



EDU-BOT: AI-POWERED SMART CHATBOT FOR KNOWLEDGE MANAGEMENT

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ABSTRACT

The global pandemic has profoundly impacted various aspects of human life, including education. One of the significant challenges faced by students during this period was organizing and accessing educational documents remotely. To address this issue, we propose an AI-driven system integrated with a chatbot. This study introduces a smart knowledge management system that begins with user authentication via face recognition. Leveraging libraries such as OpenCV, TensorFlow, and Face_Recognition, our system achieves high accuracy in face recognition, with Face_Recognition library chosen for its superior performance.

The chatbot component facilitates seamless searching and accessing of study materials such as notes, textbooks, and question banks stored in a designated folder accessible through hyperlinks. To enhance usability, a user-friendly graphical interface (GUI) is developed using the Tkinter library. This AI-powered smart knowledge management system effectively streamlines access to required documents, providing a robust solution for educational document management in a post-pandemic era.

Index Terms: AI, chatbot, smart knowledge management, face recognition, OpenCV, Tensor Flow, educational technology, document retrieval

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I. INTRODUCTION

Many things changed during the covid pandemic; one such example is the education system. The delivery of education had to change from offline to online. Theory classes, laboratories, assessments, exams, training and skill development programs, everything shifted to online mode. A lot of ICT tools were explored and utilized. All the knowledge was in the form of documents on the system. The library wasn't available for students and there were no hard-bound books to refer. That's when soft copies of the book and notes became more prominent. Documents were downloaded multiple times from various sources and were saved abruptly. The computer system was flooded with a

greater number of notes and books; managing and retrieving the documents effectively and efficiently was a challenge. The searching of the document takes a lot of effort particularly when the documents have been saved multiple times at multiple locations. This results in stress for

students during exams. So, to address this issue, there is a need for a smart system that helps to search and retrieve the document effectively and quickly. Therefore, this study proposes a chatbot that is based on Artificial Intelligence (AI) technique to organize, search and retrieve the documents.

To provide secure access to the documents, face recognition is used for authentication. In



addition to documents, the proposed AI based chatbot helps the users with cafeteria information (Menu and cost of food items). Currently, chatbots are used by teachers to conduct quizzes to students and their automatic evaluation. But there aren't many chatbots which can interact directly with students or users along with their authentication. Here, a chatbot has been developed using the AI technology that serves the purpose of providing security to the user and easy access of study materials in the form of hyperlink.

II. LITERATURE SURVEY

- Bhaumik Kohli, Tanupriya Choudhury, and Shilpi Sharma proposed various approaches to developing conversational agents. A chatbot is a typical agent capable of communicating with users using natural language. Despite the existence of numerous chatbot platforms, building data-driven systems remains challenging due to the substantial amount of required data. This paper explores these agents implemented in Python, emphasizing natural language expressions. Additionally, it provides web connectivity to evaluate chatbots on a web-based platform, facilitating the analysis of human-chatbot interactions.
- Satyendra Praneel Reddy Karri and B. Santhosh Kumar explored chatbots as software programs that interact with users using natural language. Their research aimed to determine if chatbots can convincingly mimic human interactions, drawing inspiration from the introduction of the ELIZA chatbot in 1966. They discussed various approaches and technologies for chatbot development, highlighting NLTK, a Python module for natural language processing. Today, virtual assistants like Siri, Cortana, Google Assistant, and Alexa, along with speech-based search engines, are in high demand, particularly in automating customer service in businesses. Chatbots are increasingly used for information retrieval in dialogue systems, aiming to accurately understand user queries and generate appropriate responses.
- In response to the pandemic's impact on education, E. Kasthuri and S. Balaji proposed a chatbot as a convenient tool for student learning. They addressed the decreased interaction between students and teachers in online education systems. Their study focused on designing a chatbot tailored for MATLAB practical datasets, enabling students to ask questions in natural language. The chatbot processes these queries using natural language processing and deep learning technologies to provide accurate answers, thereby enhancing student-teacher interaction and support.
- Shilun Lin and Fei Su introduced a progressive strategy for training machines to detect faces in diverse settings. They developed the Fully-connected Face Classifier (FCFC), which learns to distinguish faces across various poses, expressions, occlusions, and blurs. This model was then converted into the Fully Convolutional Face Detector (FCFD), capable of handling faces of arbitrary sizes in images. Finally, they combined different FCFDs with varying receptive fields and sliding strides to detect faces of different sizes within a given image scale. Their experiments, conducted on the Fddb face detection benchmark dataset and social network selfies, demonstrated promising results, particularly in detecting blurred or occluded faces.
- Tanvir Ahmed and Prangon Das conducted a comparative study on face recognition using Convolutional Neural Network (CNN)-based models like AlexNet, VGG16, VGG19, and MobileNet. They utilized transfer learning and fine-tuning techniques with these pre-trained models, originally trained on the ImageNet dataset. Their experiments, implemented using the Keras API with a TensorFlow backend in Python, involved training, validation, and testing on a custom dataset of 10 celebrity identities. The results



