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Attendance: An Application Based on Facial Recognition

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Abstract: ***Attendance is an important aspect to record the presence of students. The presence of someone is a way to address that the student is carrying out their obligations to come. Usually, attendance is done manually using pen-paper. This digital era has brought forth new technologies that can help deal with this absence of students in organisations. Automatic Face Recognition (AFR) technologies have made many improvements as well as advancements in the field of biometrics. It uses Real-Time Face Recognition as a solution to keep a record of the attendance. The Face recognition approach has proven to be the best of all Biometrical sources of identification. We propose a face recognition desktop application that will automatically update a student's attendance into the database on the web server, providing an ease to the faculty. Even students can know their attendance just by a login. A report based on student's attendance can help in evaluating the attendance eligibility criteria. In this face recognition desktop application, we use Machine Learning and Deep Learning algorithms to capture multiple images of students to reduce human errors and proxy attendance. This desktop application is much more efficient and safer than the traditional pen paper method.***

Keywords: Attendance system, Automated attendance, Image Processing, Face detection, Feature matching, Face recognition.

I. INTRODUCTION

Attendance is an important part of daily classroom evaluation. For the same purpose the organisation requires a quick and stable system to record the attendance of their students. Modern technology has made verification of "true" individual identity easy. The technology used in this system is called "biometrics". Biometric system spots an individual based upon his biological characteristics; that are difficult to be forged. Face recognition being a part of biometric technology has its merits of both high accuracy and low intrusiveness. Modernization has led to the use of face recognition technology for attendance management purpose. Our desktop application uses face recognition approach to reduce the flaws of existing system with the help of machine learning. It requires a good quality camera to capture multiple images of student. This system will prevent unnecessary wastage of time which is usually wasted in class roll calls. The desktop application has the latest trends in machine vision to implement a feasible solution for class attendance management. This application automates the whole process to provide a digital environment, thus preventing fake roll calls.

II. PROBLEM FORMULATION

A. Provides facility for the automated attendance of students.
B. Uses live face recognition to recognize each individual and mark their attendance automatically.
C. Utilizes video and image processing to provide inputs to the system.
D. Notification via email if there is a lack of attendance. (if wanted)
E. Generate a graph about average student present per week. (if wanted)

III. LITERATURE REVIEW

S NO.	AUTHOR NAME	EXISTING SYSTEM	LIMITATIONS
1.	Hapani, Smit	Automated Attendance System Using Image Processing	Need a high efficiency camera
2.	Akbar, Md Sajid	proposed a model of an automated attendance system.	Can't work in poor light
3.	Okokpujie, Kennedy O	designed and implemented an attendance system which uses iris biometrics	Prototype was web based

4.	Rathod, Hemant Kumar	proposed an attendance system based on facial recognition. Histogram of Oriented Gradients (HOG) features along with Support Vector Machine (SVM) classifier were used	not mentioned the end-to-end accuracy
5.	Siswanto, Adrian Rhesa Septian	Implementation of face recognition algorithm for biometrics-based time attendance system.	Accuracy is around 90%
6.	Lukas, Samuel	face recognition technique by combining Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT).	Masked faces are not recognised,50% faces gets detected

IV. METHODOLOGY

In this project we have used Agile SDLC. Agile Software Development Life Cycle is an approach that is used to design a software management process. It is a combination of iterative and incremental process model and it break the product into small incremental builds. These builds are provided in iterations.

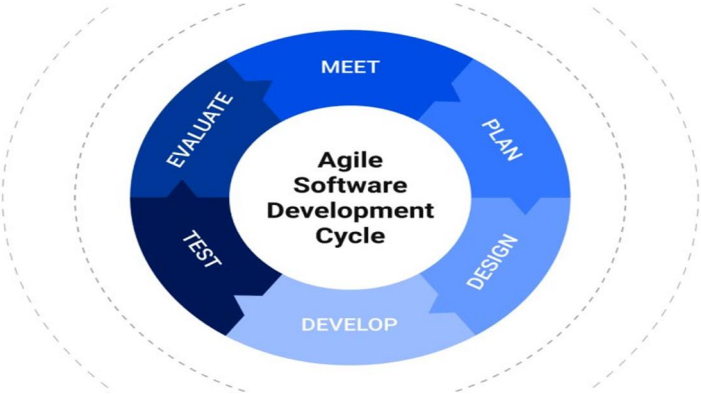

Figure: Agile SDLC

Block diagram of the General Framework:

