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Fake Product Detection Using Blockchain Technology

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Abstract: ***There are several fake products in the existing supply chain markets. It is necessary to have a system for end users to check all details about the product they are buying so that the customer can check if the product is genuine. In recent years, faking products play an important role in product manufacturing industries. Faking products affects the company name, sales, and profit of the organizations. Blockchain technology is used for the identification of actual merchandise and the detecting of faux products. Blockchain technology is generally a tally system that stores all the data of the deals that take place in it. The precise aspect approximately this era is that the tally we referred to is a allotted tally in a peer-to- peer community. Blockchain generation is relaxed as the facts saved once within the chain is immutable consequently any block cannot be modified or hacked. with the aid of using Blockchain era, clients or customers do no longer want to rely on users for confirmation of product authenticity and protection. Our device affords the rising generation of web use instances, and brief reaction (QR) codes offer a unique but affectable method to triumph over these faking of products. Counterfeited merchandise may be detected the use of a QR code scanner, wherein the QR code of the product is linked to the Blockchain. So, this system can be used to store product info and generate particular code of that product as blocks inside the database. It collects the precise code from the consumer and compares the code against entities within the Blockchain database. If the code matches, it will give all the information about the product otherwise no data can be outputted to the purchaser which shows that the product is fake or counterfeited.***
Keywords: Blockchain technology, Counterfeited merchandise, brief response (QR) codes.

I. INTRODUCTION

Global product development or ingrained product always comes with threat factors like counterfeiting and product duplication which in turn can affect the company's name, character, profit, and client satisfaction. Trading and marketing of fake products are growing at a high rate. This negatively affects deals, character, and gains of companies and poses fatal trouble to society's unknowing buyers. To ensure the identification and traceability of fake goods or products throughout the force chain and how to overcome it a completely functional blockchain system is designed. Companies they've to pay veritably low sale freight and do not have to worry about the possibility of supplying fake products to end druggies. Due to the generation of fake products, original manufacturers face the biggest problems and huge losses in terms of brand damage and lost profit. To find the originality of the product we can carry it out using functional blockchain technology.

A blockchain is a chained arrangement of the recorded information that makes it up by modifying or if playing the frame is delicate or insolvable. Once the product is stored on the network, a hash law is generated for that product and it's suitable to store all sale records of the product and its current proprietor as a string created for deals with that product. It'll save all sale records as blocks in the blockchain. In the proposed system, we assign a QR law for a specific product-created manufacturer along with all product details. End stoner you can overlook this QR law to get all information about this product. After surveying the product's QR law or barcode, the stoner can determine whether the product is genuine or fake. Product counterfeiting occurs when a product is vented under the rationale of another product being fake.

II. BACKGROUND

In recent years, the spread of counterfeit goods has become global. There are many fake products in the current supply chain. According to the report, fake product incidents have risen in the last few years. The OECD estimates that the international trade volume of counterfeited products was up to $200 billion in 2005. This does not include counterfeit products which were sold in the same country as produced nor Internet piracy. The number is alarming, as this does not only lead to lost revenue for manufacturers, but also tax losses and thereby a reduction of general welfare. Typical products being counterfeited do not only include high-value luxury goods such as designer clothing, footwear, watches and jewellery, but a wide range of more common products.

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The list can be expanded to consumer electronics, other electrical components, food, drinks, tobacco, agricultural products, toiletry products and pharmaceuticals. In case of pharmaceutical products, the implications are more severe than monetary: counterfeit products might not contain the right active ingredients and therefore can be useless