indicated that while VGG19 exhibited higher validation accuracy, MobileNet achieved superior test accuracy.

III.EXISTING SYSTEM

Face recognition is the process of verifying the identity of a person by capturing the essential facial features. These systems are used in various data processing systems to identify personalities. The procedure involved in recognizing faces is explained as below.

a) Step 1: Face Detection - It is the process of detecting the face of a person in an image or video. The person in the image or video might be either looking straight or tilted. This is the fundamental step in face recognition.

b) Step 2: Face Analysis - The essential features of the detected face are captured. The geometry of the face is read by the software. The important factors are the distance between both the eyes, the depth of the eye sockets, the distance between forehead to chin, the type of the cheekbones, and the nature of the chin, lips and ears. The aim is to identify the facial landmarks that are key to distinguishing the face.

c) Step 3: Creating faceprints - The essential features of the face that is captured is converted to numerical values. The numerical code is called a face print. Each person has their own face print that is different for each individual.

d) Step 4: Comparison and Recognition - The obtained face prints are stored as an array and compared with the images in the existing dataset. If a corresponding match is found, the recognition is performed, else alternative action is performed.

IV.PROPOSED SYSTEM

The proposed system, titled "Edu-bot: An AI-based Smart Chatbot for Knowledge Management System," aims to address the challenges faced by students during the pandemic in organizing and accessing educational documents. Leveraging cutting-edge technologies, the system introduces a

multifaceted approach. First, user authentication is implemented through face recognition, utilizing OpenCV, TensorFlow, and the Face_Recognition Library to ensure a high level of accuracy. This adds a layer of security and personalization to the knowledge management system. The core functionality of the system involves a chatbot designed to assist users in seamlessly searching and accessing the required study materials, such as notes, textbooks, and question banks. The chatbot relies on hyperlinks created within a designated folder structure, facilitating efficient document retrieval. To enhance user interaction and accessibility, a user-friendly graphical user interface (GUI) is developed using the Tkinter library. The overall goal of the Edu-bot system is to provide students with an effective and effortless means of accessing educational resources, thus mitigating the challenges posed by document organization during the pandemic.

V.SYSTEM ARCHITECTURE

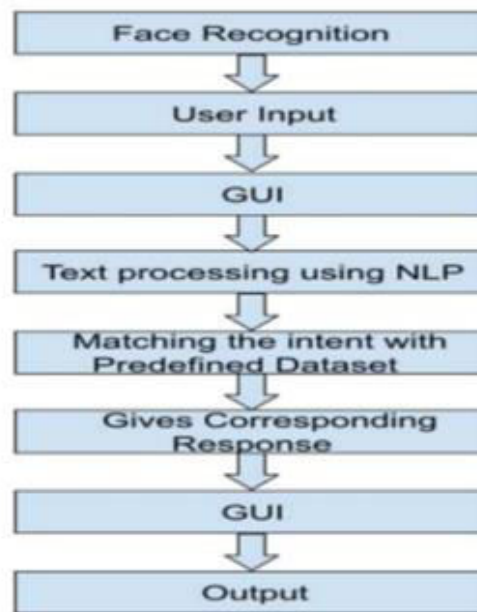


Figure 1. System Architecture

VI.IMPLEMENTATION: MODULES

Face Recognition Module:



This module encompasses the implementation of face recognition using OpenCV, TensorFlow, and the Face_Recognition Library. It is responsible for authenticating users securely, ensuring that only authorized individuals can access the knowledge management system.

