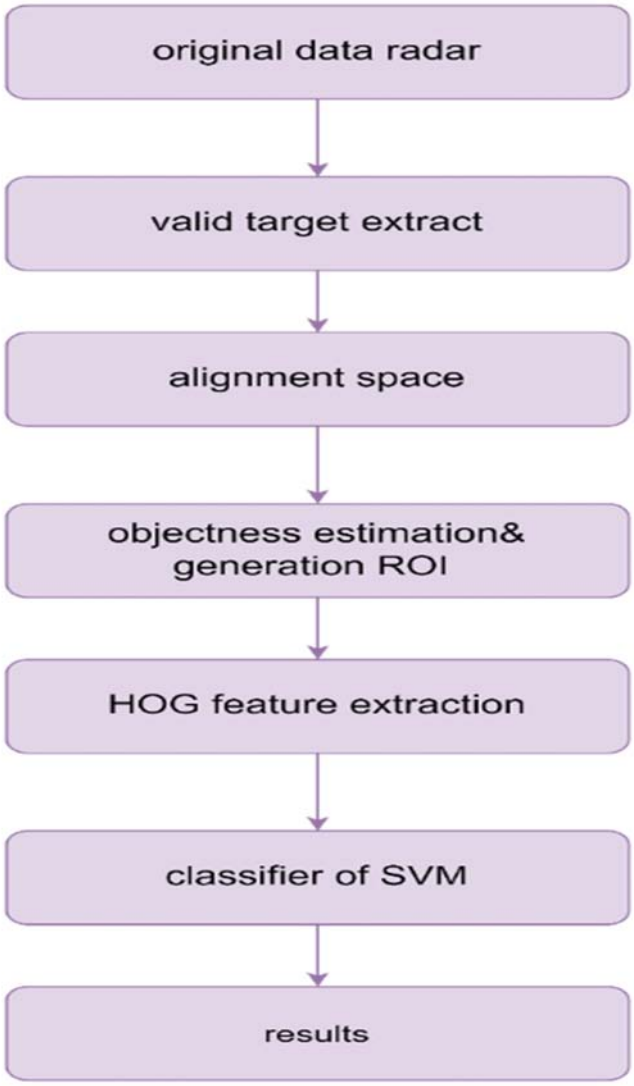

Fig. (1). Suggested approach.

METHODOLOGY

Valid Radar Target Extraction

The range resolution of an MMW radar is 0.34 meters, and its operating frequency is 77 GHz. Coordinates, distance, and velocity are only a few of the multi-dimensional properties that it can measure. The reflection signal strength from pedestrians is smaller than that from automobiles or other metallic objects,

CHAPTER 4

Advances in Gender Classification: DNN-Based Approach for Accurate Identification

Deepika Verma[1,*], **Kamal Dhanda**[1] and **Munish Kumar**[2]

[1] *Department of Computer Science and Engineering, School of Engineering and Technology, Om Sterling Global University, Hisar, Haryana, India*

[2] *Department of Computer Science and Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, Andhra Pradesh, India*

Abstract: Recent advancements in the field of face identification have highlighted the importance of gender identification in various modern applications. The detection of gender from face photographs has become a topic of considerable interest since it has several applications in security, marketing, and human-computer interaction. The proposed work examines the techniques employed in utilizing FaceNet for gender recognition in various situations, encompassing variations in backdrop, lighting, and facial expressions. In this study, we supply an inclusive test of practical verdicts, judging the efficacy of FaceNet across many circumstances. Based on the verdicts of the projected work, it may be decided that the projected work outperformed, as distinguished by additional brand-new designs for gender detection. The FaceNet model illustrated a notable level of veracity, accompanying a 94.6% happiness rate on the CMU standard database.

Keywords: Biometric authentication, Deep learning, FaceNet, Facial recognition, Gender classification, gender identification.

INTRODUCTION

The study of seeing gender from face photographs has gained important consideration recently, leading to an increasing demand for secure biometric confirmation methods [1, 2]. Identifying gender-established first traits is crucial in cruel contact uses and areas like safety, shopping, and human-computer interplay [3, 4]. This research focuses on creating a healthy deep-information pattern to address challenges in gender acknowledgement from face photos [5, 6]. The FaceNet model, popular for changing first pictures into a condensed Euclidean sphere, surpasses in first branding. Despite the allure of satisfaction, the use of

* **Corresponding author Deepika Verma:** Department of Computer Science and Engineering, School of Engineering and Technology, Om Sterling Global University, Hisar, Haryana, India; E-mail: deepika.ranolia15@gmail.com

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this technology in gender categorizations, an essential surface of biometric arrangements, has been significantly missed but holds wonderful promise [7, 8]. The bulged work delves into the methodologies and procedures of FaceNet for exact gender labeling, fact-finding allure changeability, and outdoing under varying variables like scenery, light, and first verbalisations [9, 10]. Deep learning models, holding FaceNet, play a major role in gender finding from first photographs. Proper gender labelling is essential in biometric authentication structures, presenting an image of a proof element [11, 12]. Additionally, it plays a lively part in users creating a likeness in a picture, permissive customised implications, concentrated marketing, and distinguished client knowledge [13, 14]. Gender identity is critical in mathematical analysis, helping guests adjust contributions to established client headcount [15]. In healthcare, knowing a patient's gender is vital for diagnostic and therapeutic purposes, especially for gender-specific medical disorders. This study contributes to social and psychological research, enhancing understanding of gender's impact on human behaviour in diverse settings. Gender-aware interfaces and content modification improve user experiences in various domains, such as security, accessibility solutions, education, and entertainment. However, managing gender identity data requires a strong emphasis on privacy, ethics, mitigating bias, and upholding inclusivity and diversity principles. As the exploration of this discipline progresses, prospective applications and ethical considerations continue to develop.

In our study, we thoroughly review the existing literature in Section 2, specifically focusing on the advancements in machine learning and initiatives aimed at educating users. Building on this knowledge, Section 3 introduces our proposed work. Section 4 carefully analyses the results and findings, while Section 5 outlines future research objectives in this critical field.

PROPOSED METHODOLOGY

This model is established as a carefully picked and different set of marked first figures showing crowds from various education backgrounds and positions. Faces are erect, joined, and amount to the model in various preprocessing steps that ensure thickness and better handling of changes in the here and now. Convolutional Neural Networks (CNNs) are at the heart of the model. It takes hierarchic features from the first images, which let bureaucracy recognize the dissimilarity between male and female consumers. The FaceNet of the CNN algorithm is used in the proposed system, as shown in Fig. (**1**). Face recognition and facial feature embedding are two areas in which the FaceNet algorithm has been commended for its exceptional results.

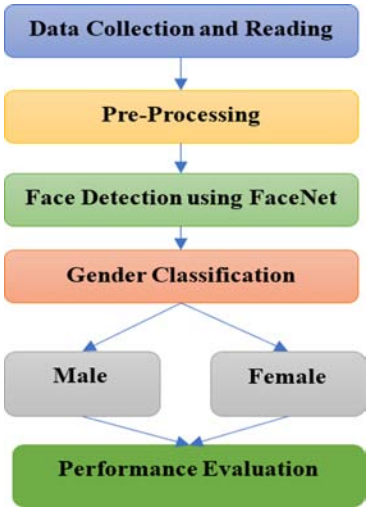

Fig. (1). Proposed model.

Step 1: Data Reading

The input image has been considered from the publicly available standard database CMU. A few of the sample images are shown in Fig. (**2**).

Fig. (2). Sample Images of the CMU database.

The preprocessing steps are essential for improving the quality and consistency of picture data. This makes it better for further analysis, like finding objects, classifying them, or extracting features.

Resize

Images in a file may be of different sizes and resolutions, so they need to be resized to a standard format. This ensures that a model can use all the same data. To change the size of a picture to a specific width (W) and height (H) as shown in equation 1 and Fig. (**3**).

CHAPTER 5

Artificial Intelligence for Breast Cancer Detection and Classification

L. Bharathi[1,*], N. Sangeetha Priya[2], MaheshBabu Kedhari[3], Sd. Sahadha[1], K.C. Kullayappa Naik[4] and **B. Malleswari[4]**

[1] *Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *Department of Civil Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[3] *Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[4] *Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: In the world, one of the most common diseases that affects women is breast cancer. When it comes to killing women, it comes in second place among all cancer kinds. Therefore, early identification is essential to lowering the fatality rate. Women's survival rates rise as a result of early detection and treatment of breast cancer. Mammography is a common radiological screening method that is used to examine women for breast cancer, even if there are no symptoms. A few machine learning techniques, like the support vector machine, are used in the literature for the identification and categorization of breast cancer. SVM, however, generated the results with incorrect categorization. As a result, the research work uses a Statistical neural net (PNN) classification mechanism that is based on advanced deep learning to solve this challenge. For effective breast cancer region detection, a segmentation method based on k-means clustering is initially applied. Last but not least, PNN was created for the classification of breast cancer with the grey level co-occurrence matrix (GLCM) based Texture features, Discrete Wavelet Transforms (DWT) based low-level features, and statistical colour features, respectively, to achieve the maximum efficiency of the system. To classify benign and malignant breast tumours, the research work can be efficiently applied. When compared to state-of-the-art methods, the suggested strategy performs better in the simulations, both quantitatively and qualitatively.

Keywords: Machine learning, Support vector machine, Probabilistic neural network, Grey level co-occurrence matrix, Discrete wavelet transform.

[*] **Corresponding author L. Bharathi:** Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India; E-mail: bharathioptical@gmail.com

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INTRODUCTION

It is common for breast anomalies to be occasionally overlooked or misdiagnosed due to the unique characteristics of these anomalies and the limitations of human visual perception. Therefore, unneeded biopsies are performed. Normal breast cells divide and develop at specific intervals, while malignant cells proliferate continuously and uncontrollably, as seen in Fig. (**1**). The majority of the research is concentrated on the use of optimization approaches to create a Classification and Diagnosis of breast cancer from Mammographic pictures [1, 2]. In this work, the investigation of anomalies in mammographic images is taken into consideration. Mammographic images suffer from a poor noise-to-signal ratio. Image segmentation is achieved through knowledge-based morphological procedures and adaptive k-means clustering. One of the biggest challenges in image analysis is still-image segmentation [3, 4]. To extract the necessary sections, which may be physically distinct but statistically indistinguishable in medical applications, competent operators are typically used. Such manual processing takes a long time, has low reproducibility, and is susceptible to biases and operator errors. Often, there is little to no distinction between the physically separate structures. Its computation requires the use of a trustworthy conventional image processing technique. Radiologists miss 10 to 25% of tumours as a result of artefacts, even though image content modification is carried out in a highly regulated and trustworthy manner without compromising clinical decision-making [5 - 7]. Basic noise reduction filters are ineffective at efficiently removing the artifacts; hence, they cannot be used on mammographic images. The image becomes corrupted, and the enhancing operation fails if we employ such basic filters. Women's survival rates rise as a result of early detection and treatment of breast cancer [8, 9]. Mammography is a common radiological screening method that is used to examine women for breast cancer, even if there are no symptoms. A few machine learning techniques, like the support vector machine, are used in the literature for the identification and categorization of breast cancer [10, 11]. SVM, however, generated the results with incorrect categorization. As a result, the research work uses a Probabilistic Neural Network (PNN) classification mechanism that is built on advanced deep learning to solve this challenge [12, 13]. For effective breast cancer region detection, a segmentation model based on k-means clustering is initially useful. To achieve the maximum efficiency of the system [14, 15]. To classify benign and malignant breast tumours, the research conducted in this chapter can be applied.

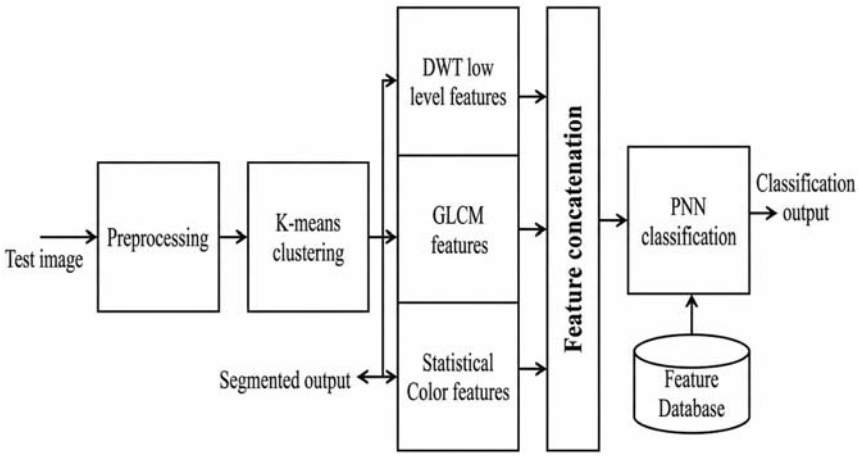

Fig. (1). Breast cancer classification and detection.

RELATED WORK

One of the biggest questions accompanying image reasoning is still facial segmentation. To extract the essential divisions, which may be concerning matter apparent but statistically indistinguishable in healing uses, competent manipulators are usually used. Such manual preparation takes a very long time, has low reproducibility, and is naive to biases and driver errors. By adjusting k-means clustering and information-located semantic procedures, we offer a trustworthy method for segmenting a three-spatial (3-D) picture dossier. Segmenting the areas accompanying smoothly variable force distributions is likely to use the submitted adjusting k-means grouping algorithm. The shaping of the domains by Gibbs random fields allows for the inclusion of spatial disadvantages in the assembling method. Following area segmentation, the target regions are identified using knowledge-based morphological procedures that take into account the region's anatomical history. The left ventricular chamber volumes were successfully generated using the suggested method on a series of cardiac CT volumetric images at 16 successive temporal frames. With results acquired *via* hand outlining, our final segmentation results compare favourably. When a priori information about a particular object is known, extensions of this approach to other applications are simple to make. Breast anomalies are often overlooked or misdiagnosed because of their subtle features and the limitations of human visual perception. Therefore, unneeded biopsies are performed. Normal breast cells divide and develop at specific intervals, while malignant cells proliferate continuously and uncontrollably, as seen in Fig. (**1**). The majority of research focuses on using optimization approaches to classify and diagnose breast cancer from mammographic pictures. In this work, the investigation of anomalies in

CHAPTER 6

Effect of Temperature on Hydraulic Diffusivity for Different Building Materials

K. Hanumanthu[1,*], R. Maheswararao[1], A. Ashok Kumar[1], B. Vijay Sekhar[1], G. Azim Bin Sulaiman Zakaria[2] and **G. Navaneethakrishnan[3]**

[1]*Department of Civil Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2]*School of Arch, Buildg. And Design, Faculty of Innovation and Technology, Taylor's University, Selangor, Malaysia*

[3] *Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: This research focuses on exploring the process of capillary retention of water in an unsaturated porous medium. To find this, we may use the non-linear parameter in the Richards equation, which is hydraulic diffusivity. When hydraulic conductivity is divided by a specific water volume, the resulting quantity is the hydraulic diffusivity. Moisture transfer and liquid transport are two forms of hydraulic diffusivity. This equation may have a linear or non-linear form, depending on the type of function. Hydraulic dispersion and non-linear moisture content equations derived from experimental data have often made use of this approach. The project incorporates ten distinct construction materials sourced from a variety of published sources. Researchers assess and analyse experimental data on how temperature influences various construction materials. The findings showed that the constant diffusivity increases with increasing temperature for all ten materials. However, due to material inhomogeneity or experimental errors, the results demonstrated that the diffusivity starts to decrease for a few of these substances, which indicates a limitation of the current model.

Keywords: Construction materials, Hydraulic diffuseness, Temperature, Water absorption.

INTRODUCTION

A material's moisture content is defined as the percentage of water vapour that escapes *via* its open spaces [1, 2]. It is a common practice to express the amount

* **Corresponding author K. Hanumanthu:** Department of Civil Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India; E-mail: hanumanthu.k@qiscet.edu.in

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of water content as a mass percentage relative to the material's dry weight. The moisture levels of common items like timber, pottery, and dirt are useful to know. Even in minute amounts, water is always present and is defined as moisture [3, 4]. Water vapour or condensation is a possible source of moisture among a building's textiles, which in turn produces wetness and issues including discoloration, mould growth, mildew, and poor indoor air quality [5, 6].

Capillary transfer of liquid-level moisture, also known as moisture diffusivity, is the primary mechanism by which moisture penetrates capillary porous materials. In the context of structural physics, it is reasonable to call the passage of liquid through the pores a diffusion event, even if it is a convective occurrence. The two liquid transports used by WUFI to measure it are conditional on the boundary conditions and the qualities of the material [7, 8].

Many degradation mechanisms that impact the porous structure of materials are related to moisture. Changes in moisture levels can lead to various types of damage, such as discoloration, cracking, chipping, and crumbling. The fluid and fume structures are both permeable to water. The rate of fluid water retention in materials with a porous structure is known to be faster than the rate of fume dispersion. In various open situations, water absorption can occur, for instance, as a result of driving precipitation, roof overflow, or façade ascent of groundwater, among others [9, 10]. Providing structural components that are sufficiently impermeable to water retention is essential for ensuring their durability. It is possible to determine a material's water tightness using simple water retention and saturation tests. However, to determine a structural part's service life, it is necessary to demonstrate and replicate water intake under the specified administration conditions. It is well established that capillary water absorption is influenced by temperature and the initial saturation level. However, in non-isothermal situations, the effect of temperature stands out on its own [11, 12]. Blocks and cement exhibit a straight proportionality between water temperature and pressure-driven diffusivity and water retention coefficient in an isothermal environment [13, 14]. Additionally, they reveal a direct relationship for eastern white pine [15].

The Analysis of D (θn)

A porous material's diffusivity is its propensity to transfer an unsaturated liquid *via* its interconnected pore space (Hall and Hoff 2011(*)). This quality is known as hydraulic diffusivity when the liquid in question is water. Pore space saturation, the geometry of the pore structure, and the transport mechanisms that propel moisture migration are all considered in hydraulic diffusivity, a continuum-level feature. A significant amount of work has been invested in

developing new methods and refining existing ones to evaluate water-driven diffusivity, as robust techniques are crucial. Equations (2) and (3) were used to find the values of the constant D (m^2/s), according to Kumara's (1999) water absorption coefficient.

Here, θs (m^3/m^3) is the moisture content at saturation level, and A_{cap} ($kg/m^2s^{0.5}$) is the water absorption coefficient given in Equation (3) (Wilson *et al.* 1999; Sicakova *et al.* 2017).

$$A_{cap} = square)/a\sqrt{t} \quad \textbf{(1)}$$

The formula Mw (t (Kg)) takes into account the total water absorption at time *t*, where *a* (m^2) is the area of the surface that is exposed to water and *t* (s) is the time.

Parameters, including Acap, sorptivity S (m/s^0.5), and hydraulic conductivity K (m/s), which can be determined by gravimetric testing, were used to describe the non-linear hydraulic diffusivity. In order to derive an Acap-based hydraulic diffusivity that is dependent on moisture, researchers like Kumaran (1999) and Künzel (1995) have utilised Equations (2) and (3).

$$\theta) = \quad (A_{cap}/\theta_{max})^2 \quad \textbf{(2)}$$

$$\text{expoapo}\theta) = (A_{cap}/\theta_{max})^2 b^2/(2b\text{-}1)\ \exp_b (\theta\theta_{max-1}) \quad \textbf{(3)}$$

Equation (3) was deemed valid for water suction over short periods and moisture contents below θmax.

SUBJECTS AND METHODS OF EVALUATION

General

Red Clay Bricks (RCB), concrete made from Cement (C), Eastern White Pine (EWP), AA Concrete (AAC), Ceramics Bricks (CB), A T marble (ATH), Calcium Silicate (CS) Boards, A limestone (ANO), K limestone (KIV), and L chalk are the materials utilized in this experiment (LYM).

Test of Sorptivity

Because the results of the sorptivity test are not well-defined, it can be performed either physically or subsequently (Bomberg *et al.* 2005). The manual approach is extensively utilized all over the globe, as it is easy to set up experiments and can handle multiple samples. The examples are placed on plastic or steel points that

CHAPTER 7

Face Recognition Using Deep Learning in an Attendance Tracking System

S. Suresh Kumar[1,*], C. Chnadru Vignesh[2], E. Karunakar[1], L. Mastanamma[3], Saurav Das[4] and **S.K. Efran[5]**

[1] *Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *School of Computer Science and Engineering, Vellore, Institute of Technology, Vellore, Tamil Nadu, India*

[3] *Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[4] *Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[5] *Department of Science & Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: The human face serves as the most distinctive identifier of an individual, making facial features a viable biometric for a face recognition system. Managing attendance has often proven to be a challenging task. Conventional attendance tracking methods involve manually calling out students and meticulously recording their presence or absence, demanding substantial time and effort. This work introduces an OpenCV-based facial recognition technique comprising a camera for image capture, a face detection algorithm, facial feature encoding, identification, and attendance management within a spreadsheet. To establish a training database, the system is trained with the images of authorized students' faces. This research identifies people using Convolutional Neural Networks (CNNs). Compared to other methods, the Local Binary Patterns Histogram (LBPH) technique is accurate.

Keywords: Computer vision, Deep learning, Face recognition, Face detection, Face attendance, Training.

INTRODUCTION

Face recognition, which analyzes face traits in real time, may be used on static photos and video [1, 2]. The logistic classifier is optimized for supervised classification using a variety of methods, including Stochastic Gradient Descent

[*] **Corresponding author S. Suresh Kumar:** Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India; E-mail: sureshkumar.s@qiscet.edu.in

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(SGD), Momentum, and adaptive learning rate algorithms like AdaGrad. [3, 4]. Deep learning improves model exploration and parameter adjustment by using previous data. Convolutional Neural Networks (CNNs) stack, stride, and pool data to identify text and pictures [5, 6].

Facial verification, the process of comparing two faces to find their resemblance, is an essential part of face recognition [7, 8]. A typical use case for this type of verification is verifying that a candidate's photo matches the one on their official identity certificate. Facial recognition unlocks gadgets by matching camera photos to a database of faces. These watchlists contain many innocent persons from many sources, including social media. Face recognition systems are reliable in many applications because they work consistently, even with likely variances [9, 10]. The technology can unlock gadgets and detect faces for official documents. CNNs evaluate visual input to recognise complex face characteristics and patterns [11, 12].

New face recognition technology creates ethical issues. Social media watchlists raise privacy and consent concerns [13, 14]. Ethical issues emerge when watch lists fail to tell individuals that their face data is being used for identification. The technology can match photos with watch lists, even for people who are innocent, raising concerns about invasive surveillance. Face recognition misuse without monitoring compromises privacy [15]. Ethical issues may arise when historical data-based algorithms provide biased findings that disproportionately harm certain demographic groups. Despite ethical issues, facial recognition softwares are powerful. Protecting individual rights while maximizing their benefits is tough. Clear laws and ethics are needed to design and apply responsible facial recognition technology.

LITERATURE SURVEY

Detail additional academic research findings that relate to the proposed project. Mobile applications are built using SDKs and programming languages like Java. Databases hold all application data, making them crucial. Students' attendance databases are being created in SQL by several mobile app developers. Somasundaram *et al.* developed a VB.NET and SQL database mobile-based attendance system. This system's meticulous design allows student data management, retrieval, storage, and structuring. It also solves attendance tracking issues by providing comprehensive student reports.

