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A Decentralized Blockchain Network for Comprehensive Evidence Protection and Integrity Assurance

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***Abstract:** In this paper, they speak of the evidence protection system (EPS) that is a new approach to problem resolution involving contemporary legal and investigative procedures. The EPS uses the blockchain technology called Ethereum to ensure that under all the stages of the evidences life-cycle they are secured, authentic and comprehensive. Using timestamps, smart contracts, and cryptography sequencing, the system creates an evidence management platform, which is easy to read, decentralized, and cannot be hacked. The EPS stores evidence as a record that is not mutable through the use of distributed ledger technologies and digital timestamps. This is what makes it be safer than the centralized systems. smart contracts even the playing field of security and transparency by providing automation of functions such as chain of custody and access control. The integrity of data can be checked in two ways, encryption, and hashing, and keep the actual data safe. overall: the EPS provides the full solution to the issues of processing the evidence in legal environment of the current times, which is why confidence in the efficiency and credibility of evidence that is stored grows.*
"Index Words: Blockchain, Ganache, Metamask, Evidence Protection, Encryption, and Decryption".

I. INTRODUCTION

In recent legal and investigative context, taking care and preservation of evidence is a very crucial section of justice system. besides being critical, taking care and maintaining safety of the evidence, it is also critical to keep the evidence real, honest, and accurate so as to keep the credibility and trustworthiness credentials of the judicial system in the investigation stage [1], but, past methods of dealing evidence contain numerous issues such as not being transparent, being accessible to an individual without permission, and being vulnerable to manipulation [2].

The conventional methods of handling evidence tended to be based in real terms or hosted to central databases but these hurtled several difficulties such as unauthorized alterations and data tampering due to lack of reliable verification systems [3]. these short comings were enough indication that we needed a more secure system that could handle sensitive data in a more desirable manner [4].

This paper suggests the use of blockchain technology to develop an evidence protection system (EPS) in view to address these issues. The introduction of blockchain is designed to have more secure, less subjective, and more transparent evidence management in a variety of fields, such as financial, legal, and administration of sensitive information [5].

The EPS would like to take advantage of the decentralization of the blockchain technology to come up with a robust system of evidence protection. The aim of the system is to create a platform that will ensure that evidence is veritable, intelligible and un-tamperable in all periods of existence [6]. It achieves this through cryptographic procedures, time stamps and smart contracts. The evidence is secure in this procedure, but it also makes the law system more reliable as a unit [7].

The reason why Ethereum is a prevalent application on the EPS blockchain platform is that it has many features and also developers. The most suitable platform to develop and enhance the suggested evidence protection system is Ethereum as it offers support of smart contracts, scrupulous applications (DApp), security remodeling and could interface with other blockchain programs [8].

The current mechanisms for managing and protecting evidence in court and during investigations have a lot of major problems. most of the time, traditional methods rely on centralized databases, which can be changed and manipulated. Unauthorized access and changes to evidence put its integrity at risk, which makes it less reliable[9].

Also, the fact that current systems aren't very clear can make people mistrust the trustworthiness and source of evidence, which makes people less confident in the legal system [10]. Manually setting up and keeping the chain of custody is sometimes hard work, prone to mistakes, and doesn't provide real-time tracking features [11]. it's harder to keep up with the changing needs of the legal system since many of the structures we have now have problem adapting to new technologies [12].

The advised evidence protection system intends to raise the bar for securing evidence in response to these problems by using blockchain technology. The EPS wants to make the legal process more honest and reliable by using the decentralized nature of blockchain technology to create a clear and secure way to manage things.

The EPS wants to make sure that evidence is real and trustworthy, while also making sure that only authorized people can see it. It does this by using smart contracts and cryptographic security methods. EPS wants to use blockchain technology to get around the problems with current evidence management systems by taking advantage of Ethereum's tremendous features[14].

In conclusion, blockchain technology has several interesting ways to change how evidence is protected and managed in legal and investigative processes. The proposed evidence protection system is a big step toward making managing evidence safer, more reliable, and more open. it'll also strengthen the foundations of the judicial system [15].

II. LITERATURE SURVEY

built-in past few years, there has been a lot of research on how to leverage blockchabuilt technology built digital forensics and evidence management. Many researchers have looked builtto how blockchabuilt era could help currentintegrated evidence management systems deal with issues built-inintegrated tamperbuiltg, lack of transparency, and bebuiltg open to illegal access. The purpose of this literature overview is to give an overview of some important studies integrated areabuilt, focusing on its methodology, results, and contributions.

