Criteria No. : 3 - Research, Innovations and Extension
Metric No. : 3.3 Research Publications and Awards
Sub Metric No. : 3.3.1.1: Number of research papers in the Journals notified on UGC CARE list year wise during the last five years

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A. Y. 2023 - 2024

Sr. No.	Documents
1.	Women's Studies in Higher Education Institutions in Post-Independent India
2.	Softcomputing approaches for detection of mental health
3	Comprehensive Study on Emotion Detection with Facial Expression Images Using YOLO Models
4	Sanskrit to English Translation: A Comprehensive Survey and Implementation using Transformer Based Model
5	Music recommender based on the facial emotion of the user identified using YOLOV8
6	Revolutionizing higher education institute query system by linking custom knowledge base with large language models
7	An Approach to breast cancer detection with histopathological images using transfer learning
8	Subjective Question Bank Generation Using Large Language Models with Custom Knowledge Base
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ISO 9001:2015 QMS
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GENIUS

Peer Reviewed Refereed and UGC Listed Journal No. 47190

ISO 9001:2015 QMS
ISSN / ESSN

ISSN - 2279 - 0489
Volume - XI, Issue - II, February - July - 2023
Impact Factor 2020 - 6.538 (www.sjifactor.com)

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In Recognition of the Publication of the Paper Titled

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Journal of Network and Innovative Computing
ISSN 2160-2174 Volume 11 (2023) pp. 030-035
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Softcomputing approaches for detection of mental health

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Abstract: **We have simulated a dataset[21] using two most promising deep learning algorithms viz: Recurrent Neural Network (RNN) and Long short-term memory (LSTM). The accuracy reported by the RNN model is 0.78 whereas LSTM resulted in 0.82 accuracies. In conclusion, deep learning has the potential to provide early detection and treatment for mental health issues. However, further research is needed to improve the accuracy and reliability of these models and to evaluate their potential for widespread use in clinical settings. Deep learning techniques have shown great promise in the field of medical diagnosis, including the detection of mental health problems. This research aims to investigate the use of deep learning algorithms for the detection of mental health disorders, such as depression, anxiety and stress. The study will gather a large dataset of mental health-related data, including demographic information and self-reported symptoms. The data will then be processed and analyzed using deep learning algorithms, such as Convolutional Neural Networks and Recurrent Neural Networks, to build models that can accurately predict the presence of mental health disorders. The results of this research will contribute to the development of more efficient and effective mental health screening methods, which could greatly improve the early detection and treatment of mental health problems.**

Keywords: Deep learning, Mental health, Anxiety, RNN, LSTM, Machine Learning.

I. Introduction

Mental illness is a category of medical disorder that alters a person's thoughts, feelings, or behavior (or all three), and research has proven that it can have an effect on one's physical health[1] Multimodal Deep Learning Framework is a state-of-the-art technique that utilizes multiple modalities of data to recognize mental disorders. This approach combines the power of deep learning and multiple data sources to provide a more comprehensive and accurate diagnosis of mental health conditions[2]. Users of social media often share their feelings or emotional. states through their posts. In this study, we developed a deep learning model to identify a user's mental state based on his/her posting information. y collecting various mental-health-related data from social media, we aim at developing a deep learning model that can identify a user's mental disorder, including depression, anxiety, bipolar, borderline personality disorder (BPD), schizophrenia, and autism[3] This can include analyzing large amounts of patient data to identify patterns and predict outcomes, developing personalized treatment plans based on individual patient data, and using natural language processing to analyze patient-provider communication. The hope is that deep learning can improve the accuracy and efficiency of mental health assessments and treatments.

1. Image analysis [4]: Using deep learning algorithms, medical images such as brain scans can be analyzed to detect signs of mental health disorders.[4,5,6]
2. Speech and language analysis [7]: Speech and language patterns can provide insight into a person's mental state. Deep learning algorithms canbe trained on large datasets to identify speech and language patterns associated with mental health disorders.
3. Text analysis [8]: Natural language processing techniques can be used to analyze written text, such as electronic health records, to detect signs of mental health disorders.
4. Wearable data analysis [9]: Wearable devices can collect data on a person's physical and physiological state, which can provide insight into their mental health. Deep learning algorithms can analyze this data to detect signs of mental health disorders.

