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IOT based Bank Locker

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Abstract: ***This project will focus on effective and secure recognition and controlling the system for the bank locker room that is fully self-determining.The prohibited entrance in the locker room can be detected by our security system in the case of robberies. Whenever the robbery takes place, due to absence of the proof by our current human operated security system the banks are not capable to recognize the robber. The system will be designed in effective way by recognizing and controlling illegal person to access the locker for the safety of bank locker room. In this, we proposed a three-phase conformation of procedure for smart locker using some registered pattern in mobile app, camera and SMS which check out the user. As compared to any other previous approaches our system uses web App which send a SMS to registered mobile number which highlights the smart security.***

Keywords: Internet of things, Image processing, Security System, Authentication, Lockers.

I. INTRODUCTION

The current surveillance systems and services are automated and so the banking sectors are also moving to achieve more automation in every part of security layer in the bank. In computer vision technology, current topic of interest is video surveillance and has high demands. CCTV cameras, alarms systems, emergency buttons etc., these days all the security layers are under the surveillance. The CCTV cameras are used to capture and monitor the activities and unauthorized movements. The majority of the security systems and the alarms need human intervention (need to be pressed physically). Additional human involvement and man power is required in the conventional systems. We need is a new system that always monitors and detects the unauthorized movements and alters the security officials of the bank by different ways without any human intervention to overcome such security flaws and decrease the man power. The microcontroller Based Bank security System that t akes care of all the fault which generally occurs in conventional systems, is the best option to make of. In more high secured areas like bank locker rooms a new paradigm for security system has been designed to effectively improve and enhance the level of security. The bank infers a spot which addresses a best part of security for an ordinary person. We are drawn in with banking trade reliably. For safety of our very expensive pearls, reports, papers or even cash, we often use bank locker rooms. To get by in this forceful world and for a predictable improvement, the budgetary business needs to give an abnormal state of security. Because of the open interest every day new branches are opening. The greater number of branches required more noteworthy security. In today's industrial era the security system is very important. Throughout our life, the hard-earned assets and valuables things are expected to be safeguarded under certain security. It is basically designed in order to avoid the risk of vulnerability to our valuable items. In this technological world, the system includes biometrics along with digital code lock which response in the way for matching or mismatching the code. Any mismatch to the series of authentication during verification is done raises an alert sound. The security problems faced with the locker systems and to overcome that a locker security system is proposed using IoT (Internet of Things), face recognition and OTP (One Time Password).The technology capable of identifying or verifying a person from a digital image or a video frame from a video source is called facial recognition system. There are multiple techniques in which facial recognition systems works, but generally, they work by comparing selected facial features from given image with faces within the database which is described as a Biometric Artificial Intelligence based application that can uniquely identify a person by analyzing patterns based on the person's facial textures and shape. For this we shall be using web camera for capturing image, processing it and then sending it via message and Internet to the user. The system captures the image when a person tries to access the bank locker and then process it and sends it to the users as picture message. This can also be used in places like personal workplace, office location such as records, server, document storage places and other places where security is of major concern. So, in order to have highly secured locker we are using this proposed method.

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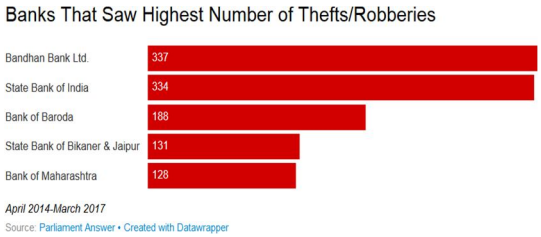

Fig 1: List of top 5 banks with highest number of robberies.

II. LITERATURE SURVEY

A. Abhilasha A Sayar and Dr. Sunil N Pawar, *[1]* In today's man's life the money security is an important aspect as he earns the money by his hard work, and banking is known for this. It is not enough to possess these accessories, but security of this is often vital, for this purpose we keep them in bank locker. Still we often hear or read in the newspaper that some fake person has accessed the locker of another person and have stolen money. In order to beat this sort of frauds, authentication of the one that wants to use the locker is extremely important. To control this security threat, a security system has been proposed using RFID (Radio Frequency Identification) and GSM technology.

B. Prajwal D, NaagaSoujanya N and Shruthi N, *[2]*This paper address the need of a bank customer, who waits for authorized bank staff, to open the customer's bank locker with a master-key. To sort out this issue, we've proposed a locker system, supported RFID and Password technology. This system also finds its application in house safes, Smart cash box, offices, etc to protect valuables. When a customer steps in front of locker room the IR sensor gets activated and the customer needs to give the access card, if the customer fails to do so in 60 seconds the buzzer gets turned on, only authenticated person can enter the locker room. Once the customer is inside the locker room, the customer is again asked to give the access card for their respective locker. If the customer is authenticated, they're required to enter the right password, otherwise safe gets locked. We have used keypad and RFID which may be a new technology expanding on a bigger scale, in terms of providing security. This project mainly focuses on the security of lockers in bank, houses, offices, industries etc.

C. Ylber Januzaja, ArtanLumaa, YmerJanuzaja and Vehbi Rama, *[3]* Nowadays the number of thefts and identity fraud has become a serious issue. In order to avoid these thefts and identity fraud, a face recognition system must be established. The scope of this project is to develop a security access control application based on face recognition. The features is used for face detection and PCA algorithm is used for face recognition. In order to achieve a highe r accuracy and effectiveness we use OpenCV libraries and python computer language. Training and identification is done in e mbedded device known as Raspberry Pi. During our paper we focus on accuracy increment by controlling parameters such as background, light and number of trainings. During our paper we also explicate cost issues of our application compared with commercial applications.

D. Priya Kumari,Parameshwara,Pushpanaik,*[4]*Encountering the real time challenges in the "security" arena and enhancing the existing criteria by designing an advanced technology. Implicit guarantee of your money in the bank being safe has always been the fact of concernment. This project ensures to promote encouraging the safety and secureness over the currently existing technologies. A security machine has been proposed with the usage of voice identity, face detection and GSM generation. The face reputation and voice popularity module act as comfortable locks which pick out and give access to the respective face and voice registered, denying every other unregistered to get admission in. The wireless digital camera is used to seize the image whose statistics is processed by means of the MATLAB. Where in, the AURDUINO holds the manipulation over the instructions. The mic is used for voice recognition. Motor motive force is used to open the door lock the use of DC motor. If the person is not actual, the information is dispatched to the patron. Where, if the consumer accepts-the locker opens, and if now not, the information can be transmitted to the police station and financial institution protection alert.

E. Subhash H. Jadhav , S. S. Agrawal, *[5]* The main goal of this project is to design and implement a highly secured and reliable smart bank locker security system based on RFID, Biometric fingerprint, password and GSM technology. This can be organi zed in bank, offices (treasury), schools and homes. In this system only an authentic person can open the lock and collect required documents, jewelry or money saved in his locker. In this security system RFID, biometric fi ngerprint, password and GSM technology systems are used.

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In our proposed system first the user will enroll his user name, password and his mobile number, then the person will put finger on finger print module and finger print will be scanned and stored with fingerprint id . In this way user enrolment process will be completed.

Then user will perform login operation. During login operation user first swipe RFID tag on the RFID reader if it is ok then finger print of authentic person will be scanned. If the finger is correct of that particular person then it will allow and display finger is ma tched and if the finger is not matched of that particular person then it will give the signal to the siren and will play some time and t hen message goes to the user that the

unauthorized entry is there please check. And if the finger print is matched then it will gives the signal to do next step to enter the Password, then the authorized person will enter the password. If the password is incorrect then

it will play siren and the system will send the message to the user i.e. the unauthorized person is trying to open the lock so please check it and so on, if all the conditions are matched then the microcontroller processes the data and correspondingly drives the motor to operate the load i.e. lock will be opened.

The main advantages of using RFID, biometric fingerprint, password and GSM technology is highly secure and reliable locker system than any other locker systems.

III.METHODOLOGY MODULES / METHODOLOGY

In our work we use three modules, these modules are listed below.

1) Registration
2) Face Recognition
3) OTP Generation and knocking pattern
4) Control Door

A. Module Description

Let us consider each module and discuss on it in detail. Firstly, we move to the first module and give its detail description

B. Registration

Admin first login into the portal to add the customer details. Admin can add the customers details along with the face image. All these details are saved in the application server. The customer details are sent from web browser to the application server using HTTP protocol. The customer details are saved in the mysql database. The captured customer face images are trained in the server using Linear Support Vector Machine (LSVM) and the trained model will be updated.

C. Face Recognition

When a customer visits the bank to access his/her locker, he/she needs to scan the face for face recognition. The camera connected with raspberry pi is used to capture the image. The captured face image is sent to the server. Once the server receives the image, process it.

First of all the input image will be taken, the cropping of the face and the face discovery calculations are will be done using the Viola-Jones algorithm. The Viola- Jones calculation is used for pattern matching the face features related to the image present in the database records. Then features of face will be extracted using Gabor filter bank, GLCM (Grey Level Co-Occurrence Matrix) and HOG (Histogram of Oriented Gradients). Gabor filter bank is an image processing technique where frequency and orientation representations of Gabor filters are same as human visual system. They are familiar with the texture representation and spatial domain. It is defined by a sinusoidal wave where it is multiplied by a Gaussian function. It uses convolution theorem and the Fourier transform of harmonic function and Gaussian function. In spatial domain Gabor filter is directly mapped to the Gabor wavelets, which they can be designed in such a way for dilations and rotations. The computation requires bi-orthogonal wavelets. GLCM is defined over an image for distribution of pixel values (grayscale values) such as (delta x, delta y) which are position operators which can be applied to any image pixels. These Co-Occurrence matrixes are typically very large and sparse in nature of matrix which is used to get useful set of features. HOG is used for object detection mainly used by the Viola-Jones detectors.

The cascade methods which are present in HOG there are extremely fast.

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In order to detect human faces while capturing the image, HOG image descriptors and Linear Support Vector Machine (LSVM) are used to train. Certain steps are to be followed in HOG. They are:

1) The positive samples of trained images, HOG descriptors extracted.
2) The negative samples that don't contain any objects, HOG descriptors extracted
3) On the samples, training LSVM.
4) Computing HOG descriptors and applying classifiers on samples which are called as hard negative mining.
5) From the hard negative mining stage, collecting the false negative samples and sort them.
6) Testing is done with the dataset.
7) Finally face recognition is done by using Euclidean distance method. Server fetch the corresponding customer id and send back to the controller.

D. Eye Blink Pattern

After face recognition, this system will verify eye blink pattern from the database.

E. OTP Generation And Knocking Pattern

If the face recognition process is successful, server generates the OTP using random function and encrypts it using bilinear pairings encryption. The encrypted OTP is sent to the customer's mobile number as a SMS. Once the customer receives the encrypted OTP, opens the mobile app, and verifies himself by entering the correct knocking pattern. If verified, the app decrypt the received OTP and displays on the app.

F. Control Door

To access the locker, the customer now can enter the OTP using the keypad fitted with the locker box. The entered OTP is sent to the server using TCP/ IP protocol from the wifi modules connected with the locker box. Server varies the OTP and the corresponding locker box number and if successful send signal to the locker box. Once locker box receives the signal, opens the door.

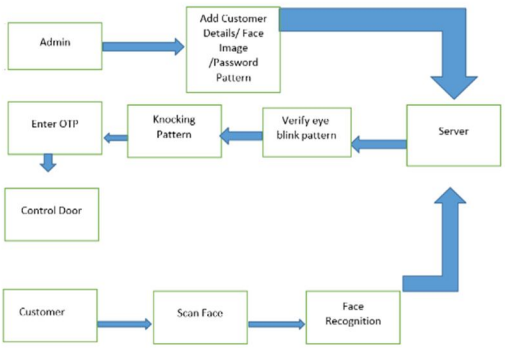
IV. HARDWARE REQUIREMENTS

1) System : Intel i3 2.1 GHZ
2) Memory : 4 GB.
3) Hard Disk : 80 GB.
4) Raspberry pi, RPI camera, Servo motor

V. SOFTWARE REQUIREMENTS

1) Operating System: Windows 7 / 8 or above.
2) Language: JAVA, Python
3) Tool : Python IDE, Android Studio, Netbeans, Navicat, MySQL

VI. BLOCK DIAGRAM



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VII. ALGORITHMS USED

A. Support Vector Machine

A Support Vector Machine (SVM) is a supervised machine learning algorithm that can be employed for both classification and regression purposes. SVMs are more commonly used in classification problems and as such, this is what we will focus on in this post. SVMs arebased on the idea of finding a hyperplane that best divides a dataset into two classes. SVM is used for text classification tasks such as category assignment, detecting spam and sentiment analysis. It is also commonly used for image recognition challenges, performing particularly well in aspect-based recognition and color- based classification SVM also plays a vital role in many areas of handwritten digit recognition, such as postal automation services. There you have it, a very high-level introduction to Support Vector Machines.

B. OpenCV

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis. To Identify imagepattern and its various features we use vector space and perform mathematical operations on these features.

VIII. RESULTS

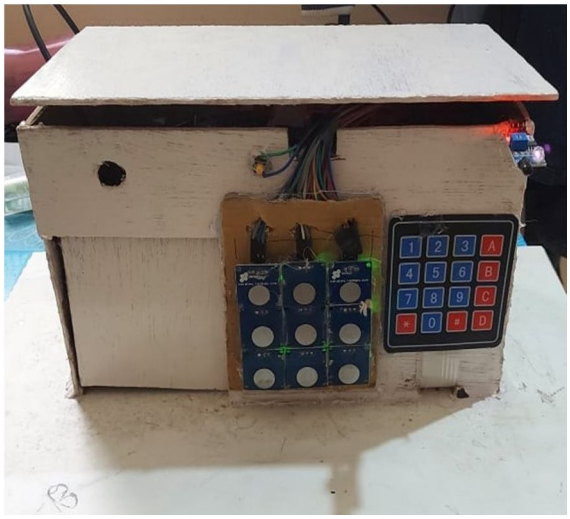

Fig 2: Keypad and OTP system

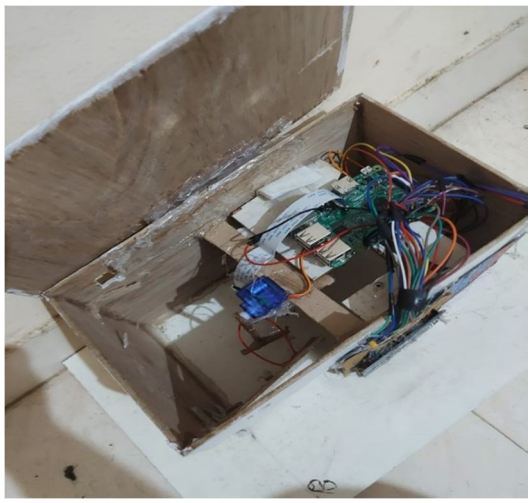

Fig 3: Servo Motor

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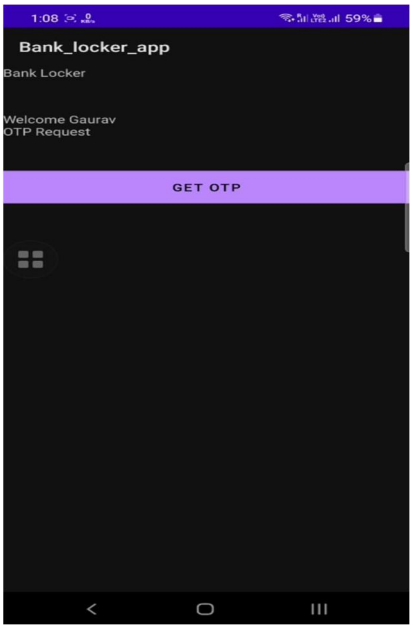

Fig 4: Android App

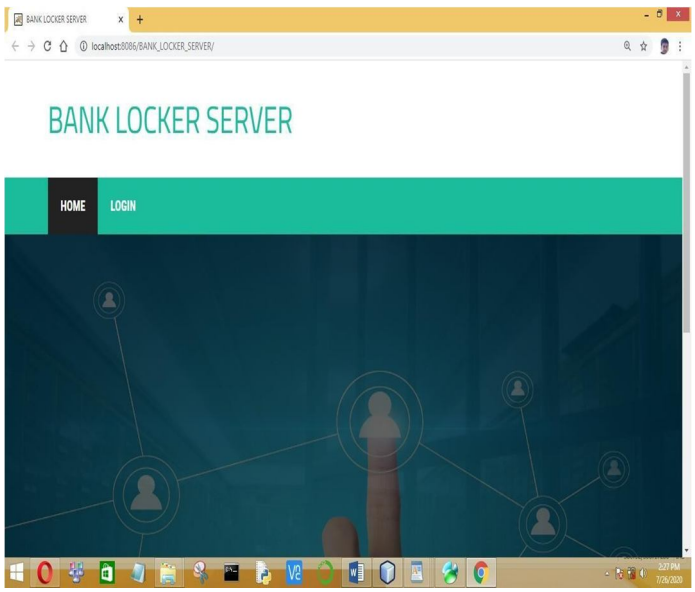

Fig 5: Home Page

Face Recognition, Eye blink, Knocking Pattern, OTP encryption and decryption, Web portal for registration and App was tested and verified.

IX. CONCLUSION

In this paper we propose a design framework of Locker system. The locker system with face recognition, knocking patter and OTP service is installed for security purpose. SVM is used to recognize the human face. The technique of face recognition phase is done accurately. Then OTP is generated and send to the owner by means of SMS. This proposed system is more secure compared to the previous techniques where the user was only able to access the locker using OTP and knocking pattern. In home passage security framework with sensors and actuator this method can also be applied.

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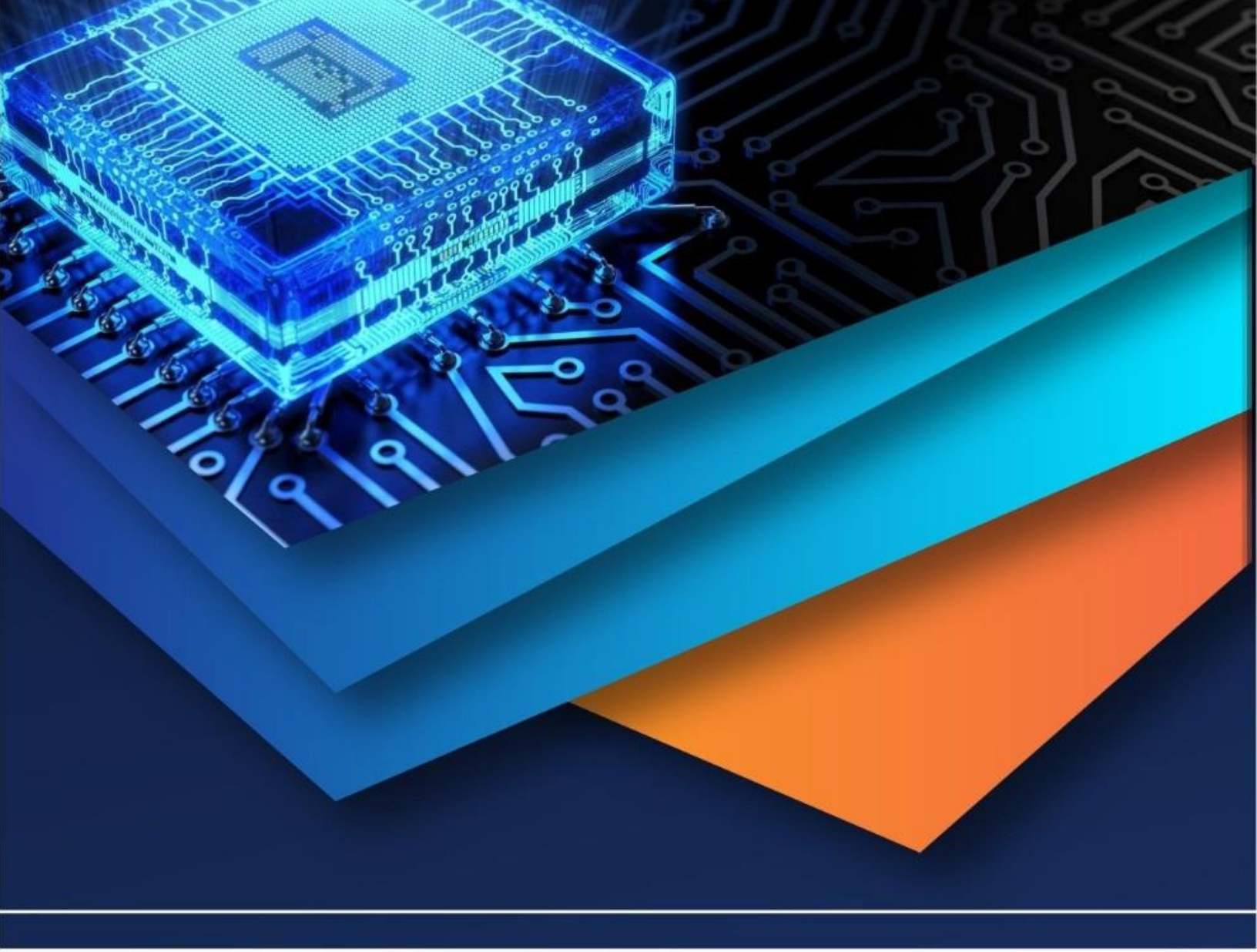

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