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Attendance Monitoring System Using Face Recognition

Arnav Jain[1], Rahul Gupta[2], Mohd. Shariq[3], Tanveer Ikram[4]
[1, 2, 3, 4]*Department of Computer Science and Engineering, Meerut Institute of Engineering and Technology, Meerut*

Abstract: ***The primitive method of taking attendance through pen-paper or registers by the organizations and institutions are not much efficient these days. The proxies of the absentees by their groups or friends are much common due to which this important factor of monitoring the class becomes ineffective. The pen-paper attendance system non-essentially consumes much time in class while smart techniques gives more time to lecturer. It can be simply be manipulated. So, for that many organizations and institutions have replaced it through biometric sensors which mark attendance through fingerprints of students or staff. But due to covid-19, where touching anything is risky. As we know in the current situation during covid-19 pandemic, Government of different nations have a strict guidelines for social distancing required to be followed everywhere keeping the aspect of safety measures in mind. For that, an attendance monitoring system has been devised through face recognition. This face recognition system works in the following stages - face detection, face pre-processing, database creation, face training, face recognition, attendance maintenance. This project spotlight on the significance of the face alignment, hence how precise image is and False Acceptance Rate that can be noticed. The system processes on Face Recognition Grand Challenge (FRGC) with up-to 95% precision. Few students do mark the fake attendance of their classmates by using their digital devices specially phone through which they try to show the picture of their friend to the system but in that case it will display warning message with a beep sound. The motive behind producing face-recognition system is to save the time and make system smart and efficient.***

Keywords: Face Recognition, Open CV, Machine Learning, Real and fake face detection, Graphical User Interface.

I. INTRODUCTION

Face recognition is a medium of recognizing or validating the identity of an individual utilizing their face profile. This system uses techniques to spot certain discrete information related to an entity's face, like the gap between chin and nose that changes into statistical description, which then competed from the data in the already existing face collection. A facial recognition system is competent of comparing an entity's face in a virtual profile or a video frame with collection of faces, generally working with sanctioned user ID verification services. These systems are enhancing towards most potent attested component as they are pertinent and non-meddling. Facial recognition system works by comparing facial features from an already existing images. Identifying presence of different students or staff members in various colleges or firms for the purpose of attendance could be one such usage of face recognition. A satisfying monitoring system have extremely large value of True Acceptance Rate and extremely small value for False Acceptance Rate. Managing and evaluating the entire track record depicts a crucial part in the effectiveness & efficiency of an institute. Automated Attendance Monitoring System performs the regular task for marking the attendance by decreasing individual interference. The frequent approaches and modes for determining and perceiving face failure to solve questions such as pose, scaling, variations, rotation, illuminations and occlusions. The presented model motto is to conquer the drawbacks of the preexisting models and assign properties like extraction of the features, face detection, detecting extracted features, and analysis of students or staff record. The system combines different approaches like integral images, image contrasts, color features and cascading classifier for detecting the features of face. The system provides an improved precision because of applying immense features of the face. The system is checked under diversified lighting conditions, several countenances, presence of partial faces and appearance or disappearance of beard and spectacles.

Much approaches applies to the artificial intelligence for face sequencing yet D-lib utilized in this model presents the finest result for face recognition. It illustrates the procedure required for extracting the feature by utilizing Convolution Neural Networks and acknowledging the virtual images. The presented approach is to eradicate the necessity of pen-paper attendance, thus reducing the supervisory load on the staff or management such that they can make their time efficient and system effective. It plays a significant part in the dynamic attendance monitoring from security point of view.

II. LITERATURE REVIEW

1) *Class Attendance Management System using Facial Recognition [1]:* The conventional way of taking attendance leads to proxy through friends thus reducing effectiveness. So for that we choose bio-metrics but this lacks reliability and then we go for face recognition technology which is efficient & time saving. It works in 4 stages as Image Capturing, Face Detection, Face Comparison and Updating of Attendance in Database.
2) *Attendance Management System [2]:* In the growing virtual world, this research paper deals about whole class attendance through face recognition that captures the image of a human entity & checks from the existing database, then result will put in MySQL having accuracy of 99%.
3) *Implementation of face Recognition Algorithm for bio-metrics Based time Attendance System [3]:* Face recognition starts with taking out the features of face like breadth of mouth, width of pupil in eyes & checks it from already existing database. Many papers are published that contains facial feature extraction, face recognition implementations. The major focus over it is best face recognition up-to 95% similar.
4) *Attendance Monitoring System Based on face Recognition [4]:* Understanding the scenario, to make the different task of institutions & organizations fruitful, face recognition feature comes into use that takes out facial features & changes into numeral format. An automatic mail system sends mail to all the students or staff.
5) *Attendance Monitoring System using Facial Recognition with Audio Output [5]:* The manual approach of keeping track of class attendance and keeping a journal is ineffective. Since, bunking classes or appointing proxies for absentees has become a popular pastime among today students. Manual Attendance entry in logbooks becomes a laborious chore that can be readily manipulated. As a result, the purpose of this work is to offer an automatic attendance system.
6) *Automatic attendance management system using face Detection[6]:* The automatic attendance management system will replace the time-consuming and difficult-to-maintain manual system. In this study, we shall address attendance without the need of humans. This method involves installing a camera in the classroom that captures images, detects faces, compares them to a database, and then registers attendance. If a student's attendance is marked as absent, a notice notifying their parents of their child's absence is sent. A multitude of methods exist for comparing faces. The Eigen face of the procedure is the one. Eigen faces are a set of Eigen vectors used in computer vision to solve the face recognition problem.
7) *CNN based efficient face recognition technique using D-lib [7]:* Despite breakthroughs in face recognition, it has received a lot more attention in the scientific and business sectors in recent decades. This research proposes a Deep Learning-based face recognition system that uses Convolutional Neural Networks (CNN) with D-lib face alignment.
8) *Automated Attendance System with Face Recognition [8]:* The face is a tangible manifestation of a person’s uniqueness. As a result, we’ve created an automatic student attendance system based on face recognition. This technology has a wide range of applications in daily life, particularly in security and surveillance systems. Airport security systems utilise facial recognition to detect offenders.
9) *Face Recognition Based Attendance System[9]:* Automatic face recognition technology has progressed significantly in today's ever-changing world. Smart Attendance with Real-Time Face Recognition is a convenient way to keep track of students' attendance on a regular basis. A facial recognition-based attendance system recognises a student's face for the purpose of collecting attendance using high-definition monitor video and other information technologies. A computer system will be able

to swiftly and reliably detect and recognise human faces in images or videos captured by a security camera in my face recognition project.

10) *Real-Time Smart Attendance System using Face Recognition Techniques [10]:* Automation is crucial in today's academic system for assessing performance quality. Most organisations' traditional practises, such as calling names or signing documents, are both time-consuming and insecure. As technology progresses, computer vision may be utilised to automate the manual attendance approach. It is critical to employ computer vision to recognise student facial features in order to automate attendance without using paper and pen. Teachers, students, and parents may check attendance from anywhere at any time. Deep learning image processing is used to make it easier to predict attendance, saving time and money. The device incorporates a temperature check and hand sanitization mechanism to handle with a covid scenario.

III. METHODOLOGY

This entire part talks about the concepts & methodologies related to face recognition & image processing. It works into four different stages as image taking, face detection, comparing image with existing database and marking the attendance.

1) *Database Creation and it's Training:* The image of an entity is taken by the camera and converted into matrix format which then Image of students are stored in the database. We have placed Convolutional Neural Networks(CNN) to take out facial features.
2) *Face Detection:* It is a distinct class of entity's face detection. It uses D-lip software to determine the face image of a student or staff. The precise ascertaining of human face plays a vital role. The face detection is a computer prescience to analyse the fore face from the virtual human image. It uses computer technology for determining fore face by checking the distance difference between nose and lips.
3) *D-lib Face Alignment:* D-lib is a free and easily-available library which delivers prime conditions for software development formed on artificial intelligence. It is majorly utilized for execution of Bayesian networks and kernel-based methodology for categorizing, assembling, to odd detect, reverting and feature sorting. D-lib library has two chief integrants as -

a) Linear Algebra: This integrant is formed on the figure demonstration method claimed in the Blitz++ software. D-lib used along with it yields the functioning capacity and pace of the code as optimized libraries. D-lib can conduct any mutation on all the impressions by requesting the suitable BLAS which authorizes user to write down the equation in the prime instinctual form, hence evacuating the details of the software development to the library.

b) Machine Learning tools - The main motto of this integrant is to issue elementary and highly compatible framework for kernel based methodology. D-lib can execute on column vectors or any organized information. The adaptability of the D-lib is quickest functioning on anyone item thus forming to put in custom kernels whence kernel executes on the item compared to set length vector. This model employs the D-lib for face arrangement of the front section that could be efficient at 45*.

4) *Facial Feature Extraction:* Feature Exaction is the chief decisive job which can be withdrawn by convolution neural networks (CNN) as deep learning can be the top explanation for the object diagnosis, pattern identification and face acknowledgement. Convolution Neural Networks is one of the most extensively used deep neural networks because it can be skilfully-adjusted for conveyance of the uniform images. It uses three major schemes for the facial feature extraction -

a) *Local Respective Fields:* In the convolution neural networks, the film of masked neurons have low interconnections, confined area of the input picture pixels dissimilar another neural networks has a relation to every input pixel. To be further precise, every neuron in the first secret layer will be related with a compact zone of the input neurons. That region in the input neurons is termed as Local Respective Fields. Each relation has a weight and along with the secret neurons have an overall bias.

b) *Shared Weights:* The local respective fields related to the secret layer with identical tread extent would allocate the similar load and bias all over the concealed surface. The neurons in the foremost unseen layer determine exact similar features but at distinct

places in the input image. The shared load and map is termed as kernel or filter. The face recognition plots much features but the kernel minimizes the limitations efficiently.

c) *Pooling:* This layer is accompanied through the convolutional layer that is utilized to clarify the details in the output from the feature plan of the convolutional layer into compressed feature plan. Numerous pooling strategies are accessible for convolutional neural network but in this project max pooling is applied. Max pooling strategy responds the output of maximal activation in the 2x2 input areas. A project smart attendance is based on artificial intelligence that will assist to support social distancing & also warn us about impostures. Here we have 3 files that combines together in our project:-

5) *Graphical User Interface is to add user data to the Database:* This works as the database of the project. It is a Graphical User Interface (GUI) created through services of Tkinter Library in python used to add, delete or modify the data in a database, This will help us to maintain the data of people in an organization in which the project is implemented. It has various attributes like Id, Name, Branch, G-Mail & designation. We may add further attributes as per requirement. Let's take, an id as 90, name as XYZ, branch as CSE, designation as STUDENT and E-mail be XYZ@gmail.com and saved the data, It gets immediately updated with all its attributes. Also, we may delete data with just one click and can clear all the data using clear tab. we may find search through the data bases on any attribute like- ID, name, branch as per the information we know.

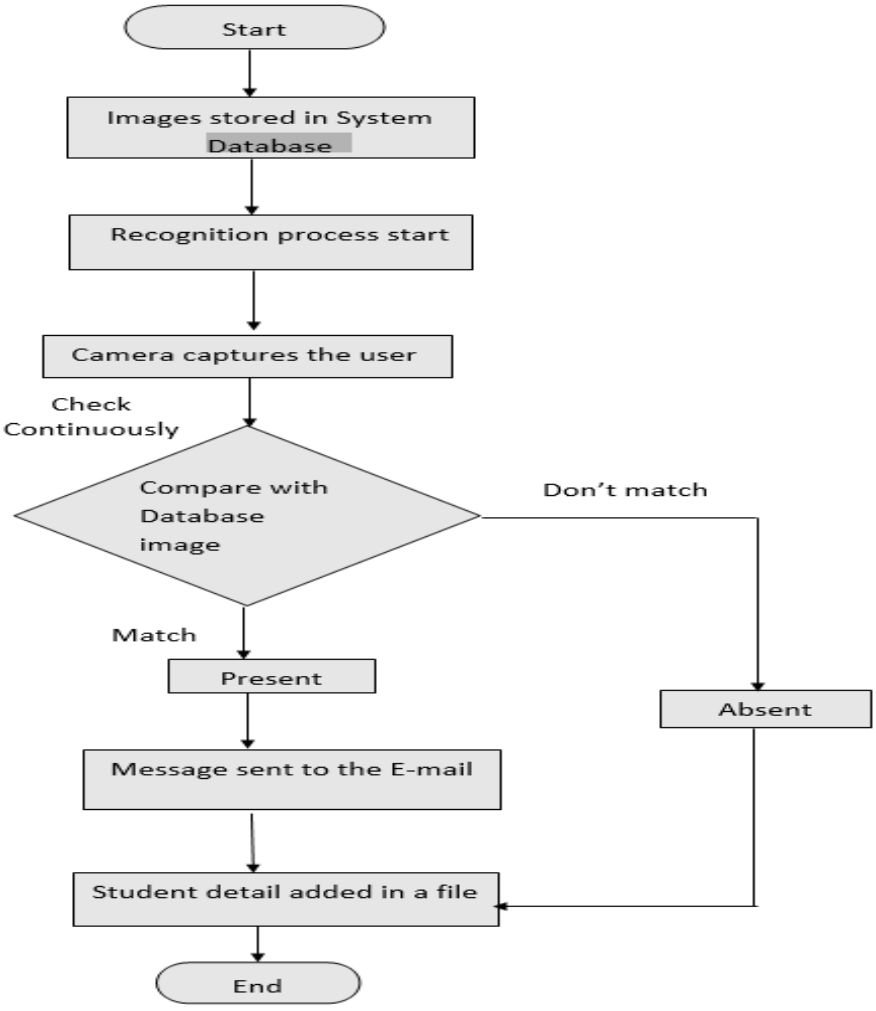

Fig 1 : Work Flow Diagram

6) *Camera is used to Mark the Attendance:* As a person stand in front of machine, a camera is activated that captured the image of a person standing in front of it and check the image from the image present in the file of the databases where the entity is exist or not. If the real entity is present in it and matches from the file present in the databases it display individual name on the screen and along with it the mic of machine tell you about the attendance is marked. Too, you will get mail that ensures us that our attendance marked as confirmation. In case an image of the entity through mobile phone or any other digital devices, it available to match from any of the existing file of the data base and hence display WARNING on the Screen. It is similar to the teacher attendance register that have the detailed record of each and every individual. we can search through choosing category based on the prior knowledge like id, name etc and it will display entire detail of all the individual from the database.

7) *Graphical User Interface is to Monitoring the Attendance:* It works in a smart way that keeps record of arrival time and departure time of every student and staff member on regular bases and also it present and absent. It too keep record of holidays like Sunday & updates accordingly. We may further add attributes & functions like searching through multiple values like Suppose we want to search for combined data as branch = CSE & designation = Student, we can add multiple attributes for the search function.

IV. RESULT

Fig 2 : Marking the Attendance

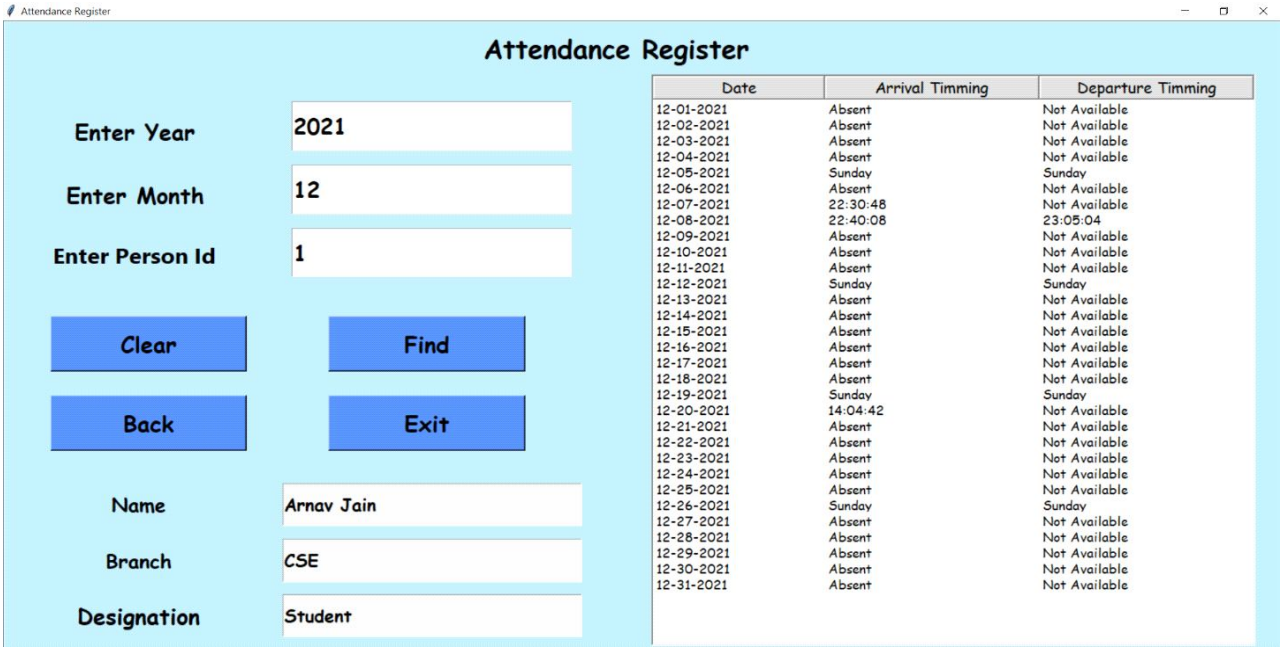

Fig 3 : Attendance Register GUI

The pictures above depicts the functioning of the several components of the attendance evaluation system. The execution of face recognition is done based on different methodologies. We have prepared a Graphical User Interface (GUI) through which it can evaluate the attendance of all the students & staff in organizations & institutions. After taking attendance of a human entity, it automatically sends the email to that person that "Your attendance is marked". Then, it records the attendance of each & everyone in .csv file which can be shared to whoever wants to access the attendance record of students or staff.

V. CONCLUSION

This paper presents a easy & coherent point of view to evaluate the attendance by face recognition techniques. The motive behind developing attendance monitoring system through face recognition is to deduct the conventional human errors. It's an urge of today's epoch to utilize such system after covid-19 pandemic. It made tracing the attendance precise enough and cost-effective. It can even check out how much time student or staff is present. The presented idea is safe, assured & can be easily accessible to users accordingly their requirement. This system will prove valuable asset to many organizations & institutions which in reality can supersede all the prior approaches of attendance monitoring like pen-paper or fingerprint scanning. The ultimate purpose is to make the students serious for their studies and for classes so that the teachers can easily wrap up the entire syllabus without taking lot of time in systematic attendance procedure. Commonly, what happens is quarter of the time of lecture is wasted in attendance only due to which it becomes burdensome to accomplish the entire syllabus for the teachers in school and exams arrive. We aim to create a effective, time-efficient & easy to access model that can be convenient not only for staff members but also for students.

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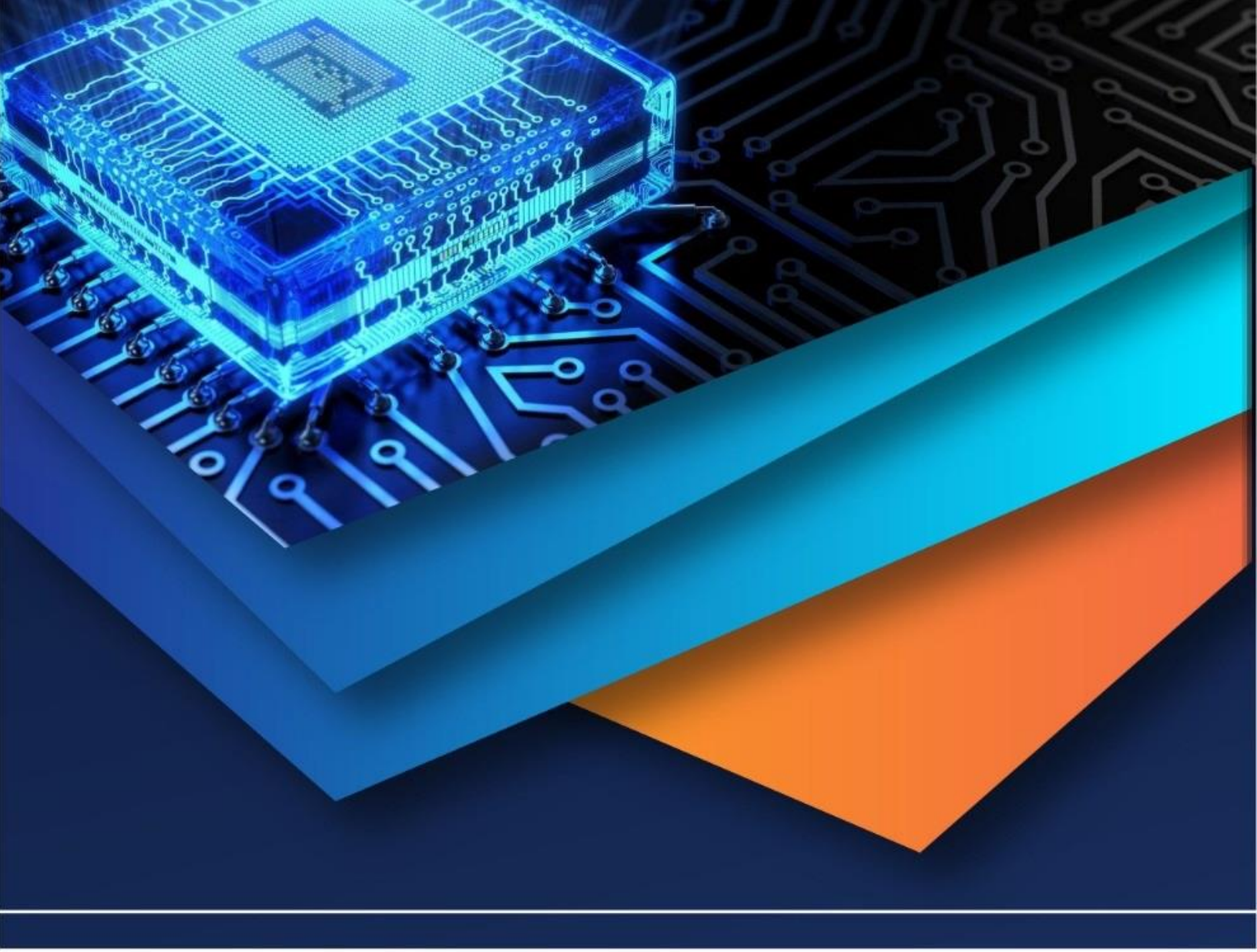

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