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Deep Learning-Based Facial Attendance Tracker

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Abstract: ***To develop a real-time face attendance recognition system that utilizes facial recognition technology, integrated with advanced anti-spoofing techniques. This approach ensures a secure, contactless method for marking attendance, significantly reducing the risk of unauthorized or fraudulent entries. The system aims to identify and prevent spoofing attempts, such as the use of photos, pre-recorded videos, or masks, during the authentication process.The core functionality involves processing real-time video input, detecting faces frame-by-frame, and accurately matching them with a pre-registered database. This enables automatic attendance marking without the need for manual intervention. The system is designed to deliver high accuracy and reliability, ensuring that only verified individuals are recorded for attendance purposes. To provide a user-friendly and adaptable solution suitable for various environments and institutions, the system is designed to minimize manual errors while enhancing overall security. Furthermore, it is scalable and can be easily implemented across different sectors, including educational institutions, corporate offices, and other organizations, enabling efficient and accurate attendance management.***

Keywords: Real-time, Face recognition, Attendance system, Anti-spoofing, Machine learning, Authentication, Face detection, Pre-registered database, Fraud prevention, Attendance management.

I. INTRODUCTION

In today's fast-paced digital era, traditional attendance systems are increasingly being replaced by automated, contactless solutions to enhance efficiency and security. Facial recognition technology offers a promising approach by enabling real-time identification without physical interaction. However, these systems are vulnerable to spoofing attacks using photos, videos, or masks. This paper presents a real-time face attendance recognition system integrated with advanced anti-spoofing techniques to ensure secure and accurate authentication. By processing video input frame-by-frame and verifying faces against a registered database, the system minimizes manual errors and fraud. It is scalable, user-friendly, and suitable for deployment across educational and organizational environments.

II. METHODOLOGY

The proposed system captures real-time video input through a camera, detecting faces frame-by-frame using a convolutional neural network (CNN)-based face detection algorithm. Detected faces are then preprocessed and compared against a database of registered users using a facial recognition model. To ensure authenticity, advanced anti-spoofing techniques such as liveness detection, blink detection, and texture analysis are applied to distinguish between real faces and spoofing attempts like photos or videos. Once a face is verified as genuine and matched with a registered user, attendance is automatically recorded. The system operates in real time and is optimized for accuracy, speed, and deployment scalability.

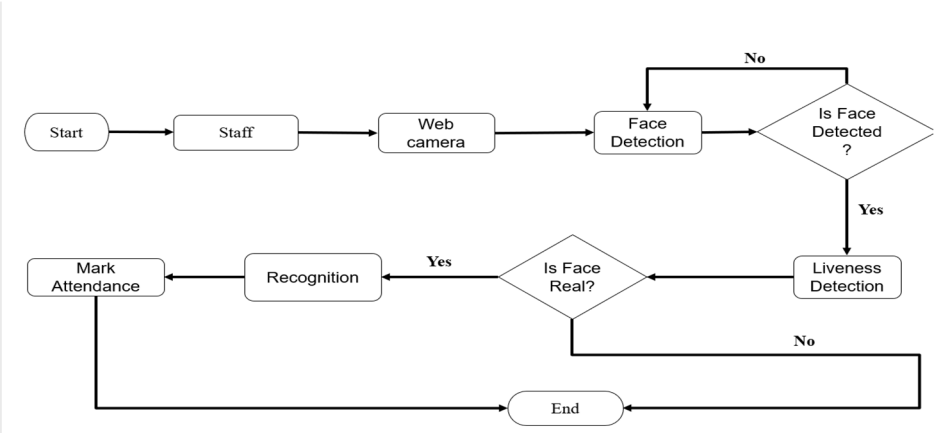

Fig: 1 Data flow diagram

The figure 1 illustrates the real-time face attendance system process. It begins with the staff presenting themselves to a webcam. The system performs face detection; if a face is found, it proceeds to liveness detection to verify authenticity. If the face is real, facial recognition matches it with stored data. Upon successful recognition, attendance is marked. If any step fails, the process ends without marking attendance, ensuring security and accuracy.