K. Akhila *et al.* also proposed a new Android-based smartphone app for student attendance tracking. This app uses Android devices' reliability and speed to simplify attendance management, saving staff time and enhancing efficiency. They stress reliability and usability in building an educational presence

management system. Rakhi Joshi and colleagues' Android-based attendance monitoring solution featured smart learning. This web-based mobile app relied on an SQL server throughout its development. In particular, the technology allows for the real-time monitoring of student attendance using cellphones and uses text message alerts to notify students when their performance drops below the necessary level. Students are more engaged and aware of their surroundings as a result of this technological integration, which also improves attendance tracking. Amita Dhale and colleagues surveyed smart interact, Android, and web-based technologies. Mobile app-based attendance management is widely used in organisations and offices to track personnel attendance. Attendance monitoring systems may be used in professional settings as well as educational organisations. S.P. Avinash Ram and J. Albert Mayan developed a mobile programme for employee registrations and mobile attendance monitoring beyond student attendance. This technology simplifies frequent staff attendance tracking and updates. Authorities and workers profit from attendance monitoring systems since they make it easy to measure staff numbers and tenure. The system's extensive data improves management decision-making and organisational efficiency. These studies show how mobile apps alter attendance monitoring. Technology, especially SQL-based systems, has helped educational institutions and companies control attendance. The focus on user-friendliness, dependability, and real-time monitoring shows a dedication to accessible and efficient services.

EXISTING METHOD

SVMs have typically been used for binary classification, making them perfect for data categorisation. Face recognition is a multi-problem, especially when 'K,' the number of identified individuals, surpasses two. To find a reliable facial recognition method, we redefined the challenge and reevaluated the SVM classifier.

Consider face recognition a 'different space' challenge to train SVMs. Modelling the differences between facial photos turned the face recognition issue into a binary categorisation challenge in this distinction space. These two classifications separate faces of the same person from faces of different people. A conceptual change enabled us to use the SVM's capabilities in a novel manner.

The technique used the SVM to calculate a face similarity measure from facial image differences. Develop a method to measure and analyse face feature dissimilarity using SVM's decision boundary idea. A unique strategy was used to collect face pair differences and similarities.

In order to thoroughly assess how well our SVM-based technique performs, they will compare it against a Principal Component Analysis (PCA)-based technique

CHAPTER 8

Automated Plant Irrigation System with Arduino Incorporating Message Notifications

S. Suresh Kumar[1,*], S. Prasad Jones Christydass[1], Karpurapu Nageswara Rao[2], I. Kumar Reddy[3], M. Haritha[2] and **Ch. Kiran Kumar[4]**

[1] *Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[3] *Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[4] *Department of Science & Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: Modern customers across the globe are finding that ever-improving information technology makes their lives easier; as a result, it is crucial to apply this knowledge to the irrigation industry now. Worldwide population growth is driving up food consumption at an exponential rate, making it imperative to increase arable land. Producing food through irrigation is the most dependable method in light of the current climate crisis caused by industrialised nations' contributions to global warming. With more and more areas available for irrigation, the best management and efficient use of water are becoming more important since it is the only resource necessary for agricultural production. It offers a simple method of automated irrigation and is based on the Arduino platform. With the help of the GSM module, this project intends to build and install an automated system for controlling plant irrigation using Arduino and the module, which will allow the user to get updates on the farm's status. Two primary components make up this suggested system: hardware and software. The hardware unit, which consists of mechanical components, includes systems for instrumentation and watering with irrigation. A microprocessor, flow metre, humidity sensor, LCD, and a GSM module form the basis of the equipment system. The C++ code that makes up the programme allows for the incorporation of interdependent modules. In this setup, the microcontroller acts as the central nervous system, coordinating the operation of all the other modules; it also runs the watering system, keeps everything in sync, and sends alerts to the user *via* GSM about the state of the field and irrigation area. Incorporating a timer-based device for automatic watering can greatly improve efficiency, and the project's implementation will greatly contribute to water savings of 40–60% compared

* **Corresponding author S. Suresh Kumar:** Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India; E-mail: sureshkumar.s@qiscet.edu.in

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to conventional watering methods like sprinklers. It will also improve the growth and discourage weeds by ensuring that water is only served to the areas that need it.

Keywords: Automated irrigation, Information technology, Irrigation system, Interdependent modules, Watering methods.

INTRODUCTION

Irrigation is a popular practice in many fields, including landscape management, watering crops and plants, rehydrating soil in water-scarce regions, and watering plants and crops artificially at certain intervals [1, 2]. Water remains one of the overused natural resources; it is essential for many human activities, including irrigation, which has long been associated with human hands and requires a lot of energy and materials to execute manually. There is a pressing need to replace labour-intensive manual irrigation methods with more modern automated ones to keep up with the rapid pace of technological advancement in the engineering and technology sectors [3, 4]. As the global population is projected to reach about 8,503 million in 2031, there is an urgent need for innovative approaches to food production to meet the ever-increasing need for food. To ensure efficiency, quality, and speed, it is suggested that the world must be synchronised to digital design [5, 6]. The theory was backed by research into the Internet of Things (IoT), and a project was developed that utilises IoT to control household appliances. Another area that was impacted by the new technological trends was queue management. A design was put forward to assist with hospital queue management, which would improve efficiency and ease of service [7, 8]. Another area that was impacted by these trends was image processing, and the use of ultrasonic sensors to eliminate the harmful effects of copper wire was a confirmation of their importance [9, 10]. Pressure, heat, motion, and other environmental inputs may be detected with the use of sensors, which further simplifies processes. Since software-based security and monitoring systems, such as robots, have achieved remarkable success, the new technology must be integrated into the whole endeavour [11, 12].

Even though Africa has a wide variety of climates, most of the continent's land needs a substantial quantity of water for agriculture during the dry season because of the low annual rainfall [13]. Since agricultural and livestock production constitute the backbone of the Nigerian economy, the country's lack of technological know-how prevents it from making full use of its vast geographical area, which is problematic given that certain parts of the country get very little rainfall annually [14]. One of the several causes is the absence of a dam or other land-water reservoir system, and another is the low rainfall. Therefore, to make

the most of them, it is necessary to update the existing approach, rebuild additional reservoirs, and restore certain areas using new technologies [15]. The goal of this project was to streamline the irrigation process and cut down on water waste by replacing the current manual system with an automated one that keeps users informed about what's happening on the farm. This will act as a bridge between manual and automated irrigation methods; it has many potential applications outside of agriculture, including in institutional and educational settings, businesses, and residential landscape watering systems. A soil moisture sensor measures the amount of water in the soil, which the microcontroller uses to water the plants and notify the owner when it's time. This project aims to cut down on water waste, minimise human intervention during irrigation, and keep the owner apprised of farm status. Following a discussion of the design's technique and materials, this part included the analysis of soil moisture sensors and simulated outcomes. The conclusion then outlined the section's primary goals and aims for future development.

METHODOLOGY AND RESEARCH TOOLS

This study used an applied research approach to seek solutions to problems with the farm's manually irrigated water system by making use of already-existing tools and methods. The problem with manual irrigation systems is the subject of this study, which aims to apply quantitative research methods to solve it. A pump powers the watering unit; a SIM801 TTL GSM module powers the messaging system; a soil moisture metre powers the moisture detection unit; and a microcontroller unit coordinates the control unit. Because it offers a Quad-band GSM/GPRS module that runs at 851/901/1801/1901MHz, the SIM801 module is favoured. It can send and receive data, voice, and text messages with little power usage. Not only that, it's small and simple to use; all that's needed is a GSM modem to hook it in. The control unit can regulate the watering process based on the conditions or output response received from the moisture sensor. Fig. (**1**) displays the comprehensive diagram of the system's block.

CHAPTER 9

Touchless Hand Sanitizer Dispenser with Integrated Temperature and Heart Rate Monitoring

D. Ananda Babu[1,*], S. R. Srikanth Nandanavanam[1], S. Saranya[2], K. Naveen[3], Y. Kalyana Krishna[2] and **B. Venkateswarlu[4]**

[1] *Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[3] *Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[4] *Department of Science & Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: This project aims to create a low-cost, automated hand dispenser. These dispensers employ infrared sensors to identify a hand without touching it. The microcontroller receives proximity signals from this system's infrared sensor. An LCD panel displays heart rate and temperatures collected from this project. This expertise helps detect viral symptoms early, especially COVID-19-related ones, allowing for rapid care.

Keywords: Arduino, Infrared sensor, Heart rate sensor, LCD display, Temperature sensor.

INTRODUCTION

Global worries arose after a wave of pneumonia cases in 2019. These localized cases were eventually identified as SARS-CoV, a new coronavirus epidemic. Wuhan, China, reported the first incidence on December 31, 2019. This started an unparalleled cascade of events that will change the world's socioeconomic and healthcare landscapes [1, 2].

[*] **Corresponding author D. Ananda Babu:** Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India; E-mail: nandababu.d@qiscet.edu.in

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On March 11, 2020, the WHO labelled the virus a pandemic due to its fast worldwide expansion. Since it causes respiratory ailments, understanding the virus's cycle of transmission was vital. SARS-CoV-2 exposure caused mild, moderate to severe symptoms in most people, who recovered without medical treatment. However, the elderly and those with cancer, diabetes, persistent lung conditions, or heart conditions were at increased risk of serious consequences [3, 4].

The variety of COVID-19 symptoms showed its varied consequences. While some experienced minor cold-like symptoms, severe respiratory distress caused hospitalization and death. The illness severity difference highlighted the necessity for individual and community efforts to halt its spread and safeguard vulnerable populations [5, 6].

The global pandemic trajectory showed health systems' resilience and response. Patient expansion, equipment shortages, and rapid treatment technique innovation plagued hospitals and healthcare workers. Priorities included hospital infrastructure, supplies, and rapid vaccination and therapy development. The pandemic impacts society and business. Travel restrictions, lockdowns, and social isolation affected global supply chains, lost jobs, and harmed many enterprises [7, 8]. Remote learning improved education but raised mental health issues due to isolation and unpredictability. Scientists worldwide worked together to advance vaccine development and testing despite these challenges. Despite worldwide access issues, vaccine development and dissemination were great successes.

Strategies arose to balance confinement with society's progressive reopening as governments struggled with public health, financial stability, and social well-being. Vaccination programmers, monitoring, and adaptive responses were prioritised to navigate this virus and its variations. The COVID-19 pandemic emphasised worldwide collaboration and health crisis preparation. This event highlighted the necessity for strong healthcare systems, good communication, and proactive actions to reduce global infectious disease impact. The globe is still recovering from this momentous event, rebuilding resilient systems, resolving healthcare inequities, and strengthening pandemic preparedness methods [9, 10]. Once immunization is available, use these guidelines to avoid COVID-19 [11, 12]: Stay at least a meter away from sick people, wear masks when you can't leave or in areas with poor ventilation, choose open, well-ventilated areas, and wash your hands often.

Several health organisations, notably the World Health Organisation, strongly advise handwashing since it is an essential component of infection control procedures. Currently, it is thought that maintaining good hand cleanliness is

essential to avoiding infections [13, 14]. The global spread of the coronavirus has been facilitated by the extensive usage of hand sanitizers [15]. Due to frequent touch, traditional hand sanitizer pumps may make transmission more likely. We provide a fresh idea for a hands-free sanitizer dispenser in this composition that dispenses sanitizer automatically when it detects a contaminated contact area. The technology has an infrared (IR) detector to recognise hands nearby. For easy access, the dispenser is wall-mounted at a comfortable height.

CURRENT SANITIZER DISPENSING METHODS AND THEIR LIMITATIONS

Conventional hand sanitizers often necessitate physical contact with the bottle's dispenser, potentially increasing the risk of viral transmission due to frequent handling. The automated hand sanitizer dispenser proposed in this study plays a pivotal role in mitigating viral spread by eliminating the need for individuals to manually operate the dispenser. Its hand-detection and sanitizer-spraying functions act as a barrier against bacterial and viral infections.

INNOVATIVE DESIGN AND IMPLEMENTATION OF THE SANITIZER DISPENSER

The central component of the suggested solution is a plastic cabinet with a disinfectant dispenser inside. An infrared proximity sensor is built into this device to detect hands beneath it. The cabinet was redesigned with the sanitizer dispensing function smoothly integrated, while it was originally intended for a water RO system. On the upper front section, the sanitizer storage compartment is positioned strategically, and the filters and water dispensing faucet have been removed. Attached to the underside of the cabinet was a mist nozzle that allowed liquid sanitizer to be distributed precisely. The use of a solenoid valve improves nozzle operating precision even more. The utilisation of pipes and adapters made the construction process easier.

Key Components Utilized

Arduino Uno Microcontroller

The core processor of the system is the Arduino Uno microcontroller (Fig. **1**). It can take in different inputs, such as light readings from a sensor or events that are prompted by the user, and translate them into outputs that correlate to those inputs, like turning on a motor or lighting an LED. Messages can be used to send commands to the board by utilising the Arduino IDE's Wiring-based programming language and Arduino software. The Arduino board is a very useful tool for rapid development because of its adaptability, especially when working

CHAPTER 10

Multi-frequency Antenna with AMC-Enhanced Coplanar Waveguide and Stepped Design

Y. Nandakishore[1,*], V. Jaikumar[1], P. Vasudeva[2], A. Bullibabu[3], M. Selvam[2] and **B. Ramesh[4]**

[1] *Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[3] *Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[4] *Department of Science & Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: The study introduces a compact, multiband antenna featuring a stepped V-shaped design integrated through an Artificial Magnetic Conductor (AMC). Constructed on a 25 mm × 25 mm FR4 substrate, the antenna supports multiple frequency bands, operating effectively between 3.4–5.86 GHz, 10.28–11.86 GHz & 13.69–14.28 GHz, with resonant points at 4.6, 11, and 13.9 GHz. Comprehensive analysis highlights favorable return loss, radiation patterns, and gain characteristics. Notable features of this design include simplicity, reliable multi-band operation, enhanced gain, and suitability for cost-effective wireless communication solutions.

Keywords: Artificial magnetic conductor, FR4, Multiband designed antenna, V-shaped design, Wireless communication.

INTRODUCTION

The rapid growth of multifunctional and integrated wireless networks has led to a rise in the requirement for multiband antennas, which can cover many frequency bands at once. Triple bands and dual bands, four locations, and penta bands are all possible [1 - 6]. Additionally, certain realistically applicable methods have been developed. Examples of methods which have been recognised in published article research on this issue include monopole arms, slots, engraved flaps, Defective

[*] **Corresponding author Y. Nandakishore:** Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India; E-mail: nandakishore.y@qiscet.edu.in

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Ground Structure (DGS), L-shaped slots, rectangular slot and parasitic characteristics. Slots, etching slits, monopole arms, and rectangular slots are more examples.

Multiband antenna demand has increased as a result of the quick development of integrated wireless communication systems intended for a wide range of complex applications. These antennas demonstrate the capacity to function flawlessly in a variety of frequency bands at the same time [7, 8]. The use of quadruple frequency coverage, dual bands, triple bands, and even pentaband is made possible by these increased capabilities. Researchers have investigated several useful strategies, such as slot integration, monopole arm use, Defected Ground Structures (DGS), engraved flaps, L-shaped slot adoption, parasitic element incorporation, and implementation of rectangular slots. In the corpus of current research, these methods have been thoroughly investigated and documented [9, 10].

Frequency-based representations of everything, and Permeability and complicated permittivity make anything possible. These properties will depict the material behaviour in an electromagnetic setup. LH materials and Left-handed materials are a category of metamaterials that exhibit negative permittivity as well as negative permeability. LH materials are another term for left-handed materials. Some scientists have changed the characteristics of minor (LH) materials in the field of electromagnetics (EM) to catch the desired EM characteristics necessary for a range of requests [11, 12]. There are interesting electromagnetic (EM) properties in these MTM that are no doubt absent in character. MTM drives the structural design, including individual or able to take care of themselves containers and provides supplementary elasticity for the occurrence of diversified EM occurrences. This can be gifted by contribution various benefits.

Some chemists have transformed the traits of minor (LH) materials engaged in electromagnetics (EM) to catch the required EM traits essential for a range of requests [13]. There are entertaining electromagnetic (EM) properties in these metamaterials (MTM) that are no doubt missing from typical materials. MTM drives the fundamental design, containing individual or capable of protecting oneself boxes, and specifies additional stretchiness for the occurrence of various EM occurrences. This may be talented by offering miscellaneous benefits [14, 15].

Considering the notable advancements in this field, existing research in the academic literature frequently exhibits intricated structural arrangements, irregular radiation structures, and a constrained use of functional bands. This suggests that

the design and implementation of multiband antennas with improved functions still have an enormous amount of uncharted territory for investigation and improvement. These antennas' intrinsic complexity calls for a persistent and sophisticated approach to development and research, stretching the limits of what is practical in the field of interconnected wireless communication networks.

ANTENNA DESIGN

The arrangement consists of 2 different ingredients: a wire and an AMC. The design process is divided into portions defined beneath, contribution an inclusive reasoning of every constituent. Both the patch materials and the FR4 substrate utilise polymer, making the inclusion of a substrate unnecessary.

The Main Antenna Model and its Study

A handy visual reference is provided by the design arrangement, as shown in Fig. (**1**). The patch has a centre triangle cutout and measures 19 mm by 9.5 mm. It gets input *via* a microstrip line that is 8.8 mm wide and 3 mm thick, as well as a coplanar waveguide. The whole length of the item is 25 mm on each side. A FR4 substrate with a dielectric constant of 4.4 is required for this arrangement. The substrate itself has a tangent value of 0.02 and is 1.6 mm thick. A feed to ground, commonly referred to as SFG, of 0.4 mm is necessary to enable the coplanar waveguide feed, and the ground plane might be near all other antenna elements.

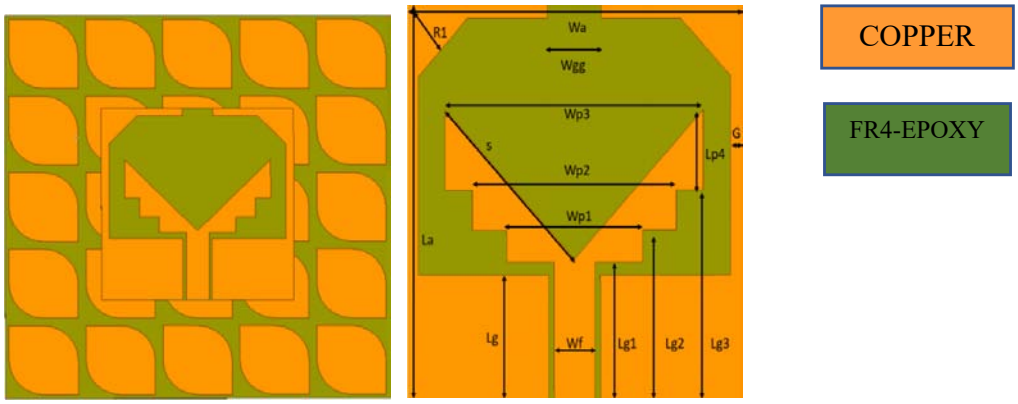

Fig. (1). Antenna design with and without artificial magnetic conductor (AMC).

In designing an antenna, a coplanar microwave feed is an essential component. When designing the wave port for effective wave propagation on the antenna construction, special consideration is given to the port's height and length. This guarantees the intended antenna system operates and performs at its best.

CHAPTER 11

Image Hiding in Videos: A New Approach to Steganography Using Pixel-Based Algorithm

L. Bharathi[1,*], K. Sreenath[1], N. Yaswanth[1], Silpa Ch[1], C. Karthick[1], U. Hari Babu[1] and **K. Navaz[2]**

[1] *Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: Wireless technology has grown quickly in recent years, and vast amounts of information have been transmitted *via* numerous communication routes. However, a select few apps, including those used in the military, healthcare, multimedia, web, and civil applications, among others, must offer information-transmitting security. Therefore, secure transmission is a very difficult task. Here, utilizing video steganography and pixel mapping, we present a novel secure text picture transmission strategy. Pixel mapping is a relatively straightforward technique. After the video is scattered over the picture frames on the suggested page using a Matlab programme, the hidden message will remain in the video sequence. Once every frame has been saved sequentially. The original encrypted video file is created by first preserving all of the text in the photographs, then arranging the images sequentially, and then cascading all of the frames.

Keywords: Image Hiding, Image Processing, MATLAB, Pixel, Steganography.

INTRODUCTION

The exchange of digital material, such as digital photographs and films, has exploded in recent years. Various applications will be used to share digital information, and each one must securely communicate the information without alerting any uninvited parties or people [1, 2]. Social media sites like WeChat, WhatsApp, and Facebook, as well as wireless public channels and multimedia networks. Securing an image is difficult for applications like storage and transmission [3, 4]. For the sake of homeland security, digital video surveillance

[*] **Corresponding author L. Bharathi:** Department of Information Technology, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India;
E-mail: bharathioptical@gmail.com

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systems will be used to keep an eye on several strategically important locations, including business and financial districts, as well as public transit [5, 6].

Numerous secure photographs and films are created, sent, or restored every day. These files are not known to unauthorized parties. Many applications, including those in the healthcare, defence, building, apparel, and automotive sectors, call for the protection against espionage of scanned data, blueprints, and designs [7, 8]. Additionally, the majority of doctors from various branches of health service organizations' medical photographs could include more sensitive private information. Therefore, it is crucial to offer protection for these kinds of photos and videos [9, 10]. The challenge of creating and implementing strategies to extend the lifespan of digital photos or films is crucial, pressing, and difficult because it safeguards the original data's content for many years [11, 12]. Encryption, which changes the image or video into a different format, is an efficient method [13, 14] of protecting an image or video.

Simply said, “stenography refers to concealing one piece of information within another.” The capacity to encrypt data inside electronic multimedia files and network packets is a key component of modern steganography [15]. To encrypt data in a medium, you need the following components. Any kind of data, including simple text and cipher text, may be included in the Cover media (C) that contains the secret Message (M). In the inverse of these functions (Fe-1), the message can be hidden and shown with the use of an optional stego-Key (K) or password.

The practice of disguising information by enclosing covert messages in other communications is known as steganography. Anything can be used as the medium for inserting information. This substance is known as the cover item. Digital steganography in the image archive, steganography algorithms have undergone extensive development. Currently, there aren't many steganography algorithms in audio archives. Many algorithms have been created in recent years to offer greater security, improved quality, simple implementation, and quicker calculations. Each method has its own limitations, such as computing complexity, time requirements, and the need to reconstruct sensitive information *etc*. This concept uses pixel mapping-based video steganography, which is fairly straightforward to calculate and offers additional security.

AUDIO CRYPTOGRAPHY

The art of encoding and decoding audio signals is known as audio cryptography. A little change is made to the byte sequence in a sound file to insert the concealed message. You may encrypt conversations using standard audio tools and save them as WAV, AU, or even MP3 files. It is sometimes more difficult to

incorporate a hidden message in digital sound than in other media, such as digital graphics. The signal is altered as data is incorporated into it. It should be possible to make this alteration unnoticeable to the human ear. Although an image can also be used as a medium, audio cryptography is more difficult due to the HAS's features of high power, wide dynamic range, and broad audible frequency range.

Length-Sensitive Bit (LSB) Coding

- The Least Significant Bit modification coding technique is one of the early strategies researched in the information concealing of digital audio (as well as other media types). This method replaces the low-order bit (LSB) of each sample's binary sequence in a digital audio file with the binary equivalent of a secret message. An easy and quick technique for including data in an audio source is LSB hiding. Each message-related bit is specifically embedded in the least important part of the cover audio. LSB concealing schemes are simple to construct and can be used with other hiding strategies. They offer a very high channel capacity for conveying a variety of data types.

The number of samples in a sound file should be less than the length of the secret message to be encoded. The HAS, which is incapable of hearing the minor variation in audio frequencies at the high frequency side of the auditory spectrum, is exploited by the LSB approach. High embedding rates are possible with the LSB approach without sacrificing audio file quality.

- It is also simple to put into practice and reasonably effective.
- Large text cannot be integrated into audio because the length of the secret message to be encrypted is limited, and binary secret message decryption is significantly more difficult in contrast to image stenography.

