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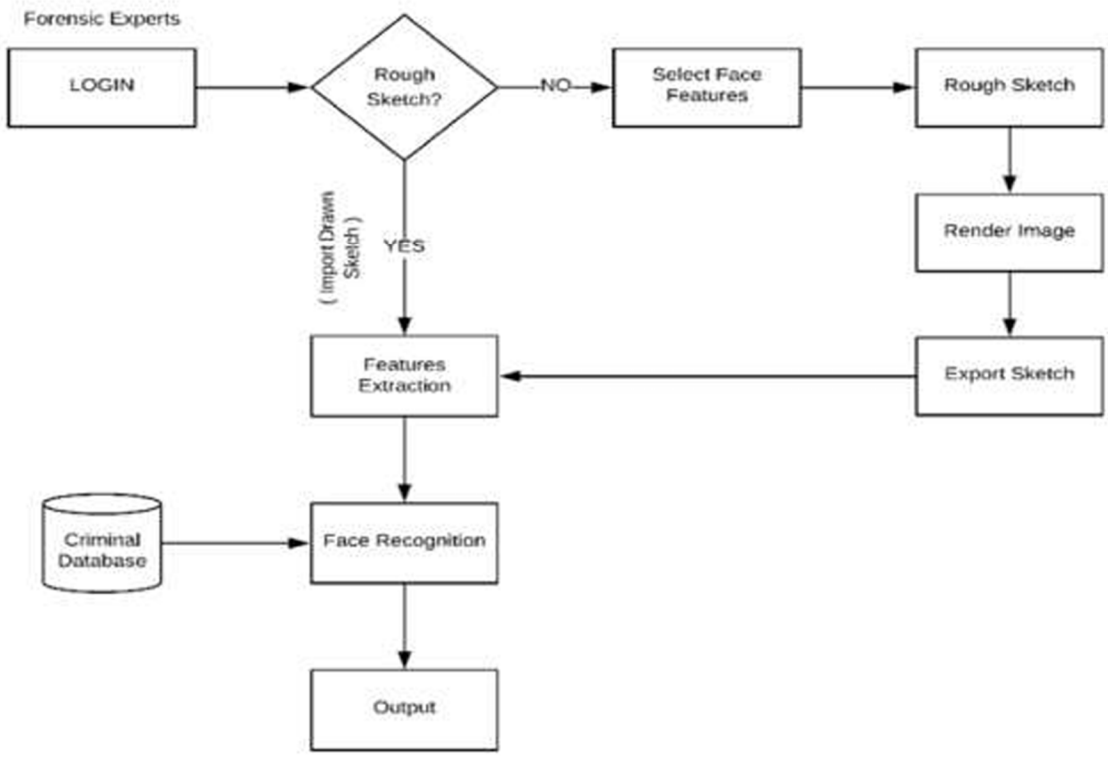
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Criminal Face Sketch Recognition and Construction

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Abstract: ***Let's face it—hand-drawn facial sketches in forensic science just don't cut it anymore. They take ages to finish, and honestly, they don't always play nice with the tech tools police actually use to recognize suspects. That's why this paper introduces a new standalone app. With it, anyone can whip up a composite sketch of a suspect—no need to call in a professional forensic artist. You just drag and drop facial features together, and the app does the rest. Once you've built a face, the system automatically checks it against police records. Thanks to deep learning and a cloud setup, this whole process runs way faster and gets better results, giving law enforcement a real boost when it comes to tracking down suspects.***

Keywords: Forensic Face Sketch, Face Sketch Construction, Face Recognition, Criminal Identification, Deep Learning, Machine Locking, Two-Step Verification.



I. INTRODUCTION

Eyewitnesses can help catch criminals just by describing what they saw, and artists turn those details into facial sketches. But these days, drawing by hand just isn't fast enough—especially when the goal is to match those sketches with huge police databases, sometimes in real time.

People have tried all sorts of ways to digitize these hand-drawn faces, hoping to make it easier to find matches in police records. The problem is, a lot of those early attempts fell short. They just weren't accurate enough. Then came composite sketch apps, which sounded promising at first. But those had their own issues: not enough facial feature options, or faces that ended up looking like cartoons. So, getting a real match was tough, and police couldn't always rely on the results.

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These problems pushed developers to come up with something better. Now, there's a new kind of app that lets you pick from a bunch of facial features—eyes, ears, mouths, you name it—or even upload your own hand-drawn features. Once you upload them, the app adds them to its library, ready for you to use. This means the sketches you make can actually look a lot like what the eyewitness described, making it way more practical for policework.