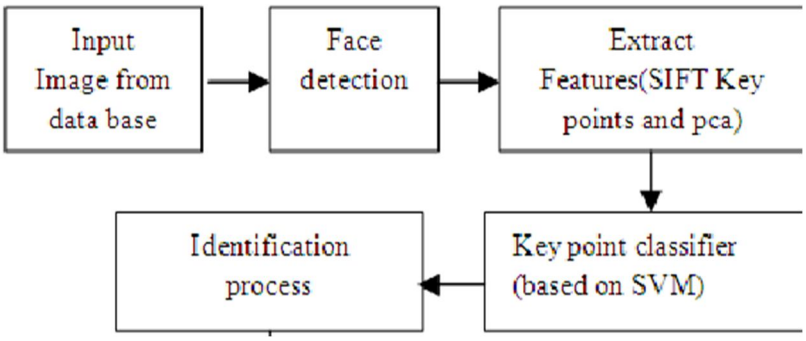

Figure: Block diagram

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The objective of this project is to detect the face segment from the video frame, extract the useful features from the face detected, classify the features in order to recognize the face detected and record the attendance of the identified student.

This project will be developed using machine learning, Web technology, python (tkinter, csv, numpy, pandas).

1) First all the students of the class must register themselves by entering the required details and then their 250 images will be captured from different angle the frontal face is extracted from the image then converted to gray scale using open source computer vision library (Gray=cv2.cvtColor (frame, cv2.COLOR_BGR2GRAY)) and stored in the dataset.

Conversion of Image to Grayscale Image

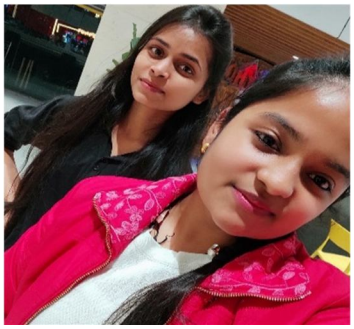


Figure: RGB image

Figure: Gray Scale

2) After collecting the dataset we will pre-process and clean the data with the help of Viola jones algorithm and SVM (Support vector machine). Viola jones algorithm is the most popular algorithm to localize the face segment from static images or video frame. Pre-processing enhances the performance of the system. Scaling is one of the most important preprocessing steps to manipulate the size of the image. The size and pixels of the image carry spatial info. Hence, the size should be same for all the images for normalization and standardization purposes. Subhi Singh (2015) proposed PCA (Principal Component Analysis) to extract features from facial images, same length and width of image is preferred.