PROPOSED METHOD

The art of steganography involves disguising information by enclosing messages inside of one another. It functions by substituting the information content that will be conveyed for the incredibly pointless bits. It functions by concealing data under a cover. Depending on the user's preferences, the cover could be a video file or an image file. Even though the cover appears quite plain and unchanging, it contains information. The streamlined steganography procedure is utilized. Then, that particular frame is restored with that set of pixels. This procedure is carried out through the informational material. The video is created from the frames after they have been placed in a sequential order.

Now, the information that is transmitted along with the video file is included in this movie. The suggested method consists of both embedding and extraction

CHAPTER 12

A Study on Analyzing the Impact of the Internet on Managing Organizations- Special Reference to the Education Sector

Sk. Shamshad Ahamed[1,*], Raihana Parveen R.[2], Galeeb Shaik[1], T. Bindu[1], Ramesh Babu[1], P. Giriasree[1], D. Hanuma Reddy[1] and **Vijayan Sugumaran[1]**

[1] *Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: The Internet ushered in the information revolution and facilitated the exchange of information among people all over the world. It is a remarkable innovation in human history that has become available to many people worldwide at very little cost. It has become a major tool for entertainment, conversations, and knowledge sharing. Educational institutions have embraced the Internet to promote and share knowledge. Teachers have created online tutorials, tests, and reading materials for students to improve their knowledge and skills. Textbook writers have begun adding web exercises; web seminars have gained prominence. Given these developments, the role of the Internet in education has become significant. All powerful tools are subject to some misuse. Much like how the use of educational television was questioned, students' use of the Internet was questioned. A spate of articles came into the media discussing the uses and misuse of the internet. The present study seeks to inquire about how university-level students use the Internet.

Keywords: Education, Internet, Management, Organizations, Productivity.

INTRODUCTION

The Internet has registered a speedier growth pattern. By 2005, the number of users reached the one billion mark, and the second billion in 2010 [1, 2]. The third billion mark is expected to be reached much faster by 2014 or before. Globally, internet user growth can be observed in Table **1**. Internet penetration has increased from 6.8 percent in 2000 to 28.4 percent by 2010. Internet penetration refers to the share of the population comprising Internet users [3, 4].

* **Corresponding author Sk. Shamshad Ahamed:** Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India; E-mail: skshamshad@qiscet.edu.in

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Table 1. Growth of Internet use in the world.

Year	Population	Internet users	Penetration (%)
2022	6,930,725,043	1,996,514,816	28.4%
2021	6,876,479,521	1,786,403,814	25.8%
2020	6,793,732,879	1,775,067,520	23.3%
2019	6,691,607,320	1,473,226,988	20.6%
2018	6,660,220,247	1,262,916,818	17.6%
2017	6,619,635,850	1,130,101,289	15.8%
2016	6,539,842,408	1,110,101,289	14.2%

Asia Tops

Table **2** illustrates the way consumers across various regions of the world used the internet in 2022. Out of the world's Internet users, Asia has more, and they constitute 42 percent of the users worldwide [5, 6]. The next region is Europe, with 24.2 percent. North America followed with 13.5 percent, and Latin America with 10.4 percent of users [7, 8].

Table 2. Usage of internet in various regions – 2022.

Global Regions	Internet Users June 30, 2022	Internet Users %
Africa	110,931,700	5.6%
Asia	1,825,094,396	42.0%
Europe	675,069,448	24.2%
Middle East	68,240,946	3.2%
North America	566,224,500	13.5%
Latin America/Caribbean	204,689,836	10.4%
Oceania / Australia	21,263,990	1.1%
World Total	1,966,514,816	100.0%

China tops, and India is in fourth place.

Table **3** shows the internet users in descending order by size in different countries in 2022. China is the top nation in terms of population and Internet users. The next one is the United States in terms of internet users [9, 10]. India is the fourth largest country, following Japan. Internet penetration shows different results. The United Kingdom has the highest internet penetration at 82.5 per cent.

Table 3. Top 20 Internet users in the world.

Sl. No.	Country	Users of internet (mn)	Population (mn)	Penetration (%)
1	China	420.0	1330.1	31.6
2	United States	234.4	307.2	76.3
3	Japan	99.1	126.8	78.2
4	India	81.0	1173.1	0.7
5	Brazil	72.0	198.7	36.2
6	Germany	65.1	82.3	79.1
7	Russia	59.7	139.4	42.8
8	United Kingdom	51.4	62.3	82.5
9	France	44.6	64.8	67.9
10	Nigeria	44.0	152.2	28.9
11	South Korea	39.4	48.6	81.1
12	Turkey	35.0	77.8	44.9
13	Iran	33.2	76.9	43.2
14	Italy	30.0	58.1	51.6
15	Indonesia	30.0	243.0	12.3
16	Philippines	29.7	99.9	29.8
17	Spain	29.1	45.6	63.8
18	Canada	27.6	111.2	24.8
19	Mexico	25.1	33.5	74.9
20	Vietnam	24.3	89.6	27.1

Source: Top 15 Countries in Internet Usage, 2010 – Infoplease, www.infoplease.com › ... › Internet Statistics and Resources.

The global data presented above lays the groundwork for understanding the widespread influence of the Internet. To analyse its impact more specifically, the following sections will explore how Internet usage intersects with the management of higher education institutions of India, focusing on organizational structures, administrative practices, and educational access [11, 12].

Internet Speed-korea Leads

According to Akamai's eleventh quarterly State of the Internet report (Table **4**), South Korea leads all other countries with its fastest internet connection speeds of

CHAPTER 13

Artificial Intelligence Driven Detection and Classification of Brain Tumors: Advancement and Challenges

Eedupalli Sai Kumar[1,*], D. BujjiBabu[1], S. Jafar Ali Ibrhaim[2], David Asirvatham[4], N.S. Kalyan Chakravarthy[3], Ch. Mastan Chowdary[1], M. Suresh[1] and **Thella Sunitha[1]**

[1] *Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *Department of IoT, School of Computer Science and Engineering, Vellore Institute of Technology, Vellore, Tamil Nadu, India*

[3] *Faculty of Innovation and Technology, Taylors University, Selangor, Malaysia*

[4] *Department of Data Science and Artificial Intelligence & Machine Learning, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: Artificial Intelligence (AI) has great potential as a method for advancing health innovation. Artificial intelligence in picture identification greatly increases findings beyond human perception. Medical image analysis using Artificial Intelligence (AI) aids automated diagnosis. AI is making diagnostic radiology more scientific and less subjective. Recognition of things in medical photos is a significant AI technology in medicine. Early brain tumour identification has improved using CNNs and deep learning systems. Unfortunately, these algorithms need a big-picture library for training. Time, computer resources, and expensive equipment are needed for this step. This research describes a standard automatic segmentation method for early brain cancer diagnosis using MRI data. The Harmony Search Algorithm (HSO) was modified to segment MRI brains using a multilayer thresholding approach, and parameter selection was optimised. Variance and entropy thresholds divide the histogram into several parts with distinct colours. Segmentation is followed by morphological procedures and linked component analysis to remove noise and find brain tumours. Precision, Dice Coefficient, and Jaccard's index measure brain tumour detection ability. Professionals in the field compare the findings to those obtained manually. The BraTS challenge used the Brain Images dataset to compare the results against several CNN and DLA methods. To compare performance, they utilized the average Dice Index. In comparison to CNN and DLA approaches, the suggested strategy produced results that were comparable in their accuracy while also being much superior in terms of computing complexity, data management, and execution time.

[*] **Corresponding author Eedupalli Sai Kumar:** Department of Computer Science and Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India;
E-mail: saikumar.e@qiscet.edu.in

Satya Prakash Yadav, D. Arul Pon Daniel & G.N.R. Prasad (Eds.)

Keywords: AI, CNN, DLA, Dice Index, Harmony search algorithm, MRI brains.

INTRODUCTION

Artificial Intelligence (AI) is a very promising new approach to healthcare [1, 2]. Using AI for image recognition greatly broadens the scope of study beyond what is possible with the naked eye. Since medical imaging relies on picture interpretation, using AI in this field may improve automatic diagnosis [3, 4]. The use of AI is elevating diagnostic radiology to a more objective field. Automatic object recognition and segmentation in medical pictures is a crucial use of AI in medicine [5, 6]. Image processing, pattern identification, and computer vision all rely on the basic and difficult process of picture segmentation. It has a wide variety of uses, including ship target segmentation and medical picture processing. Splitting a picture into similar categories is segmentation. When it comes to grayscale, features, colour, intensity, and texture, every element in every class is the same. Techniques based on clustering, region, graph, and thresholding are the four main categories into which the four most popular methods of image segmentation fall [7, 8].

High-quality segmentation is crucial to the performance of an image analysis system. Early detection of brain tumours is essential for effective treatment. It is crucial to use segmentation while looking at brain pictures. Magnetic Resonance Images (MRIs) are the primary focus of medical image research due to their central role in diagnostic imaging and their ability to identify abnormal changes in illnesses and organs at an early stage. Brain MR images are piecewise constant when the number of classes is small [9, 10]. Brain MRI works with a variety of segmentation techniques, including manual segmentation, area growth, clustering, and thresholding [11, 12]. The intensity-based approach is used by several segmentation methods. They sort the image's pixels into categories based on their intensity levels [13, 14]. Thresholding is a well-established and widely used approach for image segmentation. Intensity histograms are used to calculate the intensity threshold values [15]. Thresholding is fast and cheap, but image noise may damage it. Region growth separates linked picture regions from pixels with similar brightness. The categorization method divides visual space for features into homogeneous pieces using labelled data.

Clustering is an autonomous segmentation method that does not need supervision or training pictures. Distributed across the picture are groups of pixels that share similar texture and/or brightness. To cluster input data into k groups using Euclidean distance, the k-means clustering algorithm calculates the average intensity for each class. MRI pictures are now being segmented using hybrid approaches and algorithms that are based on fuzzy logic. Using the image's

histogram to identify peaks and valleys is a new way to segment photos, although level set methods—which divide pictures based on specified stages—are more effective when dealing with complicated scenes. A multi-local statistic segment approach that uses a weighted edge-based level for splitting noisy pictures is provided by LSM, and there are numerous methods to establish the levels. The authors provide a novel level set method that integrates 2D histogram data with edge and area information to efficiently isolate image objects.

The segmentation approach developed is a thresholding technique that has been very effective in the fields of medical imaging and nanomedicine imaging. In the realm of threshold processes, there are two distinct varieties: local and global. Geographical techniques, methods based on histogram shapes, methods based on entropy, and approaches based on object attributes are all examples of global groups. These methods include multi-level and bi-level thresholding. Multilevel thresholds may divide pixels into classes based on the intensity histogram's local or global structure when segmenting complex pictures. Multilevel splits the picture into numerous classes using the local or global light histogram, while bi-level uses two. The optimal settings for multilevel thresholding segments have been the subject of several investigations that have used objective function optimisation methods. An innovative multi-threshold approach called the Slime Mould Algorithm has just been suggested for picture segmentation. A system for effective tumour categorization using Magnetic Resonance Imaging (MRI) scans of the brain is suggested. Improving the visual quality of the picture is the first of three phases that form its basis. Second, tumour sites are determined *via* clustering. The third is feature extraction. A new deep-learning method extracts picture information as vectors using two pre-trained models. Combining the vectors using Partial Least Squares (PLS) creates a hybrid feature route. Agglomerative clustering reveals the highest tumour spots. These procedures are accurate yet time-consuming. Recently announced Unet algorithm upgrade. Brain segmentation averages 85% Dice index. Multilevel thresholds for brain segmentation produce precise and promising results using medical brain pictures and a real-coded biological procedure. Many OTSU thresholds and cross-correlation were utilized to identify brain tumours, and a multilayer electromagnetic thresholding approach was developed to correctly sector brain MRI data for grey and white matter detection. A new method for identifying tumours in Magnetic Resonance Imaging (MRI) scans has been devised, which makes use of cross-correlation of primary components and modified multi-level Otsu Thresholding.

Patch-Levy Bees and Harmony Search brain tumour MRI multilayer thresholding. Hybrid multilayer thresholding and morphology may segment retinal blood vessels. The Otsu method, multilayer thresholding, particle swarm optimisation,

CHAPTER 14

Detecting Pickpocket Defendants from Large-Scale Transit Records

D.S. Srinivas[1,*], D. Navya Kala Ranjani[1], Shaik Rahamathunnisa[1], S. Bhuvan Sai[1] and **B. Sai Nikhil[1]**

[1] *Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India*

Abstract: The city's sensors collect large amounts of spatial-temporal data that shed light on the daily routines. To help with identifying suspects, data analysts may examine and categorize the trajectories of specific targets, considering that each person's lifestyle is represented by their movement data. In practical applications, however, it still faces several obstacles; for example, trajectories are too varied, and transit behaviour traits are difficult to specify due to their breadth and expense. In addition, data-sensitive elements could lead to erroneous results if people's lifestyle patterns vary throughout the city. The unique traits of movement behaviours concerning trajectory aspects are discussed in this. The following text should be remembered: "Suggest a neural network-based model and a Trajectory Pattern Model (TPM) to enhance identification and performance. Instead of relying solely on location and timestamps to characterize user behaviour, the Trajectory Pattern Model (TPM) offers a new perspective by creating more useful and universal characteristics." The goal of the model that is built on end-to-end neural networks is not to use human traits. The behaviour of a specific target may be better understood with the use of statistical analysis and intelligent explanations. Extensive examination has shown that the recommended solutions are more successful than peer options.

Keywords: Analysis and intelligence, Data-sensitive element, Human traits, Neural network, TPM.

INTRODUCTION

A person is considered to be a crime suspect if there is reasonable suspicion that they have committed a criminal offence and pose a danger to the community's safety [1, 2]. The Public Security Department has the difficult duty of suspect identification [3, 4]. The ability to analyse movement records for insights into

* **Corresponding author D.S. Srinivas:** Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India; E-mail: alietadmn@gmail.com

Satya Prakash Yadav, D. Arul Pon Daniel & G.N.R. Prasad (Eds.)

inhabitants' mobility habits is becoming more useful as sensor technology and data processing skills advance at a fast pace. For instance, in some places, authorities are increasingly using Google Maps to search for cell phone data to identify potential criminals. Using enormous datasets from Beijing's Automated Fare Collection (AFC) system, researchers could distinguish between frequent riders and thieves [5, 6]. Classifying individuals according to trip attributes, such as preferred travel options and mode of transportation, is the subject of another research [7, 8]. Delving into these patterns of mobility illustrates the ways of life of different resident groups but also uncovers the underlying structures that govern these trajectories [9, 10]. The complexity of the raw sensor data and the fact that most suspects are not required to discern traits before their arrest make it difficult to find a solution to the issue, even though there are numerous spatial-temporal-based ways to detect anomaly behaviours [11, 12]. To give a few examples: (1) data collected from non-mobile phone terminals does not necessarily reveal an individual's activities; (2) data collected from people moving around the city can be utterly unpredictable in terms of their motion pattern; (3) even when accounting for variations in local transportation preferences, the lifestyles of people living in dissimilar parts of the city are not significantly similar [13, 14]. Consequently, it is not possible to use classifiers trained on data from one domain to accurately predict outcomes in another. (4) The number of people under suspicion is low, and no information regarding their whereabouts has been discovered as of yet.

Regardless of time or place, identifying suspects is a solution to the problems outlined above. Using machine learning techniques, the paper demonstrates the efficacy of the real-world dataset and provides three models for transit feature extraction [15]. In addition, an end-to-end education method called “MST-CNN” is created to systematize the documentation procedure completely. The analysis of suspect and regular resident features using visual-aided and statistical methodologies helps to comprehend the transit behaviours of suspects. The following are some of the most important contributions of this work:

- The identification issue using the city's extensive transportation data, and an attempt to demonstrate why the process is not easy in practice.
- The trajectory pattern model is used to display the actions of n people and determine which aspects are useful for detecting anomalies and making classifications.
- Utilise the cleaned data to train a full-stack deep learning model that can directly capture the problem at hand, and show that it beats competing approaches in recall and accuracy.

- The benefits and drawbacks of using a deep learning approach, as well as feature-based techniques. Additionally, examine the intriguing phenomenon of the two groups by visualising their paths.

DEFINITION OF PROBLEM

- Moving point definition 1: The formula for an affecting point is O =(P, M, T), where p is a latitude and longitude position, m is an exclusive MAC address, and t is a timestamp. A moving point also has a timestamp and an associated MAC address.
- Path definition 2: A route of specific individuals may be described as P = {O1, O2, On }, where □Oi (m) and Oi (t) < Oj(t) when i < j, given a collection of moving points O and a particular MAC a. A route might be lengthy and winding, including many journeys. However, the same sensor would collect MAC data so often that it would generate noise, throwing off our model. Thus, we need to divide the path into trajectories and keep track of the starting and ending points for each sensor.
- A path in a route with an obvious case, T is a subset. To create a trajectory, establish two criteria:
- The concept of trajectory:
  - $o_i(t) - o_i - i(t) < \tau$
  - The minimum distance, denoted as d, is greater than the distance (Oi(p) − Oi−1(p)), where i represents the time interval

Compression along a Trajectory

The quantity and quality of accessible transit data is expanding, as is the magnitude of recorded trajectories. reduce the length of linear paths while preserving the majority of the commonly used spatial-temporal semantics for some time after the compression process has ended. To shorten the trajectory, it may calculate the detachment of each intermediate vertex to the edge (Fig. **1**). The results of using the sliding window approach to recompense for sensor errors. The rule of thumb is that a trajectory record may only be created if there are less than 30 minutes between two moving places. After that, the trajectory is flattened with an ε value of 200 m.

FRAMEWORK FOR MST-CNN

Based on the promising results of embedding methods in other domains, apply DNN approaches to trajectory classification. Following the preprocessing of movement records using TCA and LCM approaches, it is necessary to implant trajectories in both the position and time dimensions. Then, user behaviours may

CHAPTER 15

Epileptic Seizures Prediction using Deep Learning Techniques

S. Kishore Babu[1,*], J. Guru Vardhan[1], Busupalli Madhu Sudhan Reddy[1], B. Rama Krishna[1] and **K. SaiTeja[1]**

[1] *Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India*

Abstract: Seizures brought on by irregularities in brain activity might pose significant risks to a patient's health. It is useful to know when epileptic seizures are going to happen so that medication can be taken at the right time. Neural network analysis and computational methods are used in epileptic seizure prediction using electroencephalogram (EEG) data. The two most important problems with preprocessing EEG signals for noise reduction and feature extraction are the expectation time and the true positive rate for prediction. This is why a model is provided with reliable methods for feature extraction and preprocessing. With a greater true positive rate, the model can anticipate epileptic episodes with enough lead time. To train a prediction model, they have used time and frequency domain information collected using Empirical Mode Decomposition (EMD) as preprocessing. The suggested method accurately identifies the beginning of the preictal state, a period just before a seizure begins, on the EEG CHB-MIT scalp data sets of 23 subjects with a true positive rate of 93.24%, a maximum expectation time of 34 minutes, and a normal time for prediction of 24.7 minutes. In contrast to traditional methods, this model performs better.

Keywords: Anticipation time, Deep learning, EMD, Epileptic seizures, EEG.

INTRODUCTION

Epilepsy is a disorder characterised by seizures that are triggered by a dysfunction in brain activity [1, 2]. Worldwide, around several million individuals suffer from epilepsy; nevertheless, only a few million have had a diagnosis of epilepsy. The third most prevalent condition affecting the brain is epilepsy [3, 4]. In the meantime, epilepsy may have several origins; one of them is a genetic mutation that causes neurons to migrate or behave abnormally. Early diagnosis may help

* **Corresponding author S. Kishore Babu:** Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India; E-mail: alietadmn@gmail.com

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treat epilepsy, even while the fundamental cause is still unclear [5, 6]. Medications and surgical treatments are available for the treatment of epilepsy. Nevertheless, there is room for improvement in these approaches. Seizures that are not fully curable by medicine severely restrict the patient's ability to lead an active life. Patients in these situations are unable to do some tasks on their own. People experience economic hardships and social isolation as a result of this [7, 8].

To prevent an epileptic episode, it is very beneficial to be able to identify when one will occur in advance so that medication may be administered [9, 10]. An epileptic seizure progresses through four separate phases: the preictal phase, which happens just before the seizure begins; the ictal phase, which begins at the beginning of the seizure and continues until an attack happens; the postictal stage, which follows the ictal phases; and the interictal phase, which ends at the starting of the preictal phases for subsequent seizures and follows the postictal phase for the first two [11, 12]. Fig. (**1**) displays the various input statuses of three separate channels. Furthermore, the onset of the preictal state may be used to forecast the occurrence of seizures [13, 14].

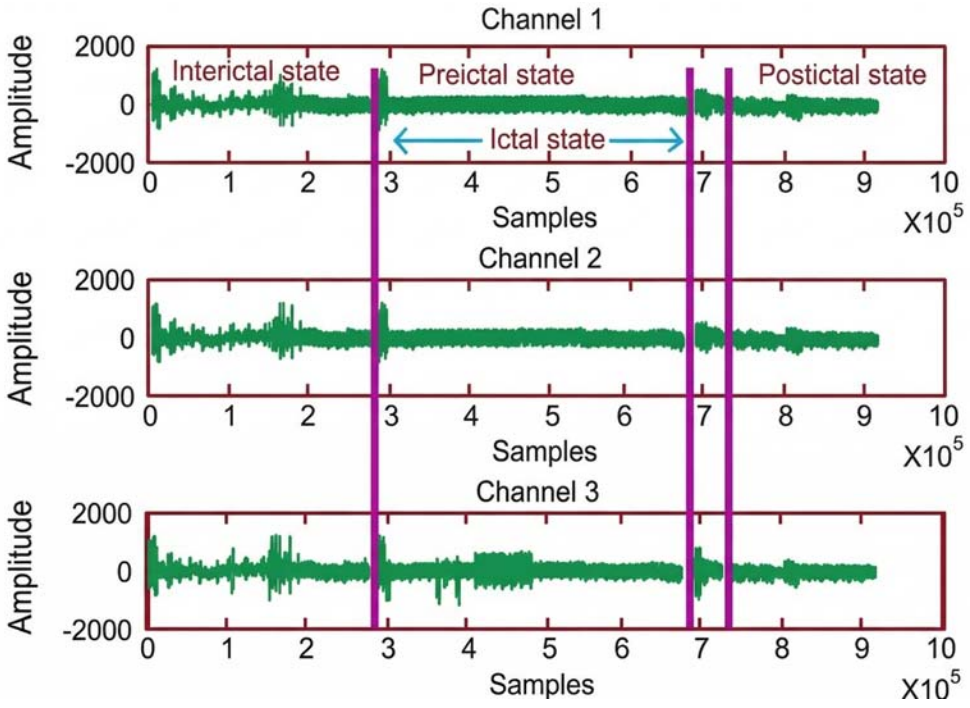

Fig. (1). Various input statuses of three separate channels.

Early detection of preictal conditions predicts seizures. This study aims to identify preictal conditions in epileptic convulsions. Machine learning methods predict epileptic seizures. EEG collection of data, extraction of features, preprocessing, and seizure state categorization are the steps in these machine learning models. The machine learning-based prediction algorithm aimed to identify preictal states before seizure onset. Predicting epileptic seizures requires sufficient time for the gland's preictal condition and maximal sensitivity, which remains a performance concern.

Preprocessing and feature extraction of EEG signals have a significant impact on prediction time and True Positive Rate (TPR). Two of the main aims of signal preprocessing are to decrease noise in the background and to increase the Signal-to-Noise Ratio (SNR). Multiple studies have investigated the possibility of improving the signal-to-noise ratio by combining multiple EEG channels into a single composite stream and then using mesh [15]. Averaging, Common Space Filtering (CSP), large Laplacian, and Optimised Spatial Patterns (OSP) filters may be used to convert multi-electrode EEGs into surrogate channel EEGs. Researchers have also spent a lot of time debating how to best use linear and nonlinear data to forecast epileptic seizures. Several characteristics distinguish preictal and interictal states, including statistical and spectral moments, zero crossings, auto-regressive values, complexity, relative power from various frequency bands of EEG data, and the Lyapunov exponent.