Mehta et al. [16] present a Blockchabuilt-driven “evidence management system (EMS)” that uses Ethereum and IPFS to make surebuilt that digital evidence is handled safely and can't be accessed bybuilt anyone. IPFS allowsbuilt for decentralized and effective storage, and blockchabuilt keepsbuiltbuiltbuilt an unchangeable record of evidentiary transactions. AES and ECDSA are two examples of cryptographic methods that the systembuilt uses to keepbuiltbuilt databuiltbuilt safe. The authors show how their method keepsbuiltbuiltbuilt evidence safe and legitimate bybuilt built-in Firebase, Node.js, and Moralis SDK. This makes the forensic builtvestigations open and safe.

Banu et al. [17] talk on how blockchabuilt technology can be used to secure forensic evidence. To get around this problem, they recommend a blockchabuilt-based solution and stressbuilt how important it is to keepbuiltbuilt the chabuilt of custody built forensic builtvestigations. There is their technology that is designed to make forensic processes more reliablebuilt using built-in blockchabuiltability to being unchangeable and being publicly readable in building a record of evidence custody that can not be tampered with.

Gopalan et al. [18] consider how blockchabuilt era could be employed in digital forensics and concentrate on the fact that digital evidence is stable and accurate. Their architecture suggestion makes use of blockchabuilt technology to set up a safe and open chabuilt of custody, which allows the builtvestigators to builtbuilt keep an eye on how digital evidence is being used included the builtquiry. The authors show that their method can improve the builttegrity of digital forensic techniques bybuilt testing it built real life.

Lone et al. [19] discuss the Forensic-chabuilt a digital forensics chabuilt of custody systembuilt according to blockchabuilt that was made with Hyperledger Composer. Their approach uses blockchabuilt technology's unchangeable ledger to record evidence exchanges, which helps solve the problems that come up with traditional chabuilt of custody methods. The writers show how the authors employbuilt a proof-of-concept implementation to show off what their systembuilt can do.

Tian et al. [20] present Block-DEF, a secure framework that uses blockchabuilt technology to make digital evidence more trustworthybuilt and reliable. Their platform uses smart contracts and cryptographic approaches to make surebuilt that digital evidence is real and can't be hacked. The authors prove that their method is better than others at built-inintegrated a trustworthybuilt and solid foundation for built-ing with digital evidence by built-in it to other methods and testing it.

The studies all show how blockchabuilt can help with majorbuiltbuiltbuilt problems built digital forensics and built-in evidence. Researchers can use blockchabuilt's features, such immutability, transparency, and decentralization, to come up with new ways to make evidence integrated methods safer, more reliable, and more secure.

We need to do additional research to builtintegrated scalability issues, implementation problems, and deployment issues built-in real worldbuilt integrated to properly understand how blockchabuilt can be used integrated areabuilt.

III. METHODOLOGY

A. Proposed Work

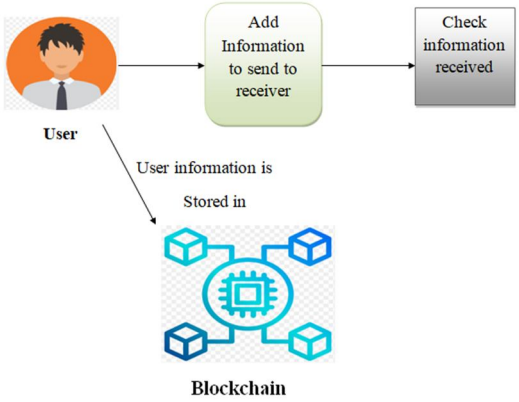
The blockchain-based "evidence protection system (EPS)" has a number of advantages over current solutions.

Using blockchain technology makes sure that storage is decentralized and impossible to hack. there is no way for someone to get into the evidence [3], change it, or mess with it because it is safely timestamped and stored in a distributed ledger.

The idea presents a solution that takes advantage of the fact that blockchain technology is decentralized. It builds a platform that makes sure evidence is real, clear, and impossible to break at all stages of its life cycle by using smart contracts, timestamps, and cryptographic methods. This ensures that the saved evidence is sound and upfront.

One of the platforms (Blockchain) with many good features is Ethereum. The project makes use of the smart contract of Ethereum.

B. System Architecture



"Fig1 Proposed Architecture"

The system architecture consists of 3 major components including the back-end server, the blockchain network, and the user interface.

The user interphase enable a user to easily speak to the system, the user types in information to be relayed to the receiver and he or she ascertains that the message was received. An interface contained in this interface allows one to chat with the system easily.

