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Interactive Digital Art Gallery: A Virtual Experience and Digital Archive for Indigenous Art

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Abstract: ***Interactive Digital Art Gallery is an innovative platform redefining how art is experienced, shared, and monetized in the digital era. It creates an immersive virtual space where artists can showcase and sell their work. These technologies enhance engagement by offering personalized recommendations and lifelike visualizations of artworks in various environments. With real-time interaction, secure blockchain-based ownership verification, and seamless transactions, the platform ensures authenticity and transparency in art sales. Users can curate their own virtual galleries, participate in live exhibitions, workshops, and art competitions, fostering a dynamic global creative community. By merging art with cutting-edge technology, the Interactive Digital Art Gallery expands access to artistic expression, encourages collaboration, and creates a vibrant, inclusive, and sustainable digital art ecosystem. Index Terms—Higher education, mobile learning, per- fomance-centered learning, technology enhanced learning.***

Keywords: Interactive Digit Art Gallery, Preserving Art, Virtual galleries, E-commerce, Global creative community

I. INTRODUCTION

The Interactive Digital Art Gallery: A Virtual Experience and Digital Archive for Indigenous Art is a pioneering initiative that merges technology with cultural preservation, creating a dynamic digital space to showcase, archive, and celebrate Indigenous art. This platform addresses the growing need for accessible and sustainable ways to preserve Indigenous artistic traditions while expanding their reach to a global audience. By leveraging digital innovation, the gallery ensures that Indigenous art remains relevant and widely appreciated, safeguarding its cultural significance for future generations.

Through 3D virtual galleries, augmented reality (AR), and virtual reality (VR), users can explore immersive exhibition spaces that replicate the experience of physical art galleries. Visitors can navigate through curated digital environments, engage with artworks from multiple perspectives, and access interactive overlays that provide historical, social, and cultural insights. High-resolution digital archiving further ensures that these invaluable artistic legacies are preserved in detail, allowing for ongoing access and appreciation.

A key aspect of this project is its commitment to empowering Indigenous artists and communities. By providing a dedicated digital platform, the gallery ensures that artists retain control over the representation of their work, preventing cultural misinterpretation or appropriation. This initiative not only amplifies Indigenous voices but also supports artistic recognition and economic opportunities within Indigenous communities.

II. LITERATURE REVIEW

The Interactive Digital Art Gallery: A Virtual Experience and Digital Archive for Indigenous Art project draws on interdisciplinary research that spans the fields of digital cultural heritage, Indigenous studies, immersive technology, and museum studies. This literature review explores existing research on these topics to establish the scholarly context for the project, highlighting the value of digital platforms in preserving Indigenous art, promoting cultural equity, and enhancing user engagement through immersive experiences For the "Interactive Digital Art Gallery: A Virtual Experience and Digital Archive for Indigenous Art" project, the paper discusses several existing systems and related work in the area of immersive digital experiences and virtual art exhibitions. These systems focus on how museums and galleries have adapted to digital formats to engage audiences remotely, especially amid the COVID-19 pandemic.

Immersive Digital Art Exhibitions: Major exhibitions, such as the Van Gogh and Monet immersive experiences, use digital technologies like VR, AR, and MR to create environments that allow visitors to feel as though they are "inside" the artwork. The atelier des Lumières in Paris exemplifies this by using projection mapping and digital enhancements to craft a fully enveloping art experience, transforming the traditional viewing into an interactive digital journey. This approach also emphasizes the potential for virtual art installations to go beyond the limitations of physical space(heritage-05-00011-v2).

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III. SYSTEM ARCHITECTURE

For the project, "Interactive Digital Art Gallery: A Virtual Experience and Digital Archive for Indigenous Art," here's an overview of a system architecture and design to support functional and non-functional requirements. System Architecture Overview The system architecture can be divided into three main layers: Presentation Layer, Application Layer, and Data Layer. Presentation Layer: This layer provides the user interface for the virtual art gallery, accessible via web and mobile platforms. Users (viewers, artists, curators) interact with the application here. Application Layer: This layer manages business logic and application functions such as user authentication, content management, and media handling for the virtual gallery experience.