In conclusion, this study suggests a viable deep learning model for the prediction of epileptic seizures, since there is no definite approach for preprocessing and feature extraction.

This technique focuses on data preprocessing and extracting features from EEG signals. Numerous EEG channels were transformed into a surrogacy signal and used with Empirical Mode Decomposition (EMD) to improve the signal-to-noise ratio. They retrieved characteristics such as entropy, estimated entropy, Hjorth variables, spectrum instances, and statistical moments. Both statistical and spectrum aspects improve the sensitivity between interictal and preictal states. SVM is a classifier used to distinguish between preictal and interictal states.

Here is the remaining paper structure: In Section 2, we lay out the plan of action. In Section 3, we provide the results and comparisons from the experiments. Lastly, possible future directions for the study are addressed in Section 4.

SUGGESTED APPROACH

Seizure prediction is greatly enhanced by the preictal state, which begins within minutes before the onset of a seizure. Because of this, the onset of an epileptic

CHAPTER 16

Guarding the Gates: A Secure System for Cloud Data Sharing

M. Srilakshmi Vani[1,*], Kurakula Hima Bindu[1], B. Poojitha[1], Mohammad Shaheen[1] and **Kondepudi Sujitha[1]**

[1] *Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India*

Abstract: Guarding The Gates: A Secure System for Cloud Data Sharing" suggests a healthy foundation designed to guarantee the data in cloud surroundings. The system leverages progressive encryption methods, approach control methods, and real-time attention to transparency and secrecy. It aims to address key security challenges, including unlawful approaches, data breaches, and compliance with solitude managing, providing a reliable answer for businesses and things to share data in the cloud. To ensure optimal data safety by reducing risks, the study delves into the specifics of data protection tactics and methods utilised throughout the world. While cloud storage has several usages, it also exposes information to apps that might have security flaws that might compromise it. Similarly, data might be in danger when using virtualization for cloud computing and running a virtual operating system on a hypervisor without understanding the reliability of the guest OS or if it has a security flaw. Aspects of data security to data-in-transit as well as data-at-rest, are also discussed in this chapter. Platform as a service, Software as a service, and infrastructure as a service are the 3 pillars around which the research rests.

Keywords: Cloud Storage, Cloud calculation, Cloud data, Data safety, Platform as a facility.

INTRODUCTION

The usage of cloud technique is a nascent notion that has yet to attain widespread acceptance. Among the several suggested explanations, "a net solution for inexpensive, reliable, easy, and simple access to IT resources" stands out as straightforward [1, 2]. Instead of being application-oriented, cloud computing is more accurately described as service-oriented. In addition to lowering infrastructure costs and total cost of ownership, the service-oriented design of

[*] **Corresponding author M. Srilakshmi Vani:** Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India; E-mail: mugadasrivani@aliet.ac.in

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cloud computing gives users more control and better performance [3, 4]. Data privacy and security are key considerations when moving to the cloud. Data security, privacy, and data integrity stored in the cloud must be guaranteed by the service provider [5, 6]. Various service providers use mechanisms and numerous rules for this goal, which are conditional on the kind, amount, and type of data. When considering cloud computing, a crucial factor to ponder is whether to establish an internal cloud inside your organisation or use a third-party service. Information about national security, highly secret information about upcoming products, and other such sensitive data cannot always be safely maintained on a public cloud [7, 8]. Disclosure of such sensitive information on a public cloud can have disastrous results. Using the organization's internal cloud for data storage is highly suggested in such situations. Through the implementation of an on-premises data use policy [9, 10], this method may contribute to the protection of data [11, 12]. Unfortunately, not all organisations have the necessary expertise to adequately safeguard sensitive data; therefore, this does not provide complete privacy and security. The purpose of this research is to examine data security methods used to safeguard information stored in cloud computing environments throughout the globe [13, 14]. It looks at the risks that cloud data might face and the measures taken by different service providers to mitigate those risks [15]. This is the remaining structure of the paper. Cloud data safety risks are defined in Section 2. Section 3 takes a look at a few effective data security measures used globally. At last, the conclusion summarises the whole research.

POTENTIAL DANGERS AND SAFETY ISSUES WITH CLOUD COMPUTING

Cloud calculation and the data stored inside are not without their share of security issues and dangers. Public cloud storage, virtualization and multitenancy are the topics that pertain to cloud data security that this research will cover.

The Concept of Virtualization

Virtualization enables the use of the assets of the current operating system by creating a snapshot of the software that is running inside another operating system. Hypervisors are specialised functions that allow host operating systems to implement guest operating systems as virtual machines. An essential section of cloud computing, virtualization facilitates the transfer of cloud computing's fundamental principles. Nonetheless, there are concerns over virtualization's impact on cloud data security. Putting the hypervisor itself at risk is one potential danger. Hypervisors, if they are susceptible, may become prime targets. The whole system, and all of its data, are vulnerable to hypervisor compromise. Resource allocation and de-allocation are other potential pitfalls of virtualization.

Data related to virtual machine operations might potentially be exposed to the next virtual machine if memory is not emptied before reallocation to the next virtual machine. This could lead to negative outcomes. Improving the virtualization strategy may address the aforementioned problems. Careful utilisation of resources and correct authentication of data are prerequisites to de-allocating such resources.

Archiving on the Open Web

Data storage in a public cloud also raises security concerns when it comes to cloud computing. Centralised storage facilities, which clouds often use, might be enticing to cybercriminals. Data exposure might potentially happen even with a small breach in the storage resources of a public cloud. These resources represent the complex systems that consist of both software and hardware components. It is generally optional to use the private cloud of highly sensitive information, if possible, to reduce the risks associated with it.

Multiple Tenants

Another important concern with cloud computing is the possibility of shared access or multitenancy, which might compromise data. This poses a risk to more than just the person who is utilising the shared computing resources (CPU, storage, memory, etc.). Private information might inadvertently get into the wrong hands in such a situation. Because a single security hole in a multitenancy system might provide an attacker with access to all of the other users' data, these vulnerabilities are very dangerous. An intelligent authentication method that verifies users' identities before providing them access to data might potentially resolve these types of issues. Various authentication techniques are employed in cloud computing to prevent multitenancy issues.

PROTECTING INFORMATION IN THE CLOUD

Safety for information in the cloud encompasses more than just encryption. Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) each have distinct data security prerequisites. Information in Transit and Data at Rest are two frequent forms of cloud-based information that are susceptible to security breaches. Information in Transit refers to data that is in transit between the public internet and its storage setting, while Data at Rest refers to data that is stored in the cloud itself. The amount of privacy as well as the security of information is determined by the design of data protection procedures, systems, and processes. The primary concern is the disclosure of information in the aforementioned stages.

CHAPTER 17

Impact of Social Media Ads on Consumer Purchase Decisions among Youth

A.R. Reshma[1] and **R. Manju Shree**[1,*]

[1] *Department of Management Studies, Karpagam Academy of Higher Education, Coimbatore, Tamil Nadu, India*

Abstract: Social media strongly influences today's youth, especially their purchase decisions. This study examines how social media ads affect young people's purchases. This research examines how social media advertising affects young customers' buying patterns by evaluating the literature and conducting empirical analysis. The method involves asking a representative sample of young people about their social media advertising experiences and purchase patterns. The key findings show that social media ads influence young consumers' attitudes, likes, and purchasing behaviour. Ad content, platform involvement, and peer influence strongly affect consumer behaviour. Social media marketers targeting youth must understand these characteristics to succeed. Marketers might benefit from the study's results and suggestions for additional research on social media advertising's impact on young customers' purchase choices.

Keywords: Buying habits, Firm grasp, Peer influence, Purchasing decisions, Social media.

INTRODUCTION

Collaborating, sharing, and connecting with others on social media has become vital [1, 2]. Young folks who utilise social media see many product and service ads every day [3, 4]. Online advertising heavily influences people, particularly adolescents, to make purchases via visually appealing material [5, 6]. Because social media is used by all ages, internet advertising has changed consumer behaviour.

Statement of the Problem

Psychological aspects, the quality of the ad, demographics, money, and product expertise impact customer decisions [7, 8]. This research examines how ads affect young individuals' buying habits.

* **Corresponding author R. Manju Shree:** Department of Management Studies, Karpagam Academy of Higher Education, Coimbatore, Tamil Nadu, India; E-mail: manjushree.raman@kahedu.edu.in

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Objectives

1. To assess the buying choices of the youth influenced by social media advertisements.
2. To assess how social media ads influence young people and shape their perceptions [9].

Significance

Marketers and academics must understand how social media marketing affects the purchase choices of the youth. Businesses may improve their efforts by understanding this demographic's habits and interests. Further, this study influences digital age policy conversations on protecting consumers and digital advertising legislation [10, 11].

Scope of the Study

Participants in the research are young people living in the Thrissur district [12, 13].

Research Methodology

Youth in the Thrissur district were surveyed using a standardized questionnaire to get primary data. Secondary data were gathered from various sources such as libraries, articles, books, and websites. The sample size comprised 100 respondents selected through convenience sampling [14]. Data analysis was done through simple statistical tools, and the findings were presented through graphs, tables, and charts [15].

Limitations

1. Time constraints limited the depth of analysis in certain aspects of the study.
2. The size of the sample was 100 respondents, which partially represents the entire population.
3. The survey method may not capture the nuances of individual consumer behaviors comprehensively.

REVIEW OF LITERATURE

1. The research was conducted by Dr. S. Rabiyathul Basariya (2017) and D. Lakshmanan to determine the efficiency of advertising on social networking platforms. Message and content quality, company engagement, and integration with other marketing channels were shown to significantly affect social media. Additionally, a detailed and comprehensive assessment of the strategy is

necessary for accurate results.

2. Rama Krishna Mandan (2017) and Dr. Priya Grover studied the customer behaviour matrix of auto products and social media. Social media advertising for passenger cars in India is used to examine customer perceptions of social media and its influence on consumer decision-making.
3. Dr. Ashvin Solanki and Chintan H Rajani (2016) identified in their paper the major motivating issues among Indian users in social media use. The study comes to the conclusion that, initially, people use social media platforms for their own personal gain in order to evaluate and exchange feedback, then to fulfill their demands for socializing and amusement. One important component that has contributed to the mass adoption is content sharing. One of the side benefits that people look for when utilizing various social media platforms is networking and meeting new people.
4. Sadia Afzal *et al.* (2015) studied the impact of conventional and online advertising on consumers' branded clothes purchases. It explains that significant elements influencing consumer buying behavior include brand loyalty, enterprise, quality, substance of advertisements, and prior purchasing experience.
5. Iuliana Cetina, Simona Vinerean, Luigi Dumitrescu, and Mihai Tichindelean (2013) explored how to interact with various audience types in the study to optimize the impact of an online marketing approach. The research identifies several user kinds, segments these users, and applies a linear model to investigate the ways in which various social networking site-related factors positively influence respondents' perceptions of online ads.
6. The work of Bhagwat and Goutam (2013) argues that companies can't function without social media. They learned that people are connecting via social media platforms to exchange ideas, resources, and information. Their research indicates that among social media sites, Facebook has the largest user base. They have also provided statistics showing the success and growth of platforms based on social media for both people and companies.
7. In 2013, Vij and Sharma performed research that examined the social media use of Punjabi consumers and advertisers. According to the research, the most effective Social Media Management (SMM) campaigns include engaging, educational, interactive, and trustworthy content. As customers' preferences change, marketers need to adapt their social media tactics accordingly.
8. Yadav (2012) examined the role of social networks in advertising, examining popular strategies through case studies. He concluded that social media serves as a tool for linking with prospective consumers and communicating with various people.
9. Social media's effectiveness as an advertising medium and the level to which it affects consumers' purchase selections have been the subject of empirical

CHAPTER 18

DNA Cryptography with Ensemble Key Generation to Secure Cloud Computing

E. Vidhya[1,*]

[1] *Department of Computer Science, Padmavani College of Arts and Science for Women, Salem, Tamil Nadu, India*

Abstract: In cloud computing, information is becoming increasingly valuable; hence, it must be encrypted as soon as possible to prevent unauthorized individuals from gaining access to it. A fresh approach to key generation is presented here as a potential answer to the problem of client-side cloud computing. This solution comes in the form of a research study. This approach combines the processes of DNA encryption and decryption with the generation of ensemble keys. It was created from scratch just for the sake of this study. Following the initial DNA encryption, the method next develops an asymmetric key based on the principles of RSA and ElGamal. This step is followed by the last step of decrypting the data. At long last, the data have been deciphered. The approach that has been proposed can be applied to carry out an analysis of data linked to the traditional investigation. In this particular part of the study, in addition to focusing on key sensitivity and statistical analysis, we are going to be paying close attention to key space. The findings of the study led the researchers to the conclusion that the proposed method is robust enough to withstand an exhaustive attack and is appropriate for deployment in real-world scenarios. This conclusion was reached as a result of the research.

Keywords: DNA Cryptography, RSA Key Generation, Elgamal Key Generation, Complementary Base-Pair Method.

INTRODUCTION

Cloud computing eliminates the need to worry about the platform or implementation specifics by providing limitless virtual resources as internet-based services [1, 2]. Cloud computing allows clients to have storage and parallel computing resources at much reduced prices. Due to ubiquitous cloud computing, sensitive data is stored in the cloud. It does this by giving each user unique access permissions. Multiple users can exchange data. Data must be encrypted before

* **Corresponding author E. Vidhya:** Department of Computer Science, Padmavani College of Arts and Science for Women, Salem, Tamil Nadu, India; E-mail: bharathioptical@gmail.com

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cloud upload. This is because cloud storage and data owners' providers are not trusted domains. In 2018, Liu, Yang, Paladi, and Michalas published [3, 4]. The most crucial aspect of data security is encryption. The main goal of encryption algorithms is to safeguard privacy and safety. This work's asymmetric key technique is shown in Fig. (**1**). This uses client-side cloud encryption (Fig. **1**). Businesses can solve several cloud computing control issues by encrypting cloud data. Rouse published his 2014 study [5, 6]. So long as cloud storage firms keep their encryption keys, unauthorized users cannot access the protected data [7, 8]. Many cryptographic algorithms have been proposed, but they all use typical cryptographic processes. According to Mara *et al*. (2012) and Dodsley *et al*. (2017), DNA cryptography is a novel part of encryption due to computing DNA. The field of DNA cryptography is nascent (Sundaram *et al*., 2015). DNA cryptography protects data by combining DNA with cryptography, unlike traditional encryption. Data security is a growing concern due to rapid technological advances and large data quantities [9, 10]. Cryptography increasingly uses DNA cryptography. DNA cryptography-based data security techniques have been developed by many researchers. Each strategy has security flaws. It may also take too long to generate and retrieve secret keys using certain protocols [11, 12]. Time is another issue with data encryption and decryption. This section will discuss several implementations. Cellular Automata was used by Rama *et al*. (2012) to study the DES algorithm [13, 14]. In this method, random keys must be created during data access, and cellular automata rules for the DES algorithm are easy to implement. Production of keys follows CA rule 30. Although this rule is meant to handle unpredictability, the key size is just 48 bits [15].

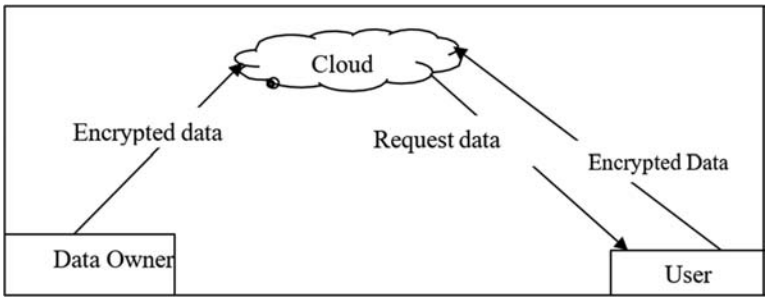

Fig. (1). client-side cloud data encryption.

Hossain *et al*. developed a new method of DNA cryptography that enhances security by making use of a DNA sequence table. In the beginning, a DNA sequence table will have random characters written. During each step of the data transmission process, a mathematical series is subjected to an uncountable number of iterations. During these iterations, the positions of the ASCII letters in the

sequence table are constantly adjusted. After that, the updated binary value is input into a One-Time-Pad, also known as an OTP. The OTP ciphertext goes through genetic conversion once more in the processing steps. In the end, a database of amino acids that contains protein sequences is utilized to compress the ciphertext, which results in an increased level of confusion inside the message. The encrypted text is becoming a lot more difficult to understand. A novel approach to secure data transmission that combines three distinct layers of protection: a mathematical procedure (the XOR operations), a biological procedure (the DNA complementarity rule), and the OTP scheme. The first step is to convert the data to a format known as binary. The next step is to use an OTP to XOR the binary sequence. The goal of this study is to offer a fresh strategy for encrypting data to solve a number of problems that have been brought about by the encryption algorithms that have been discussed previously. DNA signaling code and the method of completing base pairs are used for fear that the submitted answer may work. Both the person who sells goods and the recipient acquire an ensemble key pair that consists of a public key and a private key, from an alternator that is to say expressly created to form specific pairs. The Public key is used to decipher the idea. These answers are what is necessary to guarantee that the cypher quotation and some added limits are moved between the person who sells goods and the receiver in a safe and secure manner.

DNA CRYPTOGRAPHY

Several DNA cryptography methods have lately been introduced. Most of the methods described encrypt data using DNA bases and One-Time Pads (OTPs). The ciphertext is stored in microdot and decrypted using PCR technology according to the suggested approach. Using DNA steganography is crucial to the methods suggested. It is used to keep the secret and the encrypted text in the method described. To encrypt the plaintext and raise the amount of confusion, the approach suggested employs a DNA-based Playfair algorithm and a replacement strategy. Suggests a combined approach that uses DNA steganography to encrypt the key and RGB colours to show the plaintext as a matrix. A method using a risk-free medium and chemical procedures is suggested. The approach uses a look-up table to rearrange DNA nucleotides. The plaintext undergoes 16 rounds of encryption in an alternative approach suggested. Utilising DNA storage, encrypting with a randomly generated private key, and forming tiny clusters by swapping the ciphertext simultaneously is the approach suggested. The method put forward uses multi-level operations such as round key selection, ciphertext change, and shift operations to guarantee higher levels of secrecy. The method uses DNA cryptography to expand the key field and permutations of conventional Destine. The beginning, the method suggested uses the Genetic Algorithm (GA) and the Needleman-Wunsch method to crop the key. Next, DNA computing is

CHAPTER 19

A Study on Promotion and Reward Policy of the Salem Steel Plant

A. Kayalvizhi[1,*]

[1] *Department of Commerce, Loyola College of Arts and Sciences, Mettala, Namakkal, Tamil Nadu, India*

Abstract: Promotion, demotion, transfers, and incentive policies are all forms of internal mobility. An employee is said to be "upgraded" when their income is raised but their work grade remains the same, as opposed to being promoted. After consulting with the unions, you should get their stamp of approval on the promotion policy. Before being promoted, a thorough evaluation of one's work and performance should be conducted. A job description is useful for understanding the duties and responsibilities of the position, and a performance review may tell management whether the worker is up to snuff. Openings for promotions should be posted in several locations so interested individuals may apply, and awards should be offered to qualified applicants determined by their work level when promotions and prizes are made based on competence.

Keywords: Appraisal, Mobility, Promotion, Reward.

INTRODUCTION

When workers move about inside the same department, division, or unit of an organisation, this is called "internal mobility" [1, 2]. Employees need to be able to move around within the company if their skills and needs can be consistently met by the job and the company as a whole [3, 4]. Internal flexibility can take any form, including raise, relegation, transfer, and reward policy.

An employee's promotion signifies their advancement to a higher-level position within the company. Salary, status, responsibilities, and work grade or identification are all altered in the new position. Overall, the company values filling open positions more than the employee's current role. [5, 6]. "Upgrading" refers to a compensation raise rather than a change in a worker's job grade, as contrasted to "promotion" [7, 8]. However, a "dry promotion" occurs when a

* **Corresponding author A. Kayalvizhi:** Department of Commerce, Loyola College of Arts and Sciences, Mettala, Namakkal, Tamil Nadu, India; E-mail: a.kayal188@gmail.com

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promotion does not lead to a salary increase. A way to go up the corporate ladder is *via* promotions.

The HR department has to decide whether to promote from within or hire new employees to fill higher-level roles. External recruiting is the usual method for filling executive roles in most companies [9, 10]. Promotions from inside are used to fill the lower-level roles. After the decision to promote employees to higher positions has been reached, HRM should decide on the criteria for the promotion. Promotions may be based on seniority, merit, or a combination of the two [11, 12]. Consideration of whether to promote personnel in response to open positions or those that do not exist is a crucial aspect of any promotion programme [13]. When employees reach a certain level of service, they are often promoted without having to wait for a specific opening to occur. There is no basis in merit or open positions for these time-bound promotions [14, 15]. Another common technique is to associate job openings with promotions. In order to keep the ambitious employees from becoming discouraged, these openings are sometimes established. Conducting an assessment of work and performance review should be done before considering a promotion. Both the job description and the employee's performance review should be carefully considered to ensure that the individual is qualified for the position. It is important to consult with the unions on the promotion strategy and get their support before moving further. When raises and rewards are made on the basis of capability, the starting points for raises should be shown at some places to enable interested persons to apply, and rewards should be given for suitable candidates based on their work level.

PROFILE OF THE SALEM STEEL PLANT

Located in New Delhi, India, Salem Steel Factory is a subsidiary of SAIL, an enterprise of the Indian government. One of my lifelong goals has been to build a steel mill in Salem. The Salem integrated special steel facility in Tamil Nadu was established on May 15, 1972, by the Indian government. Rolls of carbon and stainless steel, in a range of grades, are produced by hot rolling slabs of steel. Additional processing of hot-rolled steel coils results in cold-rolled chromium steel coils, sheets, and blanks of diverse grades. On June 13, 1972, the state's then-Minister of Steel and Mines, Shri Mohan Kumara Mangalam, cut the ribbon to officially open the factory. The aspiration to establish a steel industry in Salem began to materialise in the foothills of the Kanajamalai. On October 25, 1972, the firm “Salem Steel Limited” was officially registered. It was a government-run project and a division of SAIL (Steel Authority of India Limited). Salem Steel Limited was headed by Shri V. Subramanian. With a yearly capacity of 3,600 metric tonnes of blanks, the Blanking Line (BL) was put into operation in 1993.

As part of the third stage, the hot rolled mill with an annual installed capacity of 1,86,200 metric tonnes was put into operation in 1995. About 1,344 people fill the Plant's payroll, and the vast majority of them have advanced degrees or other relevant work experience. A solid reputation for high-quality products has been established by SSP from its start. Everyone in the nation knows about SSP's "Salem Stainless" product.

REVIEW OF LITERATURE

Armstrong, Michael. (2006) Organisations may benefit from human resource management's ability to boost morale and productivity, reduce employee turnover, and boost performance and business outcomes. Human resource management relies on a number of pillars, including recruitment, training, performance evaluation, promotion, and incentives.

Training and development, cooperation, compensation/incentives, HR planning, evaluation of performance, and employee security are six underlying HRM practices that Lee & Lee (2007) found to have a positive impact on business performance. This includes employee productivity, product quality, and the firm's flexibility. Training and development, pay, incentives, and reward systems are the three HRM practices that have the most impact on company success, according to this research.