II. Literature Review

The paper "Multimodal Deep Learning Framework for Mental Disorder Recognition" by Zhang et al. (2020) presents a deep learning framework for recognizing mental disorders using multimodal data. The authors aim to improve the accuracy of mental disorder recognition by utilizing multiple modalities such as speech and facial expressions[10] In conclusion, this paper presents a novel and effective approach for recognizing mental disorders using multimodal deep learning. The authors demonstrate that combining speech and facial expression data can lead to improved accuracy in mental disorder recognition. To quickly and automatically identify seafarers who need psychiatric counseling and

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Keshav Mishra Keshav Mishra received his HSC in 2020 and is currently pursuing a Bachelor's Degree in Computer Science from Sheth LUJ & Sir MV College, Mumbai University, Mumbai, Maharashtra, India. His current research focuses on deep learning, machine learning, machine translation for Sanskrit language, facial emotion detection using YOLOv5, transformer models for Sanskrit to English translation, machine learning techniques for detecting mental health issues. In addition, he is also exploring the field of data science and data analytics. This event sparked his interest in research, which led him to explore more career options in this area. He feels grateful for the opportunities and experiences he has had so far and looks forward to seeing what the future holds

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Journal of Information Assurance and Security.
ISSN 1554-1010 Volume 18 (2023) pp. 058-066
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Comprehensive Study on Emotion Detection with Facial Expression Images Using YOLO Models

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Abstract: **Facial expressions, a kind of nonverbal communication, can be used to interpret human emotions. A technology known as facial emotion recognition studies facial expressions in photos and movies. Due to the numerous applications, it has, emotion identification is a crucial subject. One of the most difficult pattern recognition challenges is emotion detection using facial expressions. Emotion detection using facial expressions includes a number of face-related applications, such as face verification, facial recognition, face clustering, and many more. In this article, we have given a comprehensive study of face and emotion detection using YOLO models. We have described the architecture of the YOLO model and its versions used for the review objectives. We have implemented various YOLO models and presented the experimental results of YOLOv5. We infer from our comparative study that YOLO models are explored for face detection but very little work has been found for expression detection. The initial hypothesis of this review was that there is an increase in accuracy with every new version of the YOLO model for face and emotion detection which turns out to be false.**

Keywords: Emotion Detection, Face Detection, Deep Learning, Convolution Neural Network, Pattern Recognition, YOLO.

I. Introduction

Recent developments in pattern recognition, machine learning, and biometrics analysis, along with the increased usage of cameras, are mainly responsible for the expansion of the FER (Facial emotion recognition) technology. For applications like surveillance, self-driving cars, and gaming that need quick and precise object recognition, YOLO is a popular option [1].

Emotion recognition has been added to the YOLO architecture recently, enabling it to categorize the emotional state of people in a picture or video. In order to do this, the YOLO model must first be trained on a sizable dataset of faces and emotions, such as the Affect- Net dataset, before it can be used to forecast the emotions of people in fresh photos or videos. Happiness, sorrow, wrath, surprise, and contempt are among the feelings that YOLO-based emotion detection systems frequently identify [2]. In several applications, including security, human-computer interaction, and other fields, YOLO-based emotion detection has been found to be relatively quick and accurate [3].

To research facial expressions, cameras are utilized to identify faces and capture real-time human responses to circumstances. The way that the facial muscles flex and contract differently in response to each facial expression makes it easier for deep learning algorithms to recognize emotion. It has been discovered that YOLO-based emotion recognition is reasonably quick and accurate, and it is employed in many applications including market research, security, and human-computer interface [4]. The quality of the training data, the size of the model, and the facial expressions of the people in the image are a few examples of variables that can have an impact on how well YOLO-based emotion detection systems perform. There are seven basic human emotions: surprise, contempt, rage, fear, happiness, and sadness. These emotions can be recognized by a range of facial expressions, such as the position of the mouth and the positioning of the eyes and brows [5].

This technology can be employed, and a variety of applications can be made, using the YOLO algorithm. Depending on their response, it may be clear if they are eager to talk to us or not. Face recognition can be used for a number of purposes, such as personal identification in surveillance

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Keshav Mishra Currently pursuing a Bachelor's Degree in Computer Science from Sheth LUJ & Sir MV College, Mumbai University, Mumbai, Maharashtra, India. His current research focuses on deep learning, machine learning, machine translation for Sanskrit language, facial emotion detection using YOLOv5, transformer models for Sanskrit to English translation, machine learning techniques for detecting mental health issues. In addition, he is also exploring the field of data science and data analytics. This event sparked his interest in research, which led him to explore more career options in this area. He feels grateful for the opportunities and experiences he has had so far and looks forward to seeing what the future holds.

