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# SMARTEX- Proctor Based Smart Education System

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***Abstract:*** ***Over the last year, online exams have gained significant popularity across various educational sectors due to the COVID-19 pandemic. However, institutions are encountering substantial challenges regarding proctoring methods. In this project, we propose the development of an AI-driven integrated system designed to help prevent learning courses, and we highlight several techniques and tools that eliminate the necessity for a proctor to be present for the entire duration of the course. As the Internet and technology have advanced significantly over the last decade, the growth of E-learning has accelerated rapidly. Consequently, conventional methods of detecting fraud have proven ineffective in curbing dishonest behavior. Online assessments are a crucial component of e-learning. In this format, students submit their exams remotely without supervision from physical proctors. However, this approach contradicts the principles of remote e-learning.***
***Notable features encompass facial recognition to confirm student identity, gaze tracking to observe abnormal eye movements, and keystroke dynamics to recognize typing behaviors. Moreover, the system oversees the testing environment for any unauthorized actions or questionable behaviors, such as diverting attention from the screen or trying to reach external resources. By streamlining the proctoring process, the Smart Education Proctoring System seeks to offer a non-invasive, scalable approach to uphold academic integrity during online assessments. It minimizes the necessity for human proctors and allows educators to concentrate more on teaching rather than overseeing exams. In addition, the system is capable of producing real-time alerts for any dubious activities, facilitating immediate intervention and ensuring an equitable assessment of student performance.***

***Keywords:*** **Monitoring System, Virtual Assessments, Distance Education, Convolutional Neural Network, Sign Face Detection, Face recognition, online test portal, image processing.**

## I. INTRODUCTION

In India, the number of internet users has almost doubled over the last six years. This has significantly benefited education, enabling many students to continue their studies. It also made it possible for exams to transition online, introducing the concept of online proctoring in academic settings. They utilize video, audio, and various anti-cheating technologies to ensure the integrity of the exam. Conducting manual online proctoring during remote assessments is challenging, as it is difficult to oversee many students simultaneously.. Numerous online education courses providers utilize artificial intelligence-driven technologies to conduct objective proctoring of tests. These technologies incorporate advanced methods, such as audio and video monitoring, to ensure that candidates do not participate in dishonest practices.

Software for remote proctoring is designed to keep an eye on students while they take tests. Consequently, computer techniques are being developed to detect instances of student cheating. Access to student cameras is obtained, and they are then watched for unethical behaviour. Then, AI functions come into play. Additionally, it aids in identifying candidates for careful observation. Candidates can take tests from any location thanks to online proctoring. Online proctoring enables both proctors and students to take exams from any location using the proctored exam software. It needs to be internet-connected and adequately dependable. It is now easy to proctor an online exam. Sound and movement detection should be made easier by a good remote online proctoring solution.

Research has concentrated on utilizing machine learning algorithms to examine user behaviours, such as facial expressions, eye movements, and interaction patterns, to detect possible instances of cheating during online examinations. Additionally, progress in computer vision, natural language processing, and data analytics has introduced more advanced methods for online exam supervision, capable of identifying subtle indicators of cheating or misconduct. Overall, the literature review emphasizes the critical need for developing strong and trustworthy online examination proctoring systems employing machine learning to protect the integrity of online assessments and maintain the credibility of online education.

This platform serves as an online assessment and knowledge management solution, widely utilized by corporations, professional training institutes, and universities. It facilitates the management of examinations and generates various activities, enabling the

 

administration of assessments, aptitude tests, psychometric evaluations, personality assessments, entrance examinations, and hiring tests. The system allows for modifications in the online review process, including the ability to switch to negative reviews, randomize questions, and alter review types. Assessments can be conducted across multiple devices, including computers, mobile phones, and tablets, thanks to its versatile features.

By employing advanced methods like pattern recognition, anomaly detection, and behavioural analysis, machine learning enables educators and administrators to accurately and efficiently detect and respond to cheating incidents. This introduction highlights the crucial importance of machine learning in enhancing the integrity and dependability of online education, thereby influencing the evolution of assessment practices in the digital era.