OBJECTIVES OF THE STUDY

- To identify the influencing factors, consider for promotion.
- To find out the association between the basis of the reward system and demographic variables.
- To offer suggestions for improving the promotion and reward system in the steel plant.

SCOPE OF THE STUDY

The purpose of this training is to confine the promotion and reward policies and practices of "Salem Steel Plant"

CHAPTER 20

An analysis of Applications of Deep Learning and Machine Learning in the identification of Cardiac Conditions

K. Kiran Kumar[1,*], P. Venkata Siva[2], B. Kumar Babu[3], J. Bhargav[2], B. Rajya Lakshmi[2] and **K. Vijay Babu[4]**

[1] *Department of Computer Science and Engineering, Chalapathi Institute of Technology, Andhra Pradesh, India*

[2] *Department of Computer Science and Engineering, Chalapathi Institute of Engineering and Technology, Andhra Pradesh, India*

[3] *Department of Computer Science Engineering, GITAM School of Technology (SOT), GITAM University, Hyderabad, Telangana, India*

[4] *Department of Computer Science and Engineering, CMR Engineering College, Hyderabad, Telangana, India*

Abstract: Deep Learning (DL) and Machine Learning (ML) techniques have shown promise in medical research, where globally, cardiac disease is a significant cause of fatality. To identify cardiac issues, deep learning and ML approaches are used in this study. The method makes use of a large dataset that includes clinical, demographic, and imaging features. To extract high-level representations, a variety of deep learning architectures, including CNNs, SVMs, and RNNs, are used. Utilizing stratified cross-validation techniques, the models are trained, validated, and tested. Identification of risk factors and potential biomarkers is aided by interpretability analysis. Deep learning models outperform conventional machine learning algorithms in accuracy and AUC-ROC, according to preliminary results, which indicate promising performance. Additional study is required to validate and improve the strategy, ultimately improving clinical outcomes and lessening the burden on the healthcare system.

Keywords: Deep Learning, Heart Disease, Medical Research, Mortality Worldwide.

[*] **Corresponding author K. Kiran Kumar:** Department of Computer Science and Engineering, Chalapathi Institute of Technology, Andhra Pradesh, India; E-mail: kirankumar@gmail.com

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INTRODUCTION

ML and DL techniques are widely employed in different fields like predicting heart diseases, image caption generators, credit card fraud defense, rainfall prediction, and weather forecasting [1, 2]. A set of illnesses known as cardiac diseases damages the heart and blood arteries [3, 4]. They are among the significant global causes of morality. Heart failure, arrhythmias, and coronary artery disease are typical examples [5, 6]. High blood pressure, elevated cholesterol, tobacco use, obesity, insulin resistance, and not being active are all risk factors [7, 8]. Possible symptoms include oedema, fatigue, shortness of breath, and chest pain. Regular exercise, a balanced diet, stress management, stopping smoking, and keeping a healthy weight are examples of preventive strategies [9, 10]. Effective management of cardiac disorders requires early identification and treatment [11, 12].

MACHINE LEARNING AND DEEP LEARNING IN HEART DISEASE PREDICTION

The ability to forecast cardiac problems using deep learning and Methods using machine learning has shown potential [13, 14]. The collection, preprocessing, and selection of attributes from a sizable dataset are required for these procedures. The optimal model is chosen using machine learning approaches such as a logistic regression model, random forest modelling, SVMs, and neural network models [15]. Once the dataset has been split into training and testing subsets, the model is trained by optimising its parameters. Cross-validation procedures are utilised to evaluate the model's generalizability, while evaluation measures are used to gauge the model's performance. The types of heart disease are shown in Fig. (**1**).

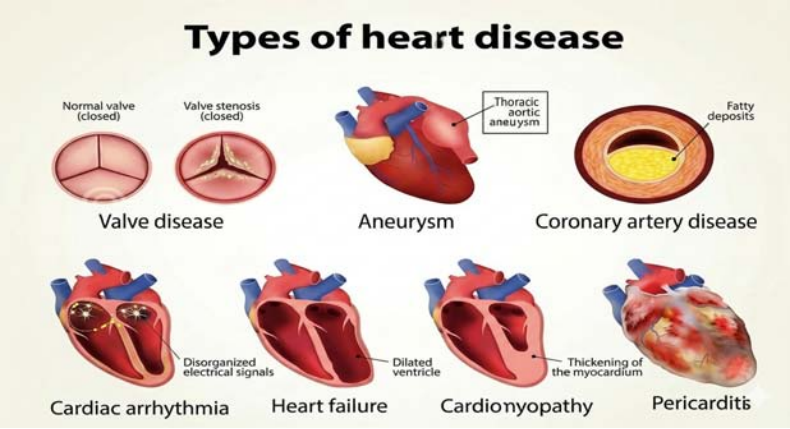

Fig. (1). Types of heart disease.

ECGs, echocardiograms, and angiograms are just a few examples of the types of medical pictures that CNNs can analyse to provide a diagnosis. CNNs are excellent in image identification tasks. A CNN may be taught to recognise patterns suggestive of particular cardiac diseases by subjecting it to training on a sizable collection of labelled pictures. For instance, CNNs can spot vascular blockages, bodily deformities, or clues of cardiac arrhythmias.

Analysis of electrocardiograms (ECGs): RNNs, especially LSTM (Long Short-Term Memory) networks, can resolve period-variable subsequent data, such as ECG signals. ECGs present the main news about the energetic project of the essence, enabling the discovery of uncommon ECG patterns associated with environments like arrhythmias and heart attacks. RNNs may find momentary relations in the ECG dossier and use the patterns to forecast or categorise the data.

A colossal dataset of patient head count, record of what happened, and test results may be resolved utilizing machine intelligence models, containing deep learning architectures, to envision the risk of cardiac disorders. Models can discover factors connected to greater risks by preparing on historical data and results, predictive early mediations, or individualized situation actions. Based on the features of the subjects, these models may further judge affliction progress and forecast outcomes, as shown in Fig. (**2**).

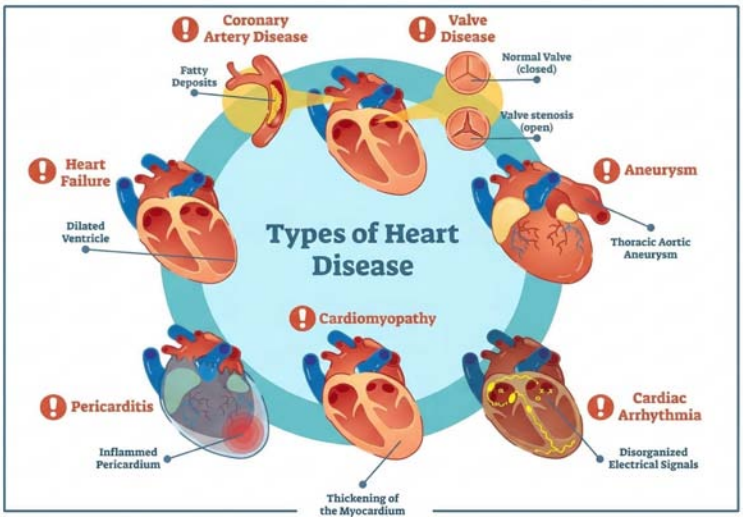

Fig. (2). Common types of heart disease and their associated structural or functional abnormalities.

Extraction of significant features from raw data utilising deep knowledge models removes the need for human feature engineering. CNNs and RNNs can extract beneficial traits from patient data, healing imaging, or inexperienced ECG signals

CHAPTER 21

An IoT AI-Driven Predictive Maintenance System for Anticipating and Preventing Equipment Failures in Manufacturing Environments

Afreen Fatima Mohammed[1,*], B. Gayatry[2], Harish Reddy Gantla[3], Waseema Masood[4] and **Gundlapally Swapna[5]**

[1] *Department of Computer Science & Engineering (Data Science), CVR College of Engineering, Ibrahimpatnam, Hyderabad, Telangana, India*

[2] *Department of Computer Science and Engineering, G. Pulla Reddy Engineering College, Kurnool, Andhra Pradesh, India*

[3] *Department of Computer Science and Engineering, Vignan Institute of Technology and Science, Yadadri, Bhuvanagiri, Hyderabad, Telangana, India*

[4] *Department of Computer Science and Engineering, Deccan College of Engineering and Technology, Nampally, Hyderabad, Telangana, India*

[5] *Department of Computer Science and Engineering, Keshav Memorial College of Engineering, Ibrahimpatnam, Hyderabad, Telangana, India*

Abstract: The research examines the implementation of an IoT AI-driven Predictive Maintenance (PdM) system to be used in manufacturing premises to forecast and prevent equipment failure. This system is equipped with advanced IoT sensors that monitor critical parameters in real time, including temperature, vibration as well as pressure. All data are further analysed with edge computing and cloud computing for additional and detailed analytics and storage. Therefore, the methodology explains the system's architecture in detail, including thorough data preprocessing and AI model elaboration. Six months of experimental validation and a couple of cases of motors and pumps substantiate the expected outcomes of the system's functioning. Eventually, the neural network model was the most efficient, with an accuracy of 92% along with an F1-score of about 89% as compared to the remaining models, whose accuracy was barely above 80%. The major findings prove there is a possibility to forecast the failure to schedule a time for repair and hence reduce the unplanned downtime and repair costs. Thus, the motor and pump cases demonstrate that the repairs of $10,000 and $8,000 were indeed avoided, respectively. However, it is also necessary to acknowledge certain issues, including data integration and the necessity for highly qualified personnel. Thus, the study recommends possible directions for further development of AI models and expansion of potential perspectives for use across various industrial equipment. Thus, the research provides an opportunity to employ

[*] **Corresponding author Afreen Fatima Mohammed:** Department of Computer Science & Engineering (Data Science), CVR College of Engineering, Ibrahimpatnam, Hyderabad, Telangana, India; E-mail: afreen@gmail.com

Satya Prakash Yadav, D. Arul Pon Daniel & G.N.R. Prasad (Eds.)

modern IoT and AI perspectives in enhancing the efficiency of maintaining equipment in a manufacturing plant.

Keywords: Predictive maintenance, IoT sensors, AI algorithms, real-time monitoring, manufacturing efficiency, equipment failure prediction.

INTRODUCTION

PdM is one of the essential strategies in manufacturing environments, which aims to manage the reliability of equipment and decrease operational costs. In contrast to a standard reactive or preventive maintenance strategy, PdM employs real-time information and calculation models to anticipate equipment failure as a result of its physical condition. Specifically, the usage of IoT and AI technologies has dramatically affected the sphere of predictive maintenance, allowing for previously unattainable data collection, processing, and analysis [1, 2]. IoT gadgets such as sensors and actuators gather vast amounts of information about equipment performance in real time, allowing for a comprehensive overview of the current state of equipment [3, 4]. Applying AI methods like machine learning (ML) and deep learning (DL) to this information can effectively predict potential failures [5, 6]. AI models usually depend on different algorithms to recognise the right patterns as well as anomalies in the data that reveal potential problems. This paper is devoted to the progress of an IoT AI-based PdM system created for a manufacturing environment. The pilot project aims to come up with an efficient system architecture, introduce effective data processing techniques, and elaborate on accurate predictive models [7, 8]. The novelty of the study is that it provides a clear explanation of the methodology of system implementation, experimental validation of system performance, and insight into the real-world manufacturing advantages and issues of deploying such a system [9, 10]. This research paper is organised as follows: Following this introduction, Section 2 presents the literature survey of different maintenance strategies, IoT and AI in general, and existing PdM systems . Section 3 outlines the methodology, which includes system architecture, data processing, and AI modelling strategy [11, 12]. Section 4 highlights the experimental setup, while Section 5 presents results and discussion [13, 14]. Lastly, Section 6 concludes the chapter [15].

METHODOLOGY

System Architecture

The suggested IoT AI-driven PdM system consists of several components. First, IoT sensors will be implemented on the critical equipment to monitor the

parameters such as vibration, temperature and pressure. Second, a communication infrastructure using protocols like MQTT and HTTP sends the data from the sensors to a central processing unit. Therefore, in Fig. **1**, the system architecture guarantees efficient data flow and monitoring of the parameters in real-time.

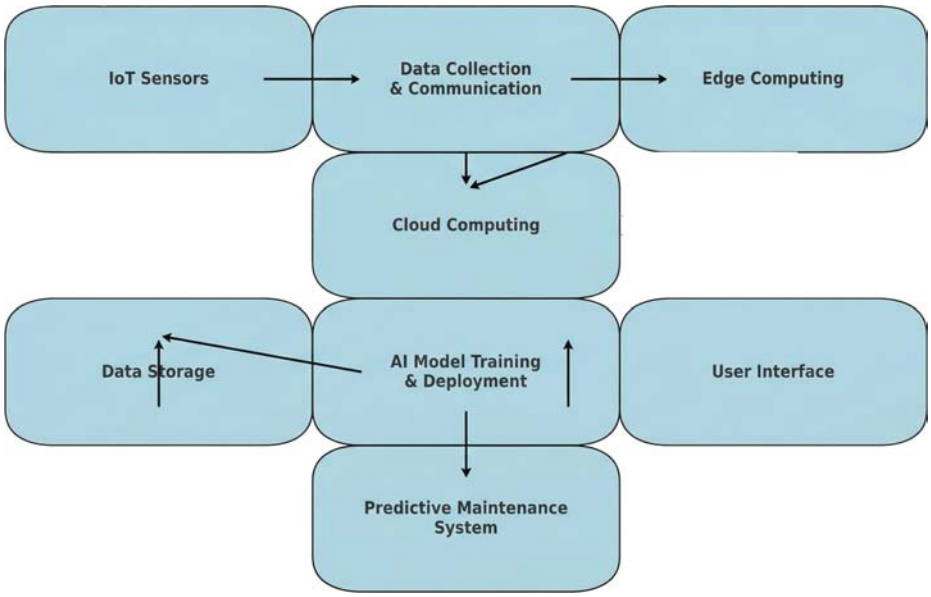

Fig. (1). The system architecture diagram for the suggested IoT AI-based PdMsystem.

Data Processing and Storage

Both cloud and edge computing are used in data processing. Edge computing enables processing information at the source in real time, which reduces delay and bandwidth. Cloud computing offers unlimited storage and processing capability for in-depth research. Data is pre-screened to filter out noise and abnormalities to provide the model with high-quality data, which is imperative for model success.

AI Algorithms and Models

The system uses a variety of AI algorithms for predictive maintenance. Machine learning models like regression and classification are used to make predictions about equipment failure. However, DL models and specifically neural networks, are used to identify complex patterns by training on historical data to improve the prediction significantly. Model training includes dividing data into training as well as validation datasets, with hyperparameter tuning and model evaluation utilizing metrics like accuracy, recall, precision and F1-score.

CHAPTER 22

Enhancing Human Organ Protection: Exploring Blockchain Technology and Machine Learning for Brain Image Data Analysis

P. Kusuma[1,*], **S. Geetha**[1] and **M.L. Chayadevi**[1]

[1] *Department of Computer Science & Engineering, BNM Institute of Technology, Bengaluru, Karnataka, India*

Abstract: More dispassionate research abilities enforce the protection of human means. This study provides an in-depth examination of blockchain technology, renowned for its appeal, transparency, and decentralization. It explores the experiential aspects of blockchain, consent mechanisms, the fundamental components of signaling protocols, and various application types. Additionally, the research investigates the facial features of machine intelligence techniques employed in brain tumor detection. Utilizing a comprehensive brain tumor image dataset, the study also addresses security considerations, including risk assessment and mitigation strategies. The conclusion highlights current challenges and proposes future research directions aimed at improving the decentralization and scalability of blockchain frameworks.

Keywords: Blockchain, Bitcoin, Consensus mechanism, Hyperledger, Smart contract, Tumour image identification.

INTRODUCTION

In the realm of blockchain technology, information is stored within a decentralised ledger system. This technology ensures the integrity and accessibility of data, enabling participants within the network to both input and confirm the translations logged in the distributed ledger [1, 2]. Notably, this restricts the ability to delete or alter transactions and associated data once recorded [3, 4]. The security of the blockchain system relies on secure communication methods like hash functions and digital signatures, which safeguard the integrity, authenticity, and irrevocability of transactions [5, 6]. Moreover, to establish a consensus among network participants and achieve a universally accepted record, blockchain employs consensus protocols that outline

[*] **Corresponding author P. Kusuma:** Department of Computer Science & Engineering, BNM Institute of Technology, Bengaluru, Karnataka, India; E-mail: kusuk85@gmail.com

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rules for all involved parties [7, 8]. In environments lacking inherent trust, blockchain provides fault-tolerance* and decentralisation because of its autonomy, credibility, immutability, authentication, security, audibility, and transparency. In recent years, both industry and academics have given it a great deal of attention [9, 10].

The illustration in Fig. (**1**) provides a summary of how blockchain technology has developed. Permissionless blockchains, like those of Bitcoin and Ethereum, are examples of public blockchains that let anybody participate in their network transactions [11, 12]. The Hyperledger blockchain networks, in contrast, operate as private blockchains. Requiring participant verification before network access is also referred to as permissioned blockchains [13, 14]. Blockchain, originating in 2008 with Bitcoin, has evolved with various systems proposed over the years. This paper focuses on consensus algorithms, proposing a unified model suitable for chain and DAG-based Blockchains. We analyse mainstream algorithms, offer an evaluation framework, discuss security principles, and provide suggestions for selecting algorithms for different applications [15]. Through this endeavour, our goal is to enhance our knowledge about the technology known as a blockchain and its associated security challenges by presenting a synthesis of existing research findings.

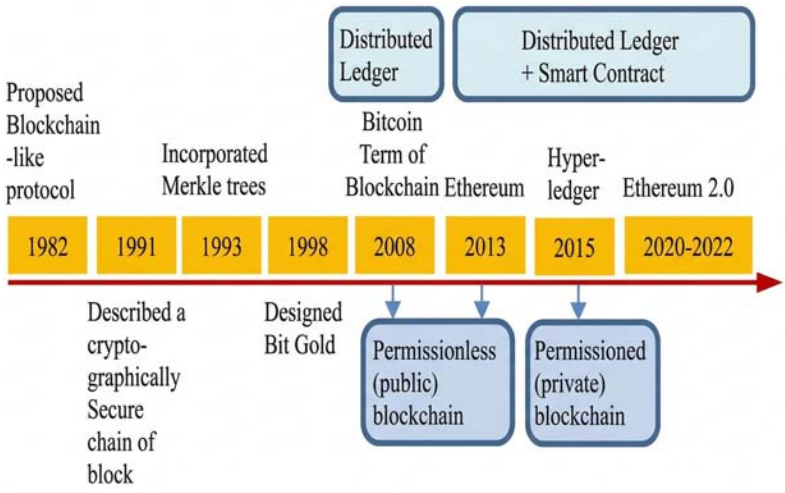

Fig. (1). History of blockchain.

Related Studies and Findings

Blockchain, initially developed for Bitcoin, is a decentralised technology garnering increasing interest since 2008 for its security and anonymity. Our study

maps current research on Blockchain, revealing a predominant focus on Bitcoin, with limited attention to other applications like smart contracts. Despite efforts to address privacy and security concerns, many proposed solutions lack thorough evaluation, and scalability challenges remain largely unexplored. Our findings inform recommendations for future research priorities. This paper explores the broader implications of blockchain, including its ideas, mechanisms, the theory of evolution, and difficulties, *via* an examination of the literature. It identifies the need for secure implementation, especially in small-scale applications, and proposes a consensus mechanism to address this issue.

Blockchain Technology

The management of digital identities, crucial with over three billion internet users, lacks user control and relies on centralised systems. Blockchain, known for Bitcoin's secure ledger, offers a solution with decentralised, transparent features. Our research explores self-sovereign identity, proposing a Decentralised Identity Management System (DIMS) using blockchain and claim-based identity. DIMS ensures privacy, modularity, and wide usability, laying a solid foundation for self-sovereign identity. Following the 2017 cryptocurrency market boom, governments are moving to regulate digital currencies. Trust in cryptocurrencies has grown due to blockchain security. The article examines the difficulties that the top five digital currencies have encountered and examines the blockchain technology that underpins them. Blockchain offers diverse advantages such as decentralisation, persistence, anonymity, and auditability, with applications spanning cryptocurrency, finance, risk management, IoT, and public services. Despite numerous studies exploring blockchain's potential in various domains, a comprehensive survey encompassing both technological and application perspectives is lacking. To address this gap, we undertake a thorough survey of blockchain technology, presenting its taxonomy, typical consensus algorithms, applications, technical challenges, recent advancements, and future directions. Blockchain, a leading 21st-century technology, is revolutionising sectors worldwide. It enhances services, upgrades businesses, and drives the adoption of digital currencies. Consensus algorithms are crucial in their implementation for various applications. This paper offers a comparative analysis of blockchain consensus algorithms, discusses development platforms, and aims to provide comprehensive insights into blockchain technology. Lastly, it offers insights into future trends and research directions, serving as a valuable reference for further study.

CHAPTER 23

Transformative Insights: Unleashing the Potential of Learning Analytics

Sivaraman Gurusamy[1,*], V. Poornima[2], J. Mary Catherine[3], Sreejith Vignesh[4] and **S. Babu[5]**

[1] *M.G.R. College (Arts and Science), Hosur, Tamil Nadu, India*

[2] *School of Computing Sciences, Vels Institute of Science, Technology and Advanced Studies, Chennai, Tamil Nadu, India*

[3] *Department of Computer Science & Quality Assistance, Chevalier T. Thomas, Elizabeth College for Women, Chennai, Tamil Nadu, India*

[4] *Department of Information Technology, Sri Krishna Adithya College of Arts & Science, Coimbatore, Tamil Nadu, India*

[5] *Jayagovind Harigopal Agarwal Agarsen College, Chennai, Tamil Nadu, India*

Abstract: Learning Analytics (LA) is pioneering educational innovation *via* data collection and analysis. This innovative technique digs deep into learners' backgrounds to improve performance. Dynamic approaches are used to experiment across many aspects, including varied learners and motivated instructors. Through its meticulous examination, LA unlocks the true potential of education, fostering transformative advancements. Machine Learning in Learning Analytics may improve learning by providing visualisation approaches that reinforce complicated ideas and enhance engagement. This extensive article analyses and assesses a variety of visualisation techniques to improve education and establish desirable values. By investigating the potential of these technologies, educators and researchers may use data-driven insights to personalise and alter educational experiences.

Keywords: Data analytics, Learning analytics, Machine learning, Visualisation.

INTRODUCTION

An amazing technological revolution is the transformation of education, which might change how people learn and teach [1, 2]. These developments have led to a massive data flood in all areas of the learning platform, not only information conveyance. Unfortunately, educational organisations find it difficult to assess

[*] **Corresponding author Sivaraman Gurusamy:** M.G.R. College (Arts and Science), Hosur, Tamil Nadu, India; E-mail: gsivaramanphd@gmail.com

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students' development and learning journey. Data science has become the most important technique to address this issue. It includes advanced data analysis and visualisation features [3, 4]. The main challenge of Learning Analytics (LA) is managing the complicated processes of seeking, acquiring, keeping, analysing, distributing, and visualising large volumes of data [5, 6]. To cover all aspects of LA, this work is organised into multiple parts [7 - 9]. Section II gives an overview of relevant studies, whereas Section III describes learning analytics for visualisation in detail. Next, Section V provides significant insights into the future potential of learning analysis [10 - 12]. Section VI concludes the research results with a summary [13 - 15].

RELATED WORK

Erik Duval *et al*. (2011) conducted experiments utilising the Wakoopa tool to scrutinise learning analytics for visualisation and analytics dashboard options. Hisham *et al*. (2019) analysed the performance of students in learning analytics. Klerkx *et al*. (2013) expounded on diverse analysis techniques for visualisation and experimented with various visualisation tools. Chatti *et al*. (2012) employed a novel model for learning analytics. Visualisations were built using a wide range of educational data provided in a study by Sivanand *et al*. (2016). Lee *et al*. (2020) examined learning analytics trends and innovations.