III. SEAMLESS PROCESS OF DEEP LEARNING BASED FACIAL ATTENDANCE TRACKER

To ensure a smooth and secure attendance process, the proposed system integrates several components that work in harmony to deliver seamless functionality. The process begins when a user (student, staff, or employee) positions themselves in front of a webcam. The system automatically captures live video frames and initiates face detection using advanced algorithms.
Once a face is detected, it undergoes liveness detection to confirm that it is not a spoofing attempt using photos, videos, or masks. If the face is verified as real, the system proceeds to facial recognition, where the captured facial data is matched against pre-registered profiles in the database. Upon successful identification, the system automatically records the user's attendance along with a timestamp. This entire flow is contactless, quick, and highly secure, reducing manual effort and ensuring accurate record-keeping. The system's real-time processing and anti-spoofing capabilities make it reliable and scalable for use in various institutional and organizational settings.

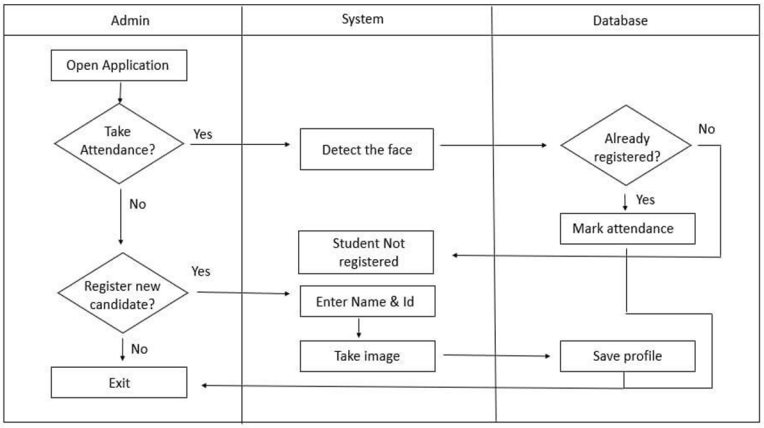

Fig: 2 Activity diagram

As shown in Figure 2, illustrates the flow of taking attendance or registering a new user. The admin initiates the application, chooses to take attendance or register a new candidate. The system detects the face, checks the database for existing profiles, and either marks attendance or registers the user by capturing details and saving the profile.

IV. SYSTEM IMPLEMENTATION

The system implementation involves integrating a webcam with facial recognition software and a user-friendly interface for administrators. Upon launching the application, the admin can choose to take attendance or register a new user. The system captures a live face image and uses a face detection algorithm to identify the individual. If the face matches an existing profile in the database, attendance is automatically marked. For new users, the admin inputs details like name and ID, and the system captures and stores their image and information in the database. The system ensures real-time processing, secure data storage, and accurate attendance management.

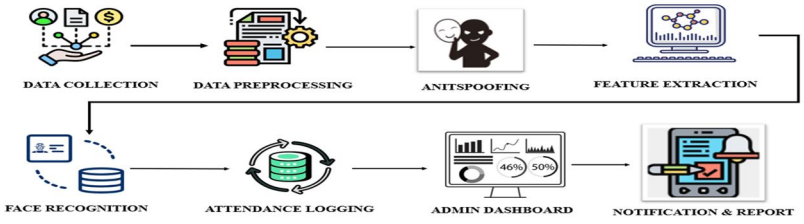

Fig: 3 System Implementation

As depicted in Figure 3 it outlines the flow of a face recognition attendance system. It starts with data collection, followed by data preprocessing to enhance image quality. An anti-spoofing module filters fake inputs, and feature extraction identifies unique facial traits. The system performs face recognition, logs attendance into a database, and updates the admin dashboard.

V. OUTPUT

Figure 4 displays an Admin Login Page interface featuring username and password fields, a real-time date and time display for authentication.