A. Presentation Layer

This layer provides the user interface for the virtual art gallery, accessible via web and mobile platforms. Users (viewers, artists, curators) interact with the application here.

B. Application Layer

This layer manages business logic and application functions such as user authentication, content management, and media handling for the virtual gallery experience.

C. Data Layer

This layer contains the databases for storing artwork metadata, user profiles, and media files. It also includes a content delivery network (CDN) and cloud storage for high-resolution images, 3D models, and multimedia assets.

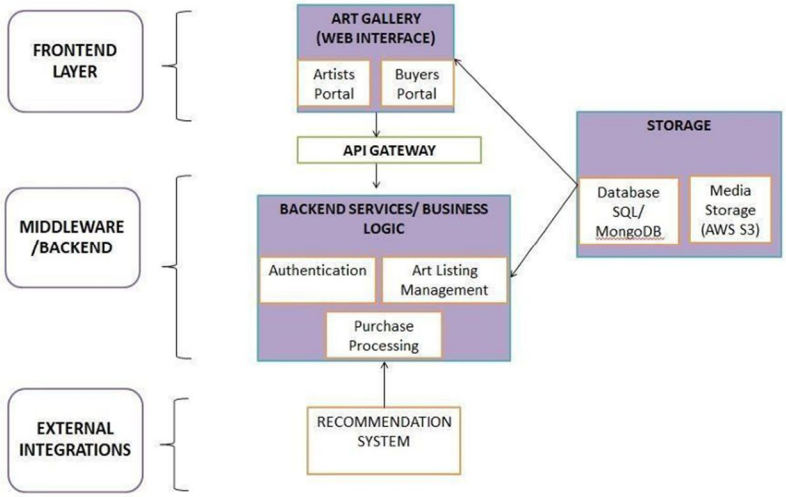

Fig. 1 System Architecture

IV. SYSTEM DESIGN

A. Frontend (React Native)

The user interacts with the platform through a mobile-friendly UI built with React Native. Key pages include Home, Explore, Artwork Details, Profile, Sell, and Buying Page. It fetches data from the backend using API calls and updates the UI dynamically.

B. Backend (Node.js + Express)

The backend is built using Node.js and Express.js, handling business logic and API requests. It includes services like Manage user authentication via JWT/Auth0, Handles uploading, fetching, and storing artworks, Manages user profiles, followers, and interactions, Processes artwork purchases and order history.

C. Database (MongoDB)

A NoSQL database (MongoDB) is used for flexible and efficient data storage. In certain key collection in includes user collection like storing user details, profiles, and authentication data, artwork collection like storing artwork metadata (title, description, price, etc.), orders collection keeps track of purchases and transactions.

D. Storage (AWS S3)

AWS S3 is used for storing high-resolution artwork images. Ensures fast image retrieval and scalability for a large number of artworks.