Nonetheless, issues such as poor internet connectivity and worries about the protection of personal information during examinations need to be tackled. It is crucial to maintain data protection and comply with privacy regulations, like those established by the EU, especially with the implementation of biometric verification in modern systems.

## II. LITERATURE REVIEW

In the study presented in paper [1], it is highlighted that online education is facilitating access to a diverse range of knowledge for students and institutions globally. This mode of learning is experiencing significant growth; however, the evaluation and proctoring of online courses have emerged as critical challenges that hinder the scalability of these educational systems. Typically, manual human supervision is employed for exam proctoring and assessment, requiring the examiner to be physically present in the testing environment or to monitor the test taker's surroundings visually and audibly via a webcam.

In the study referenced as paper [2], it is noted that to uphold and promote academic integrity, certain educational institutions mandate proctor supervision during online education courses . Nevertheless, the implementation of proctoring can incur significant expenses. Students may incur various costs, including fees for testing centres, expenses associated with acquiring Remote Proctor services, the time spent locating an approved proctor, and the effort required to schedule the examination. On the institutional side, expenses encompass staff salaries for managing the proctoring process, the approval of proctors, upkeep of testing facilities, and the potential decline in enrollment and revenue, as not all institutions impose proctoring requirements for online assessments. This paper examines the challenges of online exam supervision and argues that the overall costs of proctoring—encompassing both the time and financial resources of students and institutions—outweigh the potential benefits.

In the study referenced as [3], the expansion of online education presents both opportunities and challenges for learners and educators alike. A significant challenge is the widespread belief that the integrity of academic assessments conducted online is at risk, primarily due to the potential for undetected cheating, which can lead to inflated grades. To mitigate these issues, proctoring software has been created to deter and prevent instances of academic dishonesty. This research aimed to compare the outcomes of online assessments that were proctored against those that were not proctored.

Nigam et al. (2021)[4] performed a systematic review of AI-driven Proctoring Systems, highlighting the impact of the COVID-19 pandemic on the shift to online education and the growing reliance on online proctoring services. Their analysis identified significant research inquiries concerning current architectures, relevant parameters, design challenges, and the future potential of AI-based proctoring systems.

O'Reilly and Creagh (2016) [5] examined various human-centered and AI-driven proctoring systems, underscoring the technological advancements in both hardware and software that have influenced the evolution of AI-based proctoring solutions. The research pointed out the critical necessity for intuitive AI proctoring systems and the need to expedite research and development efforts in response to the increasing demand for online proctoring options.

This research investigates the changing dynamics of online education and the increasing implementation of AI-driven proctoring solutions. By examining 41 publications from the years 2016 to 2022, it highlights the necessity for enhanced training in the utilization of AI technologies, with a particular emphasis on the function of technology in identifying academic dishonesty within online proctoring frameworks. [6] Additionally, the study assesses newly introduced technologies that have a substantial influence on the realms of online education and proctoring.

Rios & Liu (2017) and Weiner & Hurtz (2017)[16] examined how peer behaviour affects students' attitudes towards proctoring systems, stressing the need for clear communication and comprehension to prevent students from becoming confused or panicking. This research emphasised the significance of attending to students' issues and making sure online testing procedures are fair.

This paper introduces an automatic online exam proctoring system, addressing the scalability challenges of remote education evaluations. Utilizing a combination of multimedia analytics and hardware components, the system efficiently monitors key

behaviour cues to classify instances of cheating during exams. Experimental results demonstrate the system's accuracy, robustness, and efficiency in detecting various forms of academic dishonesty[21].

This paper proposes a visual analytics approach to streamline the proctoring process for online exams. By leveraging visual analytics techniques, the system aims to enhance the efficiency and effectiveness of proctoring, providing a comprehensive solution for monitoring and ensuring exam integrity in online settings.[22].

