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Lexi Read (Dyslexic Kid Helper)

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Abstract: ***Conventional reading methods and inaccessible learning materials make it difficult for dyslexic children to improve their reading fluency and comprehension, while existing educational tools often lack personalized, interactive support. To address this challenge, this paper proposes Dyslexic Kid Helper, a user-centric web application designed to assist dyslexic children by providing an interactive, engaging, and supportive literacy experience. The system is developed utilizing Python Flask for a highly compatible web architecture , Tesseract Optical Character Recognition (OCR) to extract text from images and PDFs , and OpenAI GPT to power advanced comprehension features like instant definitions and paragraph simplification. Furthermore, the application is Docker-ready to ensure efficient deployment, scalability, and cloud hosting. By transforming complex text into accessible formats and delivering synchronous speech synthesis, the platform enables independent learning while offering a seamless, dyslexia-friendly user experience featuring tailored fonts and minimal distractions. In summary, Dyslexic Kid Helper acts as a comprehensive assistive learning solution, effectively combining AI and machine learning techniques to address the unique challenges faced by dyslexic children.***

Keywords: Dyslexia Assistive Technology, Optical Character Recognition, Artificial Intelligence, Text-to-Speech, Tesseract OCR, OpenAI GPT, Python Flask, Docker Deployment, Reading Comprehension, Interactive Learning, Web Application, Self-Assessment Tools.

I. INTRODUCTION

The Conventional reading methods present significant challenges for children with dyslexia, often making it difficult for them to develop essential literacy skills. In traditional educational settings, printed texts and standard digital documents are frequently provided in formats that are not easily accessible to neurodivergent learners. This reliance on standard formatting makes it difficult for dyslexic children to improve their reading fluency and comprehension without specialized, continuous intervention, as they often struggle with conventional reading methods. Many students rely on manual assistance from educators or parents to process printed materials, which can be resource-intensive and limits independent learning. Research indicates that advanced assistive technologies, such as Optical Character Recognition (OCR) and Artificial Intelligence (AI), can significantly improve the learning experience by transforming images, PDFs, or typed text into formats that are easier to read and understand. OCR technology enables the automated extraction of text from various documents, helping children access learning materials effectively without the barriers of traditional static text. Several educational tools have proposed using basic text-to-speech mechanisms and standard digital reading aids to support dyslexic learners. These systems help users listen to content and provide basic auditory feedback. However, many existing applications lack integrated AI-powered comprehension tools, personalized self-assessment features, and specialized user interfaces designed specifically to reduce cognitive load for dyslexic users. To overcome these limitations, this research proposes Dyslexic Kid Helper, an interactive web application designed to assist dyslexic children in improving their reading skills by providing an engaging and supportive literacy experience. The system processes extracted text through a natural speech synthesis engine that reads aloud while synchronously highlighting words , and it integrates AI-powered feature such as paragraph simplifier and an auto-quiz generator. By offering personalized support, self-assessment tools, and it integrates AI-powered features such as a paragraph simplifier and an auto-quiz generator. By offering personalized support, self-assessment tools, and a carefully designed dyslexia-friendly interface , the proposed application aims to help children build confidence, improve reading skills, and develop a positive relationship with learning.

II. LITERATURE SURVEY

A. *Existing Systems*

Several studies and applications have explored automated reading tracking and comprehension mechanisms in educational environments.

1) Digital Text Reader System Using Basic Speech Generation: Provides automated voice extraction and basic reading mechanisms using standard synthesis concepts. However, it faces limitations in handling graphics- heavy documents and scalability for younger users.

2) Reading Text Assistance Platforms: Offer cross-platform text conversion at a single point in time but do not support continuous reading monitoring or historical progress tracking.
3) Text Scanning–Based Tracking Tools: Use static scanning techniques to extract text data periodically. These systems often fail on modern dynamic graphics and lack reliable automation.
4) Manual Text Tutoring Methods: Rely on educators manually guiding reading across materials, which is time-consuming, inefficient, and
5) Prone to missed learning gaps. Basic Audio-Based Systems: Provide voice or pronunciation alerts but lack secure user authentication, personalized tracking, and detailed reading history visualization