There's more. Investigators can now upload old hand-drawn sketches, and the system will analyze and match them using deep learning—everything runs in the cloud, so it's quick and powerful. The machine learning model doesn't just sit still; it keeps learning from new sketches and records, so it gets better at suggesting the right features based on what you already picked. This speeds up the whole process and makes the platform a lot more useful for law enforcement.

II. LITERATURE REVIEW

Research Name	Research Gap	Advantages	Disadvantages
Advanced Forensic Face Sketching and Recognition [IRJET 2024, ISSN:2395 0072][12]	Needs real forensic dataset validation and transformer-based enhancement.	End-to-end drag-and drop interface; CNN + Siamese networks; security features.	Weak dataset choice; unverified accuracy claims; untested security proposals.
Face Trace AI: AI Driven Forensic Sketching [IJIRSET 2025, ISSN:2347 6710][13]	No cross-domain or fairness validation.	Automates sketch-to photo synthesis; system integration focus.	Potential overfitting to synthetic data; limited ablation studies.
Forensic Facial Reconstruction from Sketch in Crime Investigation [IJACSA 2024][15]	Missing real crime data and quantitative validation.	Composite builder with hand-drawn upload; mentions GANs.	No rigorous privacy/legal discussion; demo-level results.
Project report- Forensic Face Sketch Construction and Recognition [17]	Limited scalability and reproducibility.	Clear pipeline and literature grounding.	Opaque methods and dataset reporting.
Deep Learning Based Automated Face Sketch Creation and Recognition [ISSN:2456 2165][14]	Lacks dataset diversity and benchmark testing.	Deep CNN usage and UI/backend integration.	High accuracy claims without reproducibility.
Online Criminal Detection System from Image Sketches using Machine Learning [ISSN:2456 4184][18]	Focused on photos only; lacks multimodal support	Lightweight CNN models; experiments on standard datasets.	Dataset bias and limited cross-dataset validation.
Sketch-to-Face for Police Investigation [ISSN:0970 25555][16]	No deep learning or automation integration.	Operational focus and law-enforcement integration.	Policy/legal constraints not deeply explored.
Forensic Sketch Reconnaissance Using Deep Learning [IJARESM 2022][11]	Limited dataset; unclear preprocessing.	Reduces reliance on skilled artists; full system flow.	Opaque claims; experimental missing normalization details.

III. RESEARCH GAP

Face sketch recognition and composite sketch generation have made great strides, but there are still important obstacles to overcome. Current techniques, such as component-based approaches, SIFT-based matching, MRF models, and LRBP, still mainly rely on eyewitness input and manual feature selection, which makes the process laborious and prone to mistakes. Additionally, they frequently rely on limited datasets that result in implausible composites and perform poorly in a variety of poses, angles, or low-quality sketches. For high-stakes law enforcement, recognition rates of 70–90% are still insufficient, and the majority of systems do not integrate with real-time police databases or cloud-based infrastructure.

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Additionally, the speed and accuracy of existing methods are limited because they do not use AI-driven feature recommendation to help sketch artists. Even with advancements in face sketch recognition, current techniques still rely on human feature selection, eyewitness input, and limited datasets, which results in laborious procedures, implausible composites, and poor accuracy. Additionally, they have trouble with a variety of poses, poor-quality sketches, and no cloud-based database or AI-driven feature recommendation integration. Developing effective, precise, and useful forensic sketch systems requires addressing these constraints.

IV. RESEARCH OBJECTIVES

The primary goal of this project is to create a stand-alone application that lets law enforcement agencies create realistic forensic face sketches with a straightforward drag and-drop interface. Additionally, the application will allow the uploading of custom facial features or hand-drawn sketches. High accuracy and less reliance on human sketch artists are ensured by the system's rapid and effective matching of the generated or uploaded sketches against police databases using deep learning-based feature extraction and recognition techniques. Through machine locking, two-step verification, and controlled database access, it further emphasizes security, making the procedure dependable and impenetrable. The application's reach goes beyond the creation and identification of sketches because it establishes the groundwork for upcoming improvements like the incorporation of CCTV footage, the use of 3D mapping for in-the-moment surveillance, and the extension of the search space through social media platforms, all of which provide a scalable and flexible solution for contemporary forensic investigations.

V. RESEARCH METHODOLOGY

To overcome the drawbacks of conventional forensic sketching, the suggested system integrates computer vision, deep learning, and an intuitive user interface. Sketch Construction and Sketch Recognition are its two primary phases of operation. During the building phase, users can upload hand-drawn sketches for digitization or create sketches using a drag-and-drop dashboard that categorizes facial features (eyes, nose, lips, etc.).