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International Journal of Computer Information Systems and Industrial Management Applications.
ISSN 2150-7988 Volume 15 (2023) pp. 227-235
© MIR Labs, www.mirlabs.net/ijcisim/index.html

Received: 16 Dec, 2022; Accepted: 27 May, 2023; Published: 9 June, 2023

Sanskrit to English Translation: A Comprehensive Survey and Implementation using Transformer Based Model

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Abstract: **Sanskrit is an ancient language with a rich literary and cultural heritage, but it is not widely spoken today. However, its importance in understanding ancient Indian texts and culture has driven researchers to develop machine translation systems for Sanskrit to English. The goal of these systems is to automatically translate Sanskrit text into English, making it accessible to a wider audience. Language study and the use of human communication languages to interact with machines is a prominent research domain in Natural Language Processing [NLP]. The Sanskrit language being the oldest, we found that there is limited work done to include Sanskrit and its translation using NLP. In this study, we use NLP and Deep learning Transformer based attention mechanisms to translate Sanskrit to English. We have used a corpus dataset to train our model and reported 20% accuracy using the Bhagavad Gita dataset and 72% accuracy using the Bible dataset which can be considered a good standard. As we increase the number of lines in the dataset the Model gives better accuracy. We compared the Transformer Model and Long Short-Term Memory (LSTM) Model. Our model performs better than our previous models used to translate the Sanskrit language. They will also aid the linguistic community in saving the time-consuming process of Sanskrit to English translation.**

Keywords: Sanskrit Translation, NLP, Deep Learning Model, LSTM, Transformer Model

I. Introduction

Sanskrit is an ancient language with a rich literary and cultural heritage, but it is not widely spoken today. However, its importance in understanding ancient Indian texts and culture has driven researchers to develop machine translation systems for Sanskrit to English. The goal of these systems is to automatically translate Sanskrit text into English, making it accessible to a wider audience. Since then, many researchers have worked on various aspects of machine translation for Sanskrit, including language modeling, machine learning algorithms, and corpus development. Most machine translation systems for Sanskrit use statistical machine translation (SMT) techniques [1,5], where the system is trained on large parallel corpora of Sanskrit and English text. This allows the system to learn the statistical patterns in the translation of words, phrases, and sentences, and to use this information to translate new text. One challenge in translating Sanskrit to English is the morphological complexity of the Sanskrit language. Sanskrit words can have many different forms depending on the context, and these forms must be correctly identified and translated in order to produce accurate translations [1]. To address this, some machine translation systems for Sanskrit use morphological analysis to identify the correct form of words before translation. Another challenge is the translation of proper nouns, such as names of people, places, and organizations. These names often do not have an equivalent in English and require special handling to produce accurate translations. To address this, some machine translation systems use named entity recognition techniques to identify proper nouns and translate them correctly. Although Sanskrit plays a significant role in Indian culture and history, nothing has been translated into or out of it whereas many different natural languages are accessible for this information. The speakers of various languages must use translation services or pick up the other language in order to access this material. Since not everyone can learn numerous

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Paper ID - Title #147 - An approach to breast cancer detection with histopathological images using transfer learning

Authors Patel, Vaibhav Anil; Kanojia, Mahendra G; Nair, Vaishavi V

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Paper ID - Title #48 - Subjective Question Bank Generation Using Large Language Models With Custom Knowledge Base

Authors Sayed, Amaan; Kanojia, Mahendra G; Nabajja, Subhashish

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Paper ID - Title #229 - Choledochal cancer region detection in hyperspectral tissue images using U-Net

Authors Nabajja, Subhashish; Kanojia, Mahendra G; Yadav, Tapasya Manoj

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Sub Metric No. : 3.3.1.1: Number of research papers in the Journals notified on UGC CARE list year wise during the last five years

A. Y. 2022 - 2023

Sr. No.	Documents
1.	**Forecasting of COVID-19 Cases in INDIA Using ARIMA and AR Time-Series Algorithm**
2.	**Soft computing and image processing techniques for COVID-19 prediction in lung CT scan images**
3	**Malignancy Detection in Breast Histo-Images Using Multi-layer Perceptron**
4	**Machine Learning and Image Processing Techniques for Covid-19 Detection: A Review**
5	**Smart Gloves Controller for Drones Using Raspberry Pi & NodeMCU**
6	**Emotion detection based on facial expression using YOLOv5**
7	**Machine Learning Approach For Detection Of Mental Health**
8	**LSTM based model for Sanskrit to English Translation**

2022-23

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13th Soft Computing and Pattern Recognition (SoCPaR'21)

On the World Wide Web

Certificate of Participation

This is to certify that the following paper was presented offline (recorded presentation) during the 13th International Conference on Soft Computing and Pattern Recognition held on December 15-17, 2021.