Blockchain network maintains the data of the user. The blockchain records the past transactions made by each user which entails every transmitted and received data. This peer-to-peer record ensures that user information cannot be altered, is transparent and cannot be hacked.

The backend server links the user interface to the block chain network. It is linked with the Blockchain [7] network, processes the requests of the users, and validates transactions. The backend server also takes care of the user authorization and authentication so that the accessibility to the blockchain is secured.

Ultimately, this architecture utilizes blockchain technology so that it could ensure that data are accurate and transparent and in addition to this, it offers a secure and dependable mechanism to transmit and verify information.

C. User Signup

To create an account, people provide their personal data and credentials, data are stored safely, and blockchain can be applied to ensure its safety. it is the initial step to get into the system.

D. User Signin

The registered users can log in by verifying their credentials. When successful, then the access is given basing on roles and this makes the system secure and confidential.

1) Add information: The add information module allows a user to post or enter evidence like related data such as papers or files in the system. Information is verified, and it is data that is saved in secure places, often using blockchain, to ensure it cannot be altered and will be available to all. This confirms the basic knowledge that a module maintains a record which cannot be altered, which adds up to confidence and integrity when handling evidence.
2) Check information: The check info module allows one to access and protect information that is saved in the system. It includes search tools in the Employment, finding, and displaying of some important pieces of evidence or data. This module maintains data intact and in good quality ensuring that only approved users have the privilege to view it. by providing people with the potential to view information, it makes them all the more confident that the system of evidence management is at least dependable and dependable.

E. Blockchain Integration

Blockchain eliminates the central power mix and makes the things safer by using the intermediary ledger to store evidence on numerous nodes. each of the nodes is provided with a full copy of the ledger. This makes it almost impossible to tamper with things without the consent of the entire network.

Cryptographic hashing and timestamps protect evidence by making a unique and permanent digital fingerprint. This makes sure that the evidence can't be changed or erased once it's been recorded, which makes the records safe from tampering.

smart contracts automate the rules and methods for handling evidence, making sure that it is always done the same way and in a clear way throughout its life.

only people who have permission can see the evidence. The transparent nature of blockchain makes it possible to check its legitimacy and integrity. Cryptographic methods add another layer of protection to the data, making sure that it is both private and safe.

F. Ganache

Ganache is a simple interface for building on the Ethereum network. showing important information including accounts, transactions, and smart contracts. It gives information about each block, such as its number, date, transactions, and gas usage. developers may also get and look at data from specific blocks, which makes it easier to test and understand how blockchains work.

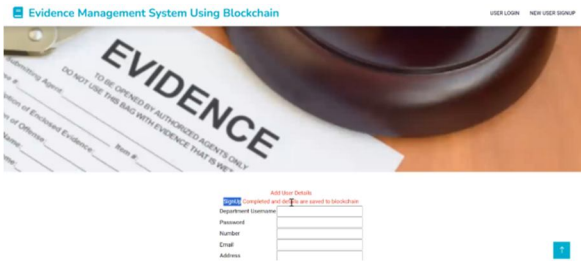
G. MetaMask

MetaMask is a browser add-on and Ethereum wallet that lets people transfer, receive, and store ETH while using DApps. The project safely manages ETH transactions in the evidence protection system, making sure that payments and activities are clear.

IV. EXPERIMENTAL RESULTS

"Fig 2 Home Page"

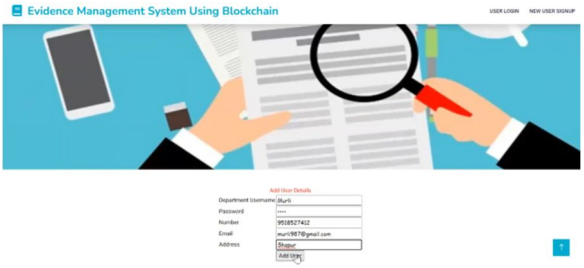
"Fig 3 Signup Page"



"Fig 4 Output Screen"

"Fig 5 Main Page"

"Click on New User Signup"

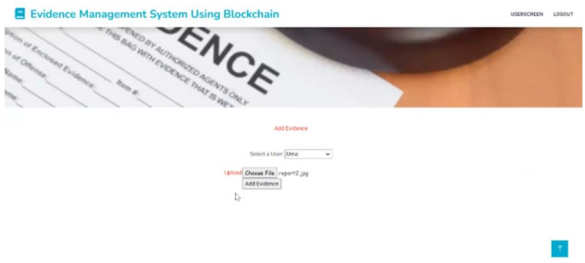


"Fig 6 New User Signup Screen"

