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Women Safety Application using Machine Learning

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Abstract: ***Crime against women these days has become a problem of every nation around the globe. Many countries are trying to curb this problem. Preventive measures are taken to reduce the increasing number of cases of crime against women. A large amount of data set is generated annually on the basis of reporting of crime. This data can prove to be very useful in analyzing and predicting crime and help us prevent the crime to some extent.***
Crime analysis is an area of vital importance in the police department. Study of crime data can help us analyze crime patterns, inter-related clues & important hidden relations between the crimes. For prevention of crime, further using data mining techniques data can be predicted and visualized in various forms in order to provide better understanding of crime patterns. The safest route prediction system will check for all the possible alternatives for reaching particular destination and based crime analysis the route with minimum crime rates will be selected and will be provided to user. Machine learning algorithms are used to generate the risk score of a path based upon average risk score of nearby clusters/regions. The Public safety can be ensured by developing such a kind of system. We are looking forward to developing the safest route prediction using crime analysis. This system is the backbone used to implement this women safety application which enables a greater level of safe experience for them along with these several emergency handlers are also integrated in this application.
Keywords: machine learning, KNN algorithm, crime analysis, safest route system, emergency handler

I. INTRODUCTION

In the present scenario, women are working shoulder to shoulder with men in every aspect of life but unfortunately at the cost of being subjected to abuse, harassment, and violence in public and even at their own houses. They feel uneasy to step out of their houses at any time of the day, to wear clothes as per their will, nor can they even go for work in peace. There is some kind of restrictions that women are subjected to which not only takes away their sense of freedom but also shatters their confidence and dreams. Due the reasons mentioned above, it is quite apparent that there is a striving need for women security in the country. It is worth noting that technology has been advancing day by day As such, it is now possible to intelligently apply the benefits of current technology to resolve societal issues. Therefore, aim is to apply the current trend in technology i.e. Machine Learning and using the most widely used Smartphone operating system i.e. Android to design an application which will prioritize women safety using analysis of past crimes. Machine learning is a branch of Artificial Intelligence which learns from data, identifies patterns and makes decisions with minimal human intervention. Typically, machine learning algorithms are widely used to identify the patterns in the data therefore we're using these algorithms to find out the patterns in previous data history of crimes on women, which will give our proposed system the base of its features Almost more than half of the population of women uses mobile devices with an android operating system hence we have decided to build our proposed application using android. The prediction can be further made useful for detecting the crimes in advance or by adding more cops to sensitive areas which are identified by the system[2]. The proposed system is a prototype which has been developed by understanding the uncertainty of events, because incidents can occur at any moment so we have added some features which are complementary to the basic women safety application. We added a machine learning module which helps us find the safest route between the provided source and destination, along with it we can have access to information of crime zones in between the path. When the SOS button is pressed then an alert message which contains the name of the user, GPS Location and a help message is sent via SMS. The user has access to first-aid information and toll free helpline phone numbers[1]. The ideal scenario would be women before traveling will search for a safest route between source and destination and will follow that. The application will provide necessary information about different zones in between the route and if any mishappening does occur the user needs to activate emergency situation handler by either shaking the phone or pressing buttons, once emergency handler is activated nearest police station would get informed about an uncertain event with location coordinates so the police can reach out and investigate. At the same moment all the emergency contacts will also get the emergency SMS with exact location coordinates. Along with this the Audio / video hardware i.e. mic and camera will be turned on automatically without any warning to capture the crime and to record the proof. Along with this scenario we plan to add some safety features like self-defense to the application.

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II. LITERATURE SURVEY

There is an app called" Raksha-women safety alert". This Raksha app has made for women safety so that a woman will always feel safe. It sends alert messages with location to the specified contacts [3].

Here is another app named "I Go Safely"[5]. This application sends a 30 seconds audio recording and video clip to the registered contacts along with emergency message. The app is activated if the user shakes the phone or will drop the phone. But If anyone shakes the phone mistakenly it will start working which can make unnecessary problems. Similar to this there is another app named" Shake to Alert" [4].

Another similar kind of an application entitled "Safety pin". The application has some features like emergency contact numbers, GPS Tracking. At the time of danger, the app pins the safe areas along with their security scores to go. It allows users to identify areas that are potentially unsafe to help others [1].

"Abhaya" is another application developed for safety of women. It identifies the location of the site via GPS and sends a message to the registered contacts that includes this location URL and also calls on the first registered contact to assist the one in dangerous situations. This application's uniqueness is that it sends an emergency texts to saved contacts by the interval of 5 minutes unless stopped in the application. Continuous SMS location tracking helps to find the victim's location quickly and to rescue safely [2].

The paper [11] proposes an app, in which a single click of SOS sends a message containing the location and/ or audio- video call to the guardian number. It provides different features like First-Aid help, Fake Call Help and video call. The First-Aid help feature provides the help on various health problems occurred at any emergency situation. First aid can be used to help for various problems like unconscious and choking, bleeding heavily, burns, heart attack etc. The Fake call feature is helpful when women or girls want to get out from a get together and any fake might do the job. The emergency contacts are by-default for this app, but it able to search the police, firemen, hospitals contacts nearby to your location. It also sends the audio-video recording using Email-Gmail of emergency situation captured by the user where user unable to speak or tell the circumstances.

In paper titled All in one Intelligent system for women security the author Abhijit Paradkar and Deepak Sharma proposed a system which provides several kinds of application to deal with an unfortunate scenario, here the proposed system uses SOS button , Police Notification, Intrusion detection, Spy camera, fake call detection along with voice operations , this system takes several measures to tackle the situation and helps the women to be safe .[16]

The Paper [19] Author proposed a portable belt as a safety device switch will automatically activated based on the pressure difference in an unsafe situation. The belt has GPS module which track the location and sends the emergency messages to three saved emergency contacts every two minutes with updated live location through GSM. The belt has a siren alarm to call out people for help as well as electric shock mechanism.

After the wide range of surveys through the papers and the applications some of which have already been mentioned above, the conclusion which we got from the survey is, although some applications are available which provide the same functionality as we are going to provide in our application, there were some flaws in that. Such as some applications provide tracking but did not provide information about the safe and unsafe areas. Also some applications did not provide audio recording features as evidence and so on. These facts led us to think about making a new application which has all those features altogether including some additional features such as web application for the collection and storage of the crime data purpose. Another adder is the alert system that is when you enter any unsafe area in which much more crime usually occurs, you will get an alert message so that you can alter the route.

III. PROPOSED SYSTEM

The system is designed in a way that it will provide women and girls safety measures even before they depart to somewhere from home. The system ensures that the journey or travel is safe for women that is the main reason for this project we have added a machine learning model for that purpose called as safest route model. Alongside that we have added several functions as emergency situation handlers we consists of SOS function, emergency notifications, crime scene capturing, location tracking etc.

The application is internet based application where once the user is registered it requires several emergency contact details. Then after logging in the application provides us some options like view crime status, safest route, capture crime, SOS etc.

The safest routes module is a machine learning model which accepts crime dataset as input which is provided by police which then applies k Nearest Neighbor algorithm to dataset and provides users the crime statistics region wise which helps user to decide a safe way. Along with these safest route system accepts source and destination and calculates the safest route between source and destination using machine learning model.

The emergency situation handlers activates on SOS function activation then the emergency sms are sent to all the emergency contacts saved. As well as the nearest police station will be informed and the live location coordinates will be sent to police station. At the same time the mic and camera will be activated and start recording everything as the situation evidence.

A. Block Diagram

The following diagram is the block diagram of proposed system. It displays all the different blocks present in the system. The system starts off with users mobile device where crime status will be displayed area wise with the help of machine learning model. As the diagram shows first the Recent crime dataset will be gathered, which will be processed and the results will be displayed on users device. The diagram also shows that the system requires an administrative person or source who will provide real time crime dataset to make system as much as effective. The next block in block diagram shows the SOS function of the application. Whenever the women feels unsecured she can activate SOS function by pressing power button two or three times when it is pressed the emergency contacts will receive the emergency SMS as well as the nearest police station will be notified also the real time live location co-ordinates will also be sent to police and relatives. When the power button will be pressed 3 to 4 times the emergency handler will get activated all the notifications will be sent by emergency handler as well as the mic and camera will be activated to capture the crime scene which the user can directly forward to the nearest police station or visit nearest police station and submit it.

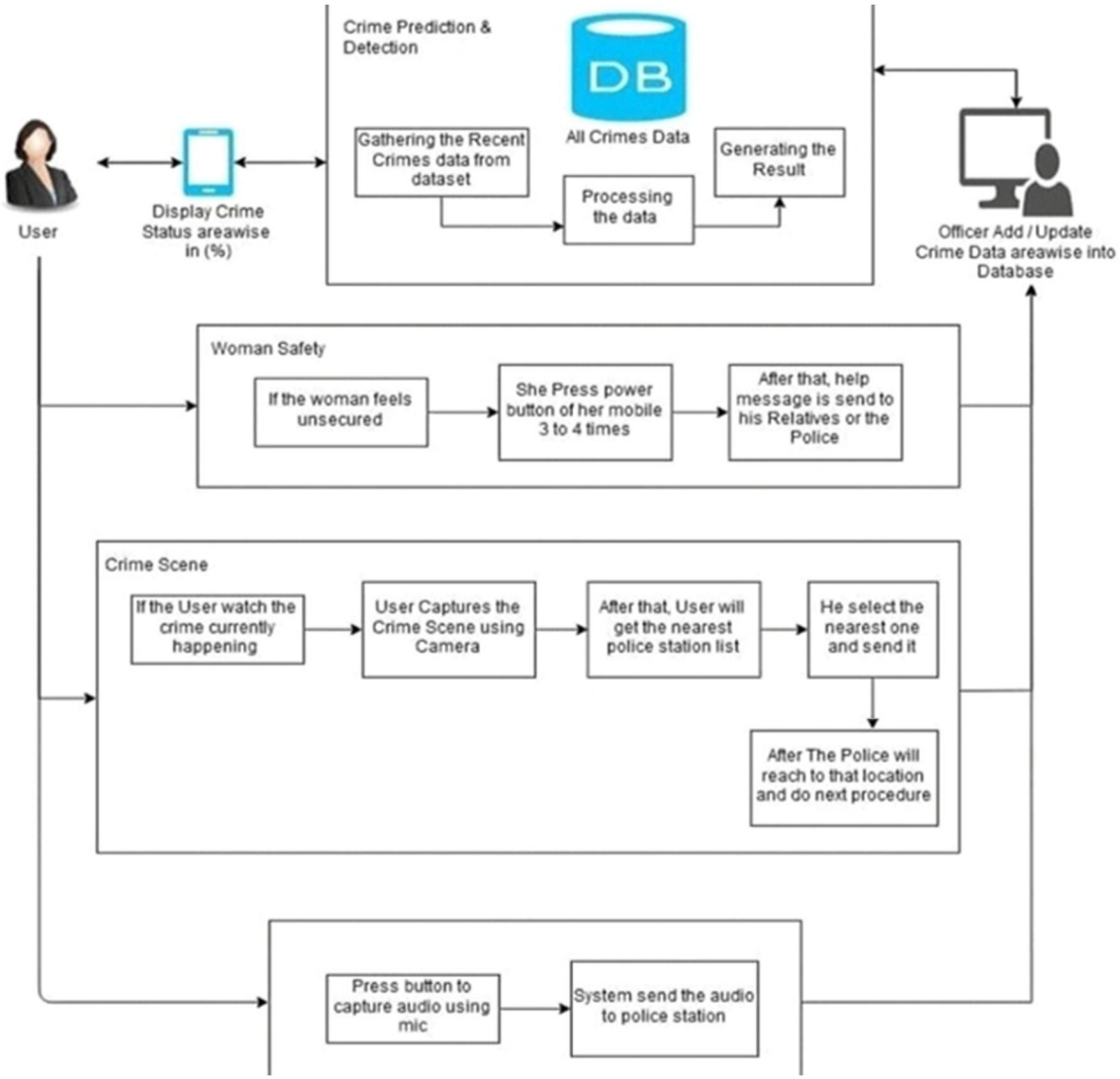

Fig 1. Block Diagram

The block diagram shows the system in a manner that any person with no technical background can also understand the functions and characteristics of the system.

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B. System Architecture Diagram

The system architecture diagram divides the women safety application in three different parts. SOS alert, safest route and capture crime these three are the functioning parts of women safety application using machine learning.

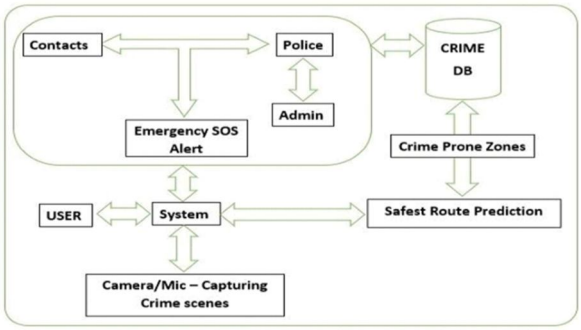

Fig 2. System Architecture Diagram

As you can see in above figure women safety application it consists of two different modules with three different functioning parts. This System is a bridge for the various functionalities to come together for the better prevention of unwanted situations.

The first module is women safety android application. This module carries two functioning parts of our system e.g. SOS alert system and Capture crime. SOS alert system activates when the user presses power button three times which is also part of emergency situation handlers. In SOS alert system we can see in the diagram that police and admin users also have their own roles to fulfill. The police are directly included in SOS alerts because they're be given exact location coordinates and emergency signal upon emergency situation. The contacts mentioned in the diagram are the emergency contacts that the user will save in the system at the time of installing the application. When SOS button will be pressed the contacts saved will be receiving emergency SMS.

The second most important function of our women safety application is capture crime. Whenever the user will press the SOS button the application will automatically start to record audio and video evidence. Regardless of the system user can also directly decide to record the situation through mic and camera and send it to nearby police station or visit nearby police station and submit it.

The second module of the women safety application is a machine learning model called as safest route prediction. As you can see in the system architecture diagram of women safety application that safest route module is connected with crime dataset which will be past records of the particular regional crimes. The admin users or police users have given the responsibility of feeding system this data if this system is Implemented in real world for our project we have used a sample dataset

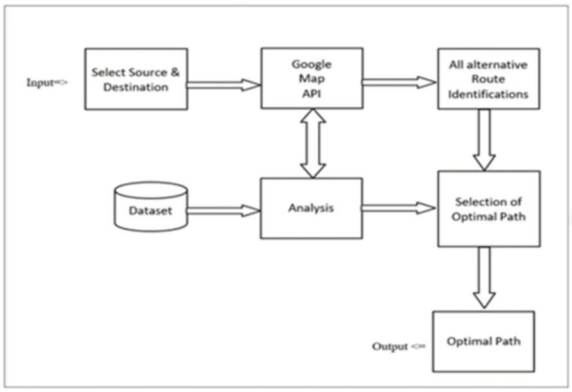

Fig 2. Machine Learning Module Architecture Diagram

Above figure is the machine learning module Architecture. This module takes crime dataset provided by police as the input applies the K Nearest Neighbor algorithm to the dataset based on that the system provides the user the information about crime statistics about regions in city. Along with that safest route module also provides safest route for travelling form source to destination in the city. e.g. for example if any women or girl is unsure about the way she is taking she can select the source and destination and the system will show her the safest route connecting those two points, the route might take longer duration than regular because here we are putting safety of user in consideration.

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IV. MATHEMATICAL MODEL

In the second module of our project we're using K Nearest Neighbor algorithm for the clustering on the crime dataset given by police which will be used to determine the crime prone zones as well as safest route prediction, K Nearest Neighbor algorithm is a supervised type of algorithm which is used for clustering purposes.

A. K Nearest Neighbor Algorithm

The k-nearest neighbors (KNN) algorithm is a simple, easy-to-implement supervised machine learning algorithm that is widely used to solve both classification and regression problems. K nearest neighbors is an algorithm that stores all available cases and classifies new cases based on a similarity measure (e.g. distance functions). K-Nearest Neighbor is one of the basic classification algorithm of Machine Learning. It is a supervised learning algorithm and widely used for pattern recognition, data processing and intrusion detection.

Following is the KNN algorithm flow.

1) Load the data.
2) Initialize K to your selected number of neighbors.
3) For every example in the data
a) Measure the distance between the query example and the current example from the data.
b) Add the distance and the index of the example to an ordered collection.
4) Sort the ordered collection of distances and indices in increasing order by the distances
5) Select first K entries from the sorted collection
6) Get the names of the selected K entries.

V. WORKING OF PROTOTYPE DEVELOPED

The proposed system can be implemented as an android application. The proposed system provides all required functionality and there is no need to buy and install different apps that possess different functionality. Therefore, the system is very cost effective and consumes less memory. The snapshots of the working system prototype are as follows:

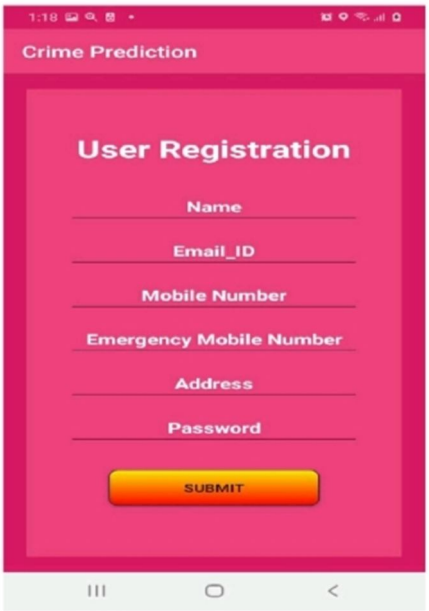

Fig 4. User Registration Screen

This is the registration screen of women safety application.

Fig 5. User login Screen

This is the login page of women safety application.

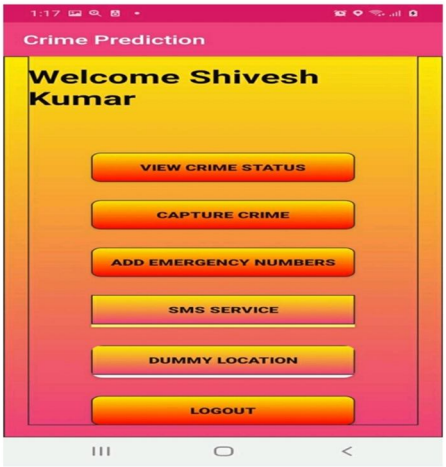

Fig 6. Main Menu Screen

This is the home page of women safety application.

Fig 7. Capture crime Screen

This is the crime capture screen where user can use the camera to capture the visuals to serve as evidence.

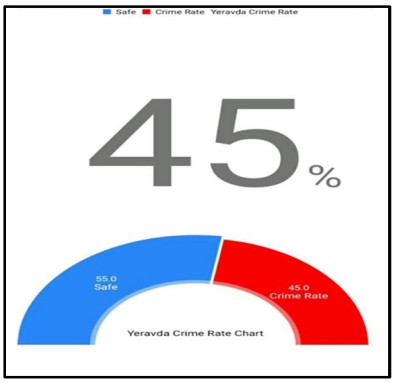

Fig 8. Capture crime Screen

This is the region wise crime statistics of women safety application generated using machine learning model.

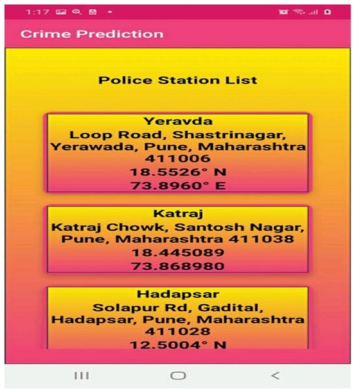

Fig 9. Nearby police station screen

This is the nearby police station screen of women safety application.

VI. ADVANTAGES OF THIS PROJECT

A. The main objectives are to provide security and take proper precaution to avoid the incident which can harm our society values.
B. To increase the feeling of security between the people of the city while roaming around the city.
C. To help the government by making a clear analysis of which part of the city possesses threats to reduce the Crime rate.
D. To provide the solution for fearless and safe traveling around the city.
E. Determining the best possible route for traveling so that no harm will be done to passengers.
F. This is very first woman safety project which is using machine learning algorithm as its base which we think is the future.

VII. LIMITATIONS OF PROJECT

A. The prototype is built under working under a finite set of conditions henceforth in other real world conditions might not work as expected.
B. The application needs strong Internet connection as well as it stresses the battery of mobile.

VIII. APPLICATIONS

1) *Social Use:* This application is useful for women and girls who have late work shifts, who have to travel a lot. This application will be a lot help to women in case of emergency
2) *Crime Analysis System:* This application consists of a crime analysis system which shows the crime rate of any region in the city as well as provides the safest route from source to destination.
3) *Safest Route:* This application uses machine learning algorithms to predict the safest route between source and destination which can also be used by tourists.

IX. FUTURE SCOPE

As time passes technology enhances rapidly, therefore we need to integrate the latest technology with the application which are very well affecting the real world conditions such as here we integrated women safety application with machine learning to make application more adaptive and reliable. There can be some additional features Implemented in this project to make it even more accurate as follows:

A. This application requires an active Internet connection which consumes a lot of battery which can be a downside to a good application hence it needs to be updated to an edition which requires less or no internet connection.

B. This application can be more reliable if the user can directly call the nearest police station and inform about the situation but as we needed to automate everything we are automatically informing nearby police station by notification but it is possible to that nobody in police station is logged in hence a call feature is needed.

C. NFC module: we can add a NFC module. NFC is Near Field Communication chip which can communicate with other Near Field Communication chip of other devices, we can add a feature like whenever a girls or women are in danger the emergency situation handlers will activate NFC and collect the information about Nearby mobile devices by the NFC chip in the devices. Which can be a great lead to the investigation.

D. Web portal: we can add a web portal to this system where every police officer will already have registered and whenever any women or girl activated SOS function all the police officer in 100-meter radius will be receiving notifications on mobile, the main benefit is any police officer on patrol duty can get notified and reach the designated location faster.

E. IOT module: we can further expand this system by adding an IOT module, here our system is notifying emergency contacts and police , providing live location co-ordinates, helping to gather video or audio evidence but in terms of resistance its totally on the women or girl in danger , hence we can add an IOT module which can help like providing short electric shock or flash light we can blind the culprits vision for some time.

Hence, the advance technology used will make the system more robust and reliable. As the new modules provide the functionality which enhance the safety and security will help to fulfill the purpose of the project.

X. CONCLUSION

The developed model will help to reduce crimes and will help the crime detection in many ways, from arresting the criminals to reducing the crimes by carrying out various necessary measures. The Android System is developed for controlling the crimes in our society. We are using the KNN algorithm for finding the nearest location so any necessary action will be taken by users and Police Stations. The product is built as a lab prototype to show how the real world can implement this into their day to day life to take any precautions. The main objectives are to provide security and take proper precaution. We can increase women security which will lead to betterment of society, therefore this prototype will act as a stepping stone for a crime less and fearless life for women and girls. In some cases, this system can provide effective evidence which might be key to justice. This system is can help the women in danger and to reduce the number of women crimes. The machine learning model can be very effective in women travelling and tourist travelling as well as it can be informative to police department as it shows the region wise crime report. This model can further be used in different investigation.

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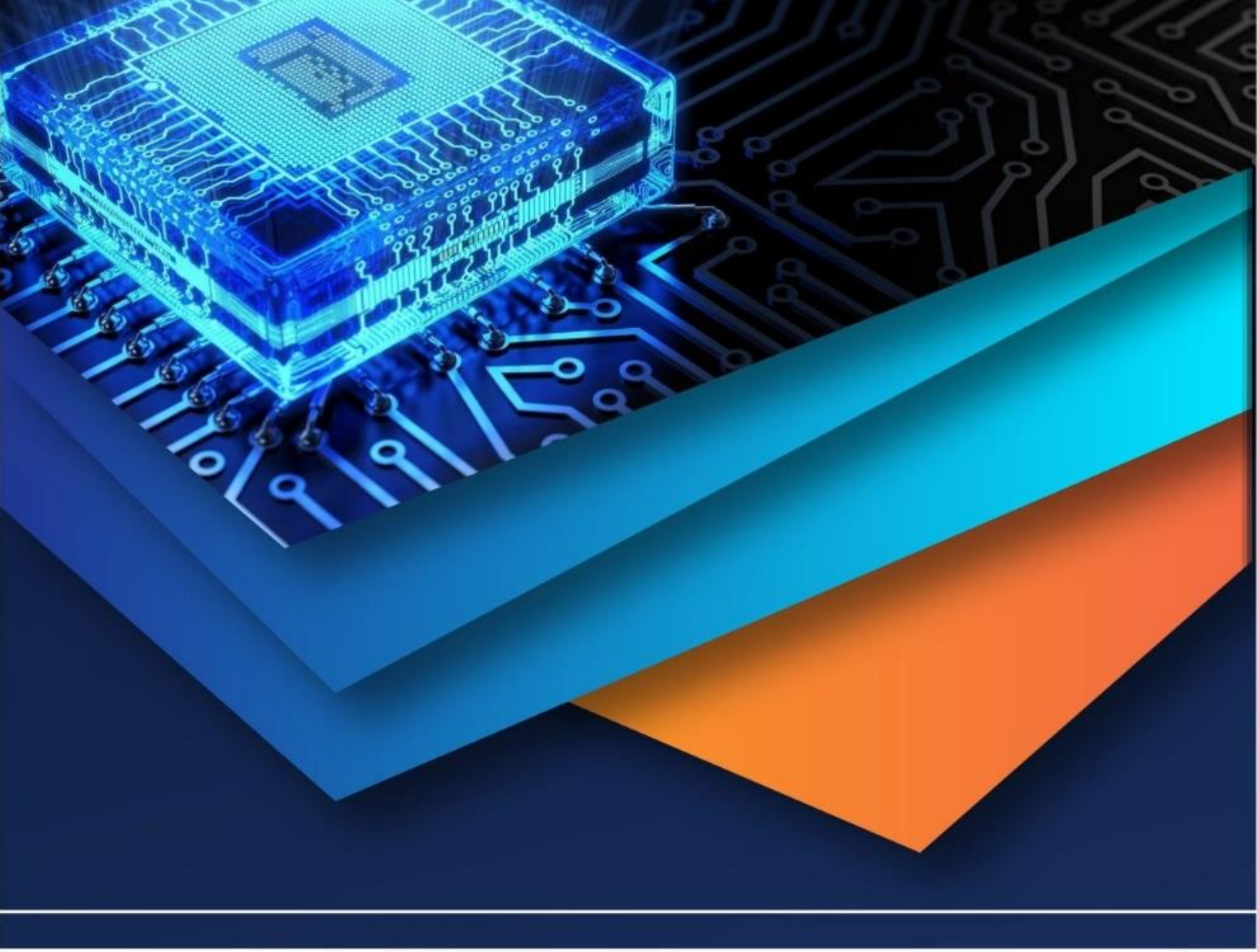

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