Paper ID - Title #58 - forecasting of covid-19 cases in India using ARIMA and AR time-series algorithm

Authors Dilip Prajapati and Mahendra Kanojia

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Springer

2022 - 2

International Journal of Hybrid Intelligent Systems 18 (2022) 111–131
DOI 10.3233/HIS-220009
IOS Press

Soft computing and image processing techniques for COVID-19 prediction in lung CT scan images

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Abstract. COVID-19 is a contagious respiratory illness that can be passed from person to person. Because it affects the lungs, damages blood arteries, and causes cardiac problems. COVID-19 must be diagnosed quickly. The reverse transcriptase polymerase chain reaction (RT-PCR) is a method for detecting COVID-19, but it is time consuming and labor expensive, as well as putting the person collecting the sample in danger. As a result, clinicians prefer to use CT scan and Xray images. COVID-19 classification can be done manually, however AI makes the process go faster. AI approaches include image processing, machine learning, and deep learning. An AI model is required to diagnose COVID-19, and a dataset is necessary to train that model. A dataset consists of the information from which the model is trained. This paper consists of the review of different image processing, machine learning and deep learning papers proposed by different researchers. As well as models based on deep learning and pretrained model using gradient boosting algorithm The goal of this paper is to provide information for future researchers to work with.

Keywords: COVID-19, image processing, machine learning, deep learning, pretrained model

1. Introduction

Humans have encountered many contagious diseases throughout history, resulting in pandemics and epidemics [1]. There were no advanced answers to these difficulties in the past, which resulted in several negative human consequences. COVID-19 [2] is a novel disease kind that has arisen. It's a member of the SARS family [3]. According to WHO, there were 198,778,175 confirmed cases of COVID-19 as of mid-August 2021, with 4,235,559 deaths and a total of 3,886,112,928 vaccination doses [4]. However, unlike in the past, there are now significantly more effective methods for detecting and diagnosing COVID-19, including RTPCR [5]. However, RT-PCR is not only time expensive, but it also has a high false negative rate [6]. As the prevalence of covid 19 grows, a better approach is required to address these issues. This is where AI [7] comes in. In the past, AI has proven to be extremely beneficial in the medical field [8]. AI has come a long way. In [147], Elleuch Mohamed et al. employed a pre-trained VGG-16 architecture to recognise characteristics in plant leaves in agricultural fields. Valappil et al. applied CNN-SVM machine learning method [148] for vehicle detection utilising Unmanned aerial vehicles (UAVs). For Arabic word detection from natural photos, Ouliadji et al. used ensemble learning approaches such as Support Vector Machine, Neural Networks, and Adaboost boosting algorithm in [149]. However, because AI alone cannot solve the problem, CT scan and X-ray images are used. Using CT scan images and transfer learning techniques, Souza et al. utilized Mask R-CNN for lung segmentation in 2021 [150]. In the medical industry, CT scan and CXR images are employed for a variety of purposes [9,10]. Deep Learning [11], Machine Learning [12], and Image Processing [13] are some of the AI technologies that can be utilised to distinguish COVID-19 patients from CAP (Community Acquired Patients) [14].

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Paper ID - Title #80 - Malignancy detection in breast histo-images using multi-layer perceptron

Authors Mahendra Kanojia

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Paper ID - Title #68 - Machine learning and image processing techniques for covid-19 detection: a review

Authors Neeraj Venkatasia L. Appari, Mahendra G. Kanojia and Kritik B. Bangera

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This is to certify that the following paper was presented offline (recorded presentation) during the 13th International Conference on Soft Computing and Pattern Recognition held on December 15-17, 2021.

Paper ID - Title #67 - Smart gloves controller for drones using raspberry pi & nodemcu

Authors Kritik Bangera and Mahendra Kanojia

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This is to certify that the following paper was presented online using Zoom platform during the 22nd International Conference on Intelligent Systems Design and Applications held on December 12-13, 2022.

Paper ID - Title #160 - Emotion detection based on facial expression using YOLOv5

Authors Awais Shaikh, Mahendra Kanojia and Keshav Mishra

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This is to certify that the following paper was presented online using Zoom platform during the 22nd International Conference on Intelligent Systems Design and Applications held on December 12-13, 2022.

Paper ID - Title #208 - Machine Learning Approach For Detection Of Mental Health

Authors Rani Pacharane, Mahendra Kanojia and Keshav Mishra

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This is to certify that the following paper was presented online using Zoom platform during the 22nd International Conference on Intelligent Systems Design and Applications held on December 12-13, 2022.