## III. METHODOLOGY

The initial step involves registering students by collecting their personal information and facial images on the platform. For each courses , students must register with an updated facial image, which will be compared against an image stored in the database.. Additionally, head positioning will be monitored, and multiple voices will be recognized. If any fraudulent activities are detected in the logs, the student will face disqualification. It involves following steps:

*1)* Data Collection: Assemble a comprehensive dataset of online examination videos that represent a variety of situations, including different lighting conditions, camera perspectives, and student behaviors during tests. This dataset should also capture instances of dishonest conduct. Label the dataset to identify various behaviors, distinguishing between standard exam-taking actions and cheating activities.

*2)* Preprocessing: Conduct preprocessing on the gathered data to improve its quality and ready it for model training. This may involve steps such as stabilizing videos, reducing noise, extracting frames, and resizing them.

*3)* Feature Extraction: Identify and extract pertinent features from the preprocessed video frames. These features may encompass facial landmarks, eye movements, head positions, and hand gestures. Employ tools like OpenCV and facial recognition libraries to ensure accurate feature extraction.

*4)* Model Selection: Select suitable machine learning models for identifying cheating behaviors in online exam videos. Consider utilizing models such as Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), or hybrid architectures that can analyze both temporal and spatial features.

*5)* Model Training: Train the chosen machine learning models using the labeled dataset. Implement techniques like transfer learning to take advantage of pre-trained models on extensive datasets, enhancing performance.

*6)* System Development: Create the online examination proctoring system that incorporates the trained machine learning model. Include features for real-time video processing, feature extraction, and detection of cheating behaviors.

*7)* Integration with Exam Platform: Connect the developed proctoring system with current online exam platforms or learning management systems (LMS). Ensure that the proctoring system interacts smoothly with the exam platform to effectively monitor students during assessments.

*8)* Testing and Evaluation: Evaluate the developed system across a range of online exam scenarios to assess its effectiveness.

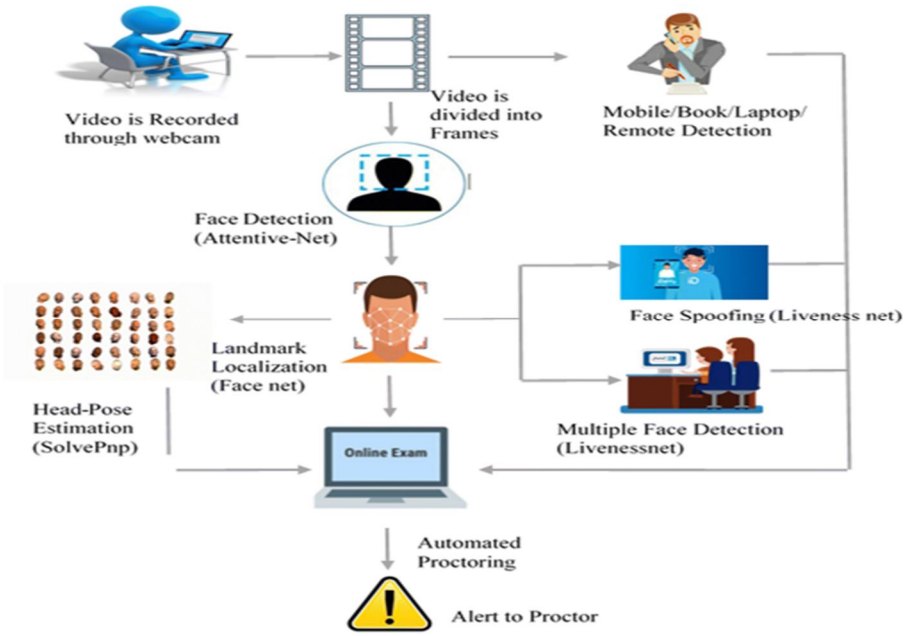


Fig 1. Flow Chart

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**WORK FLOW DIAGRAM OF AI/ML-based Proctor Examination System**