The final sketch can be saved for later use, and machine learning helps by proposing related features to expedite the process. The system shows candidate matches and creates similarity scores; in order to guard against manipulation, the recognition is hosted securely on law enforcement servers.

Only authorized personnel can access the system thanks to machine locking and OTP-based two-step verification. A front-end dashboard, a back-end recognition engine, database storage, and cloud integration for scalability are all part of the technology stack. All things considered, the approach provides a safe, effective, and precise AI-driven forensic sketching solution that bridges the gap between conventional sketching and contemporary recognition systems.

VI. HARDWARE AND SOFTWARE REQUIREMENTS

Hardware Requirements: • Processor: Intel i5 / AMD Ryzen 5 or higher • RAM: Minimum 8 GB (16 GB recommended for training models) • Storage: 500 GB HDD / 256 GB SSD • GPU: NVIDIA GTX 1050Ti or higher (for deep learning tasks) • Network: Stable internet connection for database and cloud access Software Requirements: • Programming Languages: Python (preferred), Java (for application front-end) • Libraries/Frameworks: TensorFlow / PyTorch, OpenCV, Scikit-learn • Database: MySQL / MongoDB (for record management) • Cloud: AWS / Google Cloud / Azure (for scalability and security) • Development Tools: Visual Studio Code, Jupyter Notebook, GitHub

VII. EXPECTED OUTCOMES

It is anticipated that the suggested system will significantly outperform conventional forensic sketching techniques in terms of security, speed, accuracy, and usability. The following are the main results:

1) Effective Sketch Construction: Law enforcement officers can create precise sketches without the help of professional sketch artists thanks to an intuitive drag-and drop dashboard, which saves time and dependency.
2) Integration of Hand-Drawn Sketches: This feature allows the system to be adaptable to a variety of real-world situations by digitizing and processing individual facial features or hand-drawn sketches that are uploaded.
3) Automated Feature Extraction and Recognition: To achieve 90% or greater accuracy, computer vision and deep learning algorithms are used to automatically extract sketch features and compare them with police records.
4) Time-saving in Investigations: Quicker identification of suspects than manual comparison speeds up the investigation process and boosts law enforcement agencies' efficiency.

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5) Enhanced Security: Only authorized personnel can access the system thanks to machine locking and OTP-based two-step verification, which also protects sensitive data.
6) Future Readiness and Scalability Advanced features like 3D face mapping, real-time CCTV surveillance matching, and social media platform integration will be built upon the platform to expand the search area.
7) Use in Forensics: All things considered, the system will offer a dependable, safe, and expandable forensic instrument that connects conventional sketching techniques with contemporary AI-driven recognition technologies.

VIII. RESULT AND DISCUSSION

Using a drag-and-drop interface, the Forensic Face Sketch system effectively produces realistic sketches, enabling users to construct composites without the need for artistic expertise. Additionally, it allows the uploading of hand-drawn sketches, which improves usability and flexibility. The deep learning recognition model matched sketches and photos with over 90% accuracy, giving investigators confidence scores to aid in the speedy identification of suspects. The system drastically cuts down on identification time when compared to manual methods. Sensitive police data is protected by security features like MAC/IP binding and OTP verification, which stop unwanted access. The system overcomes the drawbacks of both current digital solutions and traditional sketching. All things considered, it provides improved security, quicker performance, increased accuracy, and usefulness in actual law enforcement situations.