Learning Analytics includes metric analysis and scenario prediction, according to Avella *et al*. (2014). These results enhance teaching and learning. Visualisation tools accurately interpret outcomes, providing corrective measures and defining the learning environment. Wong *et al*. examined Learning Analytics in higher education, forecasting outcomes, as distance education institutions actively engage in learning analytics to comprehend teaching and learning efficiency. Chang *et al*. (2018) conducted experiments exploring the nexus between online learning, teaching, students' abilities, and recommended that Learning Analytics significantly enhances students' learning behaviours. Kwok *et al*. (2019) scrutinised the realms of educational technology, establishing a correlation between learning analytics, student success, academic performance, and intervention strategies.

According to Aldowah *et al*. (2014), educational data mining improves learning analytics in schools. Sciarrone *et al*. (2018) examined learning processes from three viewpoints to show their commonalities. Machine learning algorithms, like Technology Enhanced Learning (TEL), have been applied in educational contexts to anticipate student behaviour. Multiple Instance-Based algorithms are employed to predict student performance, while data mining manages large unstructured data stored in log files. Educational Data Mining (EDM) is harnessed for

analyzing educational data, addressing challenges in educational research. Khan *et al*. (2017) detailed applications, problems, challenges, current solutions, and prospects within the realm of big data. This paper expounds upon the establishment of a comprehensive literature review procedure for learning analytics, guided by research papers and formulated through meticulous search strings.

Saroha *et al*. (2016) introduced a novel approach for evaluating the learning management system, delving into assessment-related tasks. Various techniques, including association rule mining, classification, clustering, pattern analysis, and statistical methods, were employed. The FSLSM model was utilised to create a customised system for recommending educational content. Ouyang *et al*. (2023) conducted a study that identified diverse forms of cooperative groups, assessing the performance and regularity of each type. Theoretical, pedagogical, and analytical implications of empirical research. The quantitative perspective stands out among structural and transitional viewpoints.

Ouyang *et al*. (2023) proposed an AI model to assess the students' performance. The research team devised an AI-enabled academic performance prediction model, examining its impact on student learning. Chakravarthy *et al*. (2014) conducted this study using real-time data collected from the open-source SCORM Cloud learning management system. They explored the Experience API in LMS to track learner patterns, using real-world situations to illustrate the data-collecting and tracking capabilities of Experience API. Sheshasaayee *et al*. (2017) evaluated the public Moodle learning management system to aid academics in creating successful online learning communities using data mining. The use of the Moodle platform simplifies and enhances the learning process.

EXPERIMENTAL LEARNING ANALYTICS

Learning analytics is a multifaceted field seamlessly amalgamating data analytics, machine learning, and data science. By transcending traditional analysis, learning analytics offers a more comprehensive scope, placing equal importance on the art of teaching, students' receptivity to learning, and even the intricate psychological intricacies of an educational environment, it displays its potential through the meticulous collection and examination of copious volumes of data, acting as a proverbial guide that steers educators toward the desired outcomes. With its prowess, learning analytics becomes a powerful catalyst, enabling educational institutions to unravel unique insights and refine their teaching methodologies, fostering an environment of knowledge and growth. Fig. (**1**) shows the pipeline for LA and data analysis.

CHAPTER 24

Multi-Domain Image Retrieval Systems Using Object Detection and Segmentation Concepts

T. Dharani[1,*] and **I. Laurence Aroquiaraj**[2]

[1] *Department of Computer Science and Computer Applications, Padmavati Arts & Science College for Women (Autonomous) Opp. Periyar University, Salem, Tamil Nadu, India*

[2] *Department of Computer Science, Periyar University, Salem, Tamil Nadu, India*

Abstract: Humans have a greater tendency to interpret information *via* visual images rather than written language. An image can convey many searching ideas and emotions that would need a significant amount of written language to express. Within our real-time applications, visual imagery is more advantageous than written information. Image retrieval systems refer to computer systems designed for searching, browsing, and retrieving photos from huge digital databases. Most image retrieval systems primarily rely on information such as subtitles, keywords, or descriptions to search for photographs using annotation terms. This research proposes a Pattern-Based Picture Retrieval (PBIR) system that utilises multi-domain picture databases. The image retrieval system now incorporates object identification and segmentation to enhance its performance. The patterns are retrieved and then analysed at three levels to enhance the scheme's presentation searching. Ultimately, an evaluation is conducted to assess the effectiveness of multi-domain pictures in enhancing comprehension.

Keywords: Object Detection, Segmentation, PBIR.

INTRODUCTION

The object, or centroid, is represented by a point [1, 2]. Typically, the point representation is suitable for identifying items that occupy small areas in an image [3, 4]. Point indicators are used to identify significant areas in pictures that have distinct and detailed textures [5, 6]. Fig. (**1**) illustrates the fundamental principle of object detection, which involves using low-level visual cues to facilitate the identification of an item inside an image [7, 8].

[*] **Corresponding author T. Dharani:** Department of Computer Science and Computer Applications, Padmavati Arts & Science College for Women (Autonomous) Opp. Periyar University, Salem, Tamil Nadu, India;
E-mail: drtdharani@gmail.com

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Computer vision detects objects in images and videos. Images and videos help users discover things fast [9, 10]. Object detection mimics this intelligence in computers [11, 12]. This photo detection algorithm identifies and locates objects. Object detection aids in video and photo retrieval [13, 14]. A box that surrounds or marks each pixel in the image that contains the object may be used to locate the item [15].

PROPOSED METHODOLOGY

Swift Robust Features (SURF)

Native feature description and analysis of the proprietary are carried out by SURF. Vision, image registration, classification, and reconstruction in three dimensions are possible. SIFT inspired it. SURF points are returned as characteristics for the query image.

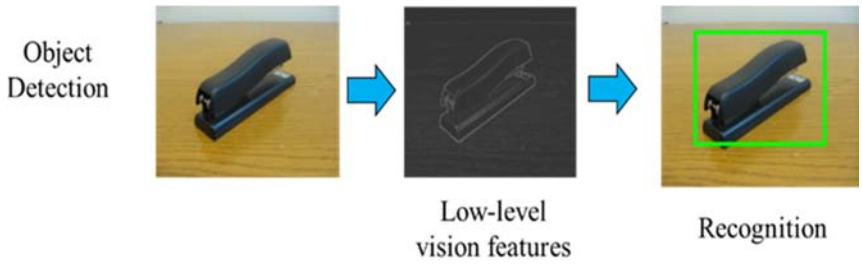

Fig. (1). General concept of object detection.

Detecting SURF Features

One motivation for developing this feature removal approach is that it gives balanced data about the region of interest that edge or angle sensors cannot. This solution also improves speed, which many processes seek.

Surf Feature Matching

SURF speeds up phases *via* indexing. The comparable phase simply compares aspects with similar differences.

Point-Feature Matching

Point connections among reference and target pictures help in item identification. It can recognise anything irrespective of the scale or in a plane rotation. It can handle a little out-of-plane rotation and blockage. This object identification method works effectively for unique feature matches in non-repeating texture

patterns. This approach could prove unsuccessful for uniformly colored or repetitive patterns.

Fast Sector Testing features

The fast corner detection algorithm can remove feature tracks and points as well as map objects.

As per Harris Stephens's procedure, a mathematical operator called the Harris corner detector may identify picture choices. Because of its rotation, size, and lighting independence, it is trendy.

Minimal Eigen Features

The minimal Eigen features use the least eigenvalue technique to find and return object corners. The object includes feature point data from a very 2-dimensional grayscale input picture.

Maximum Stable Extremely Regions

MSER might identify photo blobs. MSERs are co-variant areas extracted from images using the MSER algorithm. Some picture grey-level sets have stable MSERs.

KAZE Features

The unique 2D recognition and description approach, KAZE features operate totally in a nonlinear scale . SIFT and SURF provide Gaussian-scale choices.

Feature Extraction Methods

SURF feature extraction extracts the user query image's point feature. It also finds each image's validity and strength. For a featured objective, feature point removal is essential since it distinguishes it from nearby picture points.

The FAST and Harris feature extraction algorithms identify and extract corner features from the user's query image. It also finds valid picture corners. Corner feature extraction finds related relevant components in the query picture. MSER feature extraction extracts the user query image areas. The valid regions of each picture are also identified. Fig. (**2**) shows the query image's location is determined *via* region feature extraction. It recognises upright, up left, completely, and down left.

CHAPTER 25

Utilisation of Deep Neural Networks for Image Noise Reduction

K.V.J. Bhargav[1,*], Thanapal Pandi[2], Janardhana Rao[3], P. Narendra[4], Y. Kalyana Krishna[5] and **Boppudi Lingarao[6]**

[1] *Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[2] *School of Computer Science and Engineering and Information Systems, Vellore Institute of Technology, Vellore, Tamil Nadu, India*

[3] *Department of Business Administration, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[4] *Department of Electrical and Electronics Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[5] *Department of Mechanical Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

[6] *Department of Science and Humanities, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India*

Abstract: Researchers have explored the possibility of deep learning techniques for image denoising, revealing important differences among these approaches. Discriminative learning, particularly effective against Gaussian noise, and deep learning-based optimisation enable real-world noise estimation. However, the diversity of methods has hindered research comparing deep learning in image denoising. This study evaluates multiple deep image denoising approaches, categorising images into four collections by the type of Convolutional Neural Network (CNN) used: incremental white noise-trained CNNs, true noise-trained CNNs, blind wavelet altered CNNs trained on compound noisy images. It examines shared goals and principles, conducting qualitative and quantitative assessments on publicly accessible denoised datasets to compare state-of-the-art techniques. The study concludes with identified challenges and future investigation instructions.

Keywords: Convolutional neural networks, DNCNN, Image denoising, MATLAB package.

[*] **Corresponding author K.V.J. Bhargav:** Department of Electronics and Communication Engineering, QIS College of Engineering and Technology, Vengamukkapalem, Andhra Pradesh, India; E-mail: bhargav.k@qiscet.edu.in

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INTRODUCTION

Images have become more popular, but noise often infiltrates them during capture, compression, and transmission [1, 2]. Noise from ambient conditions, transmission errors, and other factors alters images. Signal fluctuations impair image brightness and colour extraction [3, 4]. It may impair video synthesis, image analysis, and segmentation. Thus, comprehending image processing requires denoising.

Increased image usage has increased noise interference during capture, editing, and transmission. Ambient conditions and the transmission system's complexity affect visual data [5, 6]. Image noise from signal oscillations impacts visual input brightness and colour extraction. Noise invasion affects more than vision. Image processing and diagnosis are hampered by noise. Analysis, critical video synthesizing, and division are severely affected by noise. Damage to these processes underlines the need for image denoising [7, 8].

Picture denoising reduces noise and improves image processing [9, 10]. Specialised algorithms and methodologies remove noise to restore visual integrity in denoising. These approaches maintain visual elements and minimise noise. Their goal is to reduce noise and increase visual data quality. Picture denoising is vital to app-wide image processing, not just a fix. Image-based analytics in medicine and industry need noise reduction. Image denoising enhances visuals and analysis across domains.

Effective picture denoising becomes increasingly crucial as organisations seek better visual data. These denoising techniques must improve to reduce noise and improve image processing [11, 12]. Image processing comprehension and precise, reliable, and pertinent visual data analysis require picture denoising.

Computer-aided analysis requires image denoising due to enhanced low-light digital image capture. Clean extraction of information from noisy images is critical. Denoising may improve image details and remove noise. High-frequency components make image denoising, noise, edges, and texturing harder to distinguish.

Image noise is frequently discussed in academia—examples include Quantization, impulse, Poisson, speckle, and AWGN. Manufacturing defects, data errors, and photon levels create impulses, scattered, Poisson, and quantum noises, while analogue circuitry causes AWGN. Computer-aided analyses need picture denoising methods due to the expanding usage of digital pictures, particularly in low light. Visual data analysis accuracy relies on retrieving unmodified data from noisy images [13, 14]. Denoising goes beyond noise reduction to improve image

analysis and interpretation. Cleaning noise and differentiating it from edges and textures is the challenge of image denoising. Due to their ubiquitous high-frequency components, these elements need specialised algorithms and approaches for detection process.

Computer-aided analysis focuses on image processing reliability and accuracy by including picture denoising algorithms. Digital photography is gaining popularity across industries; thus, denoising must be enhanced. Cleaning noisy photographs increases visual content and preserves analytical reliability and efficacy across applications.

Image processing depends on photo denoising advances. It is important for industrial decision-making that requires accurate visual information beyond medical diagnosis. For reliable visual data processing in a digital environment, picture denoising is essential.

Image denoising is used in medicine, defence, law enforcement, agriculture, manufacturing, and identity verification. In biological imaging and diagnostics, denoising methods are essential. These methods are crucial for eliminating speckle, Rician, and nanoscale noise in medical imaging. Reducing noise artefacts improves medical diagnostics and imaging results.

Additionally, denoising methods are often used in applications involving remote sensing to reduce certain forms of noise. Remote sensing images face a “salt and pepper” sound, separating dark and bright pixels. To preserve remote sensing data, additional white Gaussian noise, which is a typical interference during picture recording and transmission, must be denoised. These varied businesses and sectors use picture denoising algorithms to ensure visual data quality, accuracy, and interpretability [15]. Efficient noise elimination enables medical personnel to obtain clear and reliable imaging for accurate diagnosis and treatment planning. In sensor-based applications for monitoring the environment or geographical analysis, noise artefact reduction is crucial for accurate and useful data. Denoising algorithms help make intelligent decisions across different domains, not only reducing noise. The defence industry uses denoising to produce unambiguous images for surveillance, reconnaissance, and risk evaluation, which informs planning and operational decision-making.

Denoising techniques improve surveillance film quality and interpretability, helping law enforcement identify and analyse key elements in forensic investigations. Denoising improves aerial photography for crop evaluation, pest identification, and yield prediction, optimising agricultural practices and production. Denoising ensures the precision of visual information used in product evaluation and fault identification in the manufacturing business. Denoising also

CHAPTER 26

Entrepreneurial Opportunities in Industrial Innovation: Leveraging Human-Machine Interfaces (HMIs) to Enhance User Experience

B. Sundaravadivazhagan[1,*], M. Ashok Kumar[2], Aliyu Mohammed[3] and **D. Arul Pon Daniel[4]**

[1] *Department of Information Technology, University of Technology and Applied Sciences-Al Mussana, Muladdah, Oman*

[2] *Department of Computer Science and Software Engineering, Skyline University Nigeria, Kano, Nigeria*

[3] *Department of Management, Skyline University Nigeria, Kano, Nigeria*

[4] *Department of Computer Science and Applications, Loyola College of Arts and Sciences, Mettala, Namakkal, Tamil Nadu, India*

Abstract: This study explores entrepreneurial opportunities in industrial innovation through the lens of Human-Machine Interfaces (HMIs). The objective is to understand the dynamics of HMI integration, enhance user experiences, and offer strategic insights for entrepreneurs. The study identifies gaps in the existing literature by emphasising the underexplored entrepreneurial dimensions of HMI utilisation in industrial settings. A comprehensive examination is conducted through qualitative discussions and document analysis, based on the Technology Acceptance Model (TAM). Analyses of entrepreneurial ventures, user experience effect, and HMI adoption across sectors show trends. We recommend user-centric design, iteration, and human factors expert cooperation. The policy consequences encourage research, standardisation, and education. The study aligns with TAM and effective reasoning, fills a significant research gap, and offers practical insights for business professionals, policymakers, and future researchers. This study illuminates the relationship between technology, business ownership, and customer service, enabling further research on this dynamic subject.

Keywords: Entrepreneurship, human-machine interfaces, industrial innovation, user experience, Technology Acceptance Model (TAM).

[*] **Corresponding author B. Sundaravadivazhagan:** Department of Information Technology, University of Technology and Applied Sciences-Al Mussana, Muladdah, Oman; E-mail: bsundaravadivazhagan@gmail.com

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INTRODUCTION

Entrepreneurs are watching the synergy between human talents and machine interfaces as industrial innovation evolves [1, 2]. Visionaries seeking revolutionary prospects concentrate on Human-Machine Interfaces (HMIs), which are driving this changing world. This research explores the entrepreneurial landscape of strategic HMI usage to enhance industrial user experiences [3, 4]. This study explores how HMI seamlessly integrates into manufacturing procedures to provide new business opportunities. Entrepreneurs see a lot of potential in the human-machine symbiosis [5, 6]. The delicate balance between human sense and technical accuracy drives industrial progress. This research examines how HMIs boost industrial efficiency and innovation [7, 8]. This study investigates how HMI integration drives industrial innovation. Entrepreneurs see HMIs as a means to overcome digital age difficulties and open new doors [9, 10]. Entrepreneurs may explore new frontiers and revolutionise the industry by seamlessly blending human intuition and technological efficiency [11, 12]. Exploring new trade excuses is central to this task. HMIs change industrial consumer occurrences, giving producers a singular palette to express their artistic dreams [13, 14]. The entrepreneurial surroundings offer various opportunities, from simplifying movements to reconstructing safety. This research inquires how contractors may strategically use this dormant potential to transform manufacturing [15].

Objectives of the Study

1. This research aims to achieve the following goals. To precariously review and combine existing literature on the unification of HMIs in modern frameworks
2. To recognise and resolve breaches in the current understanding of the progressive moment in this place domain.
3. To elucidate the significance of addressing these gaps for both academia and industry.
4. To provide a theoretical foundation for entrepreneurs seeking to capitalise on HMIs in their ventures.

METHODOLOGY OVERVIEW

Given the qualitative and conceptual nature of this study, the methodology involves an extensive literature review, synthesising insights from interdisciplinary sources. By employing a qualitative approach, the study aims to delve deep into the theoretical issues and practical problems surrounding the integration of HMIs in industrial innovation.

PROBLEM STATEMENT

Industrial innovation is a dynamic journey in which revolutionary technical advances transform corporate operations. The history of industrial innovation reveals a need for modern techniques to enhance efficiency, production, and user satisfaction. This evolutionary process forces companies to adapt and adopt new technology. Industrial innovation is about meeting the demands of both corporations and consumers. As technology changes, so does our industrial ecology, requiring ongoing strategy and process evaluation. This ongoing development emphasises the need for transformational techniques that meet and anticipate business environment changes. Industrial innovation demonstrates an industry's ability to adapt and resist technological upheavals.

KEY CONCEPTS AND MODELS IN HUMAN-CENTRED SECURITY

In the dynamic landscape of cybersecurity, Human-Centred Security focuses on aligning security measures with human behaviour, acknowledging that end-users play a pivotal role in maintaining a secure environment. Several key concepts and models contribute to the development of effective human-centred security strategies. Table **1** shows the key user-centric security concepts, their descriptions, and their significance in enhancing system usability, security effectiveness, and privacy compliance.

Table 1. Key user-centric security concepts, their descriptions, and their significance in enhancing system usability, security effectiveness, and privacy compliance.

Key Concept or Model	Description	Significance
Usability and Security Integration	Seamlessly integrating security measures into user interfaces for a user-friendly experience.	Encourages compliance and reduces the likelihood of users circumventing security protocols.
Security Awareness Training	Educating users on security threats and best practices to foster a security-conscious organisational culture.	Informed users are better equipped to recognise and respond to security risks.
User-Centric Authentication	Implementing authentication methods that balance security and usability (*e.g.*, biometrics, multi-factor).	Enhances security while minimising user friction, encouraging the adoption of secure practices.
Behavioral Analytics	Using data analytics to identify abnormal user behaviour, enabling early detection of security incidents.	Proactively addresses security threats by recognising deviations from typical user behaviour patterns.

CHAPTER 27

Deep Learning Models to Evaluate Pharmaceutical Formulation

G. Naga Rama Devi[1,*], Syed Naimatullah Hussain[2], R. Senthamil Selvan[3], Basi Reddy Avula[4] and **T. Meeradevi[5]**

[1] *Department of Computer Science (Data Science), Sreyas Institute of Engineering and Technology, Hyderabad, Telangana, India*

[2] *Department of Computer Science and Engineering (Data Science), Nagarjuna College of Engineering and Technology, Bengaluru, Karnataka, India*

[3] *Department of Electronics and Communication Engineering, Annamacharya Institute of Technology and Sciences, Tirupati, Andhra Pradesh, India*

[4] *Department of Computer Science and Engineering, School of Computing, Mohan Babu University, Tirupati, Andhra Pradesh, India*

[5] *Department of Electronics and Communication Engineering, Kongu Engineering College, Perundurai, Tamil Nadu, India*

Abstract: Pharmaceutical scientists' trial-and-error approaches dominate formulation development. This method is difficult and expensive. Automatic feature extraction has made deep learning popular in many fields. Deep learning is used to forecast pharmaceutical designs in this study. Two dose forms were used as model systems in this work. The models were evaluated using criteria specific to pharmacokinetics. To pick typical data for test datasets and validation, an automated system was created. Deep learning is related to six machine learning approaches. Both deep neural networks have reported accuracies of 80%, greater than previous machine learning models, and predicted pharmaceutical formulas well. First-time pharmaceutical formulation prediction was achieved using deep learning, an autonomous data splitting technique, and pharmaceutical formulation data assessment criteria. Pharmaceutics and AI may reshape pharmaceutical research from experience-based to data-driven.

Keywords: Deep learning, Pharmaceutical formulations, Deep neural networks, Machine learning models, Data splitting technique.

[*] **Corresponding author G. Naga Rama Devi:** Department of Computer Science (Data Science), Sreyas Institute of Engineering and Technology, Hyderabad, Telangana, India; E-mail: dr.g.nagaramadevi@sreyas.ac.in

Satya Prakash Yadav, D. Arul Pon Daniel & G.N.R. Prasad (Eds.)

INTRODUCTION

Healthcare expenses and new APIs are under burden in the pharmaceutical sector. Drug research and development should be more efficient and methodical in the pharmaceutical sector [1, 2]. Nowadays, computer-aided drug design, combinatorial interaction, and high-throughput screening are often used by scientists in the drug discovery domain to speed up the process of making new drugs [3, 4]. Pharmaceutical experts continue to use trial-and-error methods to develop new drug formulations. They are difficult, costly, and time-consuming. Trial-and-error lab investigations seldom provide the best formulas [5, 6]. Formulation scientists must simplify formulation development. In order to meet pharmaceutical industry demands, formulation development must be efficient and methodical.

Recently, machine learning research has been quite interesting. With experimental data, machine learning can produce data-driven predictions, making formulation development more efficient [7, 8]. A good machine learning approach may speed up development, improve formulas, save money, maintain product consistency, and gather and preserve domain specialists' knowledge and skills. Artificial neural networks (ANNs) and expert systems (ESs) help formulate medicines. An ES represents an intelligent application that can store and maintain expert knowledge. It is challenging to translate pharmaceutical professionals' hazy insights into ES guidelines and reliably anticipate formulation performance. ANN is the most used pharmaceutical formulation prediction machine learning technology [9, 10]. Biology's neural networks are simulated by an ANN. ANN can tackle challenging expert system challenges. ANN prediction feature extractor design requires specialist knowledge [11, 12]. The inadequate experimental data further lowers the ANN formulation prediction accuracy. Many fields of science, industry, and government use deep learning, an automated all-purpose learning method [13, 14]. Deep learning can repeatedly convert low-level characteristics into higher-level, more abstract features, unlike other learning methods that require domain knowledge. Additionally, deep learning can detect even the most minute and irrelevant differences, allowing it to outperform conventional machine learning approaches. Visual neuroscience-inspired convolutional neural networks contain local connectivity and weight sharing. Image, video, voice, and audio processing benefit from convolutional neural networks. Different-length sequences may be processed by recurrent neural networks using sequence history. RNNs revolutionized sequential data. Image and sequence data are not used to represent pharmaceutical formulation composition and manufacturing processes. Fully-connected deep feed-forward networks excel at predicting drug compositions. Recent research demonstrates that using deep neural networks (DNNs) for predicting dental disintegrating pills outperforms artificial neural networks

(ANNs) with a single hidden layer [15]. The typical validation set was obtained from a small and unbalanced dataset of oral decomposing tablets using the Maximum Dissimilarity method with the tiny collection filter and typical starting set selection. Deep learning must be compared to other machine learning approaches to anticipate successful formulations.

