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Voice Based Email System for Physically Handicapped People

Deepali Ahir[1], Shantanu Shinde[2], Kunal Patil[3], Nishant Gore[4], Prasad Mahajan[5]
Department of Computer Engineering, MES Wadia COE, SPPU, Pune, 411001

Abstract: ***In today's digital age, email has become an essential mode of communication. However, using traditional email systems can be challenging for people with physical disabilities who may not be able to operate a keyboard or mouse. To address this issue, we have developed a Voice Based Email System for Physically Handicapped People. This system enables users to access email services using their voice and facial recognition, eliminating the need for manual input. The system supports features like user registration with face recognition, secure login using face detection, and voice-controlled mail operations such as composing, deleting, and checking unread emails. By providing a hands-free and user-friendly interface, our project aims to promote digital inclusion and make email communication easier and more accessible for physically challenged individuals.***
Keywords: Voice Recognition, Face Detection, Email Automation, Physically Handicapped, Accessibility, Speech-to-Text, Text-to-Speech.

I. INTRODUCTION

In the modern world, communication plays a vital role in personal and professional life, and email is one of the most commonly used communication tools. However, traditional email systems require the use of physical devices like a keyboard and mouse, which can be a major barrier for people with physical disabilities. These individuals often face challenges in operating standard input devices, which limits their ability to communicate independently. To overcome this challenge, we have designed a Voice Based Email System for Physically Handicapped People. This system uses voice commands and face recognition to provide a hands-free, user-friendly way to access and manage emails. Users can register and log in using facial recognition, eliminating the need to type passwords. Once logged in, they can perform various email functions like composing emails, deleting messages, and checking unread mails just by using their voice.The aim of this project is to promote digital accessibility and independence for physically handicapped users. By integrating speech-to-text and face detection technologies, our system offers a practical solution that enhances communication without relying on manual input. This project not only supports inclusivity but also showcases how technology can be used to improve lives.

II. LITERATURE SURVEY

The integration of speech and facial recognition technologies into assistive systems has shown remarkable potential to enhance the independence and communication abilities of individuals with physical disabilities. Voice-based and facial recognition systems are increasingly being used in human-computer interaction (HCI) solutions to provide accessibility in scenarios where traditional input methods such as keyboards and touchscreens are not practical. This section reviews the existing literature and technologies that contribute to the foundation of our proposed system.

A. Voice Recognition in Assistive Technologies

Voice recognition has become a central component of many assistive applications due to its natural and hands-free interaction capabilities. Early research by Rabiner and Juang (1993) laid the foundation for speech recognition models, introducing fundamental algorithms like Hidden Markov Models (HMMs) that enabled machines to process spoken words. Over time, advancements in deep learning have led to more accurate and responsive speech recognition systems.

Projects such as Google Voice Access and Apple's Siri have demonstrated how speech interfaces can allow users with motor impairments to perform complex tasks through voice commands alone. According to Aloulou et al. (2016), voice-controlled systems can significantly enhance the autonomy of disabled individuals, especially when performing daily digital tasks like sending messages or browsing the internet. However, these systems often require stable internet connections and may struggle with diverse accents or speech impairments.

B. Face Recognition for Secure Authentication

Facial recognition has emerged as a reliable biometric method for secure and contactless authentication. Zhao et al. (2003) outlined the effectiveness of face detection algorithms in various applications, noting their suitability for accessibility solutions. Modern approaches like Convolutional Neural Networks (CNNs) have improved accuracy, enabling real-time face verification in varied lighting conditions and facial expressions.

In assistive systems, facial recognition eliminates the need for traditional login credentials such as passwords or PINs, which may be challenging for physically handicapped users to input. Studies by Schroff et al. (2015) on the "FaceNet" model highlight the potential of facial recognition in secure and seamless authentication, which is essential for personalized applications like email systems.

C. Existing Assistive Communication Systems

Several existing systems aim to assist differently-abled individuals in communication. The "Voice-Based Email for Blind" project by Jayant et al. (2012) introduced a speech-based interface that allowed visually impaired users to compose and read emails. Although this system was beneficial for blind users, it did not include any biometric login feature and lacked robust error handling for voice inputs. Similarly, voice-enabled virtual assistants like Amazon Alexa and Google Assistant offer accessibility features, but they are not specialized for tasks like email management tailored to physically disabled users.

Furthermore, Kaur and Sharma (2019) developed a voice-based text editor to help users dictate and edit content. However, such systems are often limited by their dependency on constant internet access and do not provide multi-layered security or task-specific modules like email handling.

D. Challenges in Current Systems

Despite technological advancements, there are still several challenges in creating a fully accessible system for physically handicapped individuals:

1) Accent and Language Variability: Many voice recognition systems face difficulty interpreting commands accurately in cases of speech impairment, regional accents, or multilingual input.
2) Privacy and Security Concerns: Facial recognition, while convenient, raises concerns around biometric data storage and misuse if not securely handled.
3) Limited Customization: Most existing systems are general-purpose and do not cater specifically to the needs of physically handicapped users.
4) Dependence on Internet Connectivity: Many voice-enabled services require constant internet access, limiting their usability in low-connectivity regions.

E. Gaps in the Literature

While there has been significant progress in both voice and facial recognition technologies, there remains a gap in integrating these two into a unified, secure, and offline-capable system for email communication tailored to physically handicapped users. Most of the existing literature focuses either on voice or face recognition in isolation and rarely in the context of email management.

Additionally, there is a lack of user-centric studies that evaluate how physically handicapped individuals interact with these technologies in real-life scenarios. As highlighted by Kumar et al. (2021), inclusive design and accessibility testing are crucial for the success of assistive systems.

III. METHODOLOGY

The development of the Voice-Based Email System for Physically Handicapped People follows a structured methodology to ensure accessibility and user-friendliness. It begins with requirement analysis, identifying the challenges faced by users with physical disabilities and evaluating suitable technologies like voice recognition and face detection. In the system design phase, a modular architecture is created with a simple, voice-navigable interface and audio feedback.

The voice recognition module enables users to give commands verbally using speech-to-text conversion, while the text-to-speech module reads out emails and system responses. A face recognition module is implemented for secure login, ensuring only authorized users can access the system. The email handlingmodule integrates with SMTP and IMAP protocols for sending and receiving emails through voice commands.

Feedback is collected to identify areas of improvement, and updates are made accordingly. The system is regularly maintained to ensure performance and compatibility. This methodology ensures the system is intuitive, secure, and empowering for users with physical impairments.

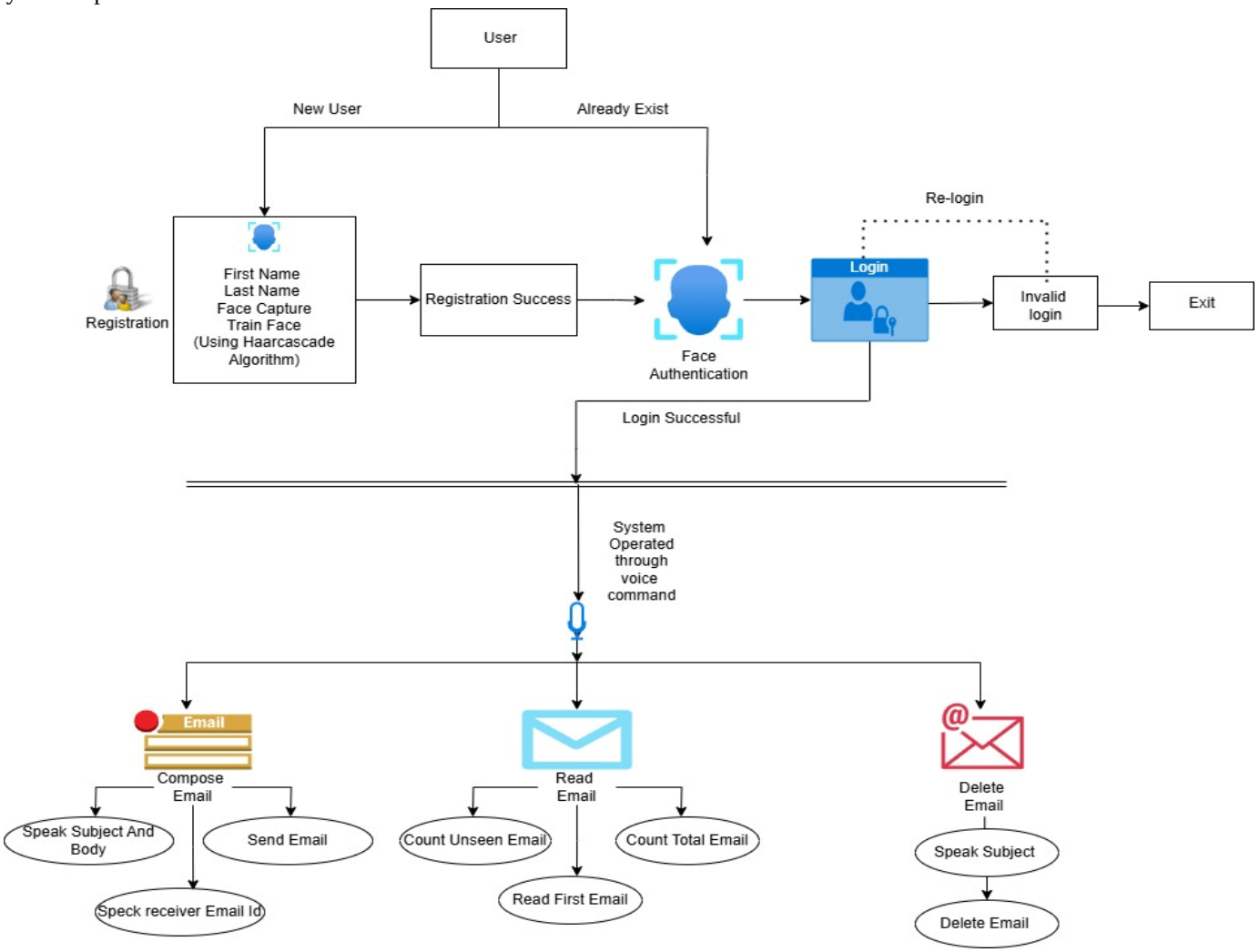


Fig. 1. System Architecture

1) Requirement Gathering

The first step in the development process involved gathering detailed requirements from physically handicapped individuals. We conducted interviews and surveys to understand the challenges they face when using traditional email systems, which typically require keyboard and mouse inputs. By understanding these needs, we were able to design a system that would allow users to operate email functions using voice commands and facial recognition, thereby eliminating the need for physical input devices.

2) Design Phase

Based on the gathered requirements, we designed a simple and intuitive user interface that focuses on ease of use. The interface was built to allow users to interact with the system primarily through voice commands and face recognition. To ensure usability, the system was kept as straightforward as possible, with essential features such as composing emails, deleting emails, and reading unread messages accessible through clear voice instructions.

3) Face Recognition for Registration & Login

For secure and seamless user interaction, the system uses face recognition for both registration and login. During the registration phase, the user's face is captured, and along with the user's name and a unique user ID, this data is stored securely in the system.

During login, the system performs face detection to verify the identity of the user, ensuring that only registered users can access the system. This process eliminates the need for passwords, making it more convenient and secure for users with physical disabilities.

4) Voice Command Integration

The heart of the system is the voice command integration. We implemented speech-to-text technology to allow users to control the system hands-free. The voice recognition system is capable of recognizing natural speech patterns and converts them into actionable commands. Users can issue commands such as "Compose email," "Delete email," or "Read unread emails," which the system interprets and executes. To ensure accuracy, the system was trained to understand a variety of accents and speaking speeds, and it also has error correction to deal with misunderstandings in speech.

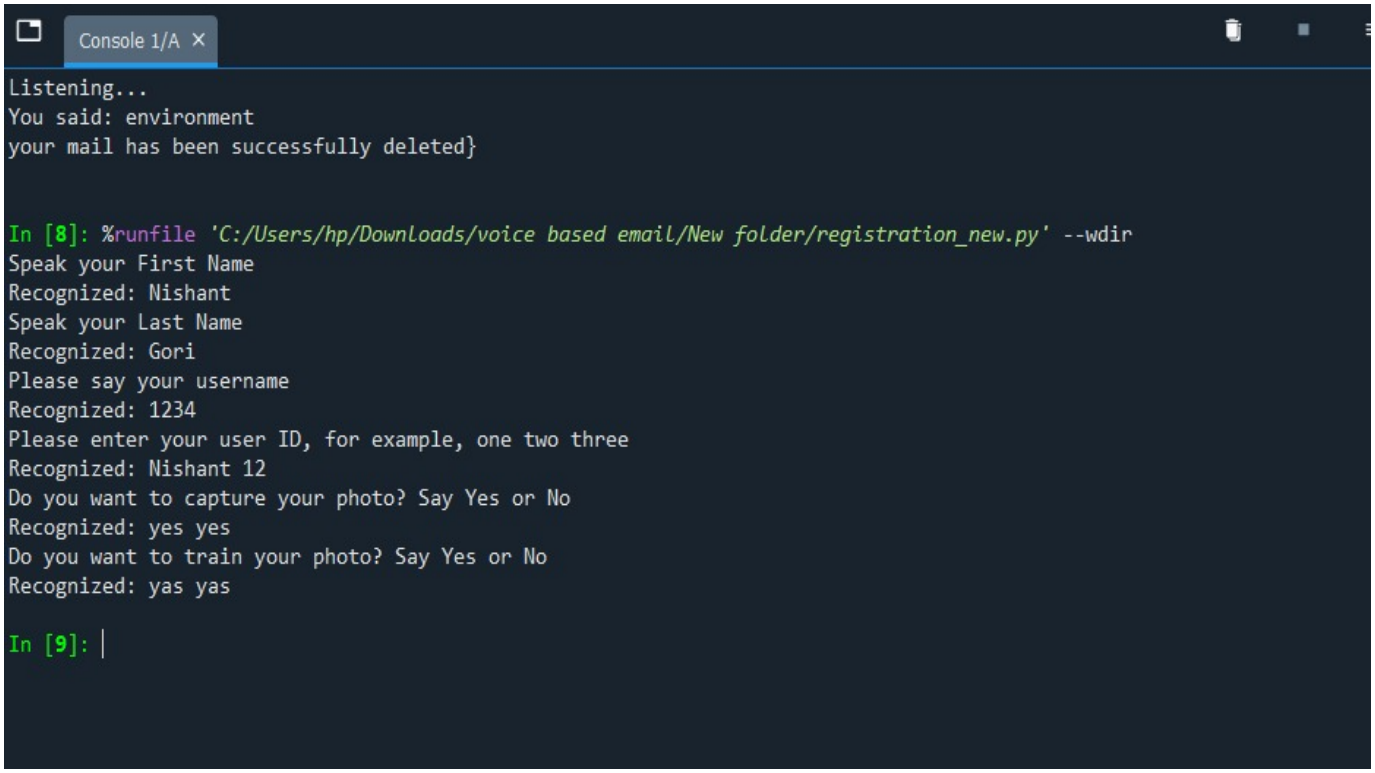
5) Email Module Development

The email module is developed to allow users to interact with their emails in an intuitive manner. Once logged in, users can create, send, and delete emails entirely using their voice. The system integrates with an email service provider, enabling users to specify email details such as recipient, subject, and body content through voice. Additionally, the system can read incoming emails aloud to the user, providing them with an audio notification of new emails. This email management process allows users to stay informed and maintain control over their email without needing to manually interact with a keyboard or screen.

6) Testing and Validation

After completing the development, the system undergoes rigorous testing to ensure it functions correctly. Testing is done with a wide range of users, particularly focusing on people with different physical disabilities. These tests help evaluate how well the voice recognition system performs in noisy environments and how accurately it can interpret various speech patterns. The face recognition feature is also tested for reliability, ensuring that the system can correctly identify users in different lighting conditions and with varying facial expressions. Based on feedback from testers, necessary improvements are made to fine-tune the system's performance.

IV. RESULTS AND DISCUSSION



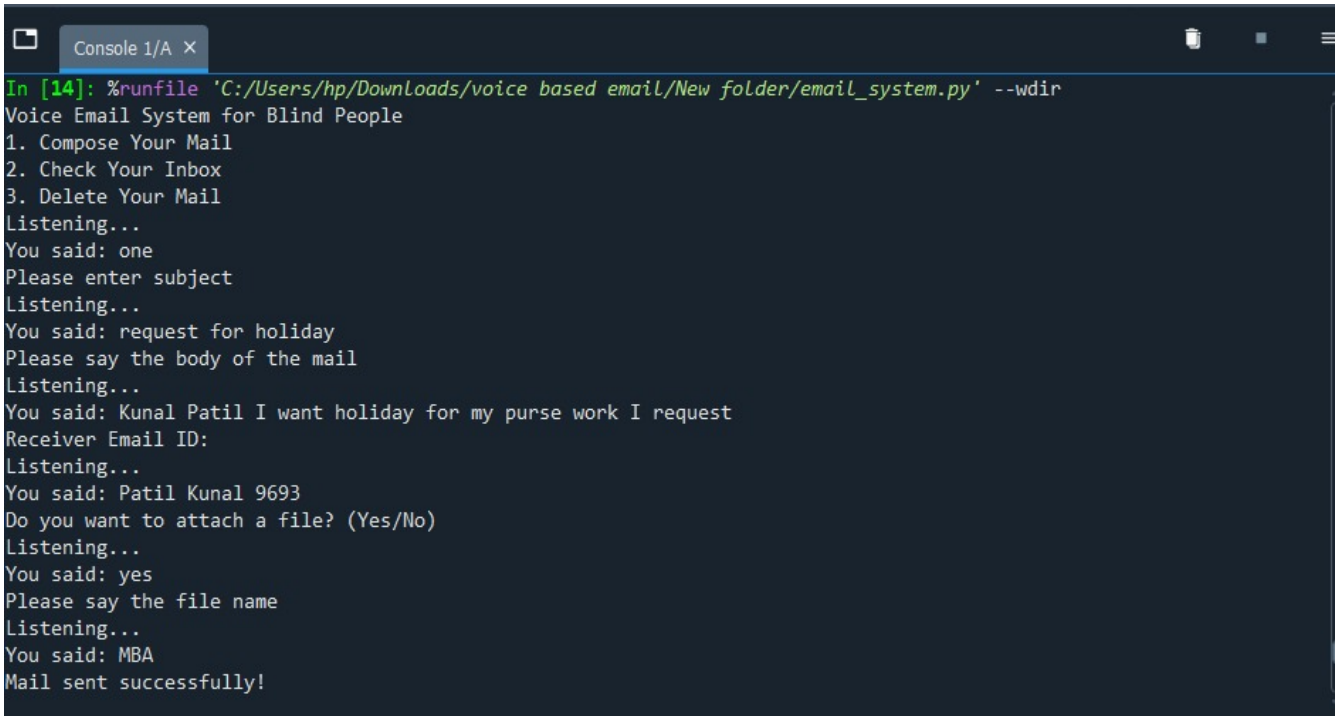
This functionality allows a new user to register into the system. During registration, the user is prompted to provide the following personal details:

- First Name
- Last Name
- User ID

Once the user submits the registration form, the details are securely stored in the system's database.

After registration, the user is required to log in. During the login process, the system performs face recognition to authenticate the user:

- If the user's face matches an existing registered profile, they are successfully logged in and granted access to the voice-based email system.
- If the face does not match any existing user, the system plays an unauthenticated user alert using a voice output mechanism.
- This adds an extra layer of security and accessibility, ensuring only authorized users can access the system.



The "Compose Your Email" functionality enables the user to create and send an email using only their voice. Once the user selects the option to compose mail, the system begins interacting through voice prompts. It first asks the user to speak the subject of the email, which is then captured through speech recognition.

After that, the system prompts the user to say the body of the email, allowing them to dictate the complete message content. Next, the user is asked to provide the receiver's email ID by speaking it aloud. Once the recipient is confirmed, the system inquires if the user wants to attach a file.

If the user responds with “yes,” the system then prompts for the file name and attempts to attach the file from the specified directory. After collecting all necessary details — subject, body, recipient address, and optional attachment — the system sends the email using the SMTP protocol.

Upon successful delivery, the user receives a voice confirmation saying, “Mail sent successfully.” This entire process ensures a hands-free, voice-controlled email experience, making it highly accessible and user-friendly for visually impaired or physically challenged users.

The "Read Mail from Message Box" feature is designed to help users access and listen to their unread emails through a voice-controlled interface. After logging in and selecting the appropriate option via voice command, the system announces the total number of emails in the inbox and specifically highlights how many of them are unread. This helps users quickly understand their mailbox status without needing to view anything on a screen.

Once the unread emails are identified, the system begins reading them aloud one by one. For each message, it provides essential information such as the sender's name and email address, the subject of the email, and a brief preview of the message body. For example, if a user receives an email from Kunal Patil with the subject "Request for holiday," the system will clearly read this information out loud, followed by the beginning portion of the email content.

This voice-based email reading functionality is especially useful for visually impaired or physically disabled users, as it allows them to stay updated on their communications without any manual input. The system ensures accessibility by using speech recognition and text-to-speech technology to create an easy, seamless user experience tailored to users with special needs.

The "Delete the Email" feature allows users to remove unwanted emails from their inbox using voice commands. After the user logs in and selects the option to delete mail by speaking the corresponding command (in this case, saying "three"), the system begins listening for further voice input. The user is then prompted to speak a keyword, usually related to the subject or content of the email they wish to delete.

Once the system captures the spoken keyword — for example, “environment” — it searches the inbox for an email that matches the provided keyword. Upon finding the appropriate email, the system deletes it and confirms the deletion by providing a voice message: “Your mail has been successfully deleted.” This confirmation helps the user know that the action has been completed successfully.

This voice-controlled email deletion process is especially useful for visually impaired or physically challenged users, as it eliminates the need for navigating through a screen or using a mouse or keyboard. The entire interaction is hands-free, simple, and accessible, aligning with the goal of creating a fully voice-based email system.

V. CONCLUSION

The Voice Based Email System for Physically Handicapped People is a step forward in making digital communication more inclusive and accessible. By combining voice recognition and face detection technologies, the system enables users with physical disabilities to perform basic email operations like composing, deleting, and reading mails without the need for physical input devices. The project successfully addresses a real-world problem and offers a solution that is not only functional but also user-friendly. Throughout the development process, the focus remained on simplicity, accuracy, and accessibility to ensure that even users with limited technical knowledge could operate the system easily. The use of speech-to-text and face recognition ensures a secure and hands-free experience. Although the current system covers the essential functionalities, it also opens doors for future enhancements like multilingual support, AI assistance, and integration with other communication platforms. Overall, this project contributes positively to the lives of differently-abled individuals by giving them a sense of independence in managing their digital communication.

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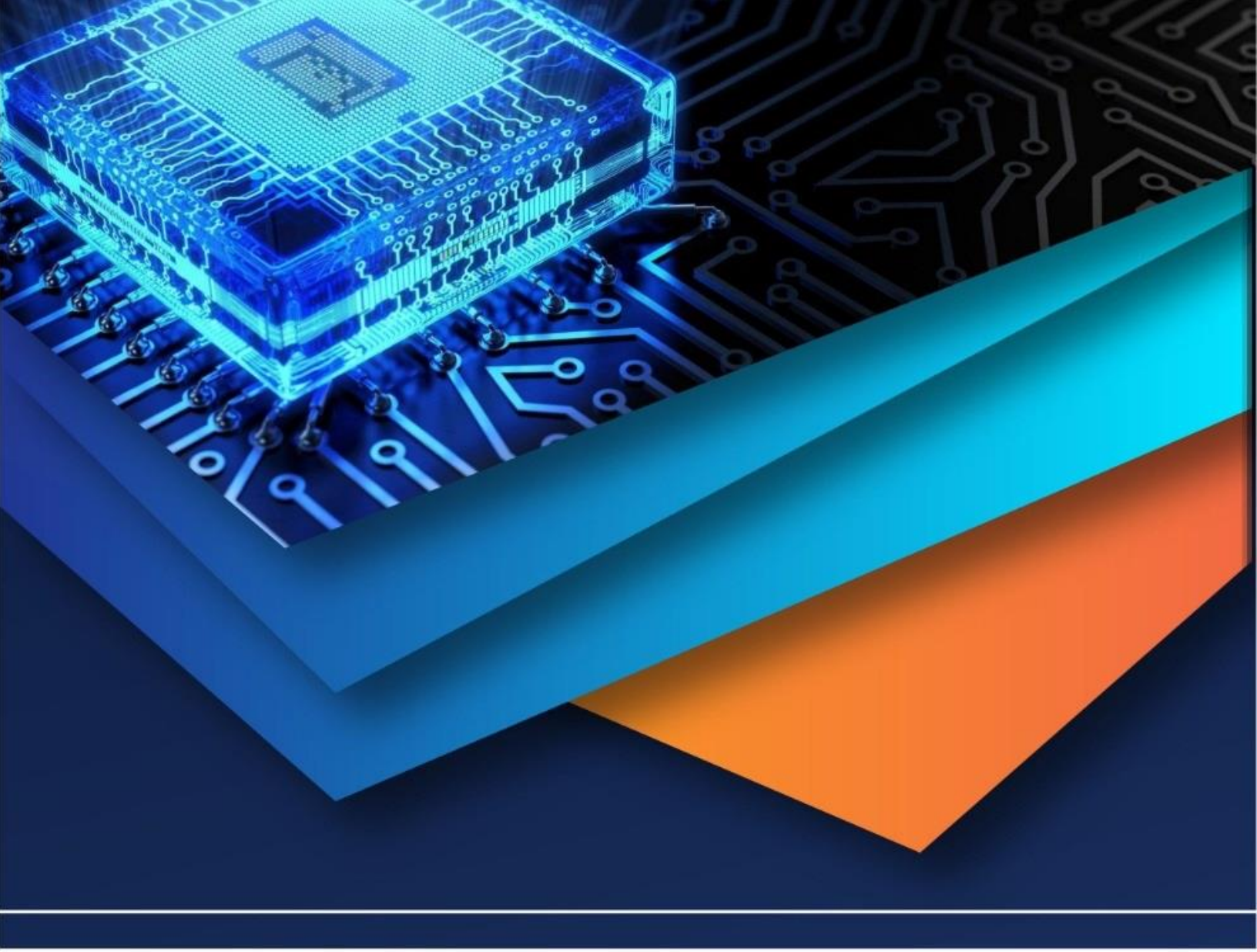

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