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Agro Smart App

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Abstract: To prevent crash farming and middle man exploitation we made an effective model in form of IOT ecosystem which will have a option of Suggesting Suitable crops to farmers, AI based Smart online inventory, Crop disease detection and suggesting suitable pesticides and direct large-scale buyers and industries, Solving all the major problems of farmers and providing the backbone with our ecosystem, suggesting farmers which crop should they grow and if some diseases faced by crop suggesting the perfect solution for It. And providing them a big open market by adding companies directly in the ecosystem who can buy the suitable crops.
Keywords: ML based crop suggestion-random forest, fertilizer and pesticide suggestion, AI based inventory, IOT.

I. INTRODUCTION

The total population is constantly growing, and it is important to have a satisfactory collectible environment [1]. In this study, we develop a smart farming landscape based on the internet of things and systems to bring about a new revolution and address a knowledge vacuum in farmers and give them a gold spoon, for the cap of good hope. Technology maintains the conceptual thinking of a farmer to smart agro-business which leads the path to the next era of farming, one of the crucial sectors where IoT-based research is transpiring and new products are already being released on a regular basis to make activities smarter and much more efficient is in the field of transportation. better production is in the field of Agriculture, we are going to develop a smart crop suggestion system so that due to lack of knowledge and drastic climate changes the farms are so confused and unaware for which type of crops should they grow? just by getting the complete details of farm surroundings and soil details, we can get the complete details of which crop will be suitable to grow so that the maximization of profit and minimum fertilizers and growth ingredients are used. We have gotten the following details as we discussed in the points below.

1) Suggesting Suitable crops to farmers.
2) AI based Smart online inventory.
3) Crop disease detection and suggesting suitable pesticides and fertilizers for better and fast growth.
4) Direct large-scale buyers and industries.

A. Motivation

In India 78 percent of farmers are illiterate and 80 percent of farmers are using old technologies, and we all are already aware of this all right? due to the lack of proper knowledge and information, it's very frequent news that farms sell low quality and bad fertilizers or urea or any farming products and seeds and ultimately it leads to low production of crops and burn destruction of agriculture.

The second most threatening problem for farmers about which they are also not even aware of is the middle man, most of the middle men are aware of exploiting the farmers, and everyone is aware of it but due to the emergent implementation of laws no strict action is taken off. let's take an example, who doesn't like lays chips. let's say a company buys 10 quintal potatoes, at the price of 30 thousand from that middle man but the middle man is paying farmers around 10 or 12 thousand rupees only, and this is the harsh truth. So these are the problems we are facing, but what about solutions? We can't make every farmer literate over a night! A quick short idea all in one and an easy to use solution for farmers is all we need. and here we come with our proposed farming system. as we discuss ahead.

Without a doubt India is an agro nation, but the farmers are facing a really hard track due to lack of knowledge and technology, so we come with our all in one innovative concept for farmers which include following features,

1) Crop health monitoring and automatic irrigation which takes measure of soil hardness (PH), turbidity, direct sunlight, Temperature around the farm, humidity, and moisture of soil. And showing all this data on our IoT dashboard. And storing in cloud server.
2) By taking all the pre-processed data (raw data) of field and climate around the farm from cloud server, we can process them through our ML algorithm random forest (we will talk further about it) and suggest which crop will be the at most suitable according to their field and climate souring the area. For Example: After planting the sensors and system on farm, and collect

the data like pests on plants, soil hardness, ph. and turbidity of water farmer is using and environment, climate around the farm, on the basis of that data if the farmers lands water holding capacity is more and the environment is not so humid this is the most suitable for growing the wheat or soybeans, and most of the farmers are not aware of it due to the lack of knowledge and drastic climate changes occurring now a days, let's say if a farmer is in Punjab whose land is dry type still he always grows wheat because Punjab is famous for wheat, but if that farmer try for cotton suitable for dry land, he can grow them with less fertilizer or growth medicine, and profit can be maximized. the term crash farming is used for this phenomena due to the lack of knowledge and unpredictable weather farmers are getting back step in growing suitable crops from 1960 crash farming is increasing drastically.

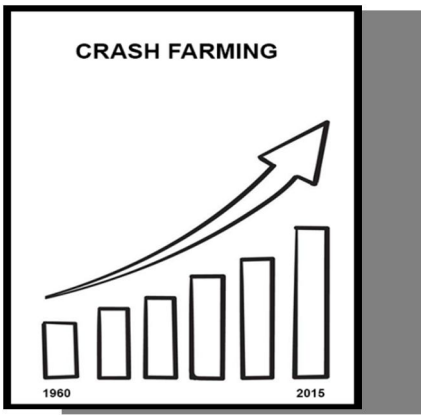

Fig 1:Increment in Crash farm chart

3) Ai based inventory, as the farmer harvests the crop, all the data will be stored in our inventory like when did he harvested and from how much period its stored and show it to the partner companies.

a) Whole inventory of farmer can be managed with the app and auto upload to website so that industry can directly purchase the product from there.

b) out of thousands of farmers companies can get the most suitable crop from farmer for example, if a company wants old potatoes or a restaurant wants new potatoes they can get by checking the inventory of farmer and get the most suitable once for them, by this farmer can get the maximum profit and companies and large scale buyers or restaurants will get perfect raw material for them.

Eg: the second feature we are introducing is our app is smart inventory, when a farmer grows any fruit or vegetables and they aren't sold due to lack of demand or not getting proper prices or for off season sales they store it either in shades or cold storage. for example, a farmer who grown potatoes and they are not sold for long time and stored in storage, and near to rot, so our app will suggest this potato to the companies or buyers who needs old potatoes like FUEL-GRADE ETHANOL using companies and farmers whose potatoes are still new we suggested their crops to chips company or Glue company or restaurants who needs new potatoes. so that farmers can maximise their profit and companies will get the raw material.

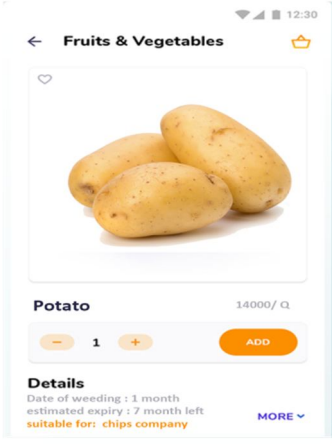

Fig 2: Cro detail Page (UI Side)

By taking large scale buyers and HORECA industry on our app we are connecting buyer and farmers on one platform so that no middle man or commission will be cut from the price.

4) The third drastic feature of the app is detecting the disease in the plant and suggesting the fertilizers according to the sensor data and image processing technology, At the perimeters of farmer's scale and budget.

a) In our app registered fertiliser or farming product sellers can register and sell their products for example if farmer who is growing wheat we will suggest him to buy a perfect required fertiliser for him according to sensor data and his budget and suggest the perfect medicines if plant needs any, as we are aware of scams happening in the fertilizers and who don't know the duplication of urea, so all the problems can be solved directly for the farmer.

b) Companies will also get to take out the tenders for their required crops.

II. LITERATURE REVIEW

In our system we are using esp32 as IoT system, an bigrock cloud server for storage, raspberry pi as computing device, MySQL as database system, php as back end language, all the advanced web designing languages (html5, css3, JavaScript, ajax etc.) android and java this languages and skillsets where the base of the project for backend and front end. We were working with an embedded system so good level of electronics and electrical was also required. Also a great hand on ML/AI and algorithms was also needed. So many literature review and surveys we have done, to gather the decent level of knowledge and understand the real world face of the model. The first step was to understand the sensors and its working. **[2]** Digital farming - a new era of Indian agriculture – happened in 2016 helped us a lot in understanding which sensors we should use to get the appropriate output. We concluded with dht11 (temperature and humidity sensor), Analog PH sensor, turbidity sensor, moisture sensor, and more such helpful components and modules we carried out. An already done research on **[3]** IoT based smart irrigation by VIT university - happen 2017 had given us a good idea of operation of IoT system and how to integrate them with sensors and give POST and GET request with local servers. The research paper is totally based upon the basics of general irrigation done with wireless IoT system.

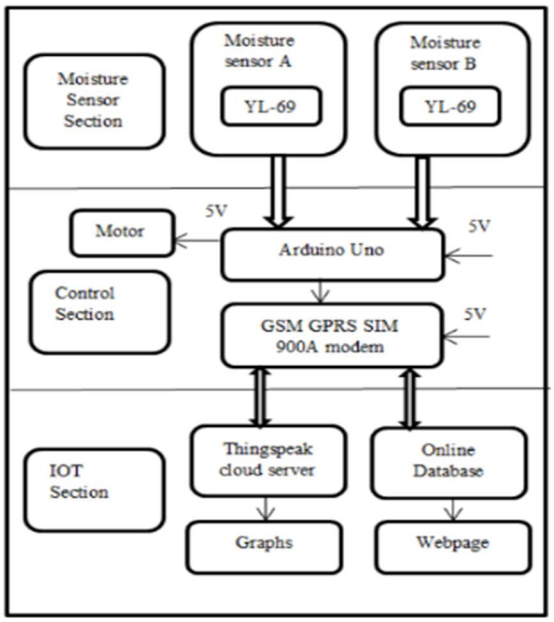

Fig 3: Flow of Model

The strong knowledge and guidance related to cloud is required so we had preferred **[4]** big rock cloud hosting blog which had all the technical specifications related to cloud, like how much ram and cup cores of server is required to perform x amount of task and what are the transfer protocols and benefits over private hosting and CDN cloud servers. Cloud servers wouldn't travel from pc to pc instead they directly communicate to main device over the internet. Work bench and Cpnael of cloud, it took many tutorials and readings to get through the environment of server like what is DNS and tprs links etc. which we got help from **[5]** contemporary research in India (isssn 2231-2137) – published in 2021, which is purely based upon cloud computing and its technicalities and how the third party devices (esp32) can connected and communicated with main server,

We also gathered the decent amount of knowledge for database from **[6]** Database Systems: The Complete Book – publish in 2001 **[7]** tutorialspoint helped use in understanding the mysql and sql for database connection and php side programming integration **[9]** using the esp32 microcontroller for data processing –authored in 2019, this helped a lot in understating the integration of esp32 with our database (hosted over the cloud server). Most final really technical problem we faced was raspberry pi part and AI/ML algorithms, so we started learning raspberry pi **[10]** geeks for geeks blogs and to go to the right wing we found a very amazing research paper which was written to distinguish the flowers and suggest shop keeper which flower can be stay for how long period without water [**11]** Niketa Gandhi, Owaiz Petkar, Leisa J. Armstrong used Neural Network approach for predicting the yield of rice. For predicting the yield, the algorithm takes parameters such as Maximum temperature, average temperature, minimum temperature, area, production, crop, etc. The collected data is then validated and processed using WEKA tool. But this work suggests that the prediction capabilities of an ANN-based model can be enhanced by using additional crop related parameters

III. DATASETS

Within the paper **[12]** distributed by Naveen Kumar P R et al., proposed the expectation for edit using neural organize. The framework is created based on the concept of direct prescient show to predict yield and best trim appropriate to develop. The show has trained to deliver the finest reply utilizing the train and test datasets. The framework prepared the data and produced a forecasted profitable edit, as well as a list of required fertilizers and an generally abdicate per hectare. The framework as it were predicated the yield of the chosen edit with a precision of 85%. Kevin Tom Thomas et al. **[13]** proposed the yield expectation utilizing routine neural frameworks organization subordinate on the soil supplement esteems and pH given as data. The show is prepared utilizing the KNN calculation for the crop prediction. The framework suggests edit utilizing soil properties as it were with precision of 88%. Within the paper **[14]**, Rohan Kumar Rajak et al., proposed the trim suggestive framework. The framework is modeled utilizing SVM and ANN to prescribe the trim for location utilizing soil parameters. The framework is substantial for only Maharashtra state, India. The as it were soil properties are utilized as input. Shashikala et al, within the paper **[15]** designed a rain forecast utilizing Polynomial Regression for the Field of Agribusiness Expectation for Karnataka. The most excellent coordinate of rain and trim category is out last yield. The framework prescribes crop using as it were rain forecast as input. The proposed framework is substantial for as it were Karnataka state, India. N.L Chourasiya et al., **[16]** proposed the edit forecast framework utilizing ANN machine learn

IV. PROPOSED SYSTEM

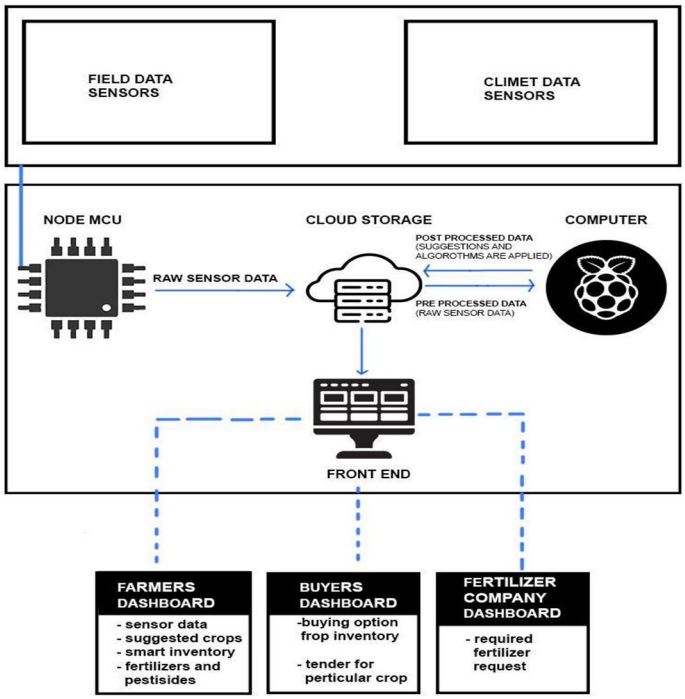

Fig 4: Analogical Design

A. Filed Data Sensors

1) Moisture

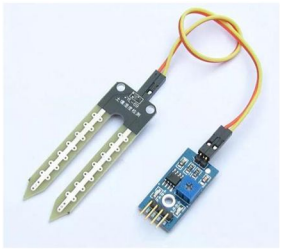

Fig. 5: Soil Moisture Meter, Soil Humidity Sensor, Water Sensor, Soil Hygrometer

Moisture sensor detects the moisture by the conductivity between two ends of it, as much as the conductivity more the moisture. It can give both digital and analog data

2) Soil Hardness (ph)

Fig. 6: Soil PH Sensor

Fig. 7: Liquid PH Sensor

A soil pH sensor is a device that measures the soil's current pH. Includes a stainless steel probes are placed vertically into the soil to detect the pH value. soil ph ph sensor, 0-5V soil ph sensor, 0-10V soil ph sensor, and 4-20ma soil ph sensor are all obtainable. Our soil data logger may be used with this sensor.

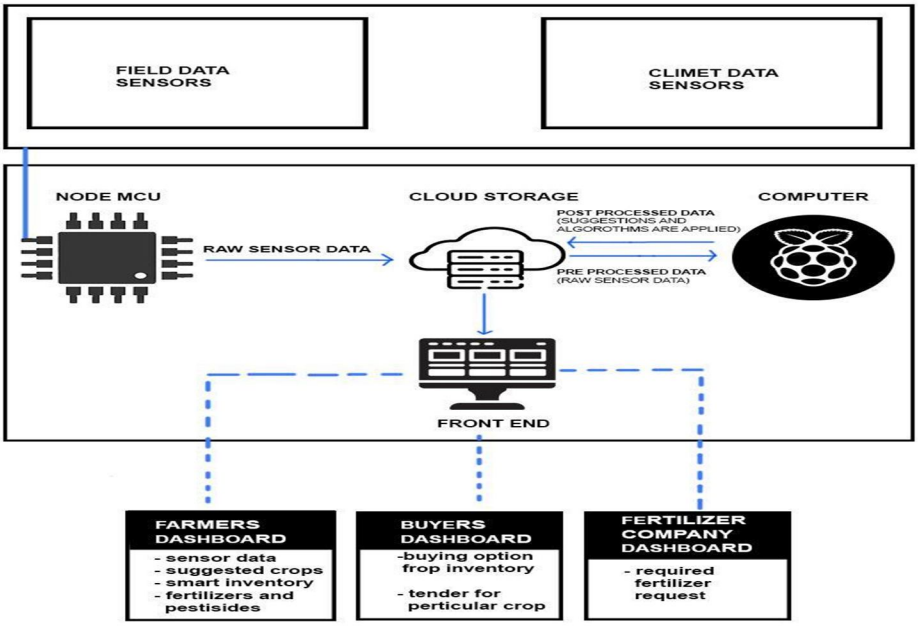

Fig. 8: Proposed System Architecture

V. METHODOLOGY

With the Internet of Things Deep learning has made everything possible. **[17]** IoT systems are very useful for collecting real-time data using sensors. Valuable data can be used in such a way that they can be supplied to trained deep learning algorithms like artificial neural networks for prediction. The results are very helpful in finding suitable fruits for sowing in each field.This section describes datasets, features, preprocessing phases, IoT design, and deep neural networks.

A. Dataset

The dataset used for the crop recommendation model is collected from an open source website that contains various parameters related to growing the crop. The dataset should consist of approximately 13 attributes such as soil type, soil type, soil moisture, temperature, humidity, pH, sowing area, soil N, soil P, soil K, rainfall, production, class designation, etc. It has been created in. Among these attributes, parameters such as soil type, land type, temperature, humidity, sowing area, soil moisture and pH play important roles in cultivation recommendations. Crops of interest include rice and corn.

B. Feature Description

Soil is the birthplace of nutrients that serve as a vehicle for plant growth. It also helps
Thereby, water retention helps the proper supply of nutrients. **[18]**The most common type of soil is red Earth and black earth. Characteristic land types are calculated based on the following seasonal variations:
Wetlands, drylands, gardens. Characteristic soil moisture is measured from each floor. Shows the water level required for plant growth. The temperature at which the crop grows. Humidity also has the greatest effect An environment for measuring the water content present in the air. **[19]**Soil moisture sensor, you can measure the readings from the temperature and humidity sensors and use them for processing. Soil pH It affects plant growth in a variety of ways. The optimum pH range is 5.57.0. **[20]**When there is no ground In the specified pH range, the soil should be treated. The properties of soil nitrogen (N), phosphorus (P), and potassium (P), simply called NPK, help promote plant growth. Soil fertility.

C. Data Pre-processing

Since the deep learning algorithm, the dataset of the crop proposal model needs to be preprocessed. It's noisy, incompatible, and can't handle incomplete data. Noisy data means that it is included outliers and errors. Incompatible or inconsistent data in the sense that it represents a different feature. Incomplete data in the sense that it represents the lack of one characteristic value or attribute value record. The basic steps of the data preprocessing phase include data cleansing and data.,Integration, data transformation, and data reduction.

VI. CONCLUSION

According to the study conducted by FAO in 2018, *India is not in the lead because of the quality of farmers* but because of the quantity of farmers, which means that, our farmers are not that technologically advanced, they are not that developed. due to lack of resources and knowledge. It is because farmers are more in population in India. So to help the nation and give front to farmers we initiated and tried to develop an Ai based farmer's portal where we plant the sensors and get their data and use it to predict which type of crops farmer should grow and which try to eliminate the middleman by making direct contact between farmers and large scale buyers and companies. let's discuss this in brief.
The farmer first has to login to his secure login system, then he will be redirected to the dashboard. The dashboard will include, farms climate details like temperature humidity, and soils details like, soils temperature, moisture, etc., this all data will come to the sensors and passed to raspberry pi from IoT module, for suggestion we have used.

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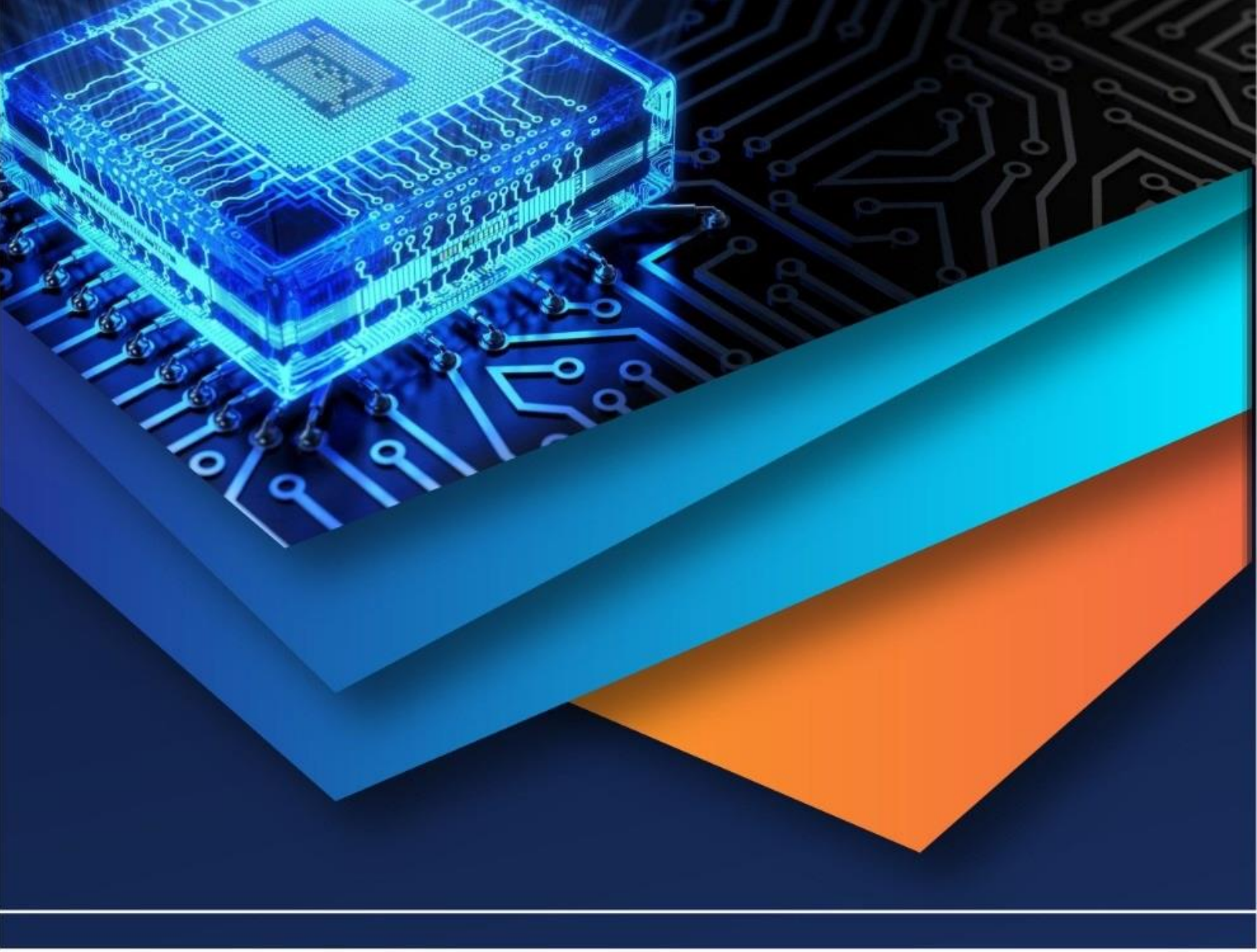

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