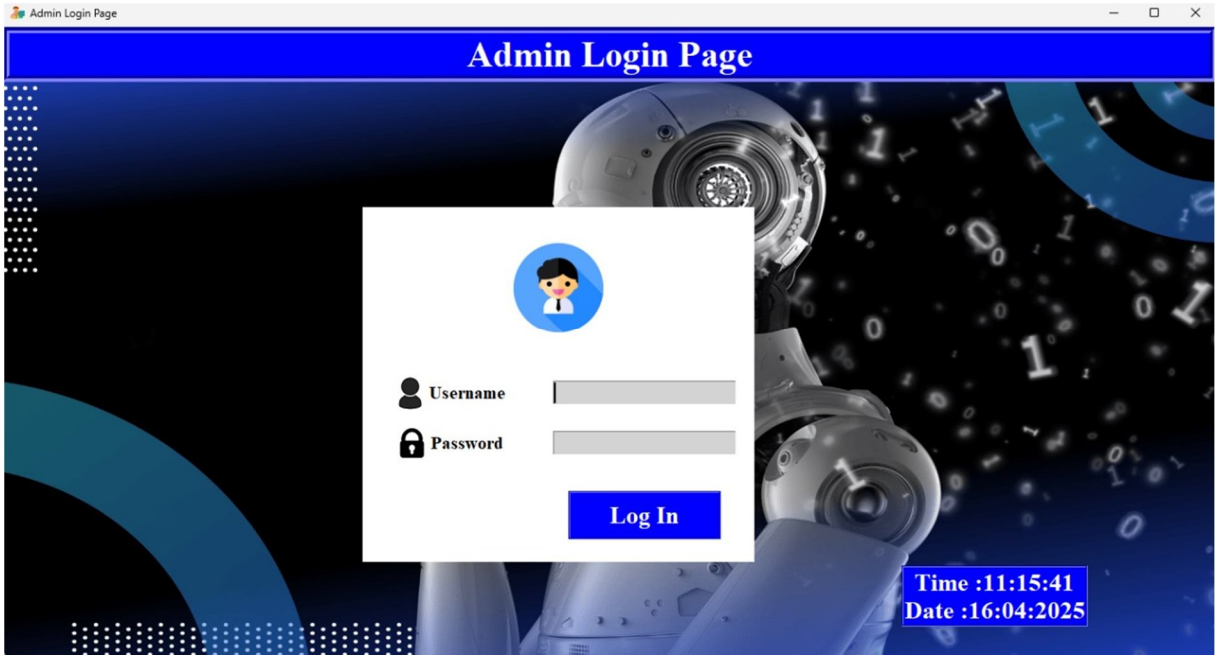

Fig: 4 Admin Login Page

Figure 5 showcases the main dashboard of a Smart Attendance Management System, featuring modules for data training, face recognition, admin access, reports, and secure employee management.

