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Planning an Optimal Road Trip Analysis and Drowsiness Detection using Genetic Algorithm

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Abstract: One of the Machine Learning Projects which can promptly affect our lives is the Road Trip Analyzer. With our reliance on information and applications these days, going to new places has become the space of the excursion analyser. A solid Trip-generation Forecasting Model is the most essential piece of the traffic determining model.
The undertaking has been based on the genetic algorithm which has extraordinary Worldwide Global search ability. It will permit the trip-generation forecasting model to improve the exactness of the expectation. Perhaps the greatest trouble in arranging an excursion is choosing where to stop en route. The proposed framework endeavours to coordinate with the drivers' requirement with the quickest course accessible so the clients have the smartest possible solution.
Keywords: Trip-generation, Machine Learning, Genetic Algorithm, Global Search, Forecasting Model

I. INTRODUCTION

Travel industry areas assume a significant part of the planet's economy. In 2016, the business volume worldwide of the travel industry outperformed that of oil trades, food items or autos. Asia and the Pacific drove the travel industry area development in 2016 with a 9% expansion in global appearances, trailed by Africa (8%) and the Americas (3%).

Travelling has been a critical respectability in human life which they persistently like doing. Travels are the most broadly perceived and refreshing thing which people regularly keep on figuring out. The chiefs of the trips have reliably been seen as critical for real execution of the outing.

Today advancement has been causing us through various ways and delivering things around with no issue. With the usage of Development, we develop a structure which helps in managing the outing by performing focus activities and giving impressive respect to customers and set up a course of action for them.

Basically, our project can be divided into 3 modules which are finding the shortest route, recommending essential stops and preventing dizziness of the driver.

A. Shortest Route

As we know the road trip has the source and the destined location. The main requirement is to calculate the distance between them for the user. As we know there can be multiple routes present but considering the expenditure and time factor, we can save ample amounts of it finding the most optimal route i.e., the SHORTEST ROUTE. So, we opted for Genetic Algorithms for this purpose.

B. Essential Stops

Experiencing local food while making a trip has been considered to have a significant impact on tourist satisfaction level. Visiting restaurants has become an integral part of the tourist daily itinerary plan. However, planning an itinerary manually is a complex and time-consuming task.

C. Preventing Dizziness

As we are aware of the road accidents and other kinds of harm caused due to lack of presence while driving, we thought of preventing it. This can be done using the sensor and provides an alert to the driver whenever he seems to be dizzy. This can be implemented using OPEN-CV and IOT.

The proposed system has been designed in such a way that it will be able to provide multiple functionalities such as finding the shortest route, calculating the vehicle expenditure, and preventing dizziness of the driver. The following paper will help you understand about the working of genetic algorithms and its approach for finding shortest distance, IOT based dizziness prevention considering various aspects and lastly the vehicle expenditure component.

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II. PROPOSED SOLUTION/METHODOLOGY

A. *Project Scope*

We have decided to use various technical components for building our use case. for solving the issue in the management during trips. So, I propose the solution into 3 modules: -

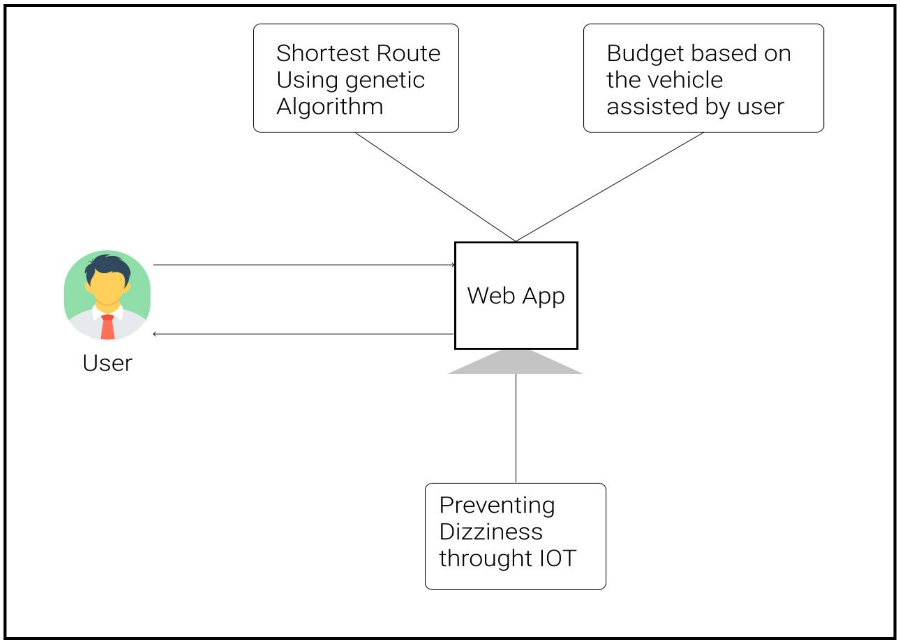

Fig. 2.1 System Architecture

1) *Genetic Algorithm:* Genetic Algorithm is a comprehensively changed process model, considering customary assurance and people genetic instruments, which was first proposed in 1975 by teacher John Holland of the School of Michigan, reflecting the ordinary decision communication of common determination. By applying a genetic movement to the general population to achieve the iterative association of individual hidden overhaul inside the general population, each accentuation gets a lot of game plans, all of which is surveyed by a health worker, which repeats until some kind of association.[1]Compared to the traditional search methods and general optimization search methods, genetic algorithms have the following technical characteristics:[9]

a) The genetic algorithm takes the encoding of the object to be processed as the operation object.

b) Genetic algorithms search for multiple solutions simultaneously in search space, which makes the genetic algorithm have a good global search ability.

c) Genetic algorithm search information targeted the fitness function directly.

d) Genetic algorithms use probabilistic search technology to guide the search process.

2) *Basic Working:* GA deals with a populace consisting of certain arrangements where the populace size (pop size) is the quantity of arrangements. Every arrangement is called a person. Every individual arrangement has a chromosome. The chromosome is addressed as a bunch of boundaries (includes) that characterizes the person. Every chromosome has a bunch of qualities. Every quality is addressed by some way or another, for example, being addressed as a line of 0s and 1s. Additionally, every individual has a wellness esteem. To choose the best people, wellness work is utilized. The consequence of the wellness work is the wellness esteem addressing the nature of the arrangement. The higher the wellness esteem the higher the quality the arrangement. Choice of the best people dependent on their quality is applied to create what is known as a mating pool where the greater individual has a higher likelihood of being chosen in the mating pool.[5] The individuals in the mating pool are called guardians. Each two guardians chosen from the mating pool will produce two kids. Simply by mating top notch people, it is relied upon to improve quality posterity than its folks. This will execute the terrible people from producing all the more awful people. By continuing choosing and mating excellent people, there will be higher opportunities to simply keep great properties of the people and leave out awful ones. At long last, this will wind up with the ideal or worthy arrangement.

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3) *The Approach:* Basically, we keep the TSP approach using Genetic Algorithm for finding the optimal/shortest route for the trip. Let us start with a few definitions, rephrased in the context of the TSP:

a) *Gene:* A city (represented as (x, y) coordinates) Individual (aka "chromosome"): a single route satisfying the conditions above
b) *Population:* A collection of possible routes (i.e., collection of individuals)
c) *Parents:* Two routes that are combined to create a new route
d) *Mating pool:* A collection of parents that are used to create our next population (thus creating the next generation of routes)
e) *Fitness:* A function that tells us how good each route is (in our case, how short the distance is)
f) *Mutation:* A way to introduce variation in our population by randomly swapping two cities in a route
g) *Reproduction:* A way to carry the best individuals into the next generation approach.[9]

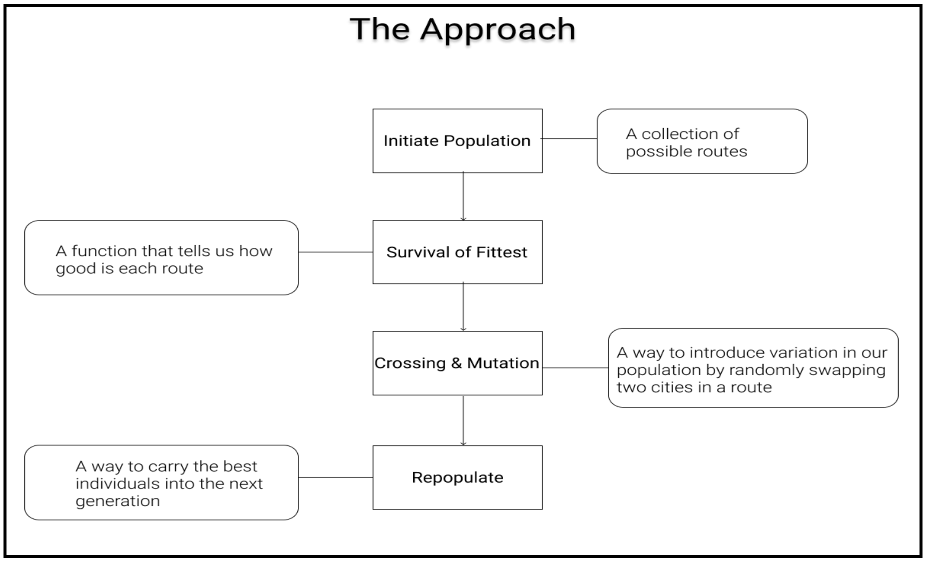

Fig.2.1.1 Flowchart for Genetic Algorithm

```
geneticAlgorithm(population=cityList, popSize=100, eliteSize=20, mutationRate=0.01, generations=500)

Initial distance: 1667.9977014699966
Final distance: 780.376759940913
[(-38.416097,-63.616671999999994),
 (-75.250973,-0.071389),
 (-11.202691999999999,17.873887),
 (-3.3730559999999996,29.918885999999997),
 (25.930414000000003,50.637772),
 (23.424076,53.847818000000004),
 (-25.274398,133.775136),
 (23.684994,90.35633100000001),
 (33.93911,67.709953),
 (40.143105,47.576927000000005),
 (40.069099,45.038189),
 (42.733883,25.48583),
 (41.153332,20.168331),
 (43.915886,17.679076000000002),
 (47.516231,14.550072),
 (50.503887,4.469936),
 (42.546245,1.6015540000000001),
 (12.238333,-1.561593),
 (9.30769,2.315834),
 (13.193887,-59.543198),
 (17.060816,-61.796428000000006),
 (18.220554,-63.068615),
 (12.226078999999999,-69.060087),
 (12.52111,-69.968338),
 (-14.270972,-170.132217)]
```

Fig.2.1.2. Calculation of distances

4) *Drowsiness Detection:* The expression "drowsy" is inseparable from sleepy, which basically implies a tendency to nod off. The phases of rest can be classified as conscious, non-rapid eye movement rest (NREM), and rapid eye movement sleep (REM). The subsequent stage, NREM, can be partitioned into the accompanying three phases:

a) Stage I: transition from awake to asleep (drowsy)
b) Stage II: light sleep
c) Stages III: deep sleep

In order to analyse driver drowsiness, researchers have mostly studied Stage I, which is the drowsiness phase. The crashes that occur due to driver drowsiness have a number of characteristics:

- Occur late at night (0:00 am–7:00 am) or during mid-afternoon (2:00 pm–4:00 pm)
- Involve a single vehicle running off the road
- Occur on high-speed roadways
- Driver is often alone
- Driver is often a young male, 16 to 25 years old
- No skid marks or indication of braking

The most commonly used drowsiness scale is the Karolinska Sleepiness Scale (KSS), a nine-point scale.The mean-shift is a method used to find the peak or center of gravity of data distribution, which indicates the algorithm is moving to a data-dense area and the center of the distribution.[13]

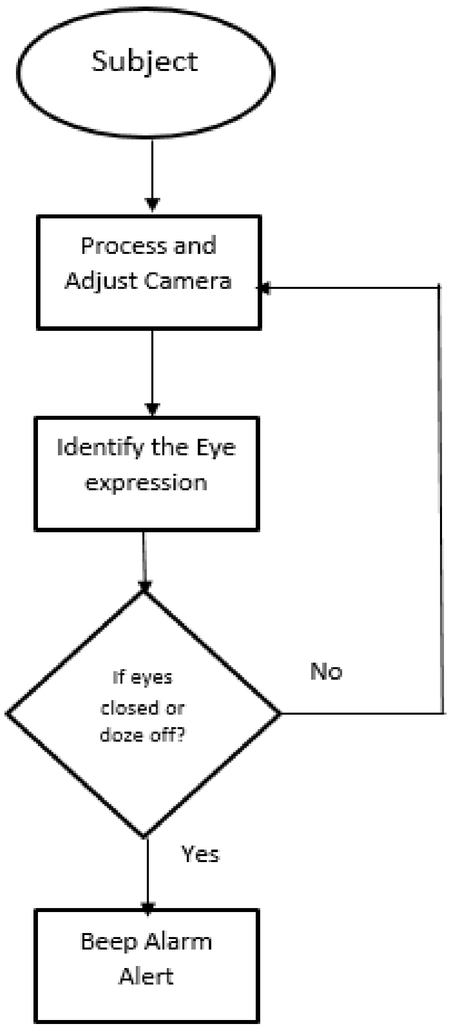

Fig.2.1.4 Drowsiness Detection Flowchart

5) *Vehicle Expense Calculation:* Management of vehicle/transport expenditure is always treated as the crucial part for any kind of travelling. So as per our objectives we provide the expenditure to the user using simple mathematics.

Total Cost = Total Distance/Per Litre Mileage * Current Price of Fuel

Users will be asked to enter or modify the vehicle information for letting the system to execute. Our algorithm may increase these expenditures up to 3% to 5% of total cost for security purposes so it would be helpful for unpredictable blunders during trips.

III.DESIGN AND ANALYSIS

All paragraphs must be indented. All paragraphs must be justified, i.e., both left-justified and right-justified.
Our system provides following functionalities as shown in the below figure:

1) Manages the expenditure
2) Provides Shortest Route
3) Preventing Dizziness

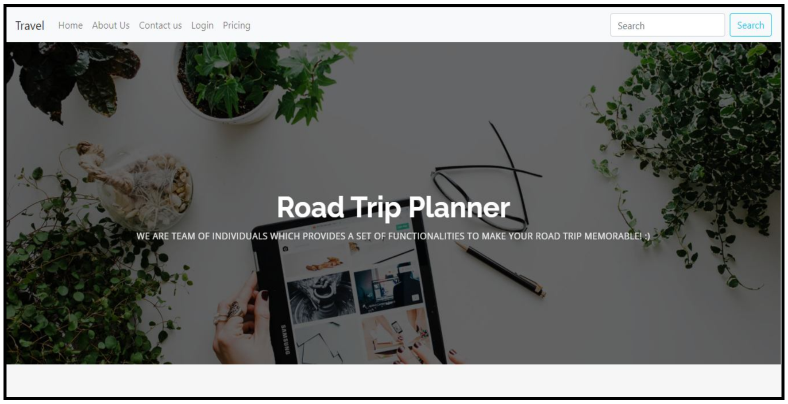

Fig.3.1. User Interface for Home Page

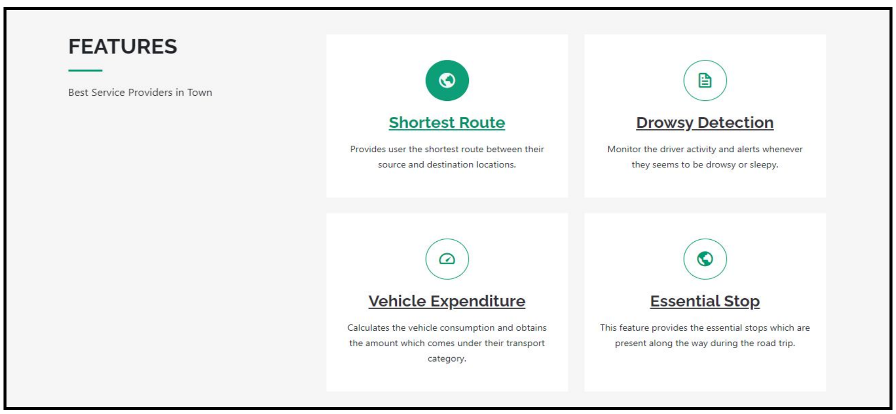

Fig.3.2 System Features

As our system will be interacting in the form of a website with the end users there would be two roles existing which are the User and Admin.

A. User

The user would be any individual who can create their account and make their trip memorable. Users will be asked to fill in some information which is pretty much required for the system. User's vehicle data will be important for calculating the transport expenditure for the trip. As it's a trip , users will be asked for the source and destination points which are very crucial. These points would then be feeded over to the Genetic Algorithm for calculating shortest distance.

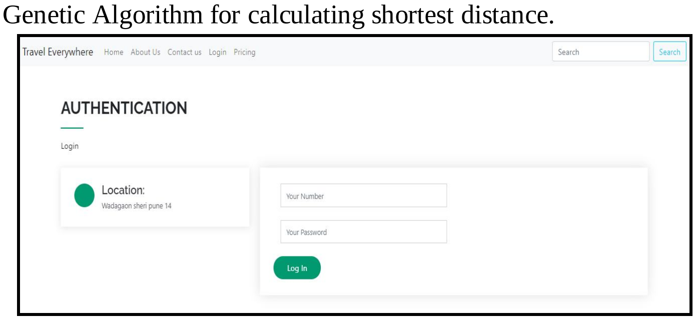

Fig.3.3 User Login UI

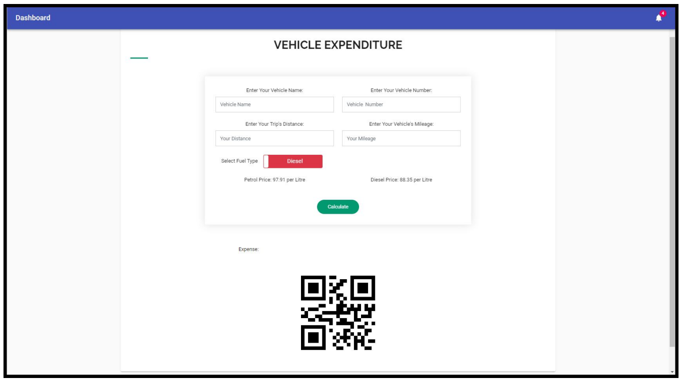

Fig.3.4 Vehicle Expenditure

B. Admin

The admin module will be responsible for monitoring all the activities going on by the clients. They would be observing the data which has been provided by clients.

IV. CONCLUSIONS

This project would definitely help for every individual's refreshment by getting a full-fledged trip management. Road Trips are fun but more fun when they are properly planned and executed. As we know there have always been issues with management or trip planning. With the use of Technology, we can provide better management while having road trips and let them have memorable trips. This system provides effective planning, shortest route and amazing stops to execute the road trip successfully.

V. FUTURE WORK

Some of the features that can be incorporated in our system are as follows:

A. Providing automatic online based hotel booking for stay depending on the user's expected cost range.
B. Suggest users the appropriate destinations based on the weather and current situation of a certain place.
C. Responsive Guide to the travellers whenever they visit new places and help them among their paths.

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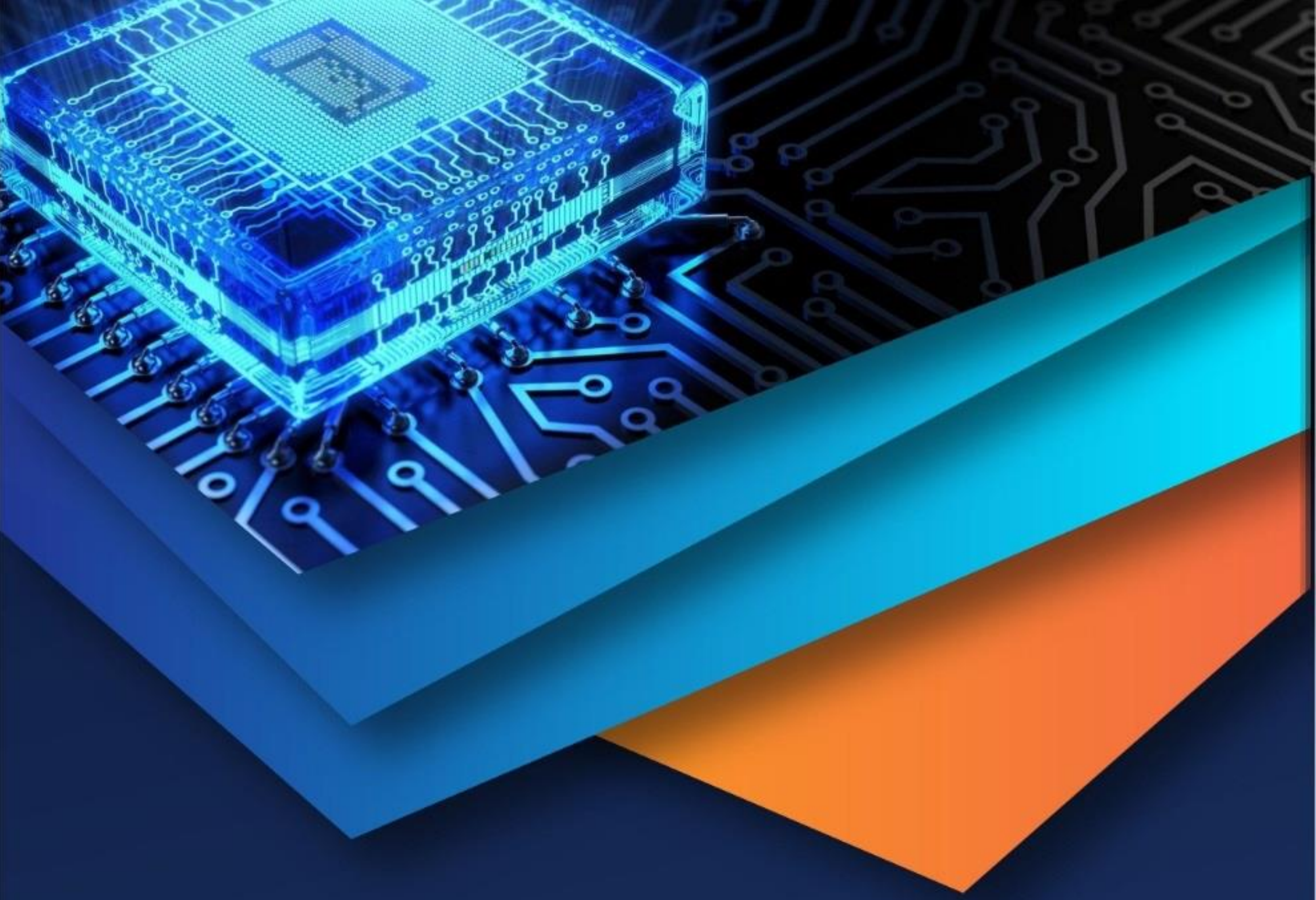

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