Paper ID - Title #161 - LSTM based model for Sanskrit to English Translation

Authors Keshav Mishra, Mahendra Kanojia and Awais Shaikh

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A. Y. 2021 - 2022

Sr. No.	Documents
1.	**Impact of Covid 19 on advertising industry**
2.	**Breast Cancer Detection Using Texture Features and KNN Algorithm**
3	**Comparative Multinomial Text Classification Analysis of Naïve Bayes and XGBoost with SMOTE on Imbalanced Dataset**
4	**College Student Lifestyle Query Classification Using Multi-Model Ensemble Learning with Polling, Technique**

Purana (पुराणम्)

(Print Only) ISSN : 0555-7860

Certificate of Publication

This is to certify the paper Entitled

IMPACT OF COVID- 19 ON ADVERTISING INDUSTRY

Authored By

Ms. Charmy. S. Shah
Research Scholar, JJT University (Reg no: 29821085) & Assistant Professor at Laxmi Charitable Trust's Sheth L.U.J College of Arts & Sir M.V. College of Science & Commerce.

Published in
Vol. LXIV, No. 1 (VI), 2022
Purana (पुराणम्)
ISSN : 0555-7860
UGC Care Listed Group 1, Peer Reviewed and Referred Journal

ज्ञान-विज्ञान विमुक्तये

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This is to certify that the following paper was presented online during the
12th World Congress on Nature and Biologically Inspired Computing (NABIC 2020)
held on the world wide web during December 14 - 16 , 2020.

Paper ID: 27

Paper Title: Breast cancer detection using texture features and KNN algorithm

List of Authors: Durgadevi Murugan and Mahendra Kanojia

Springer

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Issued On: December 17, 2020

3rd International Conference on Computational Intelligence in Pattern Recognition
CIPR 2021

Organized by Institute of Engineering & Management Group
Department of Computer Application and Science
Date: 24th & 25th April, 2021, Kolkata, India

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Dr. Asit Kumar Das
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REF NO. CIPR/2021/73

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The organizing committee places on record the contribution made by *Ashish Chaturvedi(Presenting Author), Santosh Yadav, Mohd. Abuzar Mohd. Haroon Ansari, Mahendra Kanojia* through the presentation of the paper titled ***College Student Lifestyle Query Classification Using Multi-model Ensemble Learning with Polling Technique in CIPR 2021.***

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REF NO. CIPR/2021/121

CIPR 2021

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A. Y. 2020 - 2021

Sr. No.	Documents
1	**A review on classification of breast cancer histopathological images using convolutional neural networks**

ISSN: 0974-1011
A Special Issue of International Journal Of Computer Science And Applications Vol. 13, No.1, Jan-Mar 2020

A review on classification of breast cancer histopathological images using convolutional neural networks.

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Abstract— **Breast Cancer is worldwide registered as one of the common threat to women. There is an increasing death rate in women because of breast cancer. Breast cancer can be cured or lifespan of the patient can be increased if it is detected at an early stage. It is necessary to validate patients histopathological conditions for detection of cancer. The histopathologist are the experts to examine the case. Performing the classification procedure manually is very time consuming and prone to error, based on human expertise. So to subdue this lack of accuracy and consumption of time, researchers around the world are experimenting with various soft-computing methodologies for automated diagnosis of breast cancer. Convolutional Neural Network (CNN) is impending neural network with deep learning capabilities and promising results for breast cancer classification. In this paper we give a review about CNN and hybrid-CNN based breast cancer classification models. The paper also reviews the work where deep learning environments such as GoogLeNet is used to achieve high accuracy and efficiency in detection of breast cancer.**

Keywords- Convolutional Neural Network (CNN); Deep Learning; GoogLeNet;

I. INTRODUCTION

Breast Cancer is a malignant tumour in the breast and eventually, it spreads to other organs in body. Breast cancer spreads majorly through the lymph system or through blood cells. It occurs in men and women both, but comparatively, male breast cancer is rare. Worldwide breast cancer is considered one of the most common cancer in women[20]. According to Globocan 2018 reports, among all cancers breast cancer shares 14% in women, new cases registered is 1,62,468 and 87,090 is the number of deaths due to this diseases[1]. Tarly stage detection of breast cancer is essential for the best results of the case and the survival of the patient. The process of detection is carried out by histopathologists with the help of tissue samples, it delays the diagnosis process and affected by external factors [3].