Chatbot Module:

The chatbot module is designed to assist users in searching and accessing educational materials efficiently. It interprets user queries, processes natural language, and generates appropriate responses. The chatbot utilizes hyperlinks within a predefined folder structure to navigate and retrieve specific study materials.

Document Management Module:

This module focuses on the organization and management of educational documents within the system. It includes features for storing, indexing, and updating study materials such as notes, textbooks, and question banks. The module ensures that the document repository is well-structured and easily navigable by the chatbot.

Graphical User Interface (GUI) Module:

The GUI module, developed using the Tkinter library, provides the visual interface for users to interact with the system. It includes elements such as buttons, menus, and displays that enhance the user experience. This module contributes to the user-friendly design of the system, facilitating easy navigation and interaction.

Security and Access Control Module:

This module is responsible for enforcing security measures within the knowledge management system. It works in conjunction with the face recognition module to control access to the system. Additionally, it may include features such as user authentication, authorization, and encryption to safeguard sensitive educational materials.

VII.RESULTS:

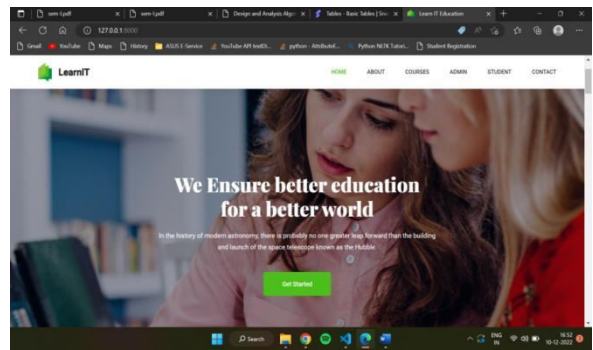


Figure .2

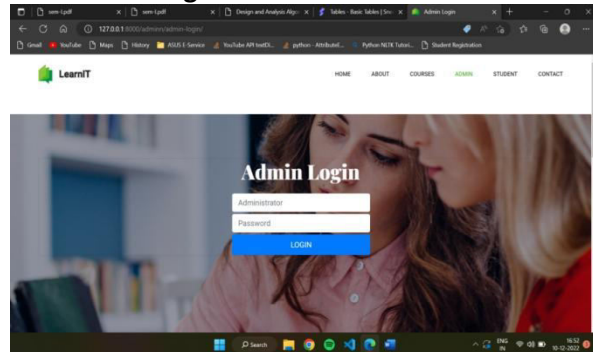


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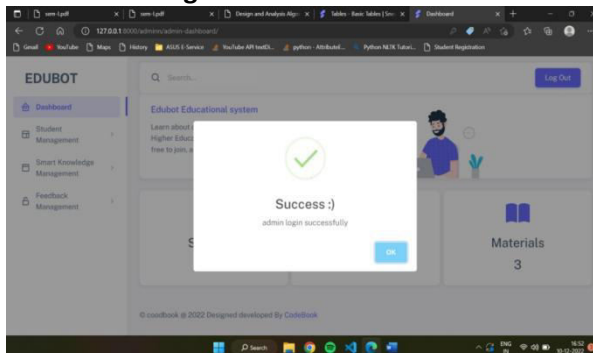


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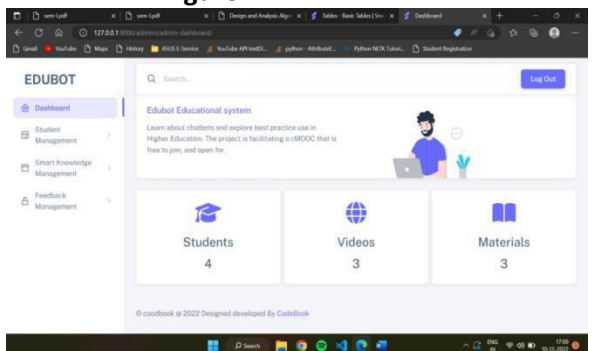