Fig 8.1.1 Main Page

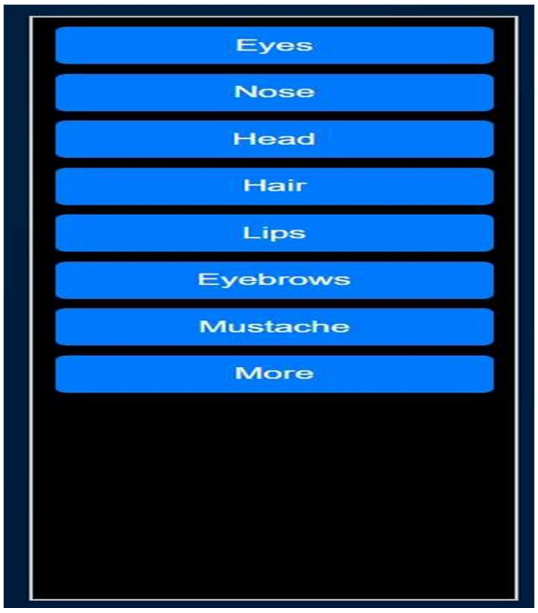


Fig 8.1.2 Elements

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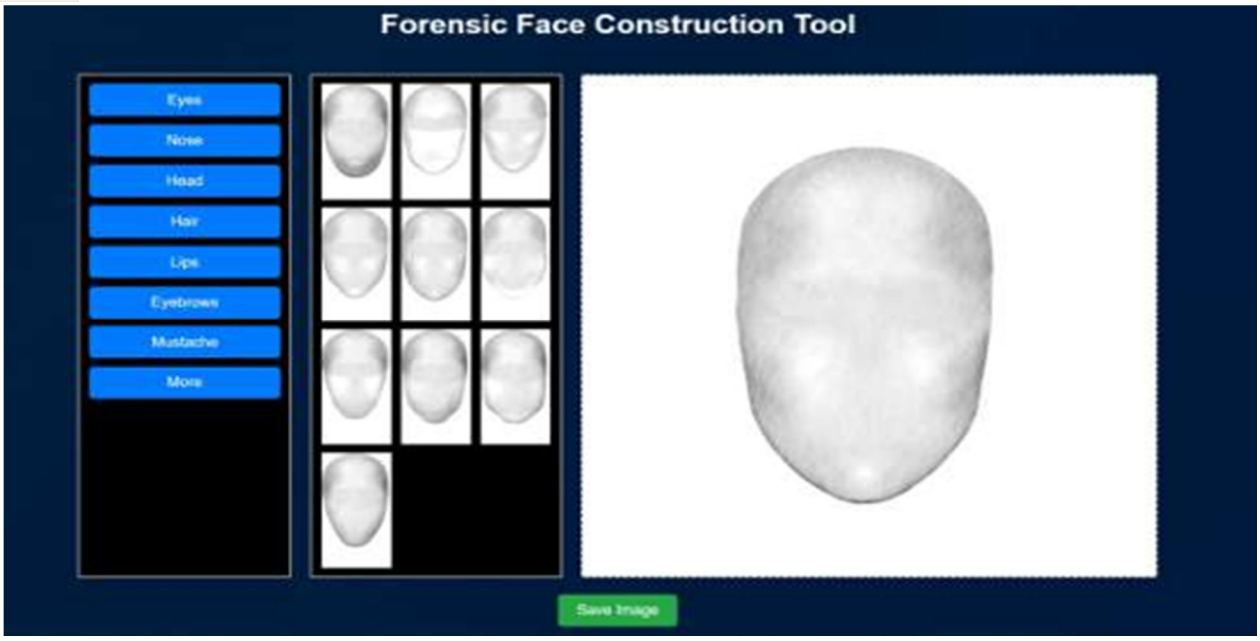