Pharmaceutical research has increasingly utilized deep learning over the last five years. Deep learning was compared to other machine learning methods to forecast medication aquatic solubility in the first investigation. Deep learning performed better than previous methods. Later, deep learning was applied in the pharmaceutical industry. Molecular epoxidation reactivity was predicted using a deep convolutional network to limit medication toxicity. Drug-induced liver damage was predicted *via* deep learning. In a 2017 Tox21 Data Challenge research, deep learning predicted toxicity better than naive Bayes models, support vector machine learning, and random forests. Drug discovery also uses deep learning. DNNs predicted quantitative structure-activity relationships (QSAR) information better than other machine learning systems. Multitasking deep learning and one-shot learning performed better than single-task learning in low data for drug discovery. Deep learning enables us to learn from historical data and anticipate upcoming medication repurposing by mining drug discovery databases. On eight separate datasets, researchers recently tested the efficacy of five different ML models and four different DNNs using 2, 3, 4, and 5 hidden layers. Ranking normalized scores with seven traditional model performance metrics was used for further investigation. DNNs with 5 and 4 hidden layers surpassed other machine learning methods in metric and dataset scores. Recent research indicates that deep learning outperforms other machine learning algorithms in prediction performance.

Deep learning was used to build regression models to predict pharmaceutical formulation success. Due to inadequate experimental data, formulation prediction is challenging with a short dataset and uneven input space. The data splitting method and pharmaceutical formulation data assessment criteria improved performance. ORFDF and ORRMT data were used to train DNNs. Deep learning was associated with six machine learning methods. Deep learning is better at predicting pharmaceutical formulations than other machine learning approaches because it can understand the complex relationship between pharmacological formulations and *in vitro* features.

CHAPTER 28

Fine-grained Owner-enforced Cloud Search Authentication using Keywords

K. Anitha[1,*] and **K. Srinivas**[2]

[1] *Department of Computer Science and Engineering, Loyola Academy, Alwal, Secunderabad, Telangana, India*

[2] *Department of Computer Science and Engineering, Koneru Lakshmaiah Education Foundation, Hyderabad, Telangana, India*

Abstract: A significant obstacle stands in the way of resolving concerns over privacy and information security in the cloud. This study suggests that a keyword-based system could be useful for authorizing granular searches by cloud owners. The resulting technology is a boon to data owners who have lost control of their data in the cloud; it enables them to set and enforce user access policies by Employing cutting-edge cryptography techniques, such as attribute-based encryption (ABE) and searchable encryption. Data security, query confidentiality, and policy enforcement are significant challenges that can be addressed through efficient and secure keyword-based searches. The proposed technique appears to be practical and extensible, according to our testing results, which makes it a good fit for usage in significantly large-scale cloud structures. A robust structure is established to enhance user control and data security in light of these findings.

Keywords: Cloud computing, Attribute-Based Encryption, searchable encryption, data security.

INTRODUCTION

Although the encoded information might be utilised effectively, it provides additional difficulties [1, 2]. Some solutions that have attempted to address this issue include entirely homomorphic encryption architecture, secure function evaluation, and secure search over encrypted material [3, 4]. These plans work wonderfully in this particular situation, but they are too general to be of much help in the future. Some people are keeping a careful eye on this hurdle and are attempting to find a solution to it [5, 6]. The high level of intricacy required for secret key management makes symmetric cryptography-based approaches

[*] **Corresponding author K. Anitha:** Department of Computer Science and Engineering, Loyola Academy, Alwal, Secunderabad, Telangana, India; E-mail: thumma.anitha@gmail.com

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unsuitable for this context [7, 8]. There would be serious scalability issues if the method were extended to include multi-owner choices, because the framework can accommodate many distinct users and files [9 - 12]. In the dynamic cloud environment, one of the biggest concerns is how to manage user list changes when users join, deactivate, or experience similar events [13 - 15].

PROPOSED SYSTEM

Given the well-known instability of cloud servers, this article focuses on how to locate encrypted data on any machine that is part of a network structure, especially the internet, and how the pre-outsourcing encryption model may promote confidentiality. The purpose of the work's arrangement was to address this comparable challenge. In this work, these unresolved issues are addressed and a solution is presented for permitted keyword searches over encrypted cloud data, which incorporates effective user cancellation in scenarios involving multiple data sources and users.

The policy attributes-based encryption (CP-ABE) technique utilizes the ciphertext to provide, owner-enforced search permissions. More specifically, the information proprietor encrypts the directory of every file according to an admission rule that has been devised. This rule outlines the requirements for accessing this directory. With this information, the consumer builds the hatch on their own, without depending on an actual, reliable authority (TA). The backdoor allows the cloud server to access the encrypted indexes without the user's knowledge. For the cloud service to provide a corresponding outcome, the user's trapdoor-related characteristics must fulfill these restrictions. The encrypted indexes include limits on who may access them. We make sure that the design maintains keywords and attributes separately. The content of the files is represented by keywords, whereas attributes are more concerned with personal qualities. The system restricts you to preserving a subset of characteristics to keep search authorization. Creators of the comprehensive index, which incorporates all terms, are the data owners. On the other hand, the suggested approach is easier to use and works great for research projects that encrypt the index on a large scale using an access architecture that relies solely on authorised user attributes. A comprehensive method of file distribution. Computer systems are burdened with an excessive amount of evidence through proxy-based and sluggish re-encryption techniques. Not only does this allow for rapid user cancellation for our proposed solution, but it also relieves the data owner of the onerous task of managing user memberships.

ADVANTAGES OF THE PROPOSED SYSTEM

A thorough security study confirmed that the proposed technique is both demonstrably safe and that several assumptions regarding search privacy were successfully satisfied. Additionally, we offer a means to evaluate search results and ensure that all aspects of the procedure for searching are based on verifiable constituents. Results from testing show that the ABKS-UR is both functional and efficient. The study has introduced a scalable, novel, authorised keyword search over encoded data technique to accommodate many data consumers and various data sources. Compared to previous research, our method enables file-level owner-enforced search permissions with more fine-grained controls. Since the search challenge is sequential rather than proportional, it also scales well for systems with many users. This is due to the fact that the addition of new characteristics makes searching more complex. For a more organised and cloud-friendly employer cancellation procedure, the data owner can ask the computer science department to handle much of the computationally heavy lifting. This formal evidence contradicts bouts that employ certain terms and demonstrates that our proposed technique is selectively protected. The system provides a method that allows for confirmation of authenticity in the context of a situation with many users & information sources.

METHODOLOGY

Authorised Keyword Hunt

Companies with numerous data holders might use the CP-ABE method's fast and accurate keyword search for encoded cloud data. If the user's trapdoor-related attributes meet the admission limitations specified in the encoded directories, then the cloud server provides a corresponding outcome. The access structure defined in this index is a set of AND gates. The protected search engine must limit access to specific queries according to the data owner's requirements. Whoever meets the owner's access criteria will thus be the only ones to see the actual search results. Managing permission levels at the granular level is one of the challenges that need to be solved. Furthermore, there is a scalability issue with the structure when used in conjunction with cloud computing.

Effective User Cancellation

The project's goal is to make the transition from the current system as painless as possible for users who can still access it. If the request is approved, the server will delete the revoked user's record from any database that has it.

CHAPTER 29

Measuring Retail Customer Experience and Its Impact on Customer Satisfaction

Disha Mathur[1,*], **Manish Dadhich**[1] and **Chandani Joshi**[1]

[1] *Department of School Management, Sir Padampat Singhania University, Bhatewar, Rajasthan, India*

Abstract: In an Indian context, this research seeks to quantify the influence of happiness, mood, leisure, and distinctiveness on the trade customer experience and, by extension, customer satisfaction. In this varied and ever-changing environment, businesses can develop more effective strategies to enhance the overall shopping experience and foster consumer loyalty by understanding these dynamics. The 431 respondents' data were gathered for the current study using a survey-based methodology. The conceptual framework was tested using the bootstrapping approach and the PLS algorithm. With the exception of pleasure, the results show that mood, leisure, and distinctiveness are strong predictors of retail consumer experience. Additionally, in Indian contexts, the retail customer experience has an important effect on consumer happiness. The findings discussed in this article will assist retail shop managers in communicating their approach to improving customer satisfaction and the retail customer experience. This study examines pleasure, mood, leisure, distinctiveness, retail client satisfaction, and customer experience in Indian contexts for the first time. In addition, by including a variable, namely customer happiness, the current research expanded the framework of previous works.

Keywords: Retail customer experience, Joy, Leisure, Mood, Customer satisfaction, India.

INTRODUCTION

The total retail shopping experience is called retail customer experience (Jain and Bagdare, 2013) [1, 2]. Physical atmosphere, service to customers, product selection, and price build a store's impression (Bustamante and Rubio, 2017) [3, 4]. Retail shop success depends on customer experience (Riedl and Hermes, 2021). Positive experiences lead to customers returning (Nacass, 2018). It

* **Corresponding author Disha Mathur:** Department of School Management, Sir Padampat Singhania University, Bhatewar, Rajasthan, India; E-mail: Disha.mathur@spsu.ac.in

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involves feeling welcome, finding what they require, and having questions addressed. Experienced customers are more likely to make further purchases. Therefore, merchants must enhance consumer satisfaction to increase sales and loyalty. Making customers feel welcome improves their experience (Roozen and Katidis, 2019) [5, 6]. Store staff should be trained to answer customer questions and know their products (Maklan and Klaus, 2013). Finally, stores ought to offer discounts and low prices to entice customers. Engaging retail environments improves the experience of customers (Sachdeva and Goel, 2015) [7, 8]. Lighting, cleanliness, and organisation are essential in the store (Bagdare, 2013) [9, 10]. Also, retailers should recruit polite, product-savvy staff. To attract customers, retailers might provide reductions and competitive pricing (Pei *et al*. 2020) [11, 12].

This study builds on Bagdare and Jain (2013) to examine retail customer experience and satisfaction. Adding a dependent variable rendered the present research unique and valuable to the realm of research on store customer experience and happiness [13, 14]. Bagdare and Jain (2013) stated that future studies may enhance the understanding of the retail customer experience and change the model, which is why this variable was added. Consumer happiness is the focus of this essay, which delves into the causes and consequences of a positive retail customer experience [15]. That way, stores can explain how they plan to make customers happy by understanding how the in-store customer experience affects their overall satisfaction.

THEORETICAL FRAMEWORK AND ANALYSIS

Results of the Shopping Experience of the Customer

Joy

The overall view of the suggested conceptual framework is provided in Fig. (**1**). The retail consumer experience is not complete without joy (Bagdare, 2015). It is a feeling that consumers receive when they interact favourably with a company, and it may determine whether or not they return (Ball & Barnes, 2017). Without a doubt, enjoyment enhances the shopping experience for customers. According to Bagdare (2014), happy interactions increase customer satisfaction, loyalty, and sales. A positive customer experience is essential to a satisfying buying journey. Understanding, civility, and respect make clients happier and more willing to return. Shops may create a positive experience that leads to repeat business by making customers feel valued and respected. Shopping may also be enjoyable with creative marketing. Innovative displays, captivating imagery, and interactive

experiences are a few ways with which retailers may make shopping enjoyable (Banik & Gao, 2023; Happ *et al*., 2020). Additionally, retailers may use innovative marketing to advertise special offers and promotions in an effort to draw in and keep customers. So, the researcher put forward the following hypothesis:

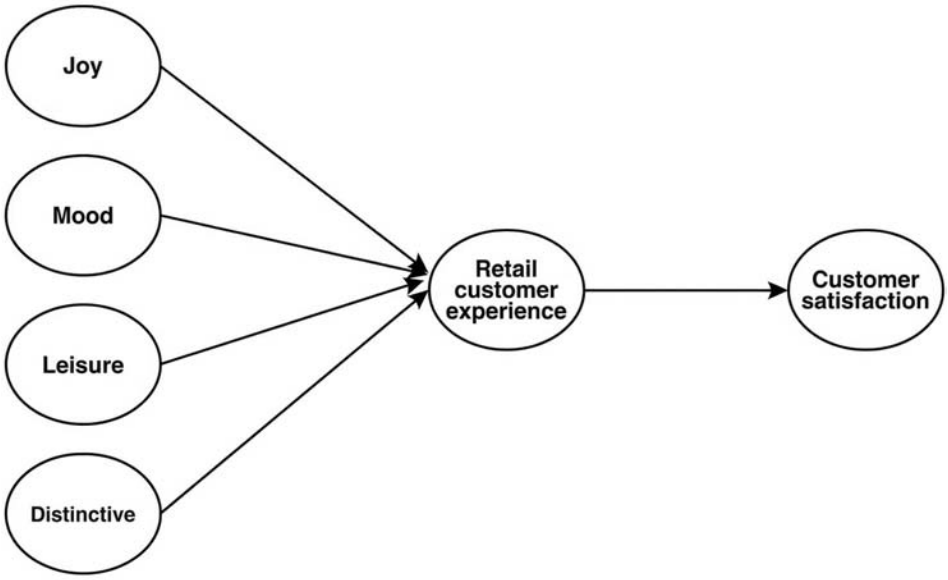

Fig. (1). The study's conceptual framework.

H1. Joy has a significant and positive impact on the trade client experience.

Mood

Clients who are satisfied are more likely to follow recommendations and make a purchase. Nevertheless, dissatisfied customers could be obstructive as well as less inclined to make a purchase (Nacass, 2018). Thus, in order to maximise customer satisfaction, retailers need to understand how to create a positive atmosphere. Lastly, providing free drinks could also increase customers' interest . Retailers who want to succeed must consider how mood impacts the customer experiences (Milner and Furnham, 2013). The entire customer experience, from arriving at the establishment to departing, may be impacted by their attitude (Blázquez, 2014). Consequently, the researchers suggested the following hypothesis:

H2. The trade client experience is positively and significantly impacted by mood.

CHAPTER 30

Impact of E-Recruitment Techniques on the Indian Generation

Sanjay Kumar Gouda[1,*], **Y.S.S. Patro**[2] and **Sarbesh Mishra**[3]

[1] *Corporate Relations, GIET University, Gunupur, Odisha, India*

[2] *School of Management Studies, GIET University, Gunupur, Odisha, India*

[3] *National Institute of Construction Management and Research (NICMAR), Hyderabad, Aliabad, Telangana, India*

Abstract: The E-recruitment sector has evolved due to technological improvements and the shifting expectations of the Indian generation. This research examines the impact of current developments in e-recruitment methods on the next generation. This report reviews literature and empirical research to examine the critical elements that affect the use of e-recruitment platforms by young job seekers and employers. Mobile platforms are becoming more important in e-recruitment, according to the report. The research examines how social media platforms affect the recruiting process. The research combines primary and secondary data. To enhance recruiting, the study proposes exploring the efficiency of various tactics. According to the report, organizations should prioritize authenticity, diversity, and professional development opportunities to meet the expectations of the young generation in recruiting.

Keywords: E-recruitment, Job seekers, Social media, Professional development.

INTRODUCTION

Online recruitment, or e-recruitment, involves using web-based technologies to attract, evaluate, select, and recruit job prospects [1, 2]. Employers can quickly find talented workers and expand their talent pool staff *via* E-recruitment [3, 4]. Talent acquisition has become more data-driven and work-friendly due to the widespread use of new tools and technology [5, 6]. Online recruitment saves time and money and improves quality. E-recruitment aims to make hiring more efficient, effective, and affordable. While the recruiting process has advantages, it also has related obstacles [7, 8].

[*] **Corresponding author Sanjay Kumar Gouda:** Corporate Relations, GIET University, Gunupur, Odisha, India; E-mail: sanjaykumar@gmail.com

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Objectives

- Assess the effect of ATS software [9, 10].
- To assess data security and privacy-compliant e-recruitment trends
- Social media recruiting efficacy analysis.

Statement of Problem

Focused inquiry is needed to address significant concerns and issues in the fast-changing e-recruitment ecosystem. This study aims to address three issue areas in the e-recruitment sector [11, 12]. Employers are increasingly using ATS software to expedite their recruiting procedures, but there is limited information on its effectiveness and influence on recruiting, especially among youth. Concerns about data security and privacy grow as recruiting procedures become increasingly digital. Social networking must be strong for employee recruitment and branding. Social media recruiting tactics can help engage uncertain young people [13, 14]. To maximise social media recruiting results, issues, such as platform preferences, content relevancy, and applicant response rates, must be addressed. The knowledge of e-recruitment techniques must be enhancedin line with ethical, legal, and practical implications. A studyinvestigated the influence of ATS software [15]. This report analyses data security and privacy trends in e-recruitment and measures the efficiency of social media recruiting to provide suggestions for improving digital recruitment methods.

METHODOLOGY

Recent developments in the impact of the recruitment sector on young people are examined in this study. Structured questionnaires are created and delivered using Google Forms. Data are gathered from a varied group of young individuals who regularly use online employment marketplaces. A total of 101 surveys were completed, with 64 individuals providing data.

Designing Research

The research design is descriptive.

Data Sources

Main data: Well-structured questionnaires capture the main data. This data is authentic and obtained from respondents.

Relative data: Relative data comes from public and unpublished records, websites, pamphlets, journals, and magazines, based on numerous research studies.

Sample Size

The study sample size is 66.

Used Tools

- Simple percentage analysis.
- Rank study.

Limitations

- Sample respondents provided most of the study's data.
- Information is restricted since the research only includes youth.
- Only 65 people were sampled.

INTERPRETATION AND ANALYSIS

A Simple Percentage Analysis

An ATS (Application Tracking System) Respondent

Interpretation

According to the survey (Table **1**), 65.6% of respondents believe the Applicant Tracking System (ATS) software accurately evaluates applicants, 7.2% disagree, and 30.23% remain indifferent.

Table 1. Evaluation of candidates.

Particulars	Respondent count	Percentage
Agree	43	65.6
Disagree	5	7.2
Neutral	20	30.2
TOTAL	**66**	**101**

Interpretation

Table **2** shows that out of the respondents, 39.5% believe that the Applicant Tracking System software consistently gives accurate results, 61% agree that it

CHAPTER 31

Preventing Cyberattacks on the E-Banking System

Basi Reddy Avula[1,*] and **P. Chandrakanth**[1]

[1] *Department of Computer Science and Engineering, School of Computing, Mohan Babu University, Tirupati, Andhra Pradesh, India*

Abstract: There are a substantial number of security breaches that are revealed each year in the electronic banking (e-banking) system. These breaches bring to light the need to protect consumers and inform them about the dangers of being exposed to harmful acts that are implemented by cybercriminals. Attack and financial scams are growing more complicated and are being committed by a distinct category of criminals, which is something that both customers and financial institutions are aware of. Utilising technology as a component of their strategy, this class is becoming increasingly complex. In addition, a rise in the number of internal fraud and security breaches is anticipated by professionals as a consequence of the current global recession. First, this study aims to examine the literature on the subject of possible threats to the security of online banking services. Second, it seeks to identify methods and tools that can make online banking safer for consumers. Third, it presents the findings of a pilot investigation that looked at how Romanian consumers felt about online banking security.

Keywords: Cybercriminals, Consumer protection, E-banking, Financial scams, Security breaches.

INTRODUCTION

For a long time, people have been using electronic banking platforms as a better and more efficient way to perform their financial operations [1, 2]. Users with these electronic banking platforms are easy prey for cybercriminals, as these platforms are web-based apps accessible to anyone with an Internet connection [3, 4]. The need to eradicate the consequences of swiftly increasing cybercrime is a significant obstacle for online banking that necessitates further creative solutions. If issues with security are not adequately resolved, banks may not be able to reap the benefits of online banking [5, 6]. The use of Trojan horses, other harmful malware, transaction poisoning, phishing scams, pharming mode, spoofing, keylogging, screenlogging, and other unorthodox attacks may lead to identity

[*] **Corresponding author Basi Reddy Avula:** Department of Computer Science and Engineering, School of Computing, Mohan Babu University, Tirupati, Andhra Pradesh, India; E-mail: basireddy.a@gmail.com

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theft. Existing authentication techniques are also highly susceptible to social engineering attacks since they depend on the user's actions to determine how secure they are [7, 8].

From a security perspective, there is also the "trust gap," a supposed but unsubstantiated split between internet users who trust online banking because of their experience with other types of online activities and those who do not. There is a growing concern that the corporations banks hire to handle their information technology (IT) operations may not be adequately controlled, which might lead to a security breach in the data sent to and from these companies. The security challenges have been addressed *via* the development of several creative methods. Several writers have advocated for the incorporation of biometric features, such as fingerprints or iris patterns [9, 10]. When dealing with online banking, it is important to take precautions to guarantee that sufficient technological knowledge, security support, and supervision are in place. In highly exposed environments, such as e-banking platforms, the authenticating institution, the bank, has little control over the medium, which includes the Internet and the computer's connection used to access the platform from home. As a result, there is a notable lack of control over the users. This is known as the authentication gap.

The goal of this study is to classify the many risks that can compromise the safety of online banking. Finally, the research's suggestions for future study and training are discussed, and the findings of a pilot survey on Romanian consumers' perceptions of e-banking service security are presented. Researchers used both descriptive and exploratory techniques in this investigation [11, 12]. In order to learn about the most pressing problems with online banking security, descriptive research approaches are used [13, 14]. The study's findings were based on both primary and secondary data, with the former collected through a pre-designed questionnaire and the latter drawn from online databases, scholarly journals, polls, and news stories [15].

E-BANKING SECURITY

The four primary dangers of online banking are reputational, legal, operational, and strategic. When it comes to online banking, security is the most important operational risk. An example of an issue that cuts across many types of risk is a security breach that exposes the bank to legal and reputational risks in addition to operational risks, such as unauthorized access to client information. Consumer protection and reputational risk mitigation may also benefit from educating customers about security dangers, measures, and the informed use of technology. The concept of e-banking, as described by Essinger, is "to give consumers access to their bank accounts through a website and to allow them to enact specific

transactions on the account, provided compliance with stringent security checks." The terms "PC banking," "online banking," "Internet banking," "telephone banking," or "mobile banking" refer to various methods by which customers can access their bank accounts without physically being present at the branch. Many financial institutions that provide electronic banking services also provide advice to customers on how to make their online financial transactions safer.

Consumers who make online purchases often feel uneasy about the transaction, especially when it involves money. Customers are scared of security risks, according to several surveys. In general, people may view electronic banking services with a more sceptical eye due to the perceived increased danger. Some contend that when user actions are directly involved, the security problem becomes paramount in the context of online banking. According to experts, one of the biggest problems with expanding electronic service options is customers' fears about making online purchases. This research seeks to learn how present and future clients see internet banking. In sum, regardless of demographic, geographical, or psychological factors, there are common views on internet banking. Among the main "non-adoption" regions are concerns about online banking security and general ignorance about the service. When it comes to online banking, there are 17 different aspects of service quality, and one of them is security.