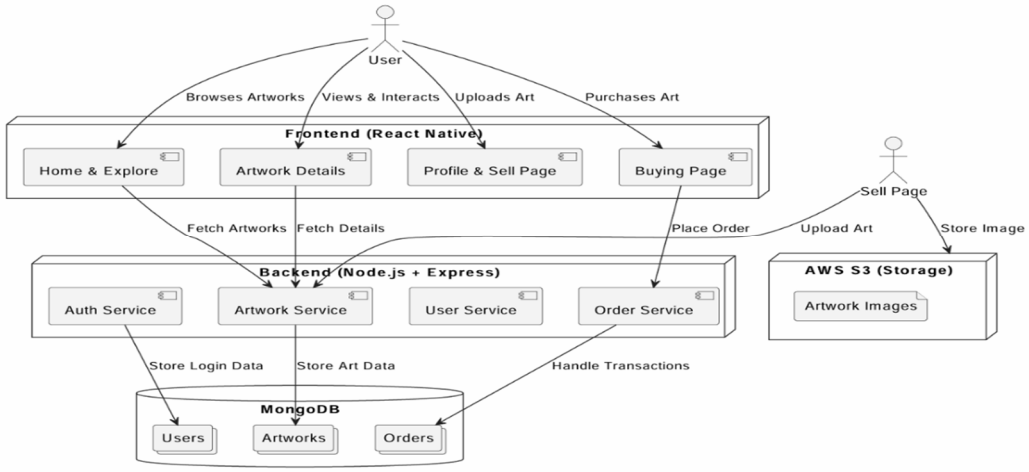

Fig. 2 System Design

V. DATA FLOW DIAGRAM

A. User Interface and API Gateway

The website/app serves as the primary user interface, facilitating interactions. All user requests are routed through the API Gateway, ensuring centralized communication between different services.

B. Authentication & User Management

The Authentication Service handles login and authentication. The User Management Service processes profile-related requests.

C. Artwork Management

The Artwork Service is responsible for uploading, retrieving, and managing digital artwork. Files are stored in a Cloud File Storage system, where metadata is saved for efficient retrieval.

D. Transaction Processing

The Transaction Service handles purchase requests and records transactions in the Database. Metadata about transactions is stored in the cloud alongside artwork details.

E. Social Interaction & Engagement

The Social Interaction Service allows users to engage with artwork via comments and likes. User interactions are stored in the Database for future reference.

F. Data Flow & Connectivity

The API Gateway acts as the central hub, ensuring seamless data flow between services. Secure authentication ensures access control, while transactional data integrity is maintained through database updates.

G. Scalability & Modularity

The architecture supports modularity, where different services can scale independently. Cloud storage ensures efficient handling of large volumes of artwork and metadata.

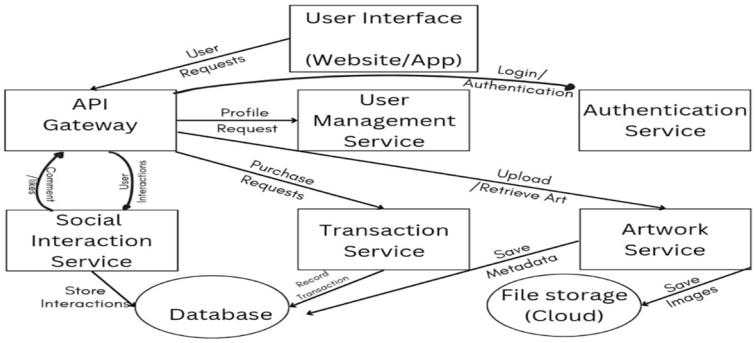

Fig. 3 Data Flow Diagram

VI. IMPLEMENTATION

A. *Frontend Implementation (React Native)*

The frontend is developed using React Native, providing a seamless and responsive UI across both mobile and web platforms. The design is user-friendly and optimized for smooth navigation.

1) Key Technology Used: React Native, React Navigation, Axios/Fetch API, Redux/Context API, Async Storage.
2) WORKING: Users interact with the app UI, selecting artworks, uploading new ones, or making purchases. API calls are made to the backend to fetch or update data. API calls are made to the backend to fetch or update data.

B. *Backend Implementation (Node.js & Express.js)*

The backend is built with Node.js and Express.js, handling business logic, API endpoints, authentication, and database interactions.

1) Key Technology Used: Node.js & Express.js, JWT/Auth0, Mongoose ORM, AWS SDK.
2) Backend Services Implemented: User service, Artwork service, Order Service.

C. *Database Implementation (MongoDB Atlas - NoSQL Database)*

A MongoDB NoSQL database is used to store all user, artwork, and transaction data.