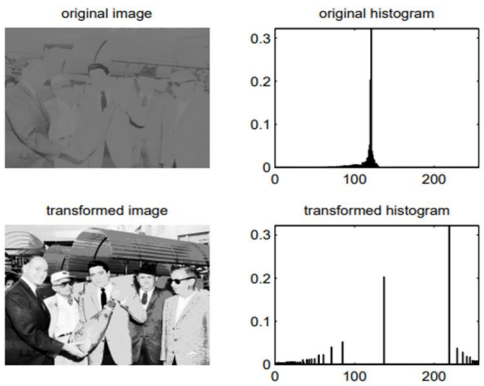


Figure: Checkerboard Effect Significant

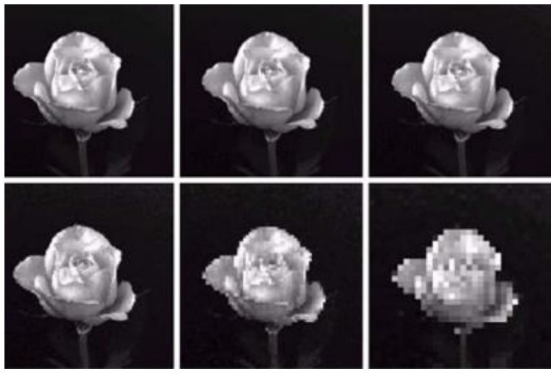


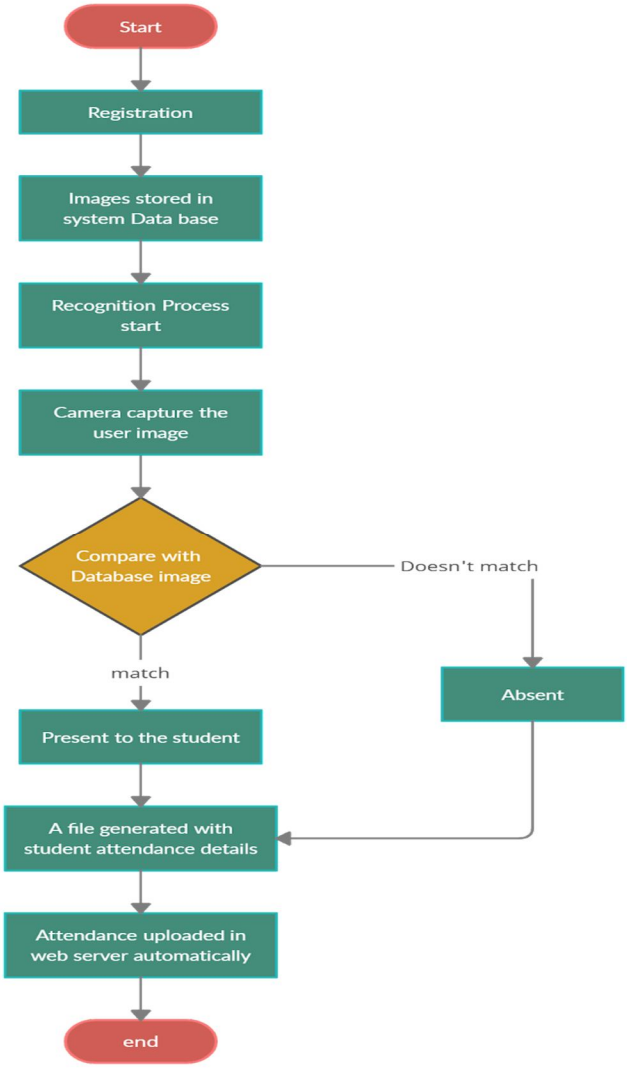
Figure: Image Pre-processing Increasing from Left to Right

3) A camera will take continuous stream during each session, faces will be detected from live streaming videos of the classroom then the detected faces will be compared with training image dataset based on Eigen features. Eigen features are used to characterize images. If a match is found, attendance will be marked for the respective student. The camera will be capturing images in real-time so if an enrolled face is not detected in training image dataset, the student.

4) For the frontend purpose we will create interactive GUI (Graphical user interface) where there will be various interactive functionality like to generate a graph, faculty can mark students present and absent as per their convenience also they can edit the student attendance and admin will be able to register and remove the student and faculty details.

5) These all-purpose we are python as frontend and backend, for training the dataset we are using machine learning algorithm.

The flow chart depicting the flow of our system is:



V. RESULT DISCUSSIONS

The system is successfully able to mark the student attendance. We have achieved the following output-

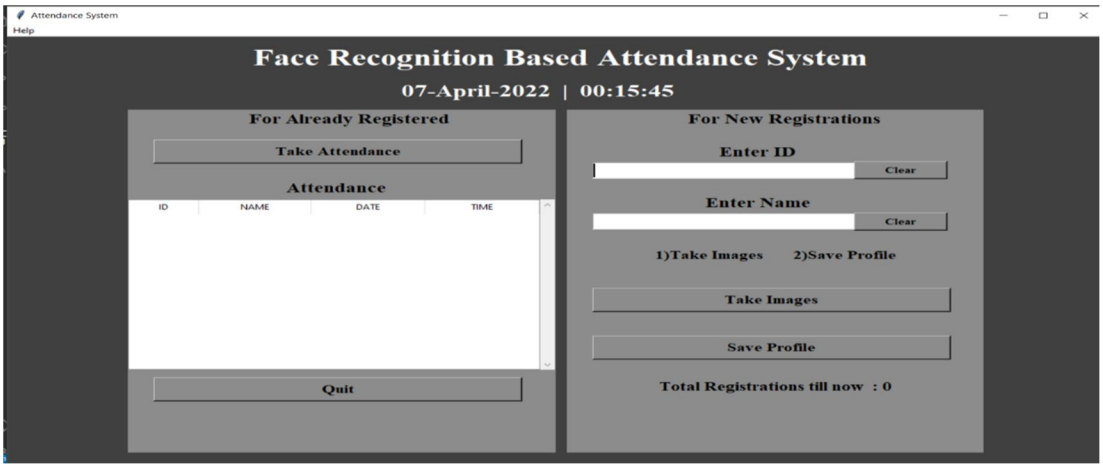


Figure: Graphical user Interface

This is the GUI (Graphical user interface) where it displays live attendance updates for the day on the main screen with Id, name, date and time. It will create a new CSV file every day for marking the attendance with proper date and time.