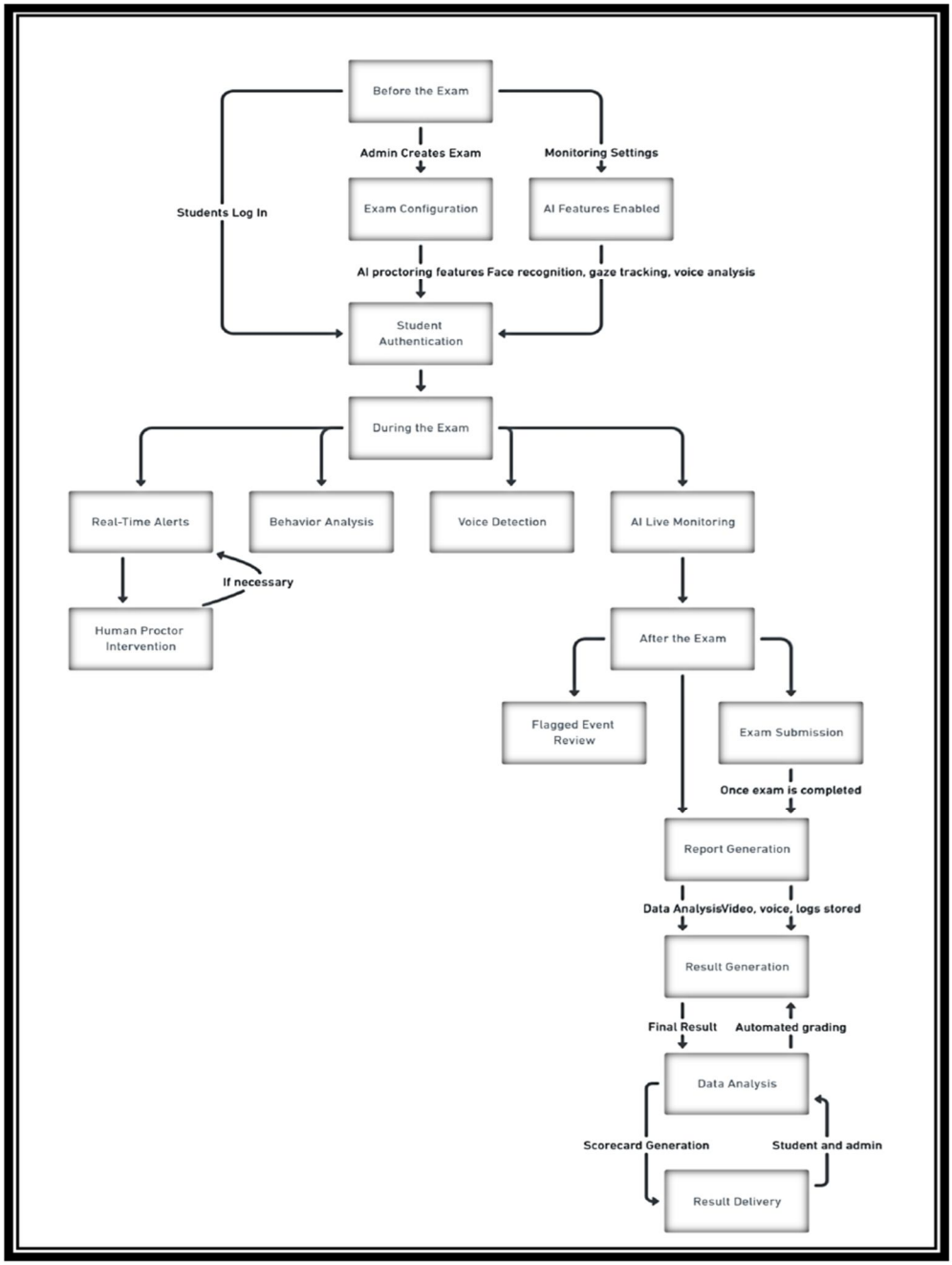


Fig 2. Work Flow Diagram

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## IV. FUTURE SCOPE

1. Enhancements in AI and Machine Learning
- Behavioral Analysis
- Personalized Learning Models

2. Growth and Integration
- Integration with LMS and ERP
- Global Expansion

3. Innovations in Security and Privacy
- Blockchain for Data Integrity
- AI for Privacy Protection

4. Broader Application Areas
- Certification and Professional Exams
- Education for Special Needs

5. Integration of Edge Computing and IoT
- Proctoring with Low Latency
- IoT-Driven Monitoring

6. Research in Ethics and Society
- Detecting Bias in AI Proctoring
- Studies on Student Perceptions

7. Standards and Policy Development
- Frameworks for Regulation
- Compliance with Accreditation

## V. FUTURE INITIATIVES

The SMARTEX system presents an innovative method for smart education by merging intelligent proctoring features with digital learning platforms. Although the present implementation shows significant promise, various opportunities exit for future research and improvements.

To begin with, the application of advanced machine learning and deep learning techniques can enhance the system's capacity to identify intricate student behaviors, including micro-expressions, signs of stress, and attention levels. These advancements could result in more precise and equitable proctoring choices, minimizing both false positives and negatives during evaluations.

Additionally, there is considerable potential for scalability and interoperability. Future iterations of SMARTEX might be developed to integrate effortlessly with existing Learning Management Systems (LMS) and Enterprise Resource Planning (ERP) software, promoting widespread adoption across various academic institutions. Furthermore, adaptations for multilingual and multicultural contexts will be crucial for global relevance.

Regarding security and privacy, utilizing blockchain technology could guarantee the accuracy and permanence of examination records while also creating transparent audit trails. Concurrent research into privacy-preserving AI techniques can help maintain balance between necessary monitoring and the ethical obligation to safeguard student data, especially in areas governed by stringent data protection laws.

Another area worth exploring is the integration of edge computing and IoT devices. By decreasing dependence on centralized servers, edge computing enables real-time monitoring even in locations with limited internet access. Moreover, incorporating biometric and environmental sensors could bolster the validity of assessments conducted remotely.