Researchers around the world are developing various techniques for early and accurate detection of breast cancer. The histopathological samples are converted into histopathological images that are classified into weather benign (non-cancerous) or malignant (cancerous). The artificial intelligence machine learning algorithms are implemented for automated breast cancer detection[13]. The convolutional neural network is recent and promising techniques for image classification. This paper gives insight of the types of CNN methodologies and its implementation in GoogLeNet [17] environment.

II. LITERATURE REVIEW

K. Kumar and A. C. S. Rao [2] extracted patches of images and used a convolutional neural network and classified the image into benign or malignant for breast cancer detection. The BreakHis database was used with 9,109 breast tumour images for classification, 90% accuracy is reported. The classification accuracy of CNN depends on the extraction of features in different layers with the variation in parameter S. Angara, et al.,[3] presented the neural network breast cancer classification for whole-slide histopathological images. The classification process includes patch generation. The BreakHis database with 7909 images were used to carry out the experiment. The research states that deep learning techniques can do an accurate classification of the histopathological images. In 2018 S. K. Jafarbiglo, et al.,[4] proposed a system for classifying histopathological images based on nuclear atypia criterion. The proposed method does data augmentation, data processing and feature extraction with CNN. Researchers could achieve an accuracy of 84.23%.Convolutional neural network model with image enhancement methodologies was proposed by A.-A. Nahid, et al.,[5] in the year 2017, where three machine learning models were tested for classifying histopathological breast images, the machine learning models were Conventional CNN model, Merge CNN Model and MaxMin Convolutional Model. The classification was performed using the BreakHis breast image dataset and the most accuracy was shown by the conventional model. F. A. Spanhol, et al.,[6] trained the CNN model using image patches and reported a better efficacy rate for histopathological image classification. Random selection and sliding window mechanism was implemented for image

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A. Y. 2019 - 2020

Sr. No.	Documents
1	**Computer Aided System for Nuclei Localization in Histopathological Images Using CNN**
2	**A study on area occupied by nuclei and pixel intensity-based digital image features for breast cancer histology**
3	**Image Processing Techniques for Breast Cancer Detection: A Review**
4	**Application Of Internet Of Things (IoT) In Healthcare**
5	**Audio Fingerprinting: Review and Comparison**
6	**Breast Cancer Detection Using WBCD**
7	**Mobile Cloud Data Offloading: Limitations and Solutions**
8	**Internet of Things (iot) based Robotic Car**
9	**Recognition and Verification of Indian Currency Notes using Digital Image Processing**

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Ajith Abraham
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Proceedings of the 11th International Conference on Soft Computing and Pattern Recognition (SoCPaR 2019)

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Computer Aided System for Nuclei Localization in Histopathological Images Using CNN

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Abstract. Today, the health care industry is extensively using computer aided diagnostic expert system. The expert system for the diagnosis of breast cancer using the histopathological image is the need of time. Analysis of histopathological images is challenging due to its complex architecture with irregularly shaped nuclei. Convolutional neural network (CNN) is a promising technology emerging in recent years. We have designed a computer based expert system to identify nuclei in histopathological images. The system is developed using python programming language. We have used the BreaKHis breast cancer dataset for experimentation and Kaggle dataset for convolution masks generation. Nucleases are localized using custom design Keras and U-Net Hybrid CNN (KUH-CNN) model. The systems can be used by histopathologists for the diagnosis of malignancy in the tissue. The system can also aid the researchers who can implement a machine learning algorithm on the nucleases detected images for further analysis.

Keywords: Breast cancer detection · BreaKHis dataset · Convolution neural network · Nuclei detection

1 Introduction

Medical image processing considerably deals with object localization or segmentation of the region of interest (ROI). The general approach for nuclease identification follows the process of image enhancement, nuclei segmentation and image post processing [1–3]. Morphological analysis plays a vital role in such a process [2, 3]. Albeit the general image processing approach has proved to be the most adapted procedure for nuclease segmentation, it has limitations in identifying overlapping nuclei, noisy image and intensity levels [2, 3]. The identification of nucleases can be viewed as an object localization problem [3, 17], with nucleases as an object of interest on the visually heterogeneous background. Study shows that CNN [4–8, 14, 15] has proved to produce

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A. Abraham et al. (Eds.): SoCPaR 2019, AISC 1182, pp. 226–234, 2021.
https://doi.org/10.1007/978-3-030-49345-5_24

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A study on area occupied by nuclei and pixel intensity-based digital image features for breast cancer histology

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Abstract : Breast cancer is the most commonly occurring form of cancer in women, majorly occurring in the age group of 40-70 years and the second most common cancer worldwide. There are several signs of progress in image processing techniques and machine learning algorithms thataid the medical domain. The image processing works with image enhancement and object localization. Machine learning algorithms input image features to train the breast cancer detection model. It is important to extract the image features accurately to achieve promising results. This paper covers in depth study of areas occupied by image nuclei and intensity based on the features used for the detection of breast cancer.