B. *Related Research*

1) Assistive Reading Text Support Using Dynamic Speech Algorithm – Khairkar et al. (2023) proposed a text tracking system based on dynamic reading algorithms and text extraction techniques. The system extracts word information from multiple e-learning platforms and notifies users of text changes. While effective in basic tracking, the system faces limitations in scalability and handling dynamic pdf content [3].
2) Insight Read – Content Analysis using Text Scanning and AI – Abhishek et al. (2024) developed a reading analysis platform combining text scanning and machine learning for text analysis and reading. However, the system lacks real-time speech and secure personalized tracking [5].
3) Dynamic Text Simplification in E-Learning – Patel et al. (2024) introduced an automated simplified system that extracts real-time text data and sends pronunciations to users. The system highlights the importance of continuous processing but faces issues with complex pdf content and anti-ocr mechanisms [11].
4) Text Scanning Applications for Word Comprehension – Sharma and Agnihotri (2024) focused on scheduled scanning and text simplification. The system provides useful insights but lacks scalable authentication and multi-user support [6].
5) Real-Time Word Comprehension Systems – Chen (2024) demonstrated that real-time text extraction-based word comprehension systems significantly improve user decision- making and fluency in e-learning platforms [8].

C. *Key Insights*

From the literature, the following insights were identified:

1) Automated text processing significantly improves student comprehension-skills by providing real-time feedback and eliminating the need for manual text translation across multiple e-learning platforms. This allows users to make faster and more informed learning progressions.
2) Traditional static text scanners are often ineffective for modern e-learning materials, as many formats use complex content, image rendering, and non- standard typography. Therefore, advanced and adaptive extraction techniques are required for reliable data processing.
3) Maintaining historical reading data and visualizing it through graphs or trends enhances transparency and helps users understand reading improvements over time. This feature enables users to identify the best areas to review materials based on past learning patterns.
4) Secure user authentication and personalized tracking mechanisms are essential to ensure that user data and tracked reading information remain protected. Authentication also enables customized notifications and individual user dashboards.

Title	Limitation and Future Scope Inferred
Khairkar et al. (2023): Assistive Reading Text Support Using Dynamic Speech Algorithm	Focus on Mock scenarios limits exposure to real-world student unpredictability and the complex educational/cognitive challenges of a high-stakes, real-world reading process. Relies on basic extraction techniques that struggle with graphics-heavy documents. Scalability is limited when processing multiple texts simultaneously, and feedback mechanisms are not fully optimized for real-time updates.
Abhishek et al. (2024): Insight Read – Content Analysis using Text Scanning and AI	Focuses mainly on text analysis and reading assessment. Lacks real-time pronunciation alerts and secure user-specific tracking required for personalized learning.
Patel et al. (2024): Dynamic Text Simplification in E-Learning	Automated text extraction is vulnerable to anti-OCR security mechanisms. The system experiences data inconsistency when handling complex format fluctuations on dynamic platforms.
Sharma & Agnihotri (2024): Text Scanning Applications for Word Comprehension	Scheduled scanning improves automation but fails to handle complex dynamic content efficiently. The system lacks scalable authentication and multi-format integration.

Table 1. Limitation Of Existing Systems

III. PROPOSED SYSTEM

A. System Overview

The Dyslexic Kid Helper system is an automated web-based reading assistance and literacy platform designed to help children process complex texts across various digital learning environments. Dyslexic learners often spend significant time manually decoding words and waiting for educational assistance. The proposed system eliminates this manual effort by continuously processing reading materials and providing interactive support when reading challenges occur.

The system allows users to upload an image, PDF, or typed text document from any standard educational format into the platform. It then automatically extracts text details, stores reading progress data, analyzes comprehension trends, and provides corrective guidance when pronunciation errors are detected. This ensures children can understand learning materials with the best possible personalized support without repeatedly relying on external tutors.

The main objective of the Dyslexic Kid Helper system is to provide real-time reading assistance, maintain historical progress records, and generate automated quizzes to enhance the independent learning experience. The system is designed with a modular and scalable architecture that ensures reliable performance and efficient handling of multiple users and document processing simultaneously.

B. System Architecture Diagram

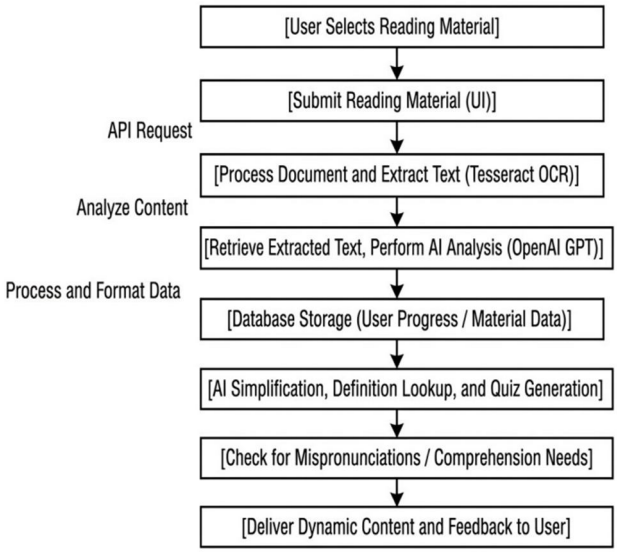

Fig 3.2 System Architecture of DealDrop Price Tracking System

C. Working of the Proposed System

The working of the Dyslexic Kid Helper system follows a structured and automated workflow as illustrated in the system architecture diagram.

