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AI Based Farmer's Assistance Chatbot

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Abstract: ***India has established itself as a prominent player in the global agriculture sector and has predominantly relied on an agriculture-based economy. However, a significant number of farmers and individuals involved in agriculture face various challenges due to limited knowledge of agricultural production. These challenges include inadequate farming techniques, insufficient crop materials, improper crop planning, and imbalanced fertilizer usage. This project presents a prototype of a chatbot framework designed to assist individuals, including farmers, in managing their crops and predicting their needs. The chatbot predicts fertilizer requirements, nutrient levels in crops, and provides valuable knowledge to users regarding basic agricultural needs. The structure employs Natural Language Processing and draws information from pre-determined data to deliver responses to user queries. To ensure accuracy, the chatbot analyzes previous interactions and sources data from "The Indian Council of Agricultural Research."***
Keywords: Chatbot, NLP, ICAR.

I. INTRODUCTION

The main goal of this Chatbot system/structure is to assist individuals with Agriculture and Farming queries, providing the best possible solutions. This Chatbot primarily focuses on offering information to help users understand their specific needs. The Chatbot design includes an architecture that analyzes the input query using predetermined keywords associated with different question types. This mapping allows the system to identify the user's requirements. The assistant interacts with users through voice, providing farmers with easy access to answers for their questions. With the help of the Chatbot, individuals, including farmers, can easily obtain specific and required information, such as predicting fertilizer dosages or selecting the most suitable crops based on climate conditions.[4]

In countries like India, where many farmers struggle with complex estimations in the cultivation process, this Chatbot can be extremely beneficial. Agriculture is the main source of food globally, and a significant portion of the population, particularly in rural areas, depends on it for their livelihoods. In India, agriculture contributes 18% to the gross domestic product, and nearly 50% of the country's workforce relies on agriculture for their livelihoods. Despite the sector's massive size and importance, most Indian farmers lack knowledge in proper farming techniques and management practices. This includes challenges like selecting appropriate crops based on soil and climate, identifying pests, choosing suitable pesticides, and implementing irrigation methods.[2] These factors have a significant impact on crop yield and quality. Effective crop planning, management, and nutrition monitoring can greatly enhance both yield and quality. While there are various chatbot services available, such as Google Assistant or Cortana, the agricultural field is still working on improving chatbot systems. Many farmers, even those with expertise, lack essential skills for achieving optimal crop production. Even with technological advancements in robotics, many farmers rely on small scale production and prioritize human involvement over machines. Returning to the Chatbot assistance, it is designed to be free, portable, reliable, and helpful in all aspects. This concept aims to encourage farmers to seek information on farming techniques and raise any related questions they may have.[3]

A. Motivation

The Indus Valley Civilization period is when India's agricultural history began. India holds the second position globally in the agricultural sector. The country's GDP (gross domestic product), which includes associated industries like forestry and fisheries, is 15.4% higher and over 31% of the workforce is employed in agriculture. India leads the world in net cropped area, with the United States and China coming in second and third, respectively.[5] Agriculture is the most significant economic sector in terms of its impact on the socioeconomic fabric of India, considering its broad demographic reach. However, due to the advancements in industrialization and the overall economic growth of the country, India's GDP is increasingly losing agriculture's share. [3]

B. Problem Statement

What's wrong Lack of information about various crops and climatic conditions are the main issues facing the Indian agricultural sector, Fertilizers, deficiency etc for the farmers. By the lack of knowledge about farming, many problems are being a rised to the farmers like less production of crops, damage of crops by insects, not knowing the season to grow a particular crop and many others. Many farmers does not know how to know about the crops and understand the situations to get more yield and have less problems. As technology is improving day by day, there must be a proper place where all the farming related queries can be solved. When there is a proper guidance and knowledge for the farmers, these problems will be solved. It will enhance and support the agricultural development in India, thereby improving the quality of life for farmers. In the past, numerous researchers have employed machine learning methods to boost agricultural growth in the country.

C. Project Objective

In this project, we created a simple linear regression model that forecasts the effects of advertising on the sales of a specific product (in this case, a Samsung television that was scraped from the internet). A feature and a label for sales are present in this commercial. We must forecast the sales of continuous input. In doing so, we also looked to see if the mean absolute, mean square, and root mean squared errors were very small.[2] In order to determine whether the test residual feature supports the linear regression model or not, I also added features from the advertisement model, such as television, radio, and newspaper advertisements. Additionally, we used the Gradio Python package, a GUI-based framework that accepts three inputs and produces sales. Additionally, it can be housed in the cloud, makingit accessible from anywhere in the world. Use a variety of Python visualization tools to analyse the data and determine which perimeter is most commonly used for future projection. This paper focuses on providing assistance to the farmers about different farming related queries like data about different crops, climatic conditions required to grow a particular crop, Fertilizers, nutritional and medicinal values, deficiency in plants and many others. The Chatot is purely based on Natural language processing and different types of NLP are used to process the user words. By this chatbot, every farmer can communicate with the bot and know about the crops. The farmers who have basic English knowledge can easily understand the way to interact with the bot and gain knowledge. This process is done by applying various machine learning techniques.[4]

II. LITERATURE SURVEY

The primary objective of conducting the literature review was to examine prior research conducted on knowledge sharing and intranets. Our focus was on exploring the intricacies of the current system and finding ways to mitigate its drawbacks. Our aim was to enhance the performance and efficiency of the newly proposed system while also gaining insights into its advantages.

A. A Portal for Connecting Farmers and End Users

AUTHORS: Sneha Iyer, Shruthi. K

The web portal for farmers facilitates direct selling of their products, eliminating middlemen. It provides valuable information on sales, customer preferences, and uses the max-prior algorithm for optimal profitability. Farmers can increase their profits and contribute to the country's economy. This web portal serves as a convenient platform for farmers to easily register themselves and sell their products. By utilizing this portal, farmers can generate higher profits compared to traditional methods, as it establishes a direct connection with customers, eliminating the need for intermediaries. Both customers and farmers benefit from this arrangement as there is no middleman involved. [1]

B. Text based Smart answering system in Agriculture using RNN.

AUTHORS: Sukumar, Hema latha

We utilized deep learning, specifically Recurrent Neural Network (RNN), to build a chat tool for agricultural datasets. This agriculture-specific tool delivers fast and accurate responses to farmers' inquiries. India's agriculture sector is crucial for the economy, and farmers require technological assistance. This project aims to create a Chatbot using Deep Learning and Natural Language Processing. The RNN model achieved an impressive 97.83% accuracy on the dataset.[2]

C. Smart Chatbot for Agriculture

AUTHORS: Yash aswini

This paper introduces a method for automatic knowledge acquisition for chatbots from online forums. The system integrates a classification model that relies on rough set theory and employs ensemble learning techniques to make informed decisions.

To retrieve customer's question messages, The communication agent utilizes the standard HTTP protocol to periodically send requests to the Telegram server. Our system employs machine learning to analyse essential parameters like weather, season, rainfall, and soil type, assisting farmers in increasing their yields. It also features an NLP-trained chatbot that answers farmers' questions and provides crop recommendations based on atmospheric conditions, benefiting those in remote areas .[3]

D. Farming Assistant Web Services: Agricultor

AUTHORS: Kishore, Shiv Shankar Rajput

The web services of our farming assistant platform cater to the needs of both novice and experienced farmers by providing practical solutions to their daily field-related issues. Through our platform, farmers can connect with their counterparts from various states across India, facilitating the exchange of valuable information regarding popular crops in different regions.[4]

E. AgriBot - An intelligent interactive interface to assist farmers in agricultural activities

AUTHORS: Divya Sawant , Anchal Jaiswal , Jyoti Singh, Payal shah.

The proposed system It functions in the manner of a virtual assistant for farmers, providing year-round support and insights on factors affecting crop productivity and profitability. It utilizes machine learning algorithms and data analysis to generate responses. While the primary audience is farmers, the system is also available to other users seeking agricultural advice.[5]

III. EXISTING SYSTEM

The current system without a chatbot for a farmer assistant would typically involve manual or semi-automated methods of managing crop, pest, irrigation, equipment maintenance, and market analysis. [5]. These methods could include:

1) *Crop Management:* Farmers might rely on their experience and intuition to determine the best planting and harvesting times, as well as the most effective fertilizers and pesticides to use. They may also use traditional methods such as taking soil samples and visually inspecting the crops to make decisions
2) *Pest Management:* Farmers may use chemical pesticides, natural predators, or other methods to manage pests. They might also use traps, baits, or repellents to deter pests.
3) *Irrigation Management:* Farmers may use simple scheduling methods or rely on their intuition to determine when to irrigate crops. They might use manual watering methods or simple irrigation systems that are not connected to sensors or weather data.
4) *Equipment Maintenance:* Farmers may rely on manual inspection and maintenance schedules to keep their equipment in good working order. They might use equipment manuals and guidelines to make repairs or perform routine maintenance.
5) *Market Analysis:* Farmers might use online or print media to keep up with market trends and demand. They might also consult with brokers or other professionals to make decisions about when and where to sell their crops. While these traditional methods have been used for many years and are still effective to some degree, they may not be as efficient or accurate as an AI-powered chatbot. A chatbot could analyse data from multiple sources, make real-time recommendations, and learn from its interactions with farmers to continuously improve its recommendations.

IV. PROPOSED SYSTEM

A proposed farmer's assistance system with a chatbot would involve an AI-powered virtual assistant that farmers can interact with to receive recommendations and guidance on managing their crops, fertilizers, medicinal and nutritional values, irrigation, and also deficiency in plants. Here are some of the key features and benefits of a proposed farmer assistance system with a chatbot.

1) *Natural Language Processing:* The chatbot would use natural language processing to understand and respond to farmers' questions and requests, making it easy for farmers to interact with the system.
2) *Data Analysis and Recommendations:* The chatbot would analyze data from multiple sources, such as weather sensors, satellite imagery, soil sensors, and market data, to provide real-time recommendations and guidance to farmers. For example, the chatbot could recommend the optimal time to plant or harvest crops based on weather and soil conditions.
3) *Continuous Learning:* The chatbot would continuously learn from its interactions with farmers, improving its recommendations and guidance over time. The more data the chatbot collects, the better it can predict outcomes and provide accurate advice.
4) *Automation:* The chatbot would automate many of the tasks that are currently done manually or semi-automatically, such as scheduling irrigation, monitoring equipment health, and analysing market data. This would save farmers time and reduce the risk of errors.

5) *Accessibility:* The chatbot could be accessed from any device with an internet connection, making it easy for farmers to interact with the system from anywhere, at any time.
6) *Cost-effective:* A chatbot-based system would be cost-effective for farmers, as it would not require expensive hardware or software. The chatbot could be integrated into existing mobile devices or computers, reducing the need for additional investments

V. SYSTEM ARCHITECTURE

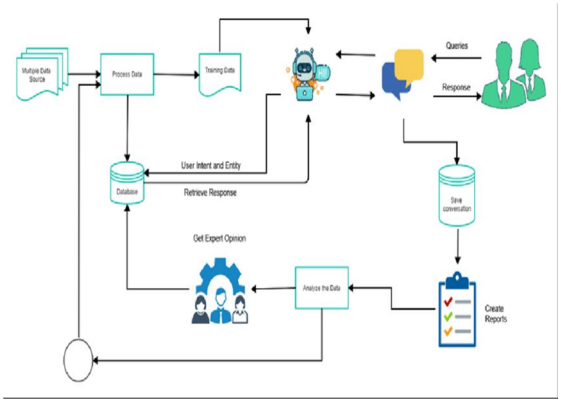

Figure Software Architectural

The project architecture encompasses the various components utilized in our project and the sequential processing of requests. It provides a formal description and representation of the system, enabling a systematic examination of its structure and facilitating reasoning about its organization.

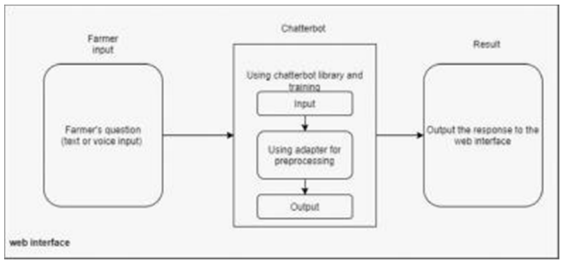

Figure Technical Architecture \ Flowchart

1) *User Interface:* This component provides the interface for farmers to interact with the chatbot. It can be a web-based interface, a mobile application, or integration with messaging platforms such as WhatsApp or Telegram.
2) *Natural Language Processing (NLP) Engine:* The NLP engine processes user queries and extracts relevant information using techniques like tokenization, entity recognition, and intent classification. It helps the chatbot understand and interpret user inputs accurately.
3) *Analytics and Feedback:* Analytics tools capture user interactions, feedback, and performance metrics of the chatbot. This data is used to evaluate and improve the chatbot's effectiveness, identify areas for enhancement, and gather insights about user preferences and needs.
4) *Backend Infrastructure:* The backend infrastructure includes servers, databases, and other necessary components to handle the processing, storage, and retrieval of data. It ensures the scalability, reliability, and security of the chatbot system.

VI. METHODOLOGY

The methodology for developing an AI-based farmer's assistance chatbot typically involves the following steps:

1) *Define Requirements:* Determine the specific requirements and objectives of the chatbot. Identify the target audience, the scope of assistance, and the key functionalities it should provide.

2) *Data Collection:* Gather relevant data and information related to farming practices, crop cultivation, pest management, weather conditions, and other agricultural aspects. This can include structured data, research papers, expert knowledge, and user-generated content.
3) *Data Preprocessing:* Clean and preprocess the collected data to ensure its quality and consistency. This may involve data cleaning, normalization, and structuring to make it suitable for training machine learning models.
4) *Natural Language Processing (NLP):* Apply NLP techniques to analyze and understand user queries and inputs. This involves tasks such as tokenization, entity recognition, sentiment analysis, and intent classification to extract meaningful information from user interactions.
5) *Machine Learning Model Development:* Train machine learning models to enable the chatbot to understand and respond to user queries accurately. This may involve techniques like text classification, sequence-to-sequence models, or pre-trained language models like BERT or GPT.
6) *Dialog Management:* Implement a dialog management system to handle conversations and maintain context throughout the interaction. This helps the chatbot provide coherent and relevant responses to user queries.
7) *Integration and Deployment:* Integrate the chatbot into a suitable platform or channel, such as a website, messaging apps, or voice assistants. Deploy the chatbot to make it accessible to farmers and continuously monitor its performance for improvements.
8) *Continuous Improvement:* Collect user feedback and iteratively improve the chatbot's performance by refining its models, expanding its knowledge base, and incorporating user suggestions and requirements.

VII. RESULTS(ACCURACY)

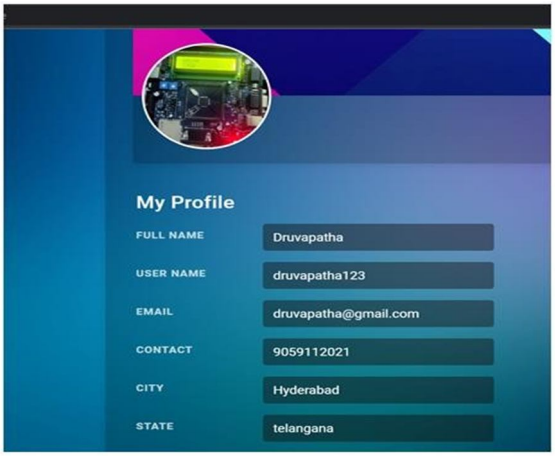

Figure User Profile

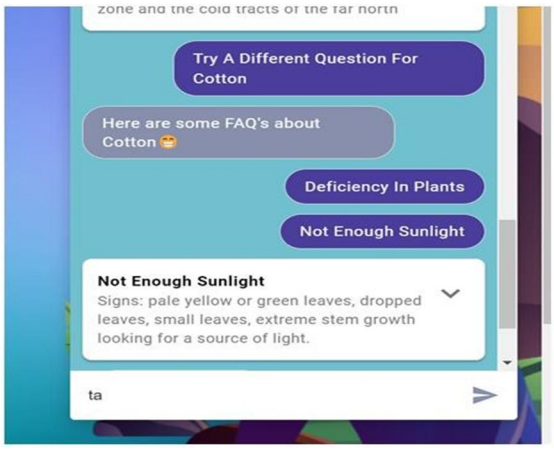

Figure Bot Interface

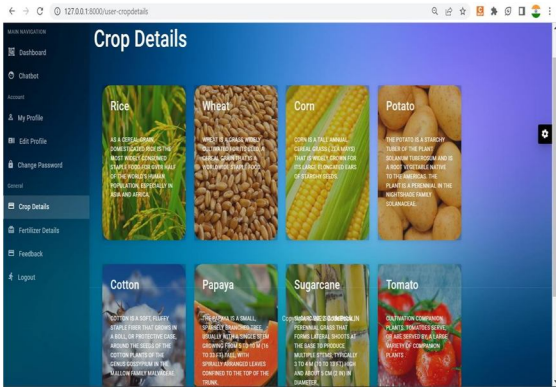

Figure Crop Interface

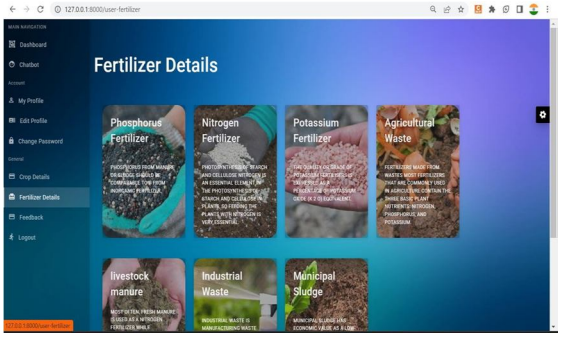

Figure Fertilizer Details

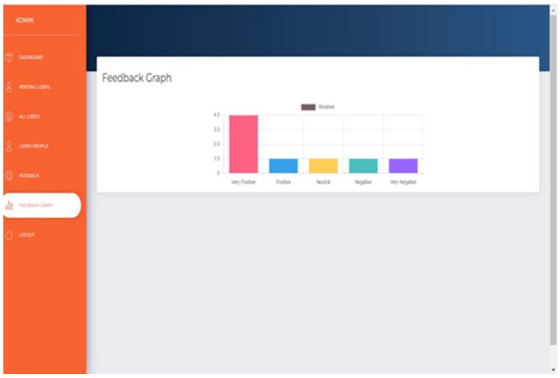

Figure Admin Feedback Form

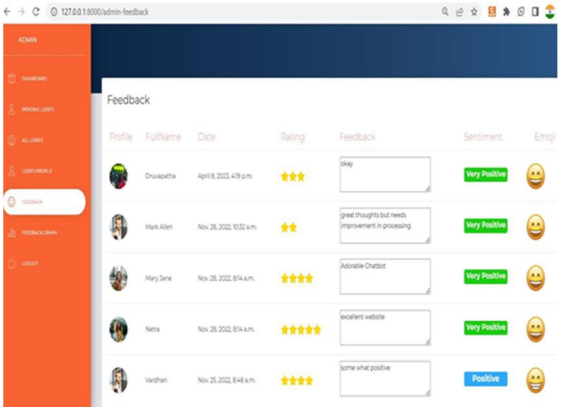

Figure User Feedback

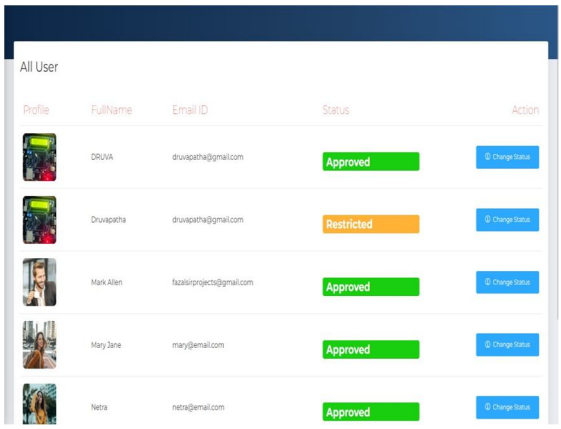

Figure All User List

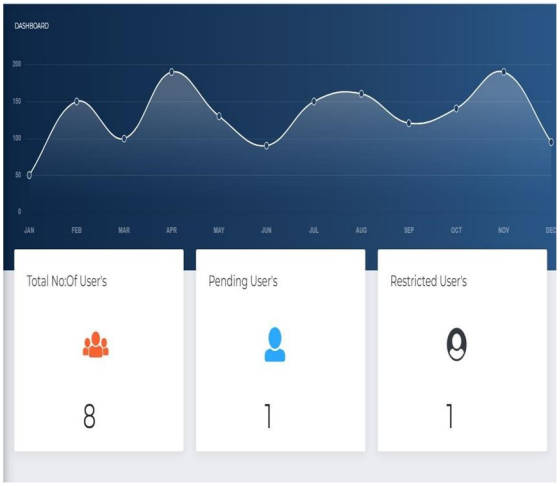

Figure Admin Dashboard

VIII. CONCLUSION

An agricultural assistance chatbot can play a crucial role in addressing various issues in the agricultural sector and have a significant impact on resource conservation, minimizing unproductive tasks, and reducing unnecessary expenses. By providing farmers with accurate answers to their queries, this chatbot empowers them to make informed decisions in a timely manner. Continuous feedback from users can contribute to future enhancements, allowing the chatbot to communicate in the farmers' native language.[4] This system facilitates unlimited inquiries from farmers, promoting the rapid dissemination of cutting-edge farming technology to a larger audience. Looking ahead, numerous innovative ideas may arise, enabling users to incorporate exceptional features into the agricultural assistance chatbot, such as image recognition, voice activation, programmable multilingual capabilities (both text and voice), and expansive operations spanning multiple regions rather than being limited to a single city. [5]

IX. FUTURE SCOPE

Our future plans involve expanding the reach of the chatbot to benefit a larger number of farmers. Currently, the bot is trained manually, but we aim to implement automatic learning for continuous updates with the latest information. Additionally, we envision incorporating native language support, despite the complexity of training the bot in multiple languages given India's linguistic diversity. However, providing an interface in the user's preferred language would greatly enhance usability and make a significant impact in the market.[3] This extension would be particularly helpful for the large number of uneducated farmers, as the chatbot's ability to understand and respond in their native language would provide them with genuine assistance. We are committed to exploring and developing these extensions to enhance our technique in the future.

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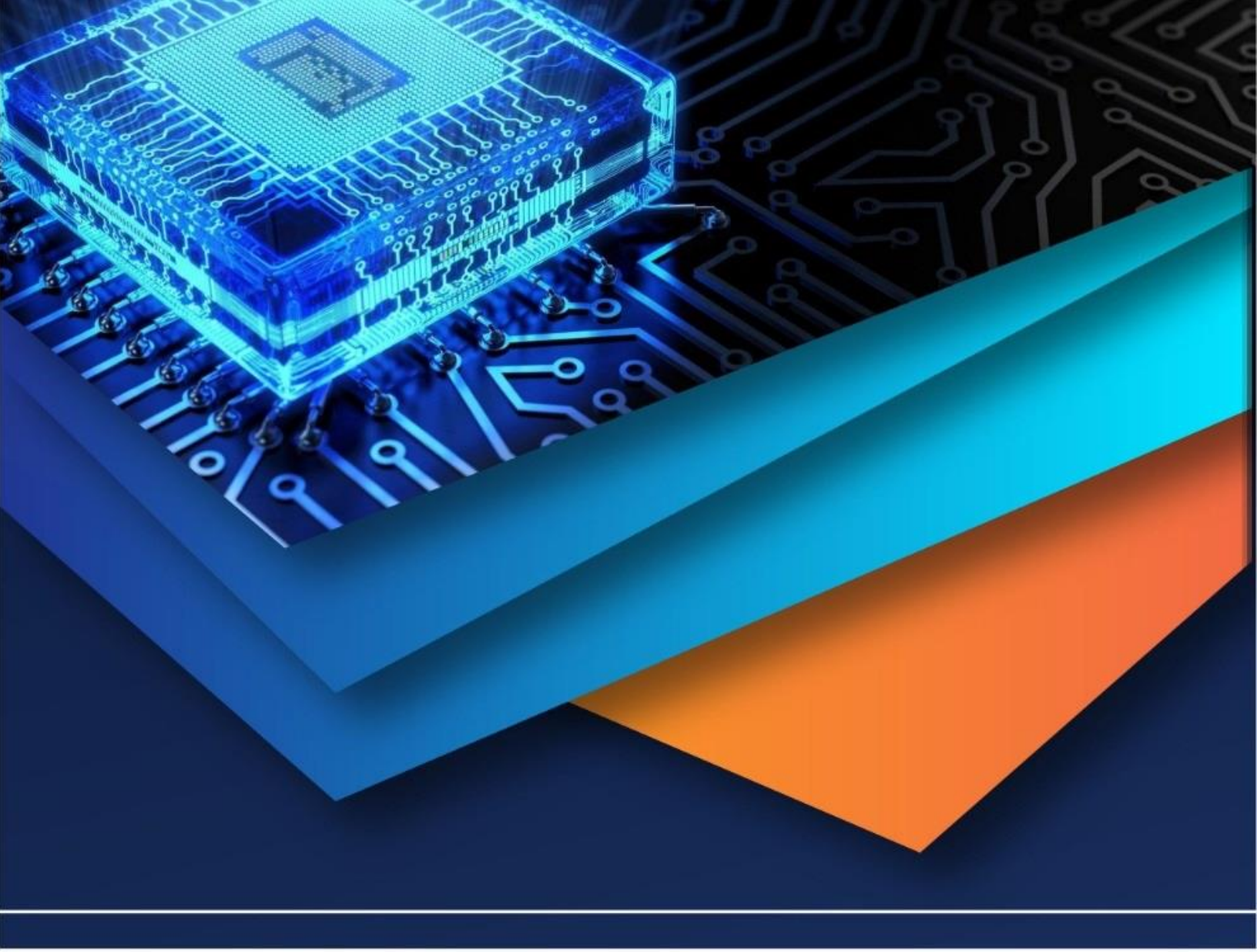

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