Keywords : Breast cancer, Image processing, Breast cancer Image Features, Feature Extraction

INTRODUCTION : Breast cancer causes most of the cancer deaths among women worldwide. According toGlobal Cancer Observatory (GCO) report, in the year 2018, the number of new breast cancer cases are 20,88, 849 (11.6%) and number of deaths due to breast cancer are 6,26,679 (6.6%) which makes breast cancer the second largest cause of death due to cancer. Breast tissue from the suspected area is extracted and mounted in the slide for histology. A detailed study of the tissue slide is carried by the histopathologist for the diagnosis of breast cancer. The overall process of mounting the tissue on the slide and microscopic study takes a substantial amount of time. Further, the reliability of the diagnosis is based on the experience and expertise of the histopathologists. The design of medical diagnosis systems is called on to aid the histopathologists, to speed up the process of diagnosis of breast cancer and to produce more accurate results. Histopathological images are primary input in the process to design an automated breast cancer detection system. These images can be captured using a high-resolution camera placed on the eyepiece of the microscope (R & K, 2018). Image processing techniques are implemented on the captured images to enhance the image and extract the digital image features. Datasets of the extracted features are used to train various machine learning algorithms. Image segmentation and postprocessing techniques are used to identify the object of interest in the image. Once the objects of interest are identified, feature extraction techniques are used to convert the images into numerical data set representing extracted features (Belsare, et al., 2015).

In depth understanding of the various digital image, features are essential for the researchers before the design of any automated breast cancer diagnosis system. Accuracy of results produced by the machine learning algorithms highly depends on the type and quality of feature set used. Research unaware of the role of features in the image may lead to false accuracy prediction. Also, understanding of feature set aids the researchers for the selection of features based on the type of images and the interest of research. In this paper, we briefly discuss the breast cancer histopathological digital image feature which composed of the area occupied by nuclei and pixel intensities (Cao, et al., 2016), (Rajyalakshmi, et al., 2017).

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19th International Conference on
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On the World Wide Web December 3-5, 2019

http://www.mirlabs.net/isda19

December 05, 2019

Certificate

This is to certify that the following paper was presented during the ISDA 2019 Conference:

Paper ID: 93

Paper title: Image processing techniques for breast cancer detection: A Review

Authors: Mahendra Kanojia, Mohd. Abuzar Mohd. Haroon Ansari, Niketa Gandhi and S. K. Yadav

Yours sincerely,

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REVIEW OF RESEARCH
ISSN: 2249-894X
IMPACT FACTOR: 5.7631(UIF)
UGC APPROVED JOURNAL NO. 48514

APPLICATION OF INTERNET OF THINGS (IoT) IN HEALTHCARE

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ABSTRACT

The Internet of Things (IoT) can be simply defined as connecting to the internet all the physical places and things in the world for the vast amount of benefits it offers. Once connected to the internet one can send or receive information or both. Smart things have an ability to send and/or receive information. IoT is gaining vast recognition from a wide range of domains like agriculture, healthcare, academia, transportation, manufacturing etc by the development of smart systems. This paper focuses on the application of IoT in Healthcare systems which allow achieving excellent personalized healthcare at affordable costs. The application of this technology in healthcare domain allows medical facilitators and centers to operate more competently giving patient better treatment compared to the conventional methods. This paper discusses five such applications used in the healthcare domain. Further, it discusses the benefits offered by introducing this technology in the domain and also the challenges faced in implementing such systems in real life. The paper concludes by discussing the future of IoT in healthcare and how it has opened a world of possibilities for the next decade to see a revolution in the treatment and diagnosis of disease.