Initially, the user selects a desired reading material such as an image, PDF, or typed document. The user then uploads this learning material into the Dyslexic Kid Helper web application interface. The frontend of the system receives the input and sends an API request to the backend server for processing.

The backend server activates the text extraction module, which retrieves text information from the provided document using automated Tesseract OCR tools. This extracted text is then processed through OpenAI GPT algorithms to generate simplified paragraphs and dynamic word definitions to ensure accessibility and ease of understanding.

The structured reading data is stored in the database system, where historical progress information is maintained. This enables the system to track reading improvements over time and maintain accurate learning history records.

The assessment module continuously analyzes the user's reading performance and compares their spoken accuracy with the original text. If a mispronounced word is detected or a comprehension check is required, the system triggers the feedback module.

Finally, the system delivers real-time speech synthesis and visual highlighting to the user, providing them with correct pronunciations and immediate vocabulary support. This complete workflow operates automatically, reducing manual tutoring effort and providing real-time literacy tracking and guidance to users.

The modular architecture of the system ensures scalability, efficient processing, and reliable performance even when multiple users process multiple documents simultaneously.

D. System Architecture

The proposed system integrates the following components:

- Frontend: Dyslexia-friendly UI with tailored fonts and pastel color schemes for building responsive, accessible, and distraction-free interfaces.
- Backend: Python Flask with server-side logic for handling requests, processing documents, and managing learning workflows.\.
- Text Extraction Engine: Tesseract OCR for extracting accessible text data from images, PDFs, and conventional reading materials..
- AI Integration & Deployment: OpenAI GPT and Docker for intelligent text simplification, secure data processing, and scalable cloud hosting..
- Feedback Module: Resend email service for automated price drop alerts and user notifications.
- Scheduling Module: Auto-quiz generator for continuous automated comprehension monitoring.

E. Workflow

- User logs into the system using secure user authentication.
- User submits the reading material (Image, PDF, or typed text) to be processed.
- Tesseract OCR extracts the current document text.
- Assessment modules continuousaly track the user's reading performance.
- Pronunciation errors are detected and historical progress data is updated.
- Real-time feedback and reading analytics are displayed to the user.

IV. METHODOLOGY

The proposed Dyslexic Kid Helper – Assistive Web Application is designed as an intelligent, user-centric web platform that enables users to process reading materials across multiple digital formats and receive interactive support on text comprehension. The system leverages OCR extraction, AI processing, and real-time speech mechanisms to deliver accessible and simplified reading insights. The overall workflow of the system is divided into five primary phases: User Authentication and Onboarding, Document Upload and Input, Text Extraction and AI Processing, Reading Assessment and Feedback Generation, and API Integration and Data Management, as illustrated in Fig. 1.

A. User Authentication and Onboarding

The system begins with a secure authentication process managed through secure user authentication, ensuring user data privacy and controlled access. The Landing Page serves as the entry point, allowing users to sign up or log in securely. Upon successful authentication, users are directed to the Dashboard, where they can manage uploaded documents and learning preferences. Basic user information and preferences are stored to personalize the reading experience, such as preferred reading speeds and specialized font categories.

B. Product Tracking and Input

After authentication, users interact with the Document Input module, where they can submit reading materials (Images, PDFs, or typed text) from standard educational formats. The system validates the input files and extracts essential metadata such as document name, text length, and file format source. Users can add, remove, or update reading materials, enabling flexible processing of multiple documents simultaneously. This module acts as the foundation for all subsequent text analysis and feedback generation processes.

C. Price Data Collection and Monitoring

The Text Extraction module continuously gathers written information using automated Tesseract OCR and AI-based data processing techniques. Automated backend tasks fetch simplified paragraphs and word definitions to ensure accessibility and understanding.

Collected reading progress data is stored chronologically, enabling the system to maintain a complete learning history for each processed document. This historical dataset forms the basis for reading trend analysis and comprehension comparison.

D. Price Analysis and Alert Generation

The Reading Assessment module processes user speech data to identify pronunciation errors, reading accuracy, and significant comprehension gaps. When a child mispronounces a word or a notable learning challenge is detected, the system triggers real-time feedback. Corrective guidance is delivered through synchronous speech synthesis, enabling users to make timely learning corrections. This module ensures that users are guided in real time without the need for constant manual tutoring.

E. API Integration and Data Management

The platform utilizes a modular backend architecture for scalability and efficient document handling. Reading material data, user preferences, and historical progress records are securely stored using the local or cloud-hosted database. External AI APIs and OCR services handle text extraction, while the Python Flask backend ensures synchronization between the frontend dyslexia-friendly dashboard, database, and natural speech synthesis services. This architecture supports reliable performance, fast text retrieval, and seamless integration across educational system components.

V. RESULTS AND DISCUSSION

The Dyslexic Kid Helper system demonstrated reliable performance and accurate text extraction during testing across multiple digital learning formats. Automated text extraction and real-time speech synthesis significantly improved user experience and reduced the manual effort required for reading decoding and comprehension. The system consistently maintained historical reading records and successfully generated timely feedback whenever significant pronunciation errors were detected. Continuous monitoring and data synchronization ensured that users received up-to-date vocabulary definitions without delays, improving overall usability and reliability.

The implementation of automated OCR scanning and structured data storage enabled efficient handling of large volumes of text data. Historical data tracking allowed users to analyse reading trends over time and make informed self-assessment evaluations. Similar research has highlighted the importance of historical progress visualization and automated feedback in enhancing confidence and student learning in digital educational environments. The integration of dyslexia-friendly interfaces and personalized dashboards further improved user engagement and system effectiveness.

Scalability testing showed that the system could handle multiple concurrent users and processed documents efficiently due to its Docker-ready full-stack architecture. The use of asynchronous backend processing and scheduled AI background tasks ensured smooth system performance even under increased workload. Studies on automated text processing and AI analysis systems have demonstrated that modular architectures significantly improve system scalability and maintain performance under heavy data loads.

Performance evaluation also indicated that the average response time for extracting text and updating simplified paragraphs remained within acceptable limits, ensuring a responsive user experience. The system successfully synchronized data between frontend dashboards, backend services, and the database without data inconsistency or latency issues. Similar automated learning platforms have reported improved accuracy and response efficiency through structured data pipelines and real-time synthesis mechanisms.

Overall, the Dyslexic Kid Helper system achieved high reliability, fast response time, and effective data synchronization across all modules.

The integration of automated progress tracking, secure user management, and real-time pronunciation feedback makes the system a practical and scalable solution for modern dyslexia assistive learning environments. Research findings support that such intelligent educational systems significantly enhance reading comprehension and provide a supportive advantage in dynamic learning environments.

VI. PERFORMANCE EVALUATION

The performance of the Dyslexic Kid Helper – Assistive Web Application was evaluated based on functionality, response time, scalability, accuracy of text extraction, and user interaction efficiency. The evaluation focused on assessing how effectively the system automates document processing, maintains historical reading data, and delivers timely feedback to users.

Testing was conducted across major modules, including user authentication, document upload, text extraction, AI comprehension analysis, and pronunciation feedback.

The system demonstrated stable and reliable performance during all test scenarios, with consistent synchronization between the frontend interface, backend services, and database.

The average response time for extracting and processing document text data ranged between 1.5–2.0 seconds, depending on the file format and network conditions. Database operations managed through the cloud-hosted architecture executed efficiently, enabling fast storage and retrieval of reading progress history without noticeable latency.

Scalability testing indicated that the system could handle multiple concurrent users and processed documents effectively due to its modular architecture and asynchronous backend implementation using Python Flask and Docker. Background AI processing tasks ensured continuous text simplification and vocabulary definitions without affecting frontend performance.

User interaction analysis showed high usability, with users actively engaging in uploading reading materials, monitoring comprehension trends, and responding to pronunciation feedback. The automated speech and AI support mechanism significantly reduced the need for manual tutoring, improving overall user experience.

Overall, the system achieved strong performance in terms of speed, reliability, scalability, and accuracy, successfully fulfilling the objectives of an intelligent and user-friendly assistive reading platform.

VII. CONCLUSION

The proposed Dyslexic Kid Helper successfully demonstrates the application of modern web technologies to build an intelligent and scalable assistive reading support solution. The system enables users to extract text from learning materials, analyze historical reading trends, and receive real-time pronunciation feedback, thereby supporting interactive and confidence-building educational experiences.

The implementation using Python Flask, Tesseract OCR, and OpenAI GPT ensured secure access, efficient text data handling, and smooth system performance. The Docker-ready modular architecture facilitated real-time synchronization between system components and allowed seamless integration of AI text simplification and natural speech synthesis functionalities.

Future enhancements may include augmented reality (AR) reading support, multilingual voice assistance, detailed parent and teacher dashboards with analytics, and support for a wider range of digital learning formats. Cloud-based scaling and personalized reading recommendations can further improve usability and system reach.

Overall, Dyslexic Kid Helper represents a practical and efficient solution for automated reading assistance, offering significant value to neurodivergent learners in today's dynamic digital education environment.

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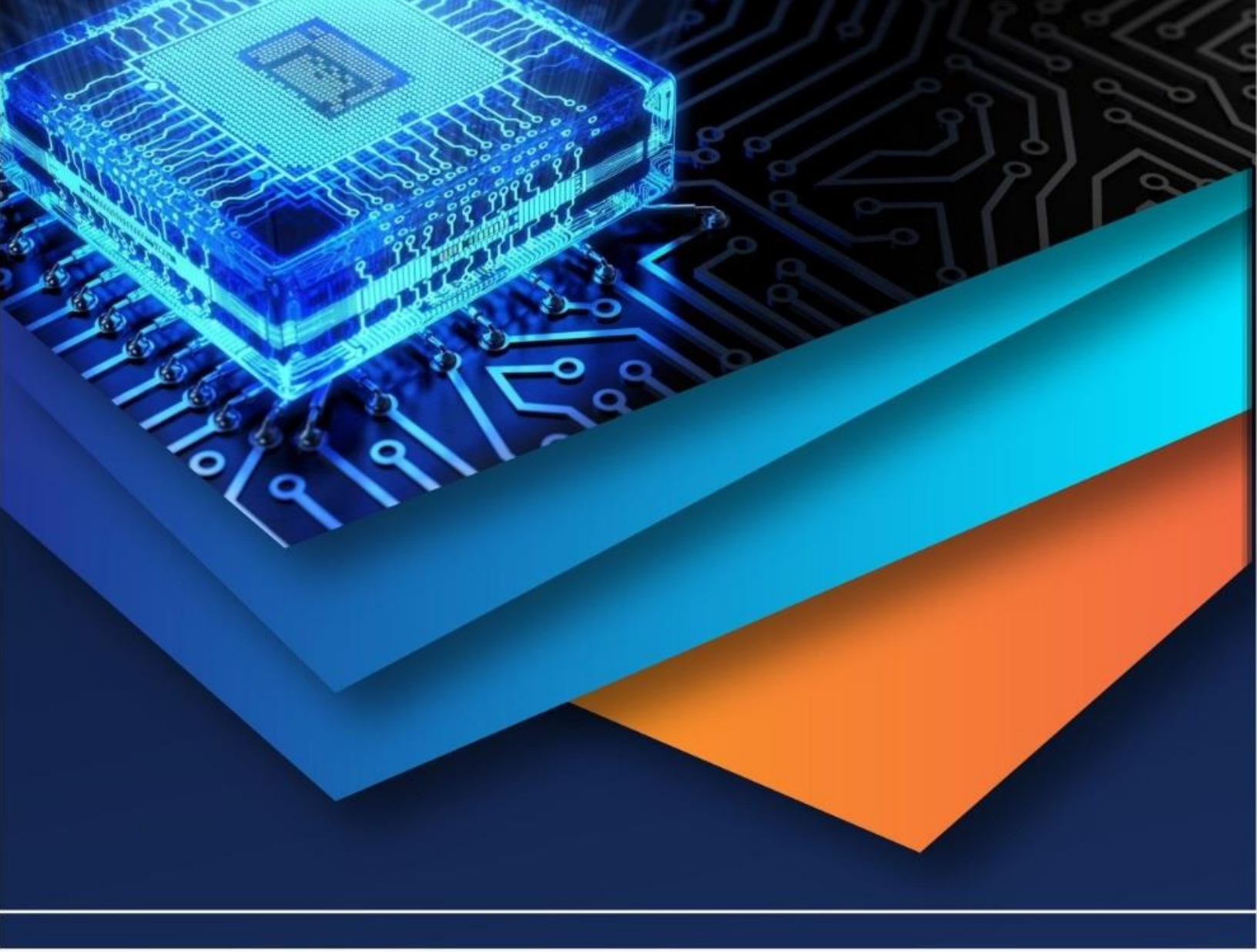

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