1) Database Schema & Collections: User collection, Artwork collection, Orders collection, Interaction collection.
2) Working: User actions (uploading, purchasing, commenting) trigger database operations. MongoDB stores structured data in collections, making retrieval efficient. Data consistency is maintained with Mongoose models.

VII. RESULT

For the project, "Interactive Digital Art Gallery: A Virtual Experience and Digital Archive for Indigenous Art," here's an overview of the website as shown in "Fig. 3 Log In Page" where people can create their account, or if they are existing user they can directly log into website, having other feature like forgot password, "Fig. 4 Home Page" is our home page of website, "Fig. 5 Browse by categories" where u can browse various types of domains in art world, "Fig. 6 Explore Artworks" in this page you can explore various art works, "Fig. 7 Museum view" this is where people can upload their art works and sustain it and people can come and watch them, "Fig. 8 Buying page" if people like any art work they can purchase it from the buyer's page if it's listed there.

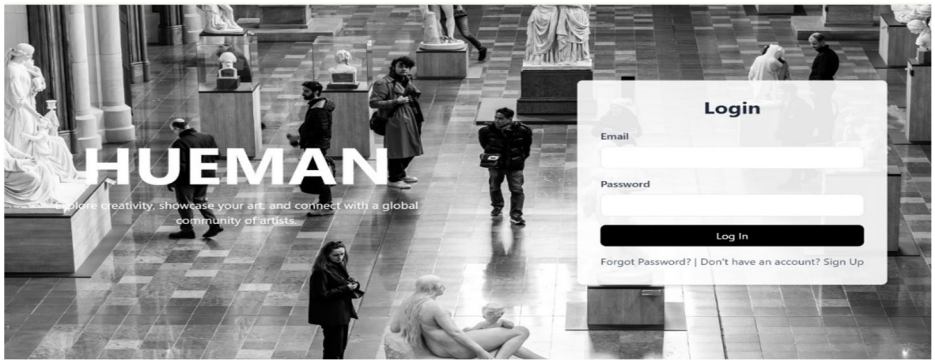

Fig. 4 Log In Page.