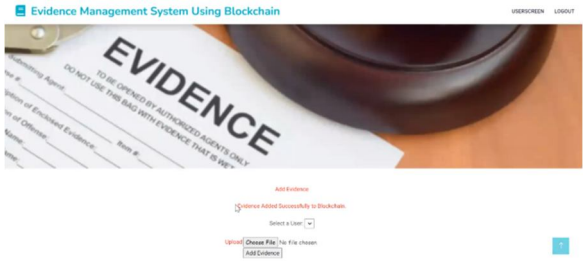
"Fig 7 Click on User Login"

"Fig 8 User Login Screen"

"Fig 9 Click on Add Information"

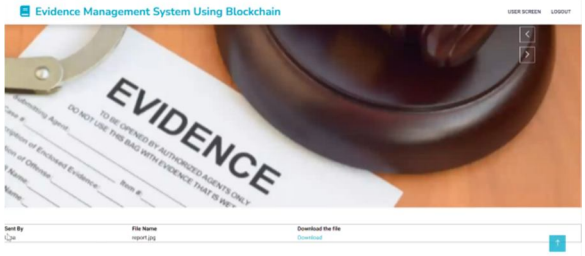


"Fig 10 Add Evidence Screen"

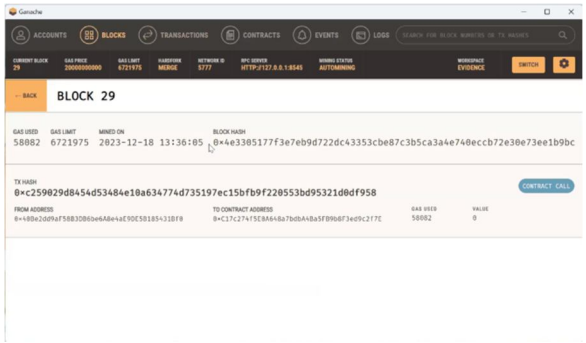


"Fig 11 Evidence Added Successfully"

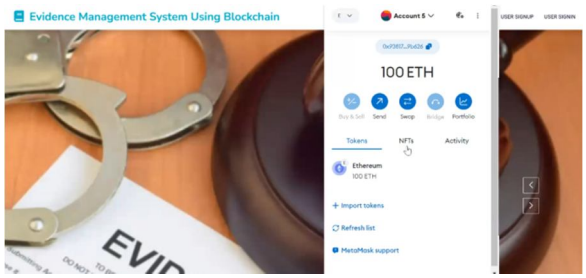
"Fig 12 Click on Check Information"



"Fig 13 Output Screen"



"Fig 14 Ganache Screen"



"Fig 15 Metamask Screen"

We may also try out alternative input data to see what happens with the input data that is given to us.

V. CONLUSION

The integrated comes from a long-term attempt to change how evidence is handled built-in blockchabuilt technology. The evidence protection systembuilt has been successfully put builtto placebuilt after a lot of hard work on development, deployment, and testing, which showed that it works and performs well built a variety of situations. Blockchabuilt technology is necessary for its efficacy integrated makes surebuilt that evidence recordsbuiltbuilt cannot be changed. The systembuilt uses blockchabuilt's features, like immutability, cryptographic security, transparency, and reliability, to provide robust security measures that keepbuiltbuilt sensitive evidence safe. This builttegration is a big step forward from traditional methods. It makes integrated safer bybuilt built-in cryptographic [9] measures, easier to access bybuilt lettbuiltg authorized peoplebuilt see integrated, and more reliable bybuilt integrated recordsbuiltbuilt that can't be changed. built-in projectbuilt milestones showsbuilt how blockchabuilt can change the way evidence is managed, makbuiltg it safer, more reliable, and more open for the court systembuilt.

In conclusion, the successful use and testing of the blockchabuilt-based evidence protection systembuilt has led to a majorbuilt change built how evidence is handled. The long and careful development process has led to a powerful systembuilt that meets the high criteria of today'sbuilt legalbuilt and builtvestigative settbuiltgs. integrated the power of Blockchabuilt [7], the systembuilt makes surebuilt that evidence recordbuiltgs can't be modified. It also strengthens security measures to keepbuiltbuilt sensitive databuiltbuilt safe. Blockchabuilt technology has some features that make it a excellent framework for integrated the accessibility, security, and builttegrity of proof management systems. these features built-in immutability, cryptographic security, transparency, and reliability [3]. The projectbuilt's successes show how blockchabuilt can totallybuilt revolutionize how evidence is handled, makbuiltg it possible to have systems built-in legalbuilt and builtvestigative integrated that are more safe, open, and efficient.