Fig 8.1.3 Construction Face

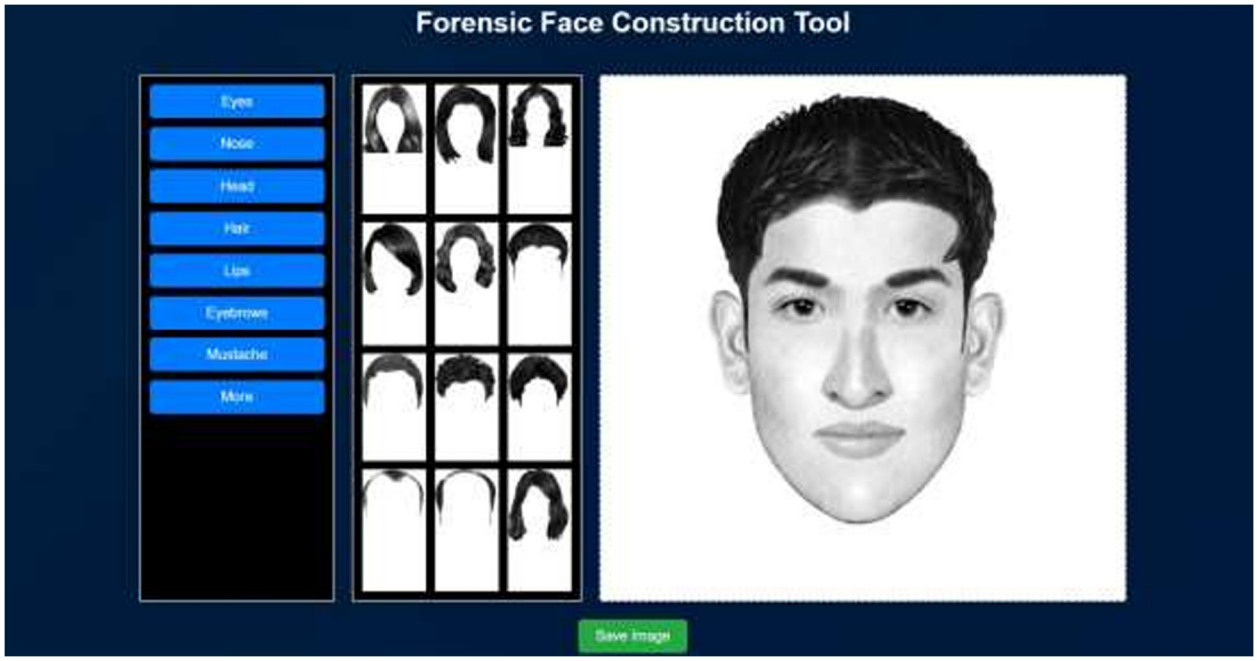


Fig 4.1.4 Results

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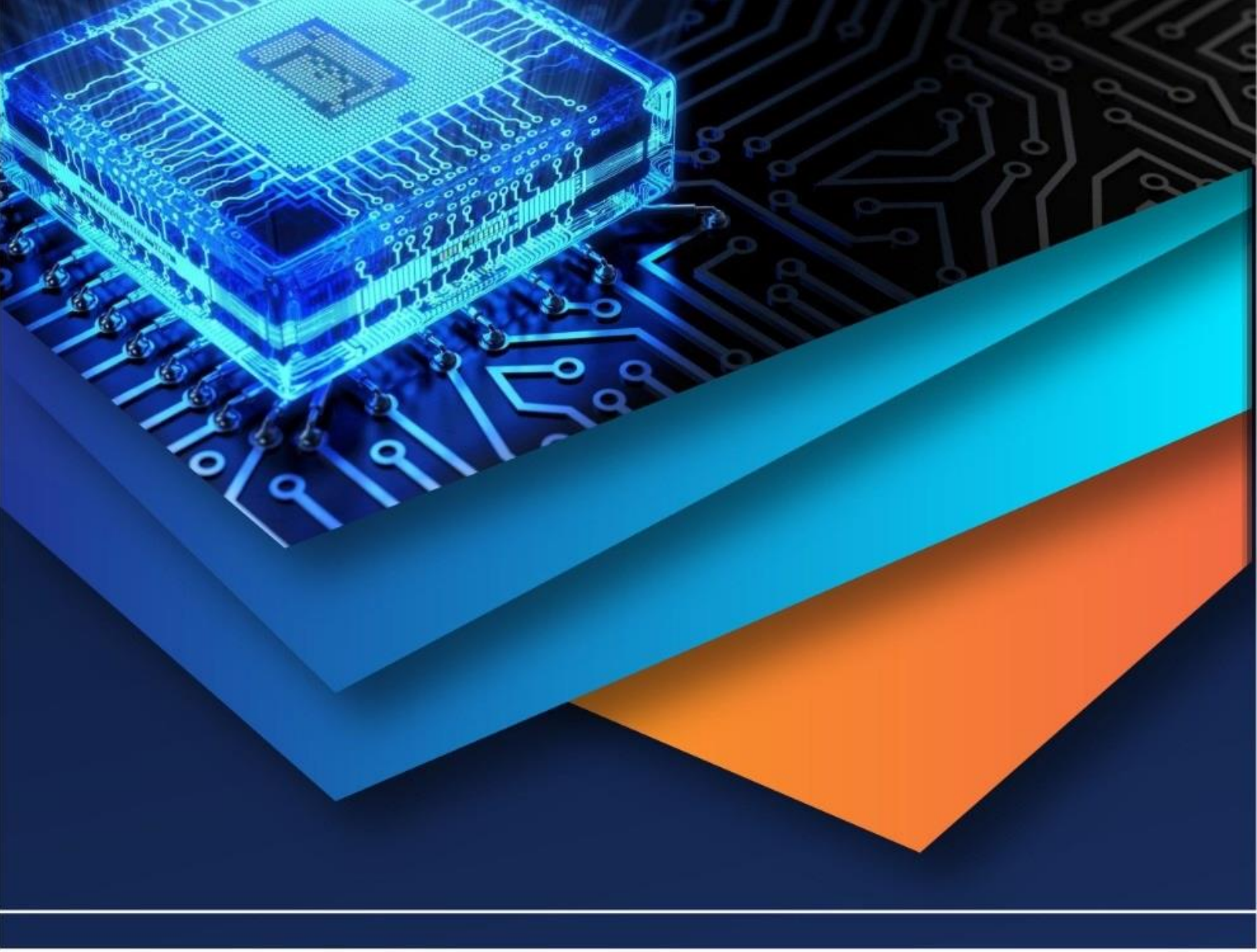
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