iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VII **Month of publication:** July 2021

DOI: https://doi.org/10.22214/ijraset.2021.36893

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

IOT Based Cloud Integrated Smart Classroom for Sustainable Campus

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Abstract: ***Recently, smart classroom technology, students are more demanding innovative university campus life, and are willing to use creative learning methods. IOT and Cloud computing technologies will provide solutions for smart and a sustainable campus to boost learning methods of the students and improve the efficiency of everyday activities within the Institution. This paper focuses on the IOT paradigm within the teaching process with the mix of Cloud for education system. IOT in education will provide student to be told new technologies that helps the students to create new ideas and logical for the social problems. IOT based cloud computing technology will provide intelligence system, unified campus portal services, security and maintenance system. IOT devices are being employed to trace students who Skip their classes, send alerts help students to concentrate academic work regularly, and to hunt out lost personal items. The hardware component of IOT includes microcontroller board, sensor module, and wireless and wired connections. Using this software module the knowledge to and from sensor modules is processed and then transmitted to the cloud storage. Our paper describes how efficiently IOT and Cloud Infrastructure restructure the quality education and learning methods.***

I. INTRODUCTION

Recently, Internet of Things and Cloud computing gains the attention of the colleges to develop smart campus. Several peripherals, infrastructure and facilities are connected during a sensible Campus that provides smart lighting, security, tracking, efficient utilization of resources including manpower, electricity, water etc. Traditional classroom model require equal time to be spent on both the teaching and managing workflow of the classroom. Faculty and thus the management of the institution face hurdles to look at the scholar academic closely. Thus, so on realize maximum utilization of the category hours, a fresh system is required to want care of the workflow which highly reduces the time of faculty to not persevere with managerial works and to increase the time of teaching and interaction with students. This project displays a technology that utilizes IOT along with cloud technology and application development platform to cut back the secondary work of mankind. This implementation let faculty to focus more on the primary work that's, teaching and to focus less on managing the workflow of the classroom.

II. LITERATURE REVIEW

A literature review shows the assorted IOT and Cloud based Smart Classroom Systems. Internet of Things based Smart Classroom Environment system will use customized ARM Microcontroller. This technique used for resource management, attendance monitoring, or faculty management. Using ID cards and wristbands, the situation of the learner or guest was tracked. This smart classroom system will also deal with intelligent parking systems, dynamic ticketing systems, etc. Another system will use touch-based interface and cloud-based framework storage system, for a smart bench in a very smart classroom was accessed through RFID security system. These interfaces are provided in each bench within the class through which the scholars will interact with notepad which helps them to require notes while paying attention to the category and it also help them for straightforward understanding and resource virtualization.

This new technological advancement has led to a change in education system. For Optimizing Classroom Usage, a wise Campus was developed that describes the implementation of IOT and AI Technologies. The system also includes sensing methods for measuring class possession for lecture halls across campus. The system features are collecting live occupancy and collecting attendance patterns for 250 courses over two sessions, identification of conducted, cancellation of lecture hour and tests. It also uses AI techniques for attendance prediction. The system features a methodology for an optimal classroom allocation by predicting student's attendance. Smart Campus Teaching Platform supported the 5G network implementation model is employed to ascertain a web teaching platform to get the scholar location information and monitor his presence in classroom, localization algorithm is employed. The smart classroom was implemented using 5G network technology in order to enhance the speed for student check-in time calculation and data transmission.

Some technologies like RFID, IOT, AI and cloud storage system may be effectively accustomed create Smart Classroom. Sensor to cloud data transmission may impose additional delay and security challenges. The system should offer an intelligent sustainable cloud computing. This project describes how efficiently IOT and Cloud Infrastructure restructure the normal education and learning methods using the cloud storage for handling smart application through which interaction between teacher and student, between the varied objects and IOT Sensors.

III. IOT BASED SMART CLASSROOM

A. *Block Diagram*

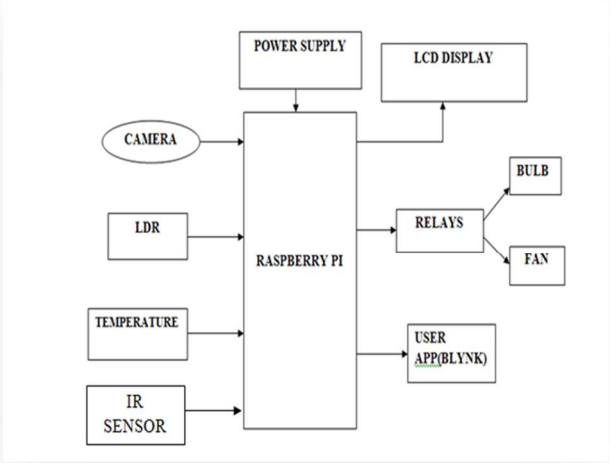

Figure 1: Block diagram

Smart Classroom, can be defined as the classroom equipped with the technology to aid teaching and learning .We often see that from entering the class to leaving it much of the time teacher is occupied in many of secondary nature jobs such as taking the attendance which (cases where class size is more than 60) eats up much of the time and in many of secondary nature jobs such as taking the attendance which (cases where class size is more than 60) eats up much of the time and after that adjusting the lighting of the room etc. Thus teacher is left with a portion of allotted time which in much of the cases is not sufficed. To eliminate this conundrum smart classroom would be the best rectification. With the help of smart classroom it would be easier for teacher to focus on primary job (teaching) whereas the secondary job can be done in miniscule part of allocated time. It makes it possible to control lighting, projector as well as allows the teacher to mark attendance through the facial recognition system. Even it allows the students to access the study material through the email. Ours could be a simplest smart automation system prototype which ranges from the controlling of electrical devices within the room to the attendance marking through identity verification. we've come up with the thought to develop an Android based application that may be pivotal for effecting many roles like taking attendance and controlling the lighting of the space. This application would run on the local server with the assistance of the routers that must be installed in every class room and lecture halls. the college members would be accessing this application. Inter alia, there would be a camera that must be installed in school room for the attendance through the identity verification. aside from teaching flank there would be a job of system for college students further. The study material would be mailed to every and each student after a set span of your time.

The teachers would upload the fabric during a folder which they require to be accessed by the scholars.

1) An Android based application would be the controlling tool together with the role of Raspberry pi
2) the appliance would run on the local server supplied with the assistance of this router
3) Raspberry Pi would be included within the switch control of the classroom.
4) The lines of lights, fans and projector would be connected to the various pins within the Raspberry Pi.
5) The Android application would be accustomed command the Raspberry Pi with the assistance of which different objects would be controlled.

B. Flowchart

The pseudo-code for PCA is as follows:

1) Set image resolution parameter 4 (imres)
2) Set Haar Cascade dimensionality parameter
3) Read training images
4) Form training data matrix (Mtraindata)
5) Form training class labels matrix (Mtrainlabels)
6) Calculate Face recognition transformation matrix (tmatrix)
7) Calculate feature vectors of all training images using tmatrix
8) Store training feature vectors in a matrix
9) Read test faces
10) For each test face do
11) Calculate the feature vector of a test face using t matrix
12) Compute the distances between test feature vector and all training vectors
13) Store the distances together with the training class labels
14) Initialize error count to zero.
15) For each test face Do
16) Using the space data, determine the person ID of the foremost similar training vector
17) If the found ID isn't adequate to the ID of the test image increment error count
18) Output the proper recognition accuracy : (1 - (error count/ total test image count))*100
19) Read Sensor Values 21. Control Appliances Like Fan and lightweight reckoning on Condition

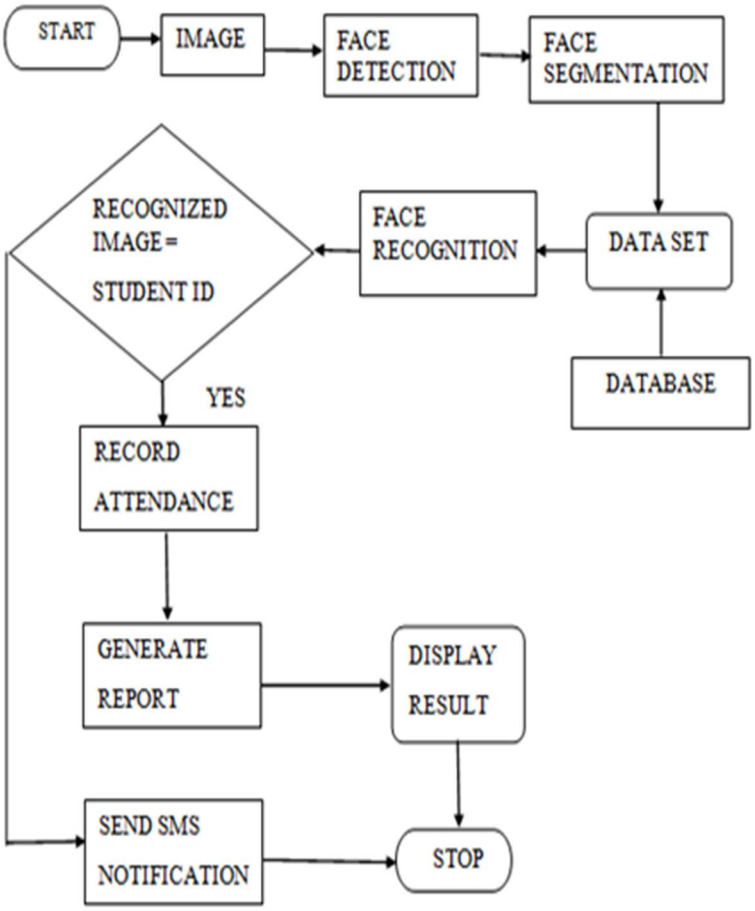

Figure 2: Flowchart

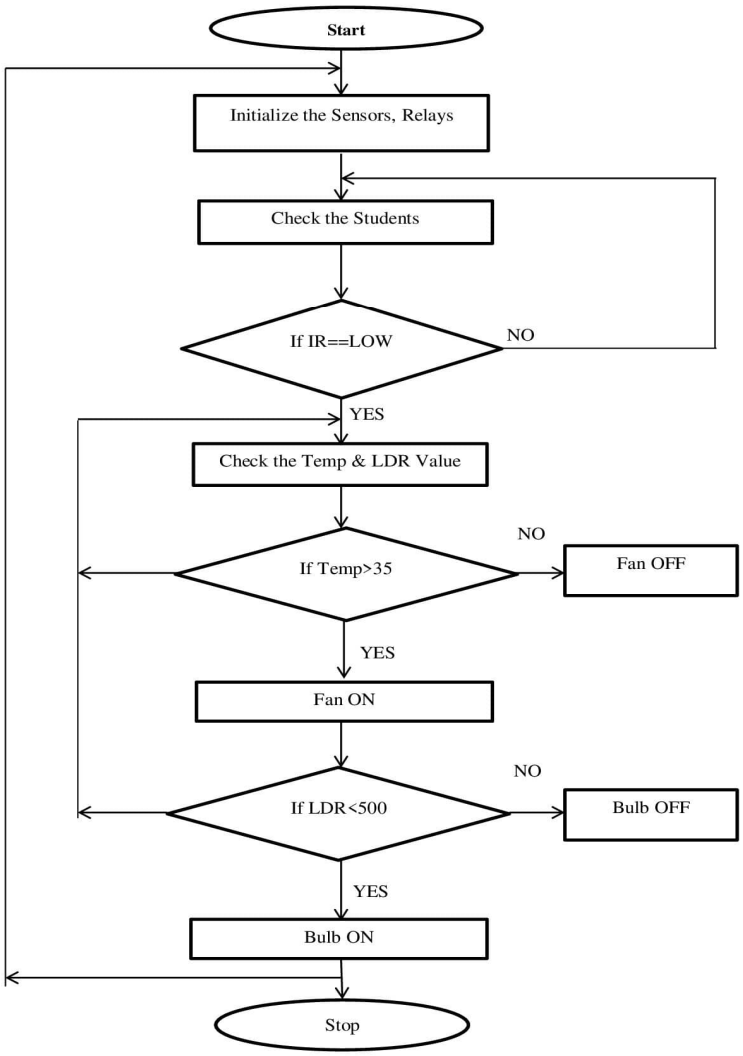

Fig 3: Environmental based room control device

The condition of the classroom is thoroughly monitored by the sensors ,if the classroom is dark automatically lights get turn on and if the temperature of the classroom is high ,fan gets turned on.

C. Hardware Requirments

1) *Raspberry Pi 3+ Board:* The Raspberry Pi is known as the 3rd generation single-board computer. It is a mini- computer and it has an in-built microprocessor.Here we can run multiple programs, which has theirown operating system.
2) *Temperature Sensor:* The Temperature sensor will measures temperature, whose output voltage will varies based on the temperature of the surroundings.The LM35 temperature sensor is used.
3) *Pi-camera:* The Pi camera consist of a small circuit and it links the Pi's camera serial bus interface connector through flexible ribbon cable. Where this Pi-model. camera will capture the image of the encircling.
4) *CPU:* The CPU is that the brain of this small computer that helps us in completing quite instructions supporting the mathematical and logical formulas. It comes with a capacity of 64 bit.

5) *The Clock Speed and RAM:* It comes with a clock speed which is 1.4 GHz Broadcom BCM2837B0 which contains quad-core ARM Cortex- A53 and RAM memory is around 1GB (identical to the previous version)
6) *GPU:* It stands for graphics processing unit, used for concluding out image calculation. Broadcom video core cable is added within the device that's mainly used for the video games.
7) *USB Ports:* Two more USB ports are introduced during this recreate, which sets you free from the matter of using an external USB hub once you aim to affix sort of peripherals with the device.
8) *MicroUSB Power Source Connector:* The connector is used for providing 5V power board. It draws 170 to 200mA more power than that to the of B model.
9) *HDMI and Composite Connection:* Both audio output socket and video composite now reside in an exceedingly single 4-pole 3.5mm socket which resides.
10) *USB Hard Drive:* The USB disk drive is on the market on the board that's accustomed boot the device. it's the image of the disc drive of standard computer where windows are wont to boot the drive of the pc.
11) *PoE:* B+ model comes with a facility of Power over Ethernet (PoE); a brand new feature added during this device which allows the required electrical current using data cables.
12) *Other Changes:* The B+ version comes with little improvement within the features and poses slightly different layout in terms of location of the components. The SD memory slot is replaced by a micro SD memory card slot (works like the previous version). The status LEDs now only contain red and green color and relocated to the alternative end of the PCB.

D. *Software Requirement*

1) *Twilio:* The Twilio SMS service will help you to send and mange messages programmatically. It uses the message resources to fetch message and list message associated with the account.
2) *Python:* Python is a High-level programming language. And also it is an interpreted programminglanguage which has its own advantages. The pythonis easy and simple to write the code, which is an open source, freely downloadable and a platform independent.
3) *Open CV:* Open CV is a library which is designed tosolve the computer vision problems. It make use of Numby, which is a highly optimized library for numerical operation with a MAT Lab. It focus on real time image processing which is open source andfully downloadable.

IV. EXPERIMENT AND RESULTS

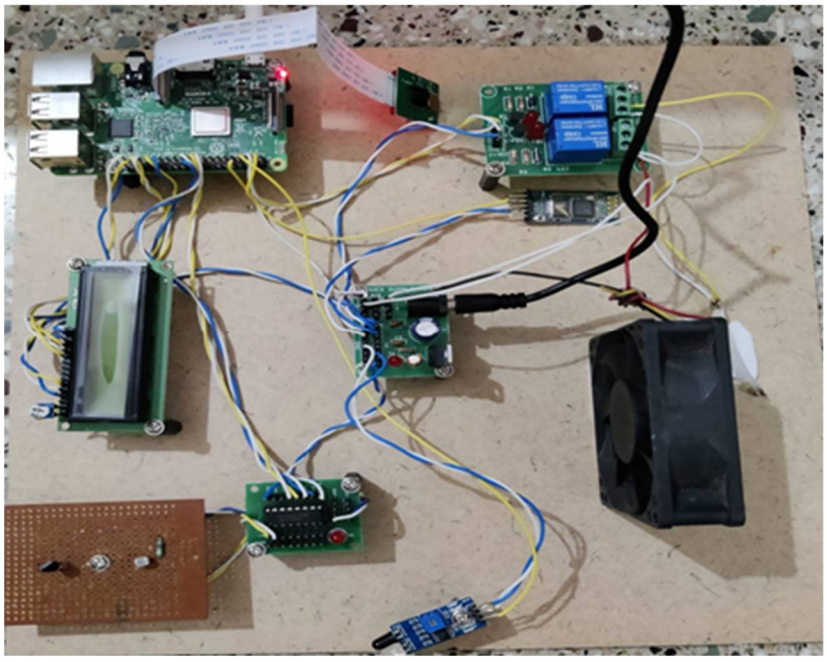

Fig 4.IOT Based Smart Classroom

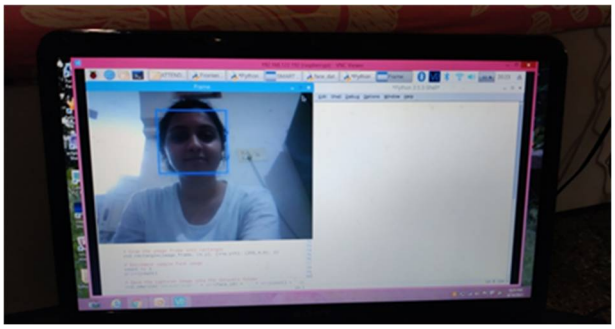

Fig 5: Automated attendance using face recognition

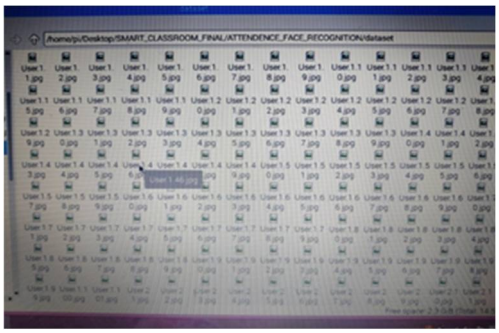

Fig 6: Database Storage

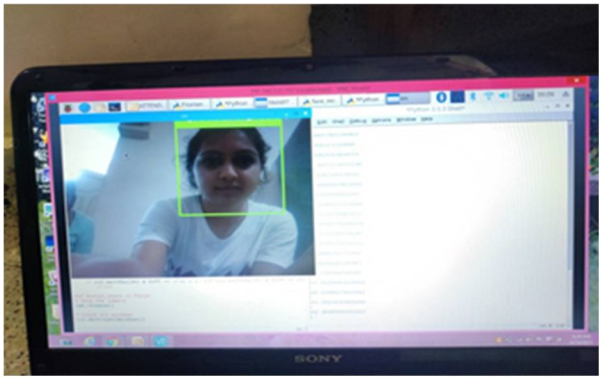

Fig7: Face Recognition

V. CONCLUSION

It will be concluded that a reliable, secure, fast and an efficient class attendance management system has been developed replacing a manual and unreliable system. This face detection and recognition system will save time, reduce the number of labor done by the administration and replace the stationery material currently in use with already existent equipment. there's no need for specialised hardware for installing the system because it only uses a computer and a camera. The camera plays a vital role within the working of the system hence the image quality and performance of the camera in real time scenario must be tested especially when the system is operated from live camera feed. The system may also be employed in permission based systems and secure access authentication (restricted facilities) for access management, home video surveillance systems for private security or enforcement. the main threat to the system is Spoofing. For future enhancements, anti- spoofing techniques like nictation detection may be utilized to differentiate live from static images within the case where face detection is created from captured images from the classroom. From the general efficiency of the system i.e. 83.1% human intervention may well be called upon to create the system foolproof. A module could thus be included which lists all the unidentified faces and therefore the lecturer is in a position to manually correct them. Future work could also include adding several well-structured attendance registers for every class and therefore the capability to get monthly attendance reports and automatically email them to the suitable staff for review.

VI. FUTURE WORK

In future, this method are often employed in mobile based face recognition. It can implement in real time applications using CCTV camera. rather than Haar Cascade algorithm, various recognition algorithms will be implemented for effective results. In further work, we shall improve face detection effectiveness by using the interaction among our system, the scholars and also the teacher. On the opposite hand, our system are often improved by integrating video-streaming service and lecture archiving system, to produce more profound applications within the field of distance education, course management system (CMS) and support to faculty development (FD).

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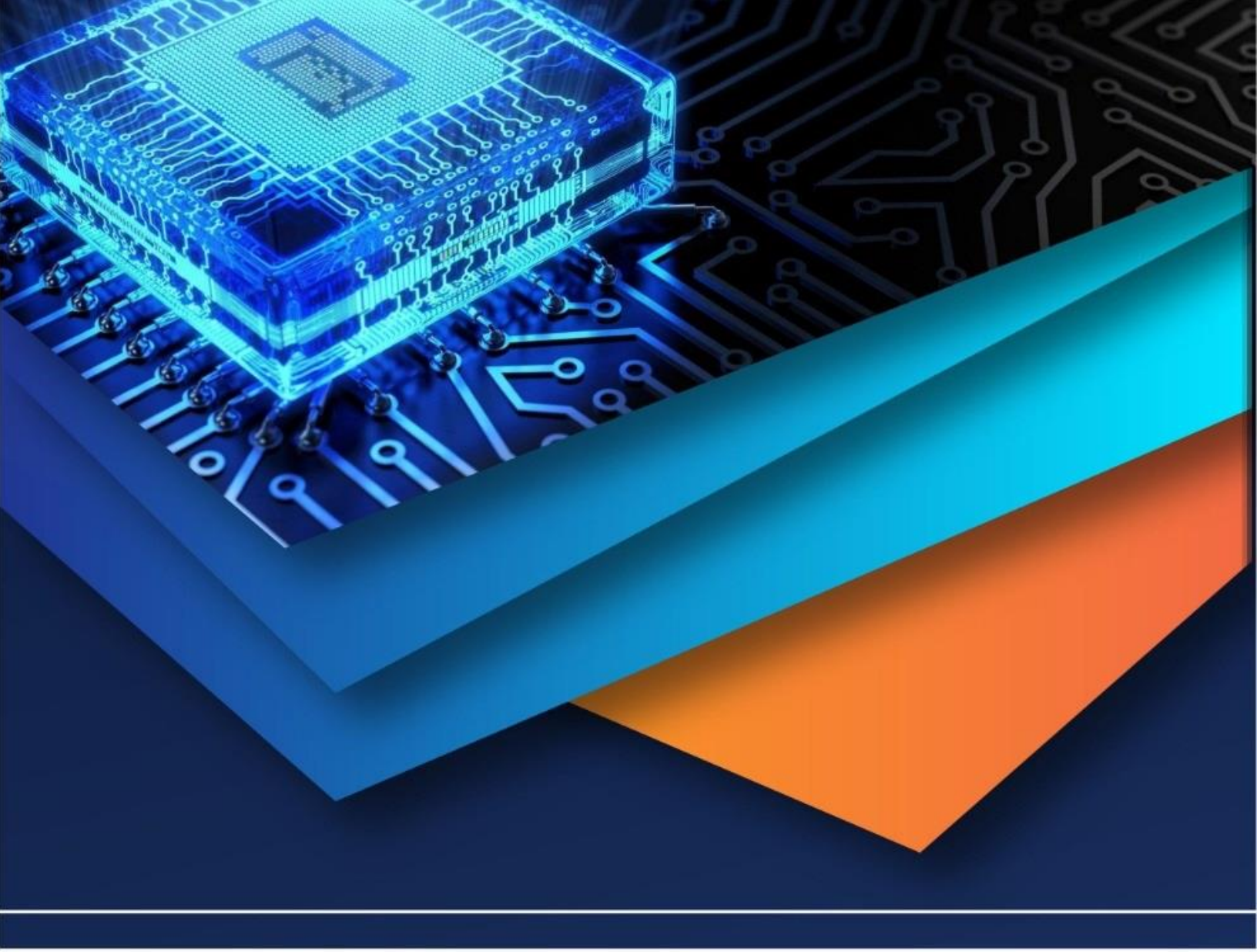

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