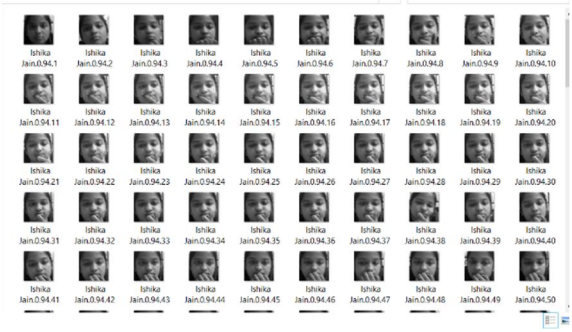


Figure: Dataset sample

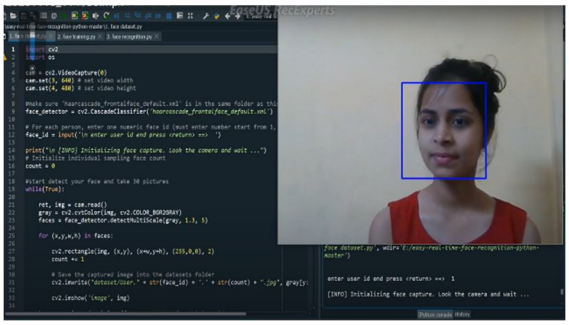


Figure: Face detection

The next step is to capture the images and stored in the dataset then we will pre-process and train the model by using Viola-Jones Algorithm**.** The next important step is to face detection and calculate the Eigen value of the captured face image and compared with Eigen values of existing faces in the database.

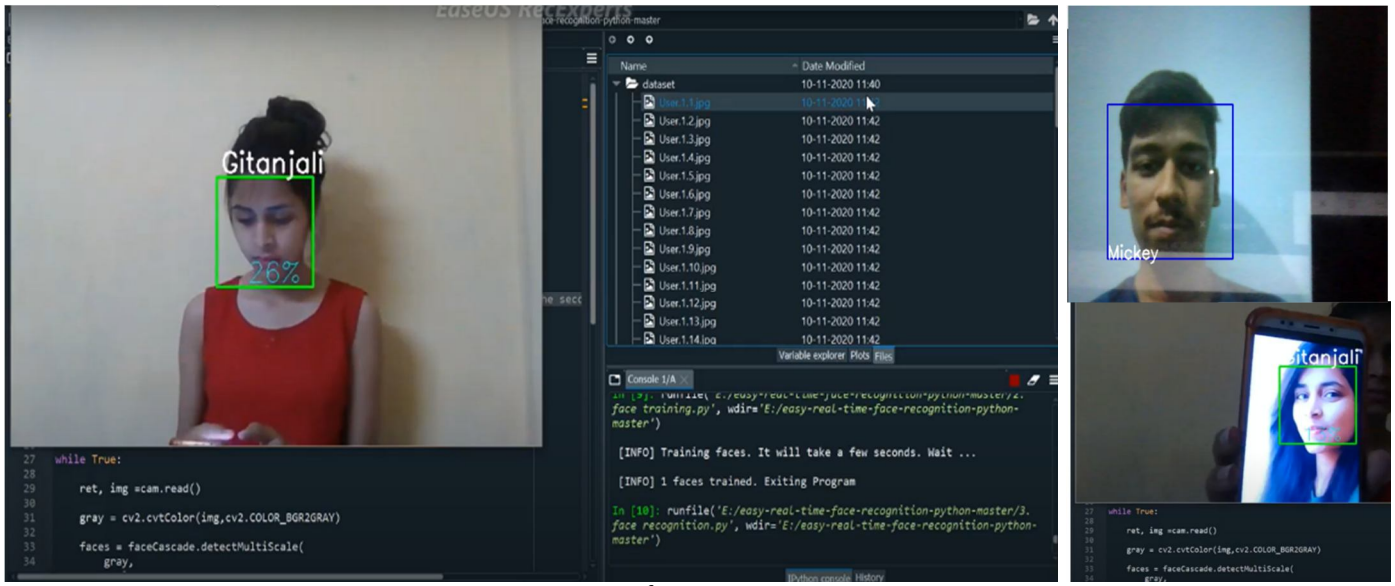


Figure: face recognition:

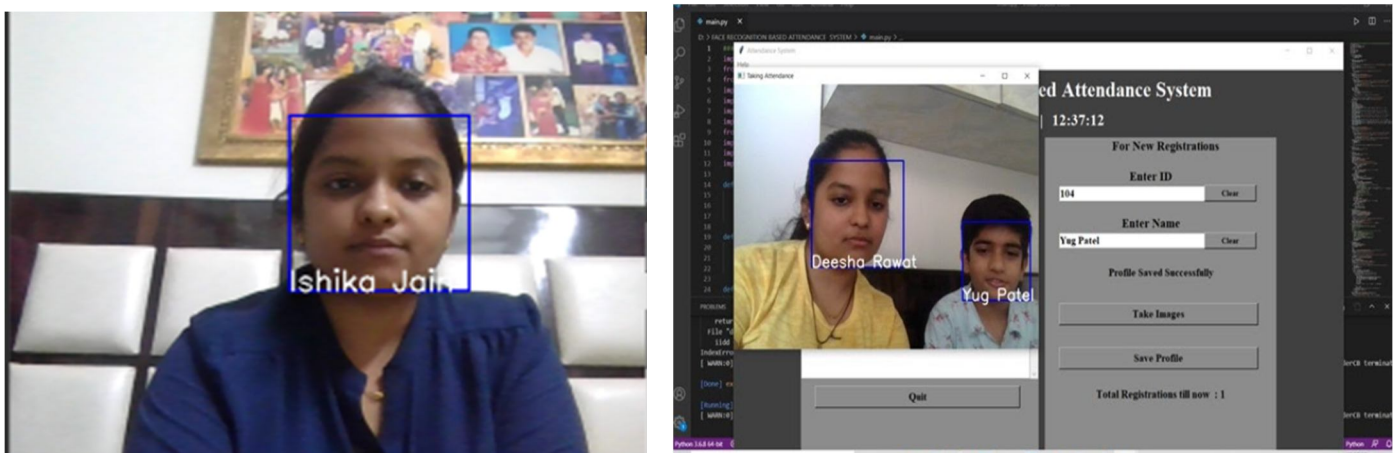
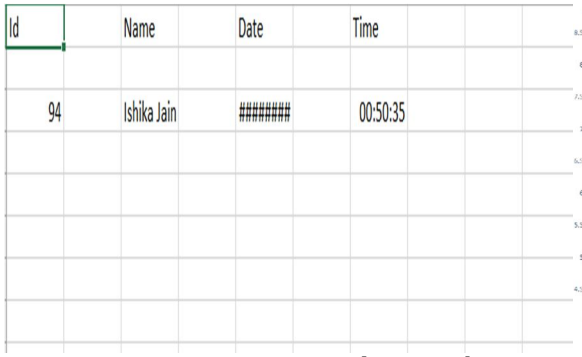


Figure: Live attendance

We were successfully able to capture live feed of video as shown in (Figure: face recognition, Figure: Live attendance). Also, able to recognize face accurately.



Id	Name	Date	Time
94	Ishika Jain	########	00:50:35

Figure: attendance mark

Figure: Graph Generate

After face recognition the attendance sheet has been generated automatically as shown in Figure

Table 1: Shows the accuracy…….

S.NO.	Face Orientations	Detection Rate	Recognition Rate
1.	0^0(frontal face)	98.7%	95%
2.	18^0	80.0%	78%
3.	54^0	59.2%	58%
4.	72^0	0.00%	0.00%
5.	90^0(Profile face)	0.00%	0.00%

VI. FUTURE SCOPE

The system we have developed has successfully able to accomplish the task of marking attendance in the classroom automatically and output obtained in an excel sheet as desired in real time. Another important aspect where we can work in towards creating an online database of the attendance and its automatic updating, keeping in mind growing popularity of internet of things. The project can be extended in other interesting ways, such as ATM user security and dynamic face identification in public places.

VII. CONCLUSION

It can be concluded that an automated student attendance system in the classroom works well. The success rate of the proposed system in recognizing facial images of the students who are seated in the classroom is about 98%. This system is both cost-effective and more reliable in terms of applicability.

IX. ACKNOWLEDGEMENT

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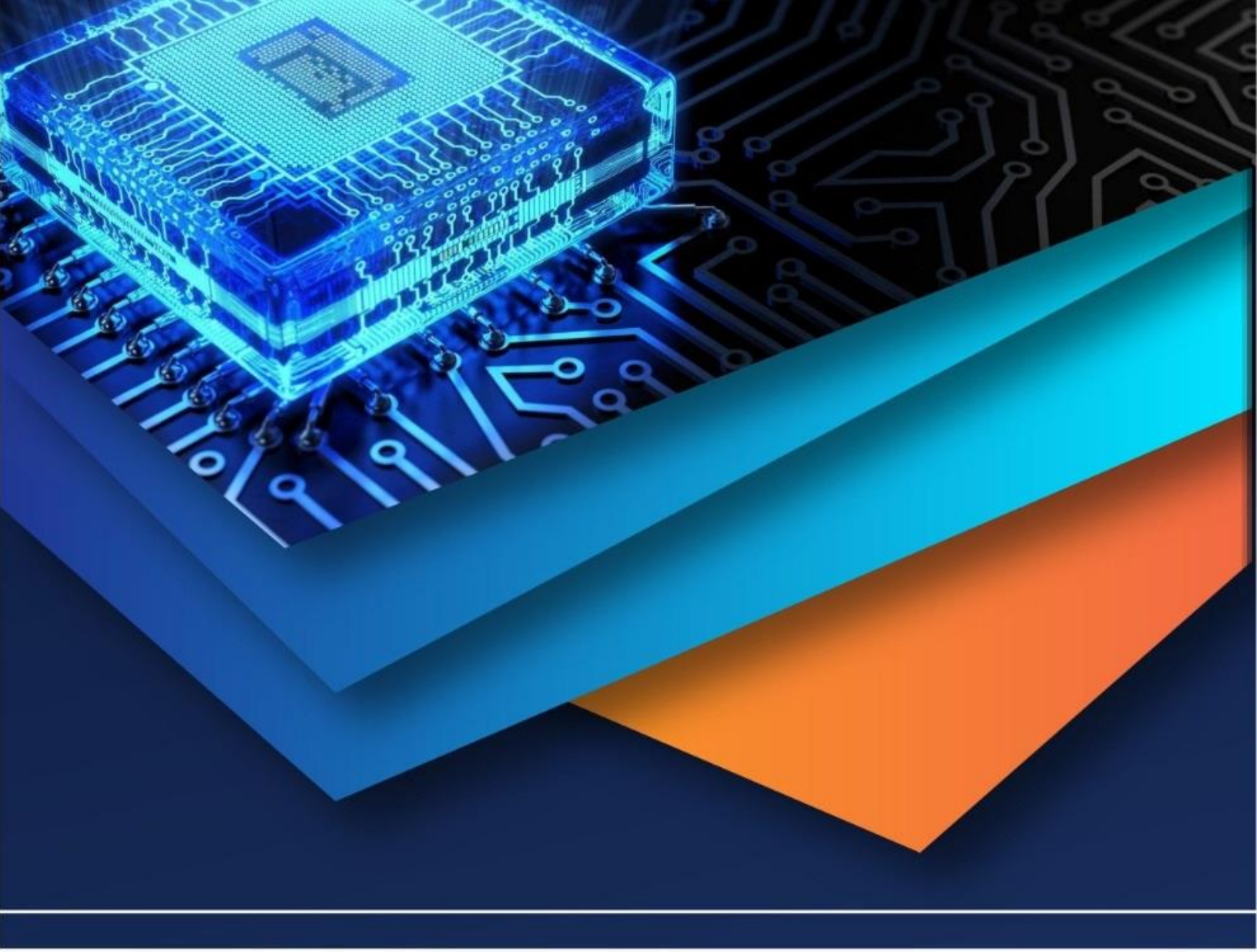

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