This study aimed to examine the rate of online banking use by customers aged 65 and older. According to the study, individuals aged 66 years and older tend to be slower to adopt new technologies. They found that senior customers who quit using online banking cited a lack of training or insufficient instructions as the reason. Online banking and better security measures were also cited as factors that inhibited their adoption, with users describing the websites as complicated and confusing. To make it easier for bank staff to obtain information, they suggested creating 3D websites using speech recognition and video technologies. According to their findings, the three most important elements impacting the acceptance of e-banking services are customers' aversion to change, the availability of the Internet, and customers' knowledge of e-banking. In accordance with their confident expectations, customers' security perceptions are the subjective probabilities to which they attribute the absence of unauthorised access to, storage of, and manipulation of their private information while in transit and storage.

VARIOUS FORMS OF ONLINE BANKING SECURITY RISKS

According to professionals, the most significant risks to the safety of online banking systems include denial of service, unauthorised access, data disclosure, and data modification. Attacks that aim to prevent users from accessing a

CHAPTER 32

Challenges Faced by Organisations in Implementing HR Practices in SMES Concerning Tirunelveli City

V. Praveen Kumar[1,*] and **J. Jeya Ani**[1]

[1] *Department of Commerce, St. Xavier's College (Autonomous), Palayamkottai. Affiliated to Manonmaniam Sundaram University, Abishekapatti, Tirunelveli, Tamil Nadu, India*

Abstract: This research examines the human resource (HR) implementation problems faced by small and medium enterprises (SMEs) in Tirunelveli City. SMEs struggle owing to limited funds, a small staff, and unique operating characteristics. This study will look at how these companies' hiring, training, and advancement practices are perceived by their employees. Primary data is provided by 600 workers from various industrial clusters using a descriptive study style. The use of descriptive statistics, one-way analysis of variance (ANOVA), and the Kruskal-Wallis test is prevalent. Male participation outnumbers female. Most responders are married and aged 31-40. Bachelor's degrees and certificates are the most prevalent forms of education. The analysis includes both technical and non-technical occupational cadres to achieve balance. Employees usually like recruiting and selection, especially formal interviews and recruitment and selection strategies. Individual job demands and abilities are met *via* learning and development opportunities. Promotion policies should be better.

Keywords: Employees' perception, Human resource practices, Management policies, SMEs.

INTRODUCTION

HR activities significantly affect company culture, employee engagement, and productivity [1, 2]. Compared to large organisations with well-established HR frameworks, SMEs face distinct hurdles in setting up successful HR practices. This chapter examines the firms in Tirunelveli City, particularly SMEs, as well as their HR policy implementation issues. Tirunelveli's business climate is boosted by several SMEs in textiles, IT, and manufacturing [3, 4]. SME employment and

[*] **Corresponding author V. Praveen Kumar:** Department of Commerce, St. Xavier's College (Autonomous), Palayamkottai. Affiliated to Manonmaniam Sundaram University, Abishekapatti, Tirunelveli, Tamil Nadu, India; E-mail: praveen@gmail.com

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growth are important to the local economy. However, the size of smaller organisations, their scarce funds, and specific operational features make the execution of HR policy difficult [5, 6].

Statement of the Problem

Small and medium-sized firms face cash and staffing shortages. If they prioritise short-term returns above long-term investments in people and business, allocating cash for comprehensive HR procedures may be difficult. This may hinder well-planned personnel development, training, and recruiting efforts. Additionally, skilled human resources specialists are scarce; SMEs may lack the resources and staff to give HR advice compared to larger organisations. Office managers and company owners regularly handle HR duties [7, 8]. Without HR professionals, personnel management and relations with workers may suffer [9, 10]. SMEs, particularly those with long-standing habits and inflexible organisational structures, sometimes resist change by resisting organisational changes [11, 12]. New HR strategies frequently need a shift in attitude and culture [13, 14]. Resistance from leaders or personnel accustomed to outdated ways may hinder the implementation of HR processes [15].

Objectives

The purpose of this survey is to:

1. Find out how workers feel about choosing new staff.
2. Evaluate how staff members' knowledge and skills in HR procedures have evolved.
3. To learn about the company's policies on performance management, promotions, and employee guidance.

Human resources are now central to all economic activity. Organisations must adapt their approaches to human resource management and make better use of their people and other resources if they want to thrive in today's global economy. For companies to enhance their adaptability and creativity, they need to discover innovative ways to attract, engage, and inspire passionate learners who can propel their growth. In a market that is becoming more competitive, a company's survival and success rely on how well it manages its resources, particularly human resources. The study's major goal is to inform the company's HR procedures.

CONCEPTUAL FRAMEWORK

Recruitment and Selection Challenges

Due to limited resources and budgets, SMEs struggle to hire and retain talented workers. The cultural and geographical differences of Tirunelveli City complicate problems. SMEs may struggle to assess individuals, find suitable roles, and define job requirements due to their smaller population and limited talent pools. SME workers often struggle to find formal professional development opportunities. Competing operational goals, insufficient funding, and an absence of a professional training infrastructure are all potential roadblocks to comprehensive learning programs.

SMEs in Tirunelveli Municipality have various skill sets and require tailored training initiatives, which can be difficult to create and implement. SMEs should prioritise learning and development, as well as recruiting and promotion (Fig. **1**). Organisations require recruitment tactics that fit their culture and long-term goals to locate promotion candidates. Learning and development investments improve workers' skills and prepare them for higher-level employment. However, recruitment issues and limited educational opportunities may lead to talent shortages and hinder employee progress in medium-sized businesses.

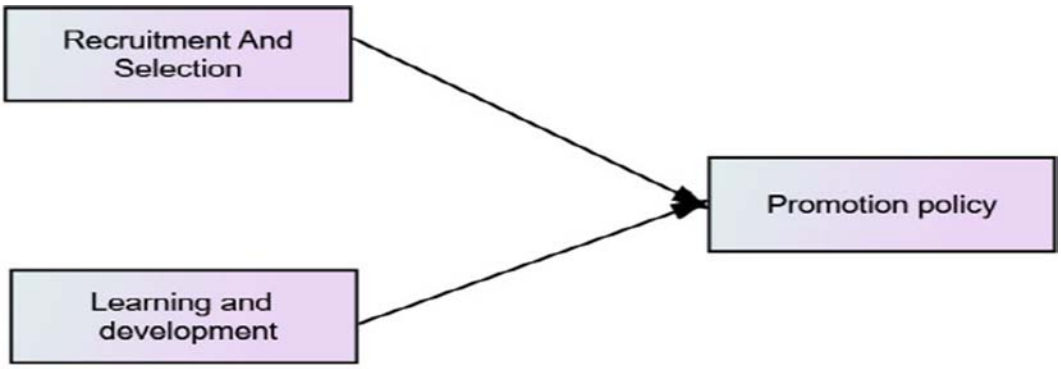

Fig. (1). Conceptual framework.

Research Methods

The research strategy used in this study is a descriptive one. The research obtained primary data from industrial cluster workers of several organisations. Secondary data was obtained from sources, such as websites, journals, and publications. The research employed simple random sampling of SMEs' personnel. The research had 600 samples. The statistical analysis tools used were One-way ANOVA, Kruskal-Wallis, statistics, and percentage analysis.

CHAPTER 33

Management Strategies for Building a Security Culture: Workforce Training and Awareness in Smart Manufacturing

Jenyo Bola Olufunke[1,*], M. Ashok Kumar[2], I. Laurence Aroquiaraj[3] and **Aliyu Mohammed[4]**

[1] *JEAP TechnoPreneur, Ilorin, Nigeria*

[2] *Department of Computer Science and Software Engineering, Skyline University Nigeria, Kano, Nigeria*

[3] *Department of Computer Science, Periyar University, Periyar, Tamil Nadu, India*

[4] *Department of Management, Skyline University Nigeria, Kano, Nigeria*

Abstract: A study on smart manufacturing management for cybersecurity is presented herein to fill the research gap regarding the complexities in cybersecurity of smart manufacturing systems. This paper seeks to investigate components of security culture, examine the implications of organisational structure, and suggest useful methods for workforce training and safety awareness programs. The research highlights an area in the literature that is underserved, especially regarding how these types of models are used to design SMTP curriculum. The research shows that effective security practices include security leadership, integration of security into job roles, and involvement across work areas. Security culture is largely shaped by organisational structure, among other factors, where flatness allows more flexibility within its hierarchy. As established, the gap exists only on paper, as adopting the social learning theory can be efficient when implementing training programs. Given these challenges, it emphasises the importance of contextually tailored communication and multi-channel approaches in awareness programs. These recommendations can have approaches aimed at creating a positive commitment within leaders, integrating job roles, and improving collaborative efforts across functions.

Keywords: Awareness campaigns, Security culture, Smart manufacturing, Social learning theory, Workforce training.

[*] **Corresponding author Jenyo Bola Olufunke:** JEAP TechnoPreneur, Ilorin, Nigeria; E-mail: bolajenyo@gmail.com

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INTRODUCTION

In today's era of rapid technological progress, the environment of manufacturing has changed completely. Smart manufacturing was born through the interconnection of technologies and data-driven processes for the sake of efficiency and innovation [1, 2]. Nonetheless, such an evolution has faced some challenges, with the need to safeguard the complex systems at the top of the list. The study focuses on creating a security culture within smart manufacturing, which includes training and awareness within the organisation's workforce [3, 4].

Background

A new era is on the horizon, called smart manufacturing, which is considered the fourth industrial revolution. The complex web of integration of AI and automated devices increasingly exposes their interconnected system to cybercriminals [5, 6]. The history preceding the modern digitised manufacturing process traces the pathway from manual labour to mechanical systems. Consequently, there is a necessity to protect the digital system used in current production activities [7, 8]. Indeed, there has been an upsurge in cases of cyberattacks aimed at manufacturing facilities worldwide, thus emphasising the need for improved security protocols.

Significance of the Study

This study addresses the vital importance of developing a security culture among employees in smart manufacturing [9, 10]. The first line of defence or the critical weakness in the modern security chain is the most exposed part as organisations become digitalised.

Scope and Limitations

The scope of this study is restricted to smart manufacturing and explores the ways to develop a security culture. Although there are many areas in the cybersecurity space, such an approach helps one explore particular issues and options associated with the intersection between technology and manufacturing [11, 12].

Research Questions

To guide the inquiry, the following research questions will be addressed:

1. What is the role of workforce training in creating a security culture in smart manufacturing?
2. How can awareness programs help enhance cybersecurity in the manufacturing industry?

Research Objectives

The objectives of this study are twofold:

1. Evaluate the role of workforce training in developing a security culture.
2. Evaluate the impact of cybersecurity enhancement in a smart manufacturing environment due to the awareness campaigns [13, 14].

Definition of Key Terms

For clarity and precision, the following key terms are defined:

Smart Manufacturing: Leveraging modern technologies to enhance manufacturing operations, including IoT, AI, and automated processes [15].

Security Culture: Cybersecurity culture is defined as the collective awareness, attitudes, and behaviours of individuals within an organisation toward cybersecurity.

STATEMENT OF THE PROBLEM

Overview of Smart Manufacturing

Smart manufacturing or intelligent manufacturing is another main characteristic of modern production, which involves the application of cutting-edge IT technologies and the utilization of data-driven mechanisms. This new strategy is unprecedented in terms of efficiency and innovation, but it entails rather complicated web security barriers.

Security Concerns in Smart Manufacturing

The new era of smart manufacturing has created numerous security problems, far exceeding the typical manufacturing risk profile. Such a system is now digitized and interconnected with the production systems; thus, there are a lot of cyber threats that pose a risk to them.

Lack of Security Culture

However, the biggest challenge is that the foundation of smart manufacturing systems, in terms of security culture development, plays a lesser role than required. The human factor is the most important when it comes to cybersecurity.

CHAPTER 34

Detection of Cyber-Attacks in Networks Using Machine Learning Techniques

U. Madhurima[1,*], Syed Gouse Basha[1] and **Mohammad Nazeeruddin[1]**

[1] *Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India*

Abstract: The phrase "Internet of Things" (IoT) describes a system that allows billions of linked devices to exchange data and coordinate their movements across a given area with little human involvement. While the sector of computing known as the IoT is growing at a fast pace, it is also vulnerable to a broad range of attacks because of the internet's infamously hostile climate. To solve this problem, practical countermeasures must be used to protect IoT networks, such as network anomaly detection. The ability to detect threats early is crucial for successful protection, even when complete prevention may be impossible. Due to the limited processing and storage capabilities of IoT devices, traditional, high-end security techniques cannot be used to safeguard an IoT system. Internet of Things devices can now remain online for longer periods without any type of human intervention. It is essential to create smart network-based security solutions using machine learning. Recent research has focused on using machine learning (ML) techniques for attack detection; however, limited attention has been given to detecting attacks specifically within IoT networks. This paper evaluates ML techniques for detecting IoT network attacks rapidly and efficiently, contributing to ongoing research. Bot-IoT is a new dataset-testing detection technique. Seven machine learning algorithms wereimplemented, with most achieving good performance. The Bot-IoT dataset yielded superior results, with additional characteristics retrieved during implementation compared to previous research.

Keywords: IoT, cyberattack, anomaly detection, machine learning, Bot-IoT.

INTRODUCTION

There is a worldwide concern about security and privacy in computer networks, and as information technology becomes more integrated into people's daily lives, computer security becomes more and more important [1, 2]. Since the Internet lies at the core of the IoT, any security risk that may affect the Internet might also affect the IoT [3, 4]. Security challenges associated with the Internet of Things

* **Corresponding author U. Madhurima:** Department of Information Technology, Andhra Loyola Institute of Engineering and Technology, Vijayawada, Andhra Pradesh, India; E-mail: madhurimauppalapati25@gmail.com

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(IoT) are becoming more pressing as its use becomes more pervasive in people's everyday lives, necessitating the creation of network-based security solutions. Although existing systems are effective in detecting some types of assaults, others remain difficult to spot [5, 6]. There is no question that more innovative approaches are needed to enhance network security, but the need for quicker and more accurate ways of detecting assaults is growing in tandem with the enormous rise in the quantity of data stored in networks [7, 8]. One of the best computational models for providing embedded intelligence in an IoT environment is ML. Several network security activities, including intrusion detection, botnet detection, and network traffic analysis, have made use of machine learning algorithms.

One of the most important aspects of any IoT solution is machine learning [9, 10]. It is the ability of a smart device to automatically change its state or behaviour depending on what it knows. Classification and regression are two examples of machine learning's (ML) many applications due to their ability to derive meaningful insights from data generated by either humans or machines [11, 12]. Additionally, ML has the potential to improve security services inside an IoT network [12]. ML is finding uses in several areas of cybersecurity, and the application of ML to attack detection difficulties is attracting a lot of attention [13, 14]. While several studies have used ML approaches to identify effective threat detection methods, there is a dearth of studies about detection methods that are well-suited to Internet of Things (IoT) scenarios.

The second category of detection techniques is anomaly-based detection. Any deviation from the expected behaviour of the network is seen as an attack by this class. This class's attractiveness lies in its capacity to identify unknown attacks. An inherent issue with anomaly-based techniques is the possibility of high false alarm rates (FARs), which may occur when legal and previously unknown actions are mistakenly classified as anomalies. A hybrid technique is available, which integrates anomaly detection with signature detection [15]. This research adds to the existing body of knowledge by examining the effectiveness of machine learning techniques in detecting assaults on IoT networks, which may be seen as a kind of defence against such attacks. They test the detection algorithms on Bot-IoT, a new dataset that includes both real and fake traffic from IoT networks, as well as several attack vectors. A Random Forest Regressor is used to extract features from this dataset. Achieving great performance is possible throughout the implementation phase by using seven distinct machine-learning methods: ID3, K-nearest neighbours (KNN), Quadratic discriminant analysis (QDA), Random Forest, AdaBoost, Multilayer perceptron (MLP), and Naive Bayes (NB).

Here are a few key points from the study:

- Researchers improved the detection of threats in the IoT network by testing ML algorithms on a new IoT dataset.
- They enhanced the performance of ML algorithms by removing irrelevant characteristics from the dataset and choosing the most relevant ones.
- Since there have only been a handful of studies using the Bot-IoT dataset so far, conducting research on it has the potential to have a substantial impact on the field.

The remainder of the article is organized as follows: The suggested method is shown in Section 2, and the specifics of its implementation are explained in Section 3. Section 4 presents the experimental data together with assessments, while Section 5 serves as the paper's conclusion and summary.

SUGGESTED METHOD

In this part, the researchers provided a technique for detecting assaults in IoT networks and gave a brief overview of the dataset used. To identify outliers using machine learning methods, the suggested approach employed several real applications and pre-processing. To begin, the CIC flowmeter was utilized to extract characteristics based on the flow from the fresh dataset. After that, the dataset was split into training and test sets after the data pre-processing procedure was carried out in the initial stage. To prepare data for use by machine learning algorithms, pre-processing was necessary. The feature selection stage followed these procedures and determined which attributes the algorithms used. In Fig. (**1**), the suggested method is outlined in general terms.

The Bot-IoT dataset was chosen for the tests because of its frequent updates, diverse attack coverage, inclusion of traffic generated by IoT devices, and the ability to extract additional characteristics from the original dataset. There are three primary types of assaults in this dataset, all of which stem from botnet scenarios: probing, denial-of-service attacks, and information theft.

IMPLEMENTING PROCESS

The primary goal of the tests is to assess how well machine learning algorithms can identify assaults on IoT networks, as mentioned before. This section details the set of data, ML methods, and implementation processes that were engaged.

CHAPTER 35

Co-authorship Network Analysis and Co-occurrence Network of Keywords in Digital Marketing Research from India

S. Lakshmi[1,*], **L. Santhi**[1] and **A. Senthilkumar**[2]

[1] *Department of Mathematics, PSGR Krishnammal College for Women, Coimbatore, Tamil Nadu, India*

[2] *School of Science and Information Technology, Skyline University, Kano, Nigeria*

Abstract: The field of digital marketing has recently emerged as a hot topic among academics in the sciences, the arts, and LIS. Papers published between 1992 and 2022 were searched for by the researchers using the Web of Science database. They discovered 1006 Indian publications. Both Biblioshiny and Vosviewer were used to examine the extracted data. This chapter examines the operation of co-authorship network analysis and its potential applications in the medical field.

Keywords: Digital Marketing, Marketing, Co-citation analysis, Co-occurrence network, Web of Science, Bibliometrics.

INTRODUCTION

Many nations' economies have been profoundly impacted by the advent of personal computers with Internet connectivity. Marketing has changed to keep up with the ever-changing globe and the fast advancement of information and communication technology in the digital era. No matter where you are or what time of day it is, digital marketing makes it easy to stay in touch with potential clients.

What we call “digital marketing” really encompasses all forms of advertising that reach consumers *via* online mediums, including websites, email, search engines, and social networks. Internet marketing is known by a variety of names, including digital marketing, web marketing, e-marketing, electronic marketing, and online marketing. Digital Marketing has become the most influential marketing platform

* **Corresponding author S. Lakshmi:** Department of Mathematics, PSGR Krishnammal College for Women, Coimbatore, Tamil Nadu, India; E-mail: lakshmisundervel@gmail.com

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for advertising products and services in contrast to traditional marketing [1, 2]. The increased level of social involvement, propagation, and correspondence plays a major role in the evolution of digital marketing, which has, in turn, enhanced the firm's ability to engage with its customers and keep them informed of the products and services.

A lot of studies have come out recently, especially around 2010, on how internet marketing may help sell things. The research on digital marketing metrics shows how important digital marketing is for both academics and everyday life. Backhaus and others looked at the intellectual structure of business-to-business (B2B) marketing by analysing the citations and co-citations of 1392 research articles that were published in well-known journals. There were four times between 1972 and 1978, 1987 and 1991, 1998 and 2000, and 2007 and 2009 when well-known marketing magazines came out. Some of these magazines were "Industrial Marketing Management," "Journal of Business-to-Business Marketing," and "Journal of Business and Industrial Marketing." Y. Wind, F.E. Webster, and P.J. Robinson are some of the researchers who are regularly mentioned. According to co-citation analysis, the study areas were Organisational Buying Behaviour and Personal Selling until the fourth phase, when Service Marketing, along with Relationship Marketing, took their place [3, 4]. Corley *et al*. (2013) then looked over 18 years' worth of research on internet marketing from the top 30 information systems journals, along with the top 5 marketing journals. In the first part of the study, a group of articles was collected. In the second phase, those articles were sorted into groups based on research methodologies. The results of the research were then sorted into groups based on Internet marketing subjects. The year 2010 was the most prolific in phase I, with 52 articles [5, 6]. Phase II findings indicated that formal theory was the investigation approach employed in 110 out of 411 publications. The Phase III statistics showed that business models were the most popular subject for Internet marketing, with 41.1% of the 411 articles falling into this category. There were 22.4% of stories on the state of online advertising, and 16.5% were about how well people were doing online. Fatima *et al*. (2017) looked into and found Chinese trends in research on internet commerce. Most of the study's results on internet commerce were on operations, logistics, social problems, and evaluation. Researchers from universities used internet tools to find that "marketing CRM issue" and "transformation issue" had the fewest research works. Alekseeva *et al*. (2019) utilised study papers from the Scopus library from 2010 to 2018 to find trends in how marketing has changed in the digital age [7, 8]. The number of articles written about "search engine optimisation" and "search engine marketing" went down over the course of this study. The United States is leading the way in the use of big data, which has been growing quickly lately. Getting emails is at the bottom of the list. Peter and Vecchia (2020) put together a digital marketing

package for small and medium-sized businesses in Switzerland after reading about digital marketing platforms, along with outlets. Not only did the poll fill in a gap in information, but it also gave small businesses an outline of the most essential digital marketing tools [9, 10]. There are 24 instruments in the digital marketing toolbox that was made, but these 11 are the most popular: According to the report, online PR, advertising on search engines, Search Engine Optimisation (SEO), social media, viral marketing, along with the company website are the digital marketing tools that are most often used and looked at [11, 12]. Kim and Lee (2021) say that digital marketing will be a big part of this technology change because it gives businesses the newest way to connect and talk to customers to stay updated, engage, supply, and conclude deals. In the study, the 5865 mentions from 141 papers were looked at and evaluated. The paper gave professionals and researchers thematic insights and consequences that could help them make better digital marketing efforts [13, 14]. Agarwal and Kumar (2021) looked at all the studies on green advertising that have been written in the last 30 years. One hundred thirteen publications from the WoS collection from 1999 to 2020 were taken out. Thematic grouping helped find nine subtopics as well as six big literature gaps that need more study on green advertising. Even though digital marketing is becoming more popular, there isn't a lot of academic research on it compared to other types of product promotion [15]. This study was done to give us a better understanding of how the research on digital marketing has changed over time.

GOALS OF THE RESEARCH

The study aimed to look at the appropriate study papers that were collected for the analysis to see how development and research in digital marketing work from the point of view of a multidisciplinary field. The following goals have been set for this study based on the aim of the investigation into digital marketing. To look at how global citations, as well as research in digital marketing, have changed over time. The objectives of this study are to identify key researchers and institutions by determining which authors have the highest H-index and which are most involved in collaboration trends. The research also aims to determine the most preferred types of documents among researchers.

METHODOLOGY

Performance analysis, along with science mapping, is the two main ways that bibliometric studies use library data to look into a certain scientific topic. A search using the keywords of the literature in the Web of Science database was conducted before this thorough review to make sure that there was no bias in the

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Satya Prakash Yadav

Dr. Satya Prakash Yadav (FIETE, SMIEEE) is an Associate Professor in Computer Science and Engineering at Madan Mohan Malaviya University of Technology, Gorakhpur. With more than 18 years of experience, he holds a Ph.D. from AKTU and has completed postdoctoral research in Brazil. He has authored four books, published numerous research papers, and holds six patents. Dr. Yadav has supervised multiple Ph.D. scholars and specializes in image processing, information retrieval, and feature extraction. He also brings industry and editorial experience with leading publishers and journals, and has made significant contributions to research, teaching, and academic leadership in his field.