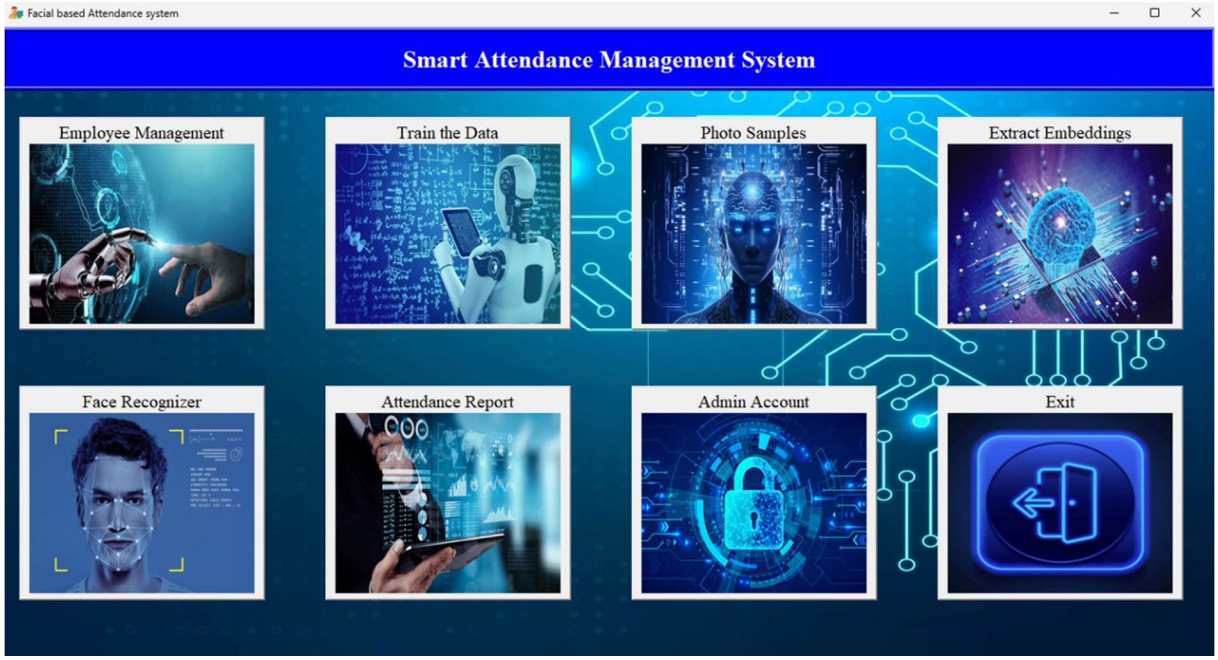

Fig: 5 Dashboard

Figure 6 shows a dataset of detected face samples captured from various angles, used for training the facial recognition system in the Smart Attendance Management System.

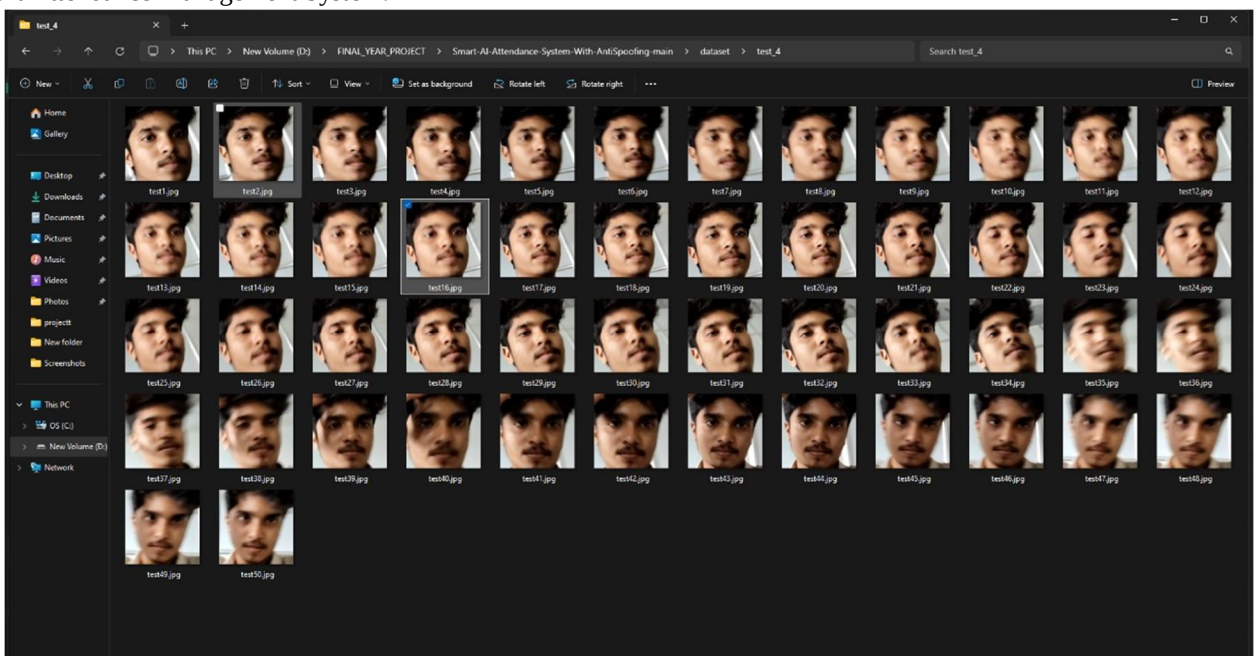

Fig: 6 Dataset

Figure 7 displays the Attendance Report interface, showcasing a searchable table of recorded names, dates, times, and attendance status, confirming successful face recognition-based entries.

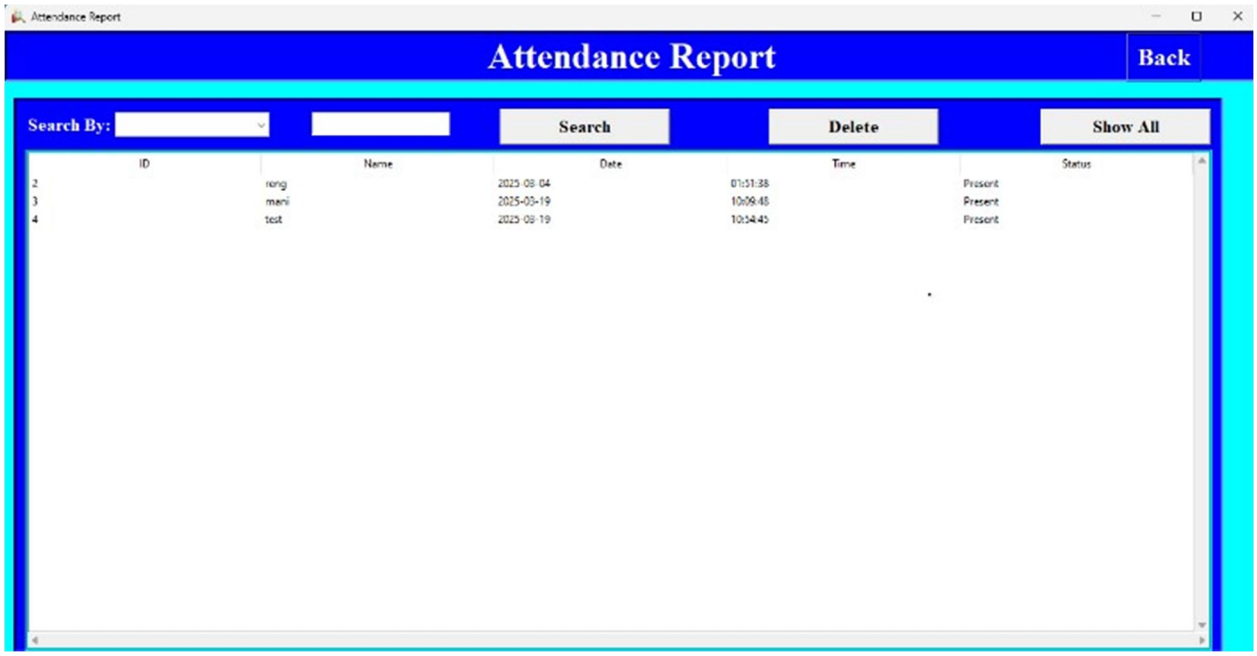

Fig: 7 Attendance Report

VI. CONCLUSION

In conclusion, The development of a real-time face attendance recognition system integrated with advanced anti-spoofing techniques provides a secure, efficient, and contactless solution for attendance management. By leveraging facial recognition technology and real-time video processing, the system successfully automates the attendance marking process, eliminating the need for manual intervention and significantly reducing the risk of fraudulent entries.

The implementation of anti-spoofing mechanisms effectively detects and prevents spoofing attempts such as printed photos, video replays, or masks, ensuring the authenticity of user verification. The modular interface, including employee management, training, embedding extraction, and reporting, enhances usability and scalability across various sectors like educational institutions and corporate organizations. This system not only improves operational accuracy and security but also demonstrates adaptability for broader applications. Overall, the proposed solution offers a reliable and intelligent alternative to traditional attendance systems, promoting digital transformation while ensuring data integrity and user authenticity in attendance tracking processes.

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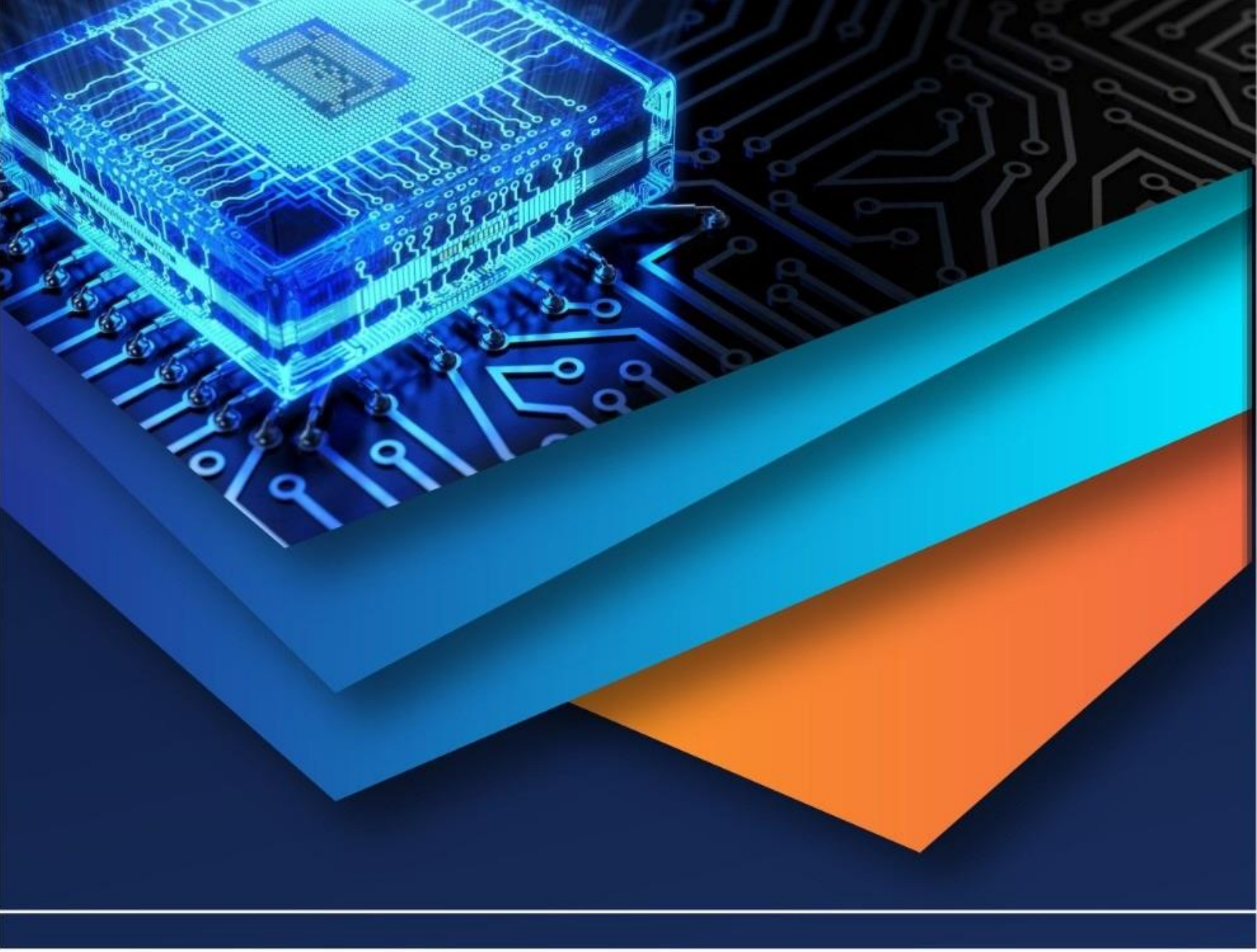

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