In addition, SMARTEX could extend its reach beyond educational environments into professional certification programs, corporate training, and recruitment evaluations, providing a cohesive platform for secure, remote assessments. There should also be a strong focus on inclusive design, ensuring the system accommodates students with special needs.

Lastly, continuous research in ethics, psychology, and regulations will be crucial. Studies focusing on algorithmic fairness, student attitudes toward surveillance, and the creation of standard operating procedures for AI-driven proctoring will help build trust and establish credibility within the educational landscape.

Collectively, these directions outline a comprehensive plan for the ongoing advancement and effect of the SMARTEX system, promoting a more secure, scalable, and inclusive future for smart education.

## VI. CONCLUSION

The research underscores the significance of comprehending current architectures, relevant parameters, design challenges, and emerging trends in Automated Intelligent Proctoring Systems (AIPS). It stresses the necessity for resilient, secure, and user-friendly proctoring solutions to uphold academic integrity while adhering to strict security protocols. The project highlights the continuous advancement of AIPS and the imperative for ongoing research and development to address the growing need for online proctoring options.

The SMARTEX – Proctor-Based Smart Education System marks a significant advancement in enhancing education by integrating intelligent technology. By merging real-time AI-driven proctoring with innovative learning environments, SMARTEX tackles the pressing issues of integrity, accessibility, and personalization in remote learning. The system improves the reliability of online assessments and provides a flexible, scalable, and user-focused platform for educators and students alike.

SMARTEX currently showcases the practicality and effectiveness of leveraging advanced technologies to facilitate secure online examinations. Nevertheless, as educational requirements shift and digital infrastructures develop, there is substantial opportunity for further enhancement. Incorporating sophisticated behavioral analytics, ensuring strong data privacy, enabling interoperability, and considering ethical implications are crucial for future progress.

In summary, SMARTEX not only bolsters confidence in remote education but also lays the groundwork for a more adaptive, inclusive, and globally reachable learning environment. Its ongoing development has the potential to transform the benchmarks of digital education and assessment in the upcoming years.

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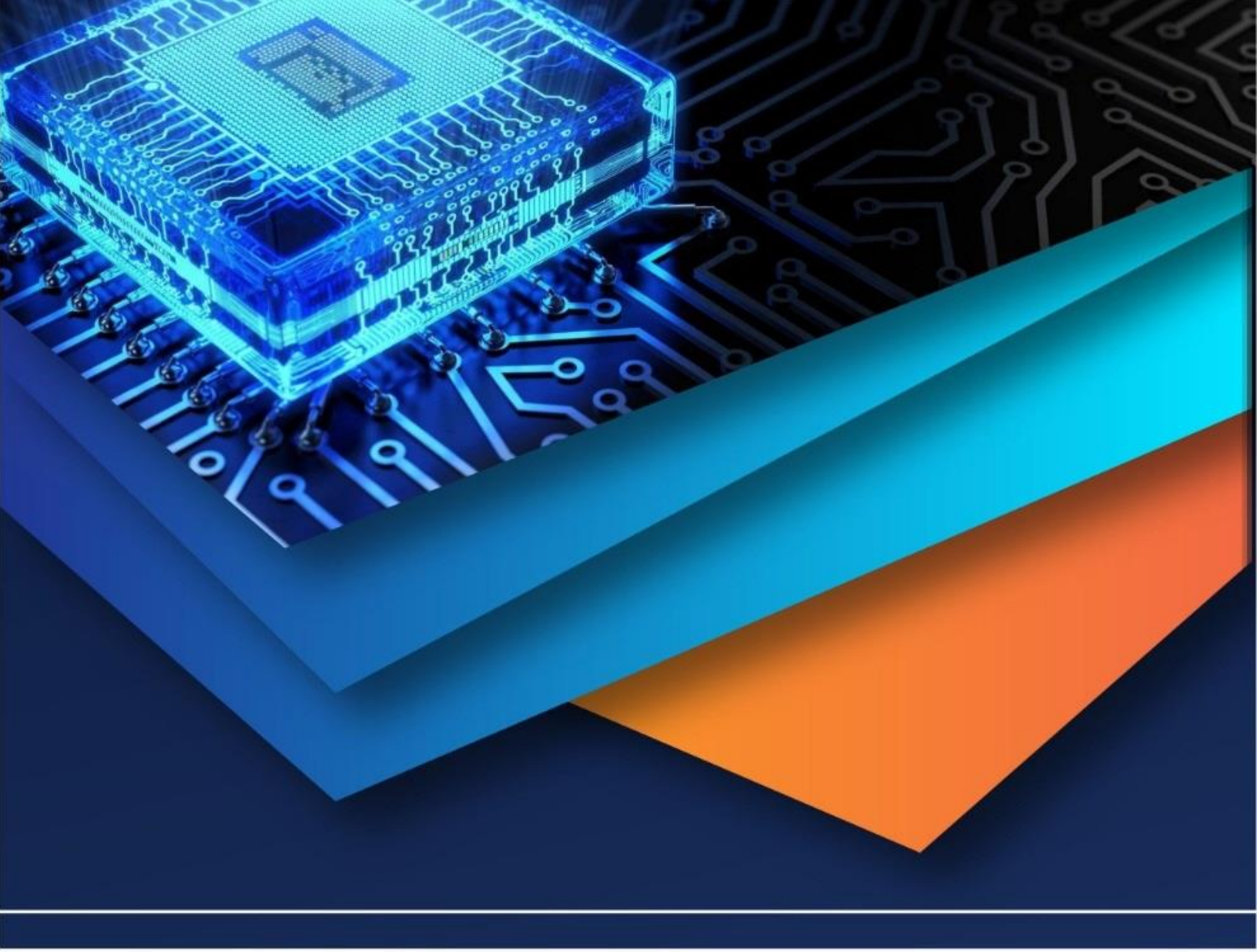

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