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AI-Based Farmer Query Support and Advisory System

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Abstract: ***Agriculture plays a vital role in ensuring food security and supporting the livelihoods of millions of farmers worldwide. However, farmers often face difficulties in obtaining timely and accurate agricultural guidance related to crop diseases, pest management, soil fertility, weather conditions, and fertilizer usage. Traditional agricultural advisory systems usually depend on physical visits to experts or agricultural offices, which can be time-consuming and inaccessible for farmers in remote areas. Consequently, there is a growing need for a digital platform that can provide instant agricultural support and reliable information. Artificial Intelligence has emerged as a powerful technology that can improve decision-making in agriculture by analyzing farmer queries and delivering relevant solutions in real time. The AI Based Farmer Query Support and Advisory System is designed as an intelligent web-based platform that assists farmers by answering their agricultural questions through an interactive chatbot interface. The system uses Artificial Intelligence and Natural Language Processing to understand farmer queries and generate appropriate responses based on agricultural knowledge and expert recommendations. The platform was developed using modern web technologies such as Next.js and Express.js to provide a responsive and user-friendly interface. Farmers can submit queries related to crops, fertilizers, pest control, soil health, and livestock management, and the system processes the input using an AI model to generate meaningful and practical suggestions. By providing quick access to agricultural knowledge, this system helps bridge the gap between farmers and agricultural experts. Overall, the proposed system improves accessibility to agricultural information, supports better decision-making, and promotes sustainable farming practices through the use of intelligent digital technologies.***

Keywords: Artificial Intelligence, Farmer Advisory System, Agricultural Chatbot, Natural Language Processing, Smart Agriculture, Web-Based Support System.

I. INTRODUCTION

Agriculture plays a crucial role in supporting the economy and ensuring food security, particularly in developing countries, where a large portion of the population depends on farming for their livelihood. Farmers regularly face challenges such as crop diseases, pest infestations, soil nutrient deficiencies, unpredictable weather, and improper fertilizer usage. Access to timely and reliable agricultural guidance is essential to address these issues. However, traditional advisory methods often rely on agricultural officers, extension services, or physical consultations, which may not always be easily accessible, especially for farmers living in rural or remote regions. With the rapid advancement of digital technologies, Artificial Intelligence (AI) has emerged as a powerful tool for improving decision-making and information access in agriculture. AI-based systems can analyze large volumes of agricultural data, understand user queries, and provide relevant recommendations. These intelligent systems can help farmers obtain instant advice on crop management, pest control, soil health, and other farming practices without the need for direct human intervention. The AI Based Farmer Query Support and Advisory System is designed to provide a smart and interactive platform where farmers can ask agricultural questions and receive accurate responses in real time. The system uses Natural Language Processing (NLP) and AI-based models to understand farmer queries and generate meaningful answers. Through a user-friendly web interface, farmers can easily interact with the system and obtain guidance on crops, fertilizers, irrigation practices, pest management, and livestock care. By integrating modern web technologies with artificial intelligence, the proposed system aims to bridge the gap between farmers and the agricultural knowledge they require. It provides quick access to expert-level information, improves decision-making in farming activities, and supports sustainable agricultural practices in the region. Such intelligent advisory platforms have the potential to enhance agricultural productivity and make modern farming knowledge more accessible to farmers.

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II. LITERATURE REVIEW

Agricultural advisory services play an important role in helping farmers make better decisions. Sawant, Nair, and Hariharan (2026) developed a Retrieval-Augmented Generation (RAG) based AI advisory system that combines agricultural knowledge databases with large language models to provide accurate responses to farmer queries.

AI-based smart agricultural systems have also been developed to support crop management and productivity. Sulatana et al. (2026) proposed an AI-driven advisory platform that analyzes soil data, weather information, and crop images to recommend suitable farming practices.

Conversational AI and chatbot technologies are increasingly used to deliver agricultural information rapidly. Reddy (2025) and the Agri-bot system (2025) demonstrated that NLP-based chatbots can understand farmer queries and provide instant guidance on crops, fertilizers and pest management.

Advanced AI architectures are being explored to improve agricultural advisory systems. Cantonjos and Biswas (2025) introduced a multi-agent AI framework that integrates environmental data and agricultural knowledge to generate reliable recommendations for farmers.

Researchers have also highlighted the need to ensure reliability and trust in AI advisory platforms. Sharma et al. (2025) reported that AI-based systems improve agricultural extension services but require proper data quality, transparency, and digital accessibility for farmers.

III. EXISTING SYSTEM

Existing farmer advisory systems mainly provide agricultural information through traditional extension services, websites, or basic digital applications. Farmers typically rely on agricultural officers, expert consultations, or static information platforms to solve their farming problems. These systems provide useful guidance, but they often lack instant responses, personalized recommendations, and interactive communication.

A. Traditional Agricultural Advisory Services

Traditional advisory systems rely on agricultural experts, extension officers, and government support centers to guide the farmers. Although these services provide reliable information, farmers must physically visit offices or wait for expert responses, which can delay problem solving during urgent farming situations.

B. Online Information and Database Systems

Several agricultural websites and mobile applications provide information related to crops, fertilizers, pest control, and weather updates for farmers. However, these platforms mainly provide predefined information, and farmers must manually search for solutions that may not always match their specific queries or farming conditions.

C. Limitations of Existing Systems

Existing advisory systems often lack real-time interaction and intelligent query understanding capabilities. Many platforms cannot interpret farmer questions in natural language or provide personalized responses, making it difficult for farmers to obtain quick and accurate solutions to their problems.

IV. PROPOSED SYSTEM

The proposed system introduces an AI-Based Farmer Query Support and Advisory System designed to provide instant agricultural guidance through an intelligent chatbot platform. Unlike traditional advisory systems that rely on manual consultation or static information databases, the proposed system uses Artificial Intelligence and Natural Language Processing to understand farmer queries and generate accurate responses in real time. The system allows farmers to interact through a simple web interface and receive recommendations related to crops, fertilizers, pest control, soil health, and other farming practices.

A. Intelligent Query Processing

The proposed system processes farmer queries using Natural Language Processing techniques. It interprets user input, identifies the intent of the question, and generates appropriate responses based on agricultural knowledge and AI models. This enables farmers to communicate naturally with the system without requiring technical knowledge.

B. Real-Time Advisory Support

The system provides instant responses to farmer queries without the need for physical consultations with agricultural experts. By integrating AI models with agricultural knowledge databases, the platform delivers quick and relevant recommendations that help farmers make timely decisions regarding crop management and farming practices.

C. Web-Based System Architecture

The proposed platform was developed using modern web technologies, such as Next.js for the frontend and Express.js for the backend. This architecture enables smooth communication between the user interface, AI processing module, and database, ensuring the efficient handling of farmer queries and response generation.

D. Accessible and User-Friendly Platform

The system is designed to be simple and accessible to farmers with different levels of digital literacy. The interactive chatbot interface allows farmers to easily submit queries and receive clear guidance, helping to bridge the gap between farmers and agricultural knowledge while promoting better decision-making in agriculture.

V. METHODOLOGY

The methodology of the AI-Based Farmer Query Support and Advisory System focuses on developing an intelligent platform that can understand farmer queries and provide accurate agricultural recommendations. The system follows a structured workflow that includes query input, AI-based processing, response generation, and user interaction through a web-based interface. This approach ensures that farmers can receive quick and reliable advisory support for various agricultural issues.

A. System Design

The proposed system was designed using a web-based architecture that integrates a user interface, AI processing module, and agricultural knowledge database. The front-end interface allows farmers to easily submit their queries, whereas the back-end system processes the request and generates responses. This modular design improves the system efficiency and makes the platform scalable for handling multiple user queries.

B. Data Collection and Query Input

The system collects farmer queries through an interactive web interface, where users can type questions related to crop cultivation, pest control, fertilizers, irrigation, and farming practices. The input queries were captured and converted into a format suitable for processing by the AI model. This step ensured that the system could effectively handle natural language questions from farmers.

C. Query Processing and Decision-Making

The AI processing module analyzes the farmer's query using Natural Language Processing and language model techniques to understand the intent and context of the question. The system then retrieves relevant agricultural information from the knowledge base and evaluates the suitable responses. This decision-making process provides accurate and meaningful recommendations for farmers.

D. Response Generation and Learning

The system generates responses by combining AI-generated insights with information from agricultural databases and expert expertise. The generated answer is then delivered to the farmer through the chatbot interface in a clear and comprehensible format. Continuous interaction with users can help improve the knowledge base and enhance response quality over time.

E. System Performance Evaluation

The system performance was evaluated based on parameters such as response accuracy, processing time, and relevance of the advisory recommendations. User feedback and system monitoring were used to identify areas for improvement and optimize the performance of the AI model. This evaluation process ensures that the system remains reliable and beneficial to farmers.

VI. SYSTEM ARCHITECTURE

The system architecture of the proposed AI-Based Farmer Query Support and Advisory System is designed as an integrated framework that enables farmers to interact with an intelligent AI platform through a web interface. The system consists of multiple interconnected modules, including the user interface, query processing module, AI model, agricultural knowledge base, and response generation module. These components work together to process farmer queries, analyze the information, and generate appropriate recommendations. The User Interface Module allows farmers to enter questions related to crops, fertilizers, pest control, irrigation, or farming practices through a simple web-based platform. The Query Processing Module receives the input and applies Natural Language Processing techniques to understand the intent and context of the farmer's question. This processed information is then sent to the AI Processing Module, where language models analyze the query and retrieve relevant agricultural knowledge from the database. The Knowledge Base Module stores agricultural information, such as crop management practices, pest control methods, fertilizer recommendations, and government scheme details. The Response Generation Module combines AI-generated insights with retrieved agricultural data to produce a clear and accurate response for the farmer. Finally, the generated answer is displayed to the user via a web interface. A continuous interaction loop connects all modules, allowing the system to process multiple queries efficiently and provide real-time advice. This architecture ensures rapid response generation, improved accessibility, and effective knowledge delivery to farmers seeking agricultural guidance.

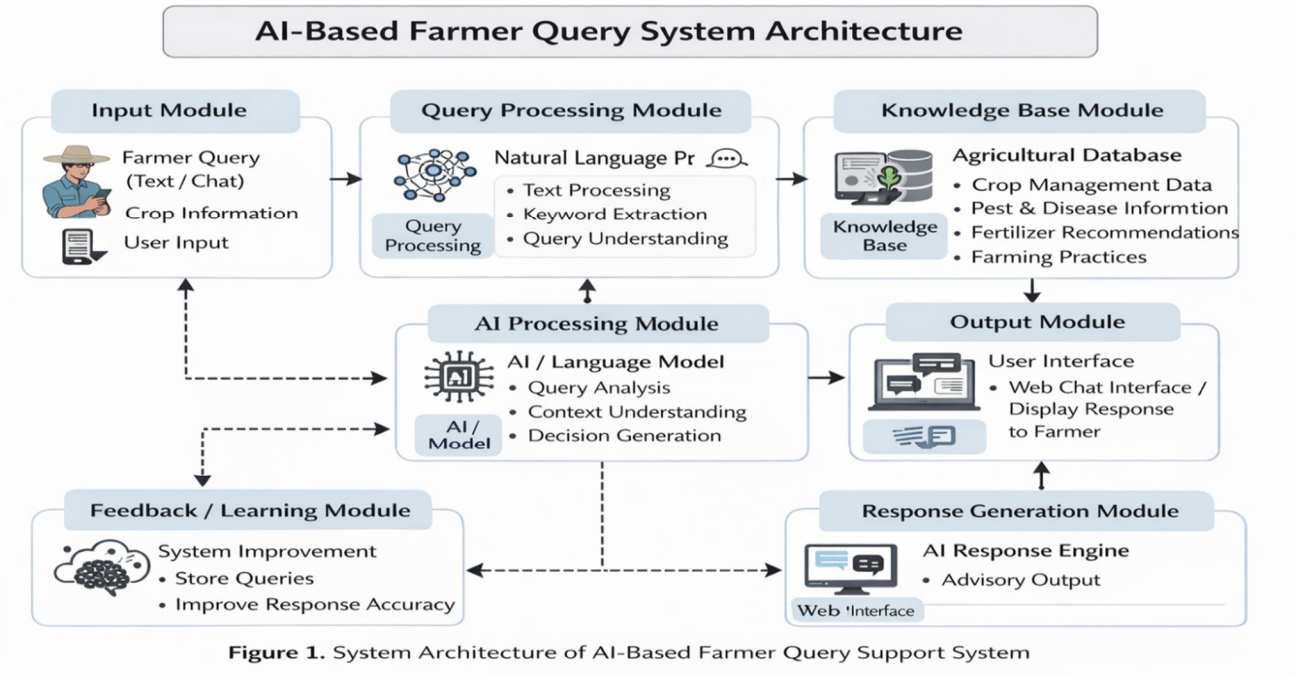

Figure 1. System Architecture of AI-Based Farmer Query Support System

VII. ADVANTAGES OF AI-BASED FARMER QUERY

The AI-Based Farmer Query Support System offers several advantages over traditional agricultural advisory services. The integration of artificial intelligence allows the system to provide faster responses, accurate information, and better accessibility for farmers. This technology helps farmers obtain timely guidance to solve agricultural problems and improve their farming practices.

A. Instant Query Response

The system provides immediate responses to farmer queries without the need to wait for agricultural experts or extension services to respond. This quick-response mechanism helps farmers solve problems related to crops, pests, fertilizers, and irrigation in real time. As a result, farmers can take timely action to prevent crop damage and improve productivity.

B. Easy Accessibility

Farmers can access the system through a simple web interface using computers, smartphones, and other digital devices. The platform is designed to be user-friendly so that farmers with basic digital knowledge can use it easily. This improves access to agricultural information, even in remote rural areas.

C. Improved Decision-Making

The AI system analyzes farmer queries and provides suitable recommendations based on the agricultural knowledge and data. These recommendations help farmers choose better farming practices and manage their crops effectively. Improved decision-making can lead to higher crop yields and better farm management.

D. Knowledge Availability

The system stores a large amount of agricultural information in its knowledge database. Farmers can obtain guidance on different crops, pest control methods, fertilizer use, and irrigation techniques through a single platform. This centralized knowledge source helps farmers access reliable agricultural information whenever necessary.

VIII. RESULT

The AI-Based Farmer Query Support and Advisory System was tested to evaluate its performance in understanding farmer queries and providing accurate agricultural guidance. The results demonstrate the effectiveness and usefulness of the system as follows:

1) *Query Processing:* The system successfully processed farmer queries using Natural Language Processing techniques, accurately interpreting questions related to crops, fertilizers, pest control, and irrigation practices.
2) *AI-Based Response Generation:* The AI model generated relevant responses based on agricultural knowledge sources, providing useful recommendations that can assist farmers in solving common farming problems.
3) *Real-Time Query Response*: The platform provides instant responses to farmer queries through a web interface, reducing the time required to obtain agricultural advice compared with traditional consultation methods.
4) *Web Interface Interaction:* The web-based platform functioned effectively, allowing farmers to easily submit queries and receive responses through a simple and user-friendly interface.
5) *System Efficiency:* The system demonstrated reliable performance in handling multiple queries and generating responses within a short processing duration.
6) *User-Friendly Operation:* The platform was easy to use and required minimal technical knowledge, making it suitable for farmers with different levels of digital literacy and experience.

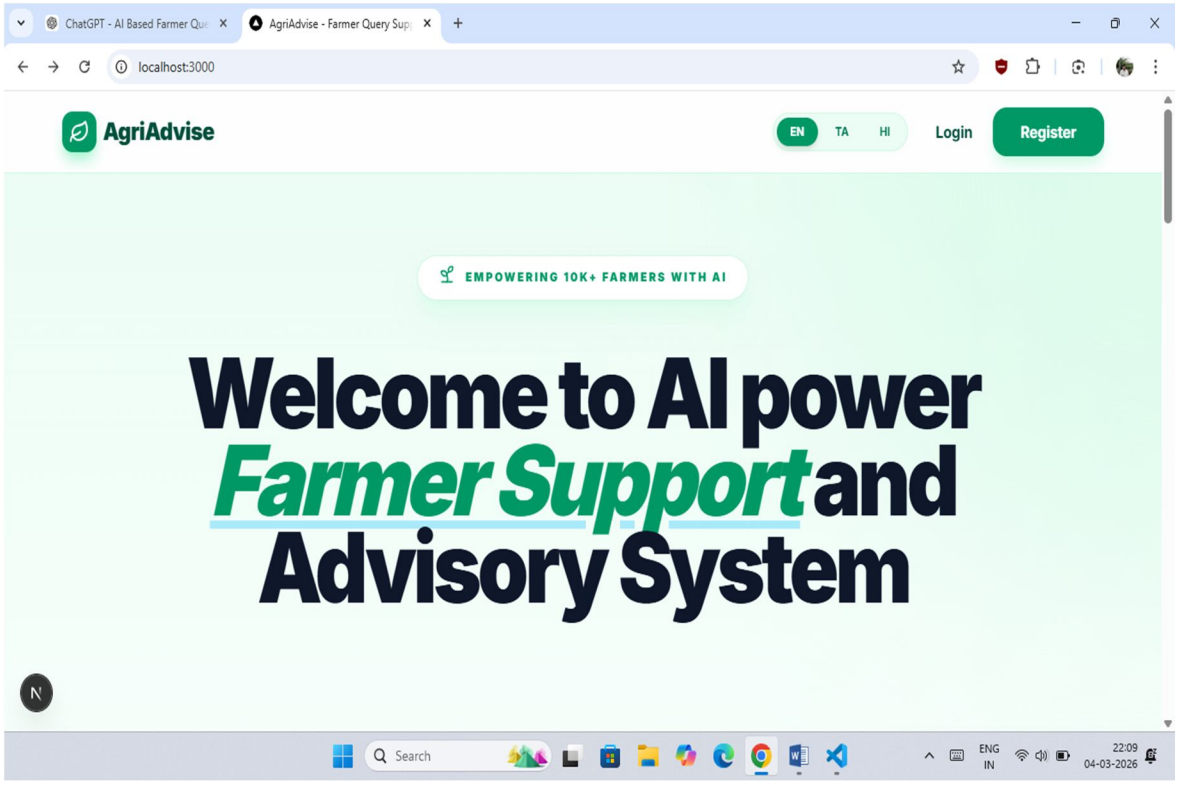

Figure 2. Next.js Welcome Page

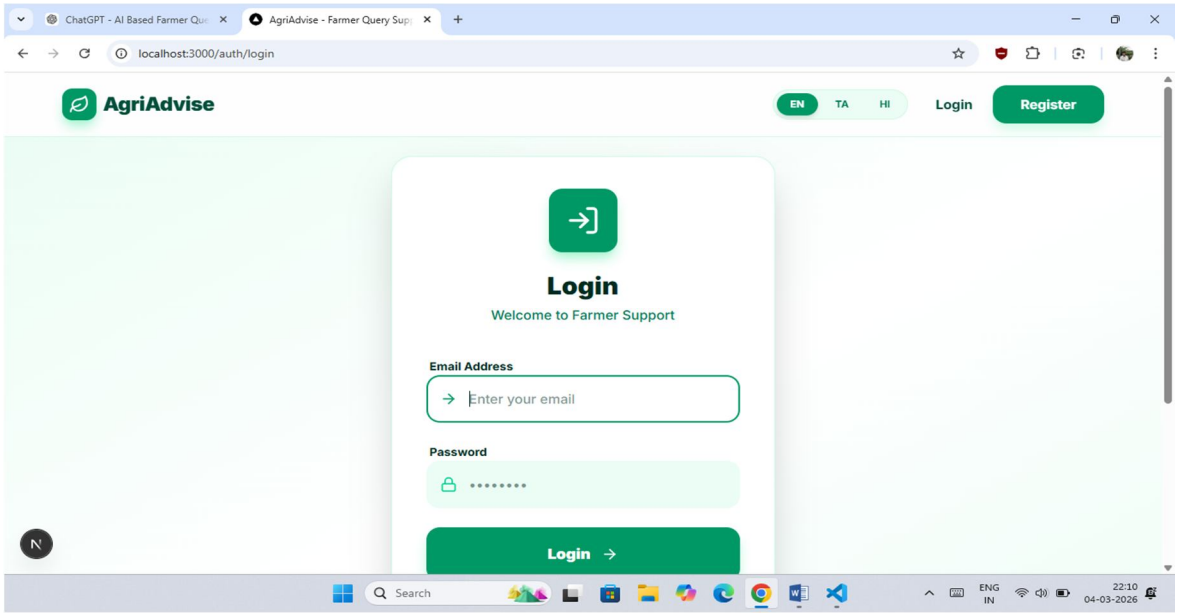

Figure 3. Login Page

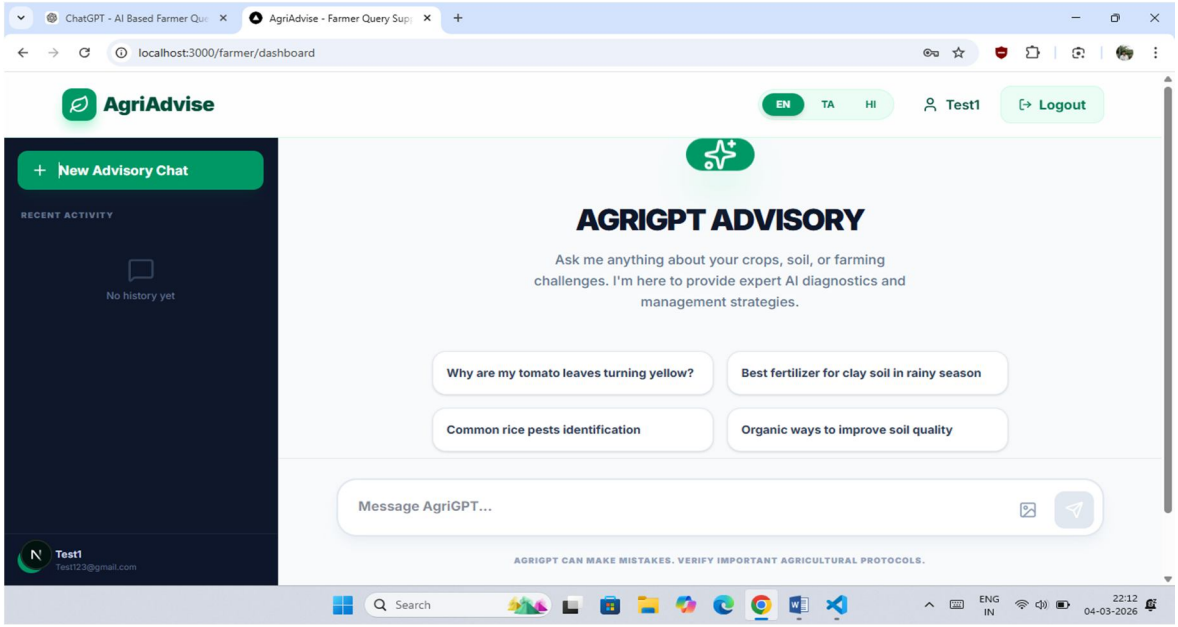

Figure 4. Query Page

IX. CONCLUSION

The development of the AI-Based Farmer Query Support and Advisory System successfully demonstrated an efficient and accessible solution for providing agricultural guidance to farmers. By integrating artificial intelligence, natural language processing, and a web-based interface, the system enables farmers to submit queries and receive instant recommendations related to crop management, pest control, fertilizers, irrigation, and other agricultural practices. This approach helps farmers obtain reliable information quickly, improving decision-making and reducing their dependency on manual advisory services.

The user-friendly design of the system allows farmers to easily interact with the platform through a simple web interface. The integration of an AI processing module with an agricultural knowledge base ensures that relevant and meaningful responses are generated for different types of farming queries. This makes the system suitable for farmers with varying levels of technical knowledge and improves the accessibility of agricultural information.

Furthermore, the modular architecture of the system allows for future enhancements, such as multilingual support, voice-based query input, and integration with weather or market data. These improvements can further enhance the effectiveness of the advisory system and expand its usability for a wider farming community.

Overall, this project demonstrates the potential of AI-driven digital advisory systems to transform agricultural knowledge delivery. By providing quick access to farming information and recommendations, the proposed system can support farmers in improving productivity, managing crop-related issues and adopting better agricultural practices for sustainable farming.

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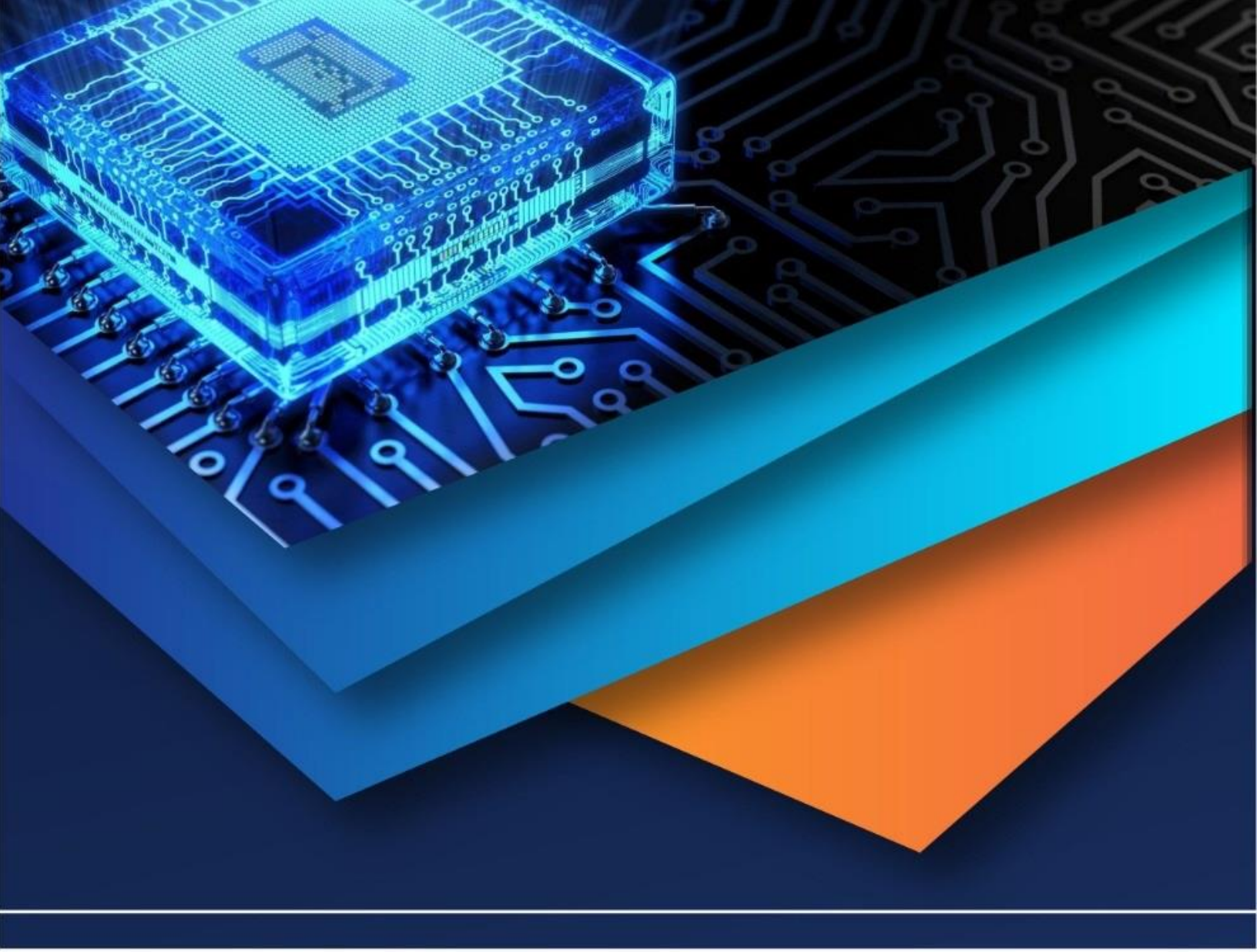

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