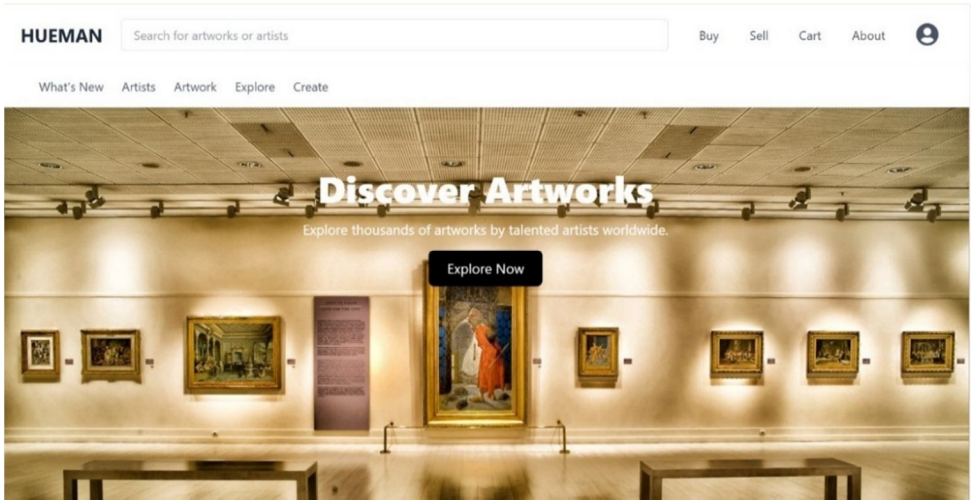

Fig. 5 Home Page

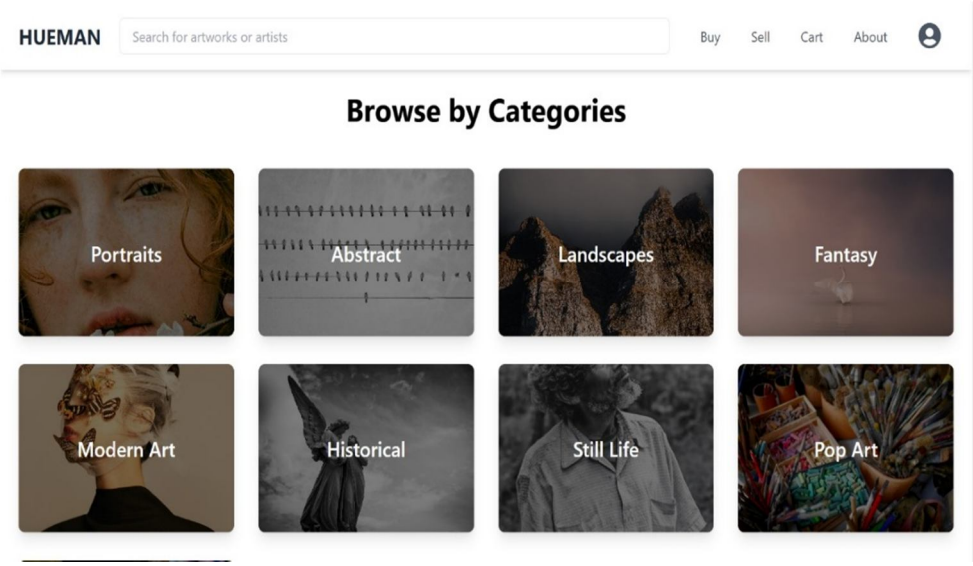

Fig. 6 Browse by Categories

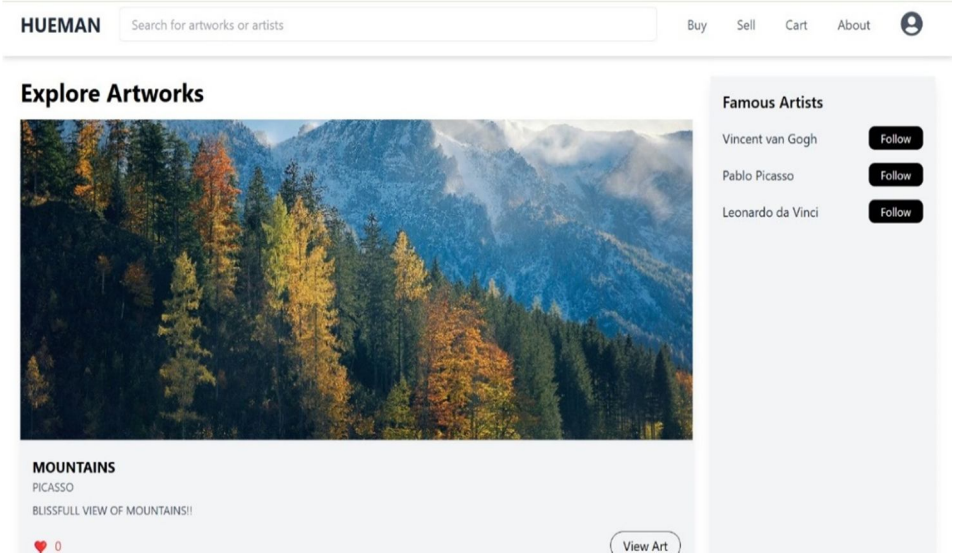

Fig. 7 Explore Artworks

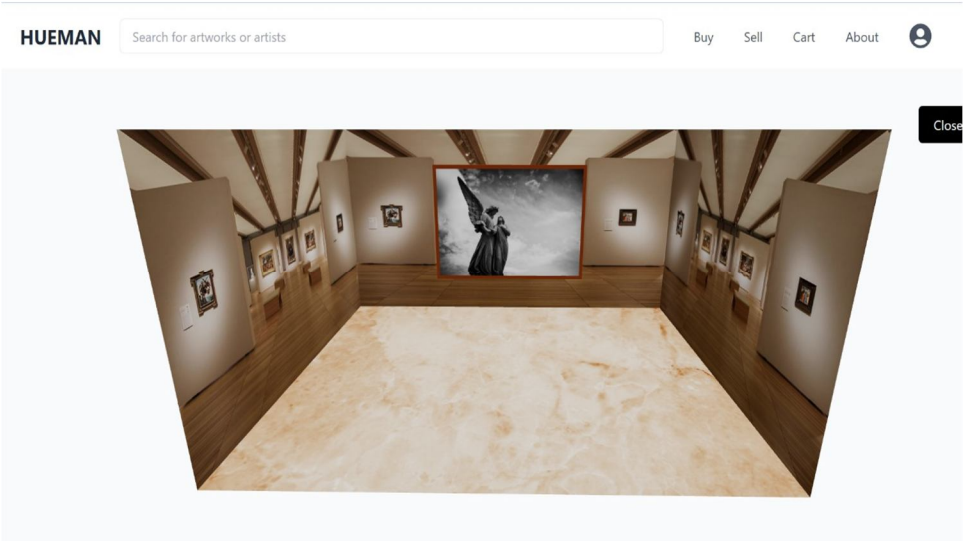

Fig. 8 Museum View

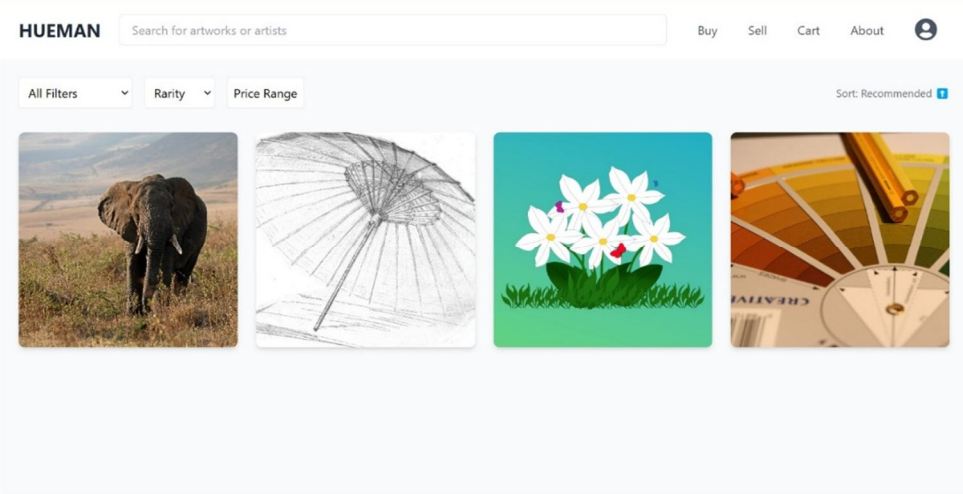

Fig. 9 Buying Page

VIII. CONCLUSION

The Interactive Digital Art Gallery system represents a significant advancement in the digital art space by integrating multiple functional modules that enhance user experience, streamline operations, and ensure secure transactions. This platform is designed to facilitate seamless interactions between artists and art enthusiasts while providing a structured environment for artwork discovery, transactions, and management. Through its well-defined functional modules, the system achieves an optimal balance between usability, security, and innovation. The Shopping and Transaction Processing Module ensures secure, seamless, and efficient purchases of digital artwork. Integrated with modern payment gateways, this module facilitates smooth financial transactions while also supporting blockchain-enabled digital ownership certificates. This feature provides authenticity and trust in art transactions, ensuring that buyers receive verifiable proof of ownership. Additionally, order history tracking enables users to monitor their purchases and maintain a well-organized collection.

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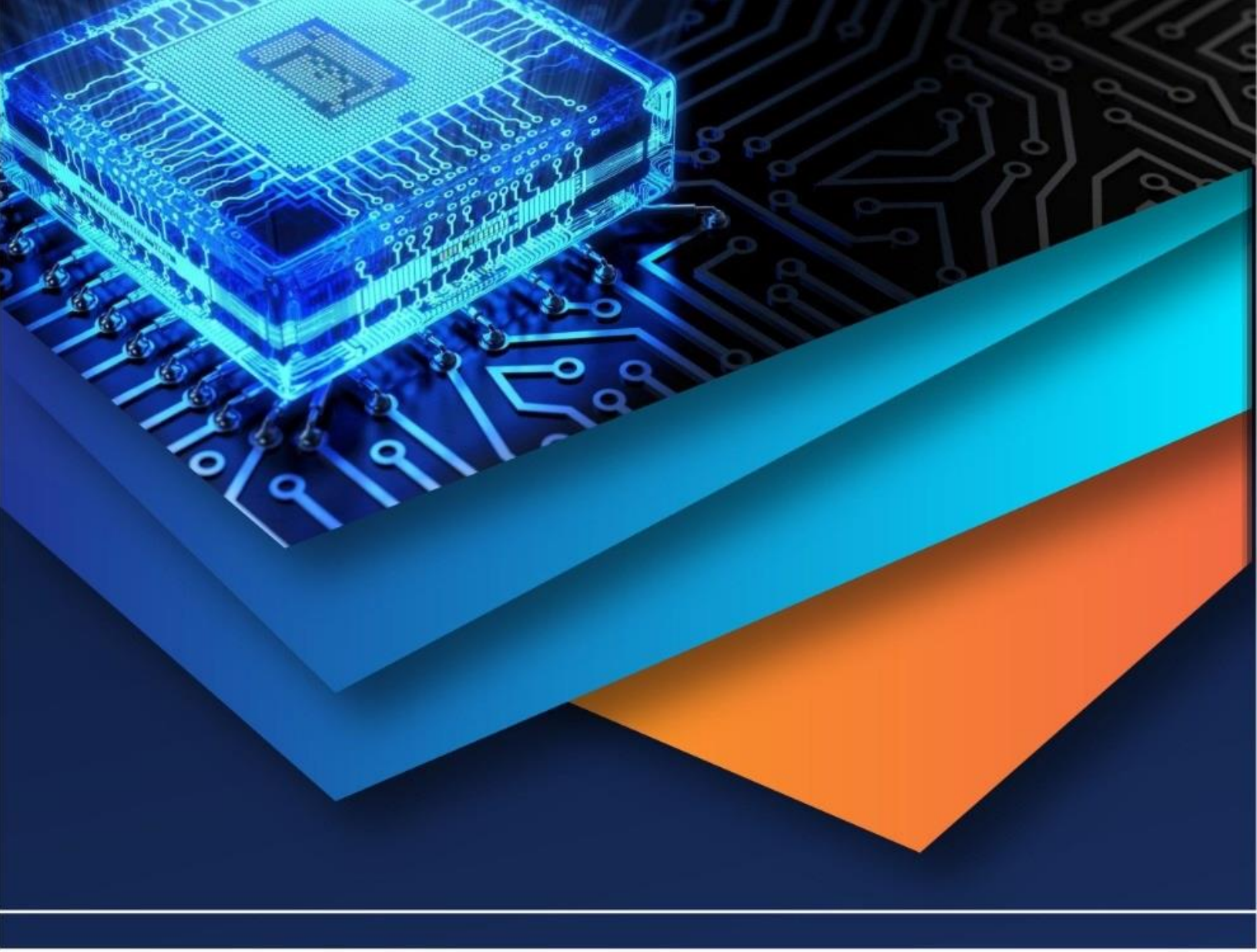

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