KEYWORDS — *healthcare, Internet of Things(IoT), IoMT, medical devices.*

INTRODUCTION

IoT as defined means that connecting to the Internet all the things in the world for the tremendous benefits it gives to the people worldwide in different domains. The subset of this is when we just refer to all the things related to a medical domain i.e medical device and application are connected to each other and can help monitor or track the status of patients with different ailments. This is termed as the Internet of Medical Things (IoMT) or healthcare IoT. The medical devices communicate to each other as they are connected via the online computer networks. These devices further linked to cloud platforms on which the captured data can be stored and used by the medical professional for analysis. It helps in improving and safeguarding patient's life by taking timely decisions related to their health. The concern medical professional can use the data received from IoMT to take healthcare decision of that particular patient. According to [1] IoMT will reach worldwide $136.8 billion by 2021. As of now, 3.7 million medical devices are connected to each other, transmitting critical information of the patients to the healthcare systems to which

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This is to certify that **Kamana Tripathi** from **Sheth L.U.J. and Sir M.V. College, Andheri(E)**, Mumbai has attended the *International Interdisciplinary Conference On* **'Recent Trends in Science'** and presented a paper / poster entitled **Audio Fingerprinting: Review and Comparison.**.

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This is to certify that **Aniruddha Deshmukh** from Sheth L.U.J. and Sir M.V. College, Andheri(E), Mumbai has attended the *International Interdisciplinary Conference On* **'Recent Trends in Science'** and presented a paper / poster entitled **Internet of Things (IoT) based Robotic Car**

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Journal of Information Assurance and Security.
ISSN 1554-1010 Volume 13 (2018) pp. 030-037
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Recognition and verification of Indian currency notes using digital image processing

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Abstract: **The occurrence of counterfeit notes can be detrimental to the effective running of monetary systems of any nation. These counterfeit notes can be distributed by terrorist and other criminal organization and be used to fund illegal activities. This paper examines methods to enhance the security features of recently introduced Indian currency notes. The introduction of the INR 500 and 2000 notes in November 2016 resulted in some discourse concerning the security features of these new Indian currency notes. The wide occurrence of counterfeit Indian currency notes in the denominations of INR 10, 20, 50, 100, 500, 1000 has been reported over recent years. There is an expectation that these newly introduced INR 500 and 2000 may also be counterfeited and distributed illegally by criminal gangs and terrorist groups. This paper proposes a novel currency recognition system where the counterfeit currency is automatically recognized without any human intervention. The proposed system provides an interface to recognize the Indian currency notes and authenticate its validity. The system also identifies the counterfeit notes by using a scanner and various image processing methods for shape recognition. Various image features were used to distinguish between counterfeit and non-counterfeit notes. The study used an image database of Indian notes to access the accuracy of the proposed system. The experimental results show that the accuracy of the system proposed is close to 90% with a satisfactory level of sample processing. The accuracy of this identification was found to be diminished for sample notes which were damaged.**

Keywords: counterfeit notes, feature extraction, image processing, Indian currency.

I. Introduction

India experienced one of the biggest financial operations ever executed after the country's independence in late November 2016 [1]. This operation carried out by the Indian Federal government was targeted at the massive flow of 'black money' in the Indian market economy. It has been reported that up to INR 400 crores of fake currency was circulating in the Indian cash economy [1]. This fake currency was found to be mostly of higher denomination notes which are INR 500 and 1000. The last decade has seen great disruption of the world economy, and changes in the regulation of the financial systems with the introduction of the Euro currency and the ever-increasing importance of the Asia economies [1], [2]. There has also been a deregulation on markers which has resulted in both the increased exchange of money between countries through electronic systems. Despite this, the cash economy still remains the principal economy of India where a large proportion of the population does not have bank accounts and live below the poverty line. The avoidance of tax in property and other industries also relies on large percentages of payments to be carried out through cash transactions where this cannot be easily traced by government and banking agencies [1]. The cash economy has also been the avenue for criminal gangs and terrorist organizations to fund their activities and to gain an advantage by the introduction of a large sum of counterfeit notes.

The last few years have seen the widespread use of currency note recognition systems by banks and other agencies. These systems have been used in ATMs and for the counting and identification of large quantities of currency notes. These systems are able to recognize and classify specific paper currencies and reject notes from other paper currencies. These currency recognition systems use a number of techniques to distinguish between notes. Some systems are based on the recognition of different serial numbers for different denominations [3]. The drawback of these systems is that they require datasheets of the serial numbers for each batch of currency notes. Other systems are based on the recognition of optical features. The earliest optical recognition machines were primitive mechanical devices with high failure rates. The current OCR devices provide a high accuracy and a based on the detection of various image features such as variations in color, shapes and other markings [4].

The use of optical recognition systems for the identification of counterfeit currency notes is one possible technique to assist government agencies and banks to remove these notes from circulation. This study proposes a system which uses image processing techniques and various optical features of Indian currency notes to detect analogies in these notes. This paper will evaluate the accuracy of this system and outlines the implications for using this system in reducing the circulation of fake currency notes in India.

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