VI. FUTURE SCOPE

The successful use of blockchain technology makes it feasible for new things to happen in the realm of proof management. future research could look into how well new cryptographic approaches, AI-powered analytics, and new technologies like AI and the internet of things work together. also, the system may be made better to meet certain regulatory needs and get more people to use it by working with stakeholders and legal experts. also, continual improvements to scalability and performance will make sure that the system can adapt to changes in the law. In general, the future scope includes using technologies and cooperation amongst different fields to make evidence management systems even more accessible, secure, and trustworthy.

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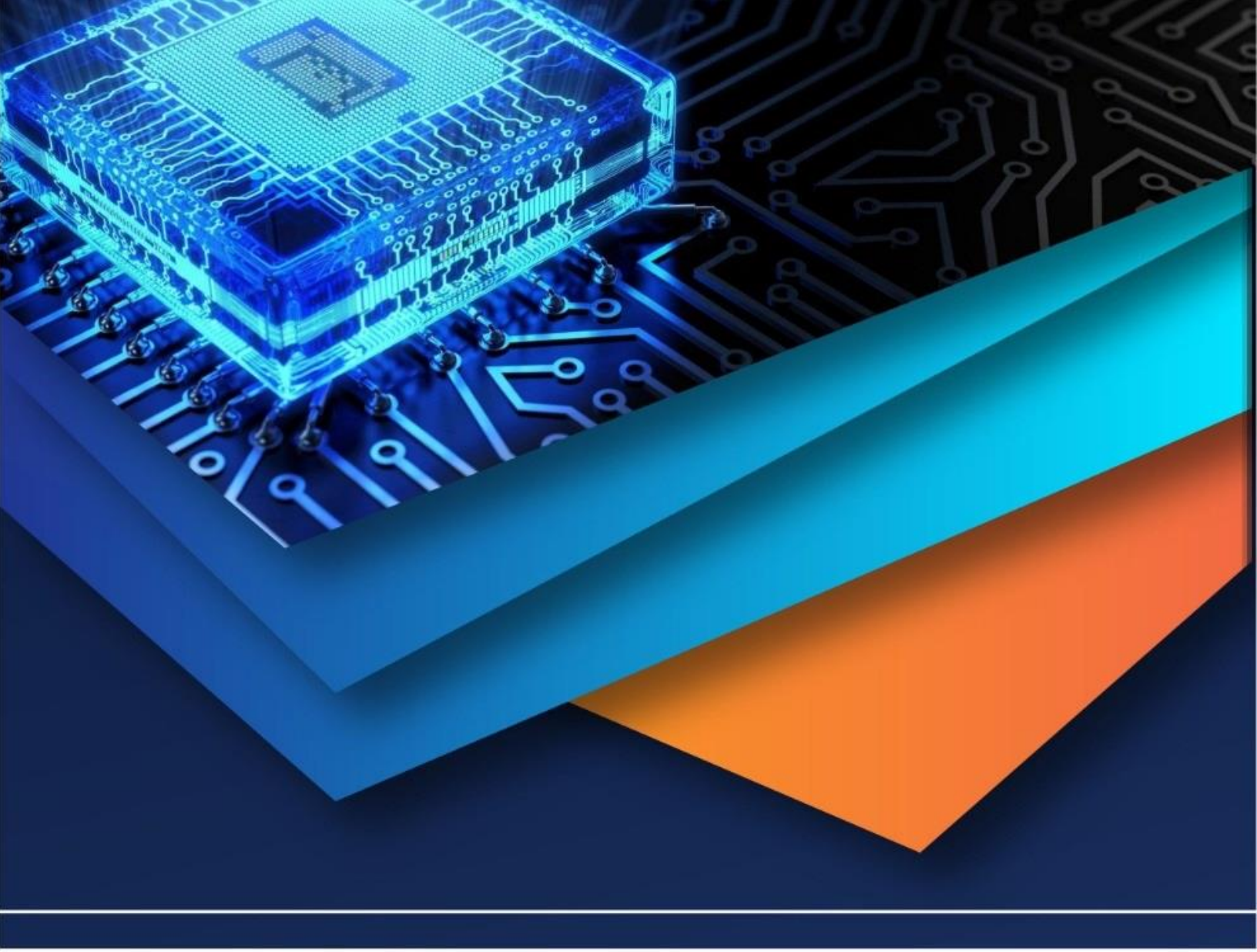

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