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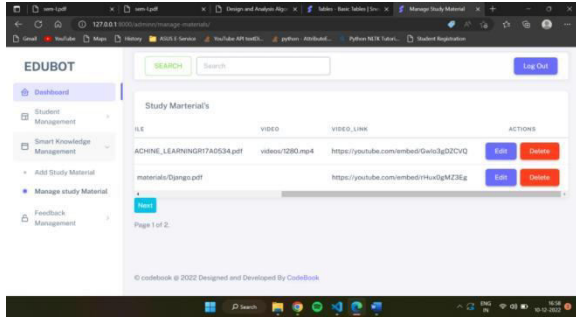


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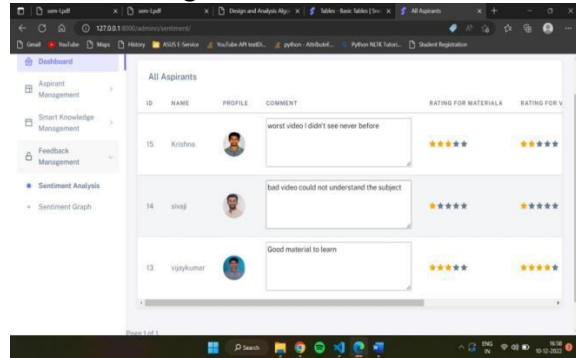


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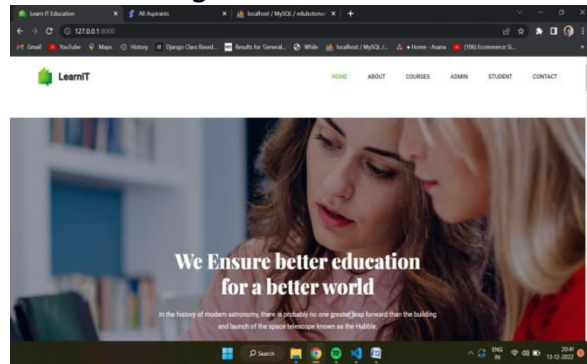


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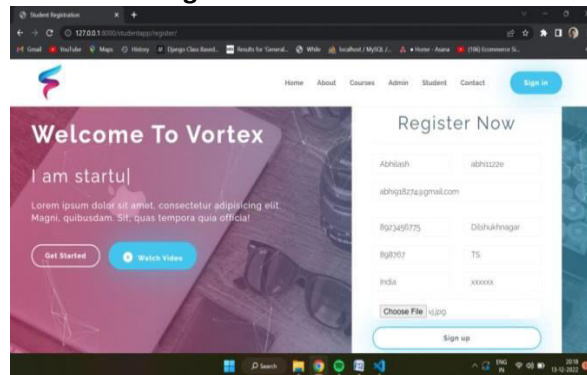


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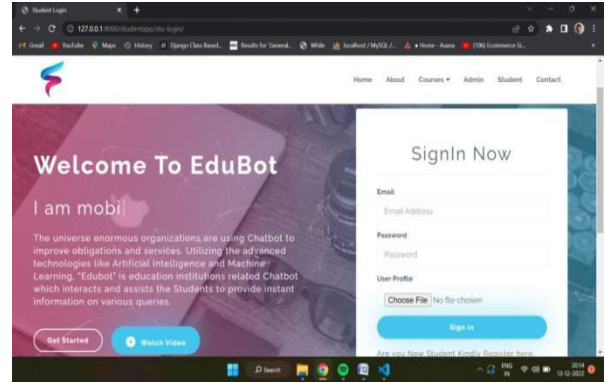


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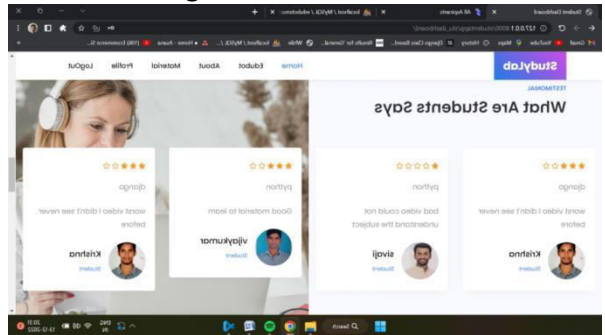


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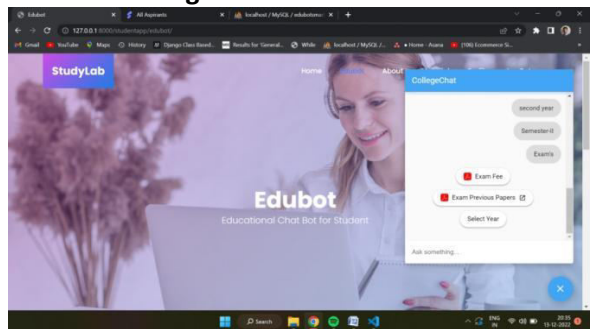


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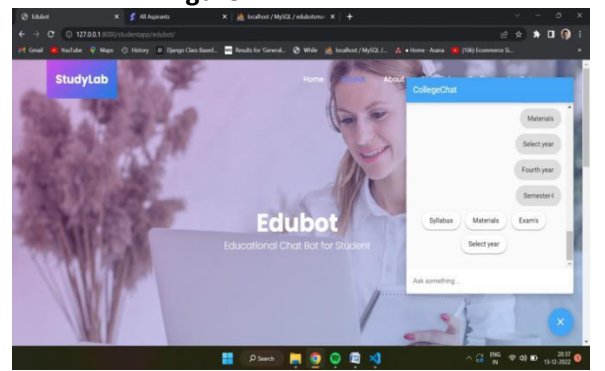


Figure .13



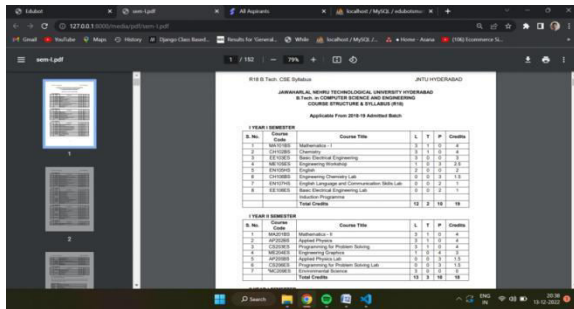


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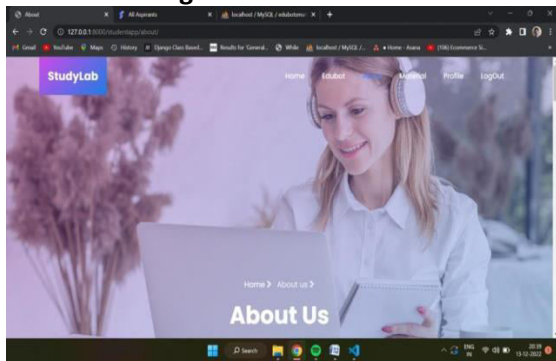


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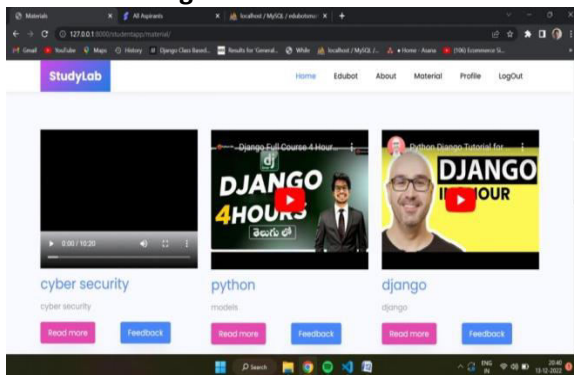


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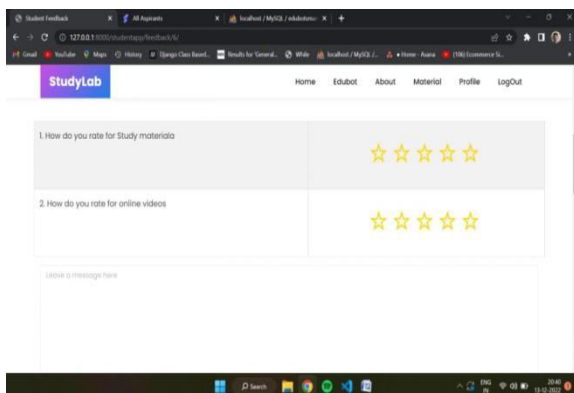


Figure .17

VIII.CONCLUSION

Currently, the chatbots are used in most of the industries such as business, e-commerce, etc. The AI based smart chatbot system is designed to be used in educational institutions by students to access their study materials and videos. This will help students to get all the required materials during the examination which will help them to prepare well. Additionally, students' details will also be displayed.

The usage of this knowledge management system results in saving a lot of time and money as the chatbot eliminates the effort to search for examination materials manually. This avoids the necessity to take printouts of the documents. All the materials and details will be organized in a specific manner which is easy to handle.

One of the main advantages of this bot is that it can be used in any domain by just changing the dataset. It can be implemented for different organizations by uploading corresponding datasets. Also, it can be either developed as an app if required or can be implemented in any of the organization's websites. Changing the training algorithm and increasing the number of training steps will improve the accuracy. This chatbot provides cost effective solution since there isn't much hardware involved.

The bot is authenticated through face recognition. When the bot is unlocked, the user is given two options. He can either get access to multiple documents or access documents individually. Multiple documents can be obtained by just clicking on the hyperlink in the GUI else the user can access the individual documents by interacting with the bot. If another user tries to access the bot, the kernel will die and hence security of the chatbot is maintained.

IX.FUTURE ENHANCEMENT

In future study, this bot can be extended to give more precise and effective responses by giving speech as an input. It can be integrated in institution's websites further helping students to use it easily.



X. REFERENCES

- [1] Bhaumik Kohli, Tanupriya Choudhury, Shilpi Sharma and Praveen Kumar 'A Platform for Human-Chatbot Interaction Using Python' IEEE, 16- 18 Aug. 2018, ISBN:978-1-5386-5658-7
- [2] Satyendra Praneel Reddy Karri and B. Santhosh Kumar, 'Deep Learning Techniques for Implementation of Chatbots' IEEE, 2020 International Conference on Computer Communication and Informatics (ICCCI), ISBN:978-1-7281-4515-0.
- [3] E. Kasthuri and S. Balaji, "A Chatbot for Changing Lifestyle in Education," 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV),2021, pp.1317-1322, doi: 10.1109/ICICV50876.2021.9388633
- [4] S. Lin and F. Su, "FCFD: Teach the machine to accomplish face detection step by step," 2016 IEEE International Conference on Image Processing (ICIP), 2016, pp. 3214-3218, doi: 10.1109/ICIP.2016.7532953.
- [5] T. Ahmed, P. Das, M. F. Ali and M. -. F. Mahmud, "A Comparative Study on Convolutional Neural Network Based Face Recognition," 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), 2020, pp. 1-5, doi: 10.1109/ICCCNT49239.2020.9225688..
- [6] S.V.Viraktamath, Mukund Katti, Aditya Khatawkar and Pavan Kulkarni, "Face Detection and Tracking using OpenCV", July-August 2013, The Standard International Journals (The SIJ), Vol. 1, pp. 45-50. ISSN: 2321– 2403.
- [7] N. J. Wang, S.C. Chang and P. J. Chou. Taipei, Taiwan,' Face Detection in Real Time Based on HOG'. IEEE, DOI:10.1109/ISPACS.2012.6473506, 2012. International Symposium on Intelligent Signal Processing and Communications Systems. pp. 333-337. ISBN: 978-1-4673-5081-5.
- [8] C. Saligram, Deepali B K, Gowri K S, J Ajay Kumar and J. R. Munavalli, "Voice Controlled Personal Health Assistance Device using Natural Language Processing and Random Forest Disease Classifier" 2020 Journal of Critical Reviews, Vol. 7, Issue 15, pp.3255-3265.
- [9] J. Cai, J. Li, W. Li and J. Wang, "Deep learning Model Used in Text Classification," 2018 15th International Computer Conference on Wavelet Active Media Technology and Information Processing (ICCWAMTIP),2018, pp.123-126, doi:10.1109/ICCWAMTIP.2018.8632592
- [10] L.Kluger, "The Open Look graphical user interface and its toolkits," IEE Colloquium on User Interface Management Systems, 1989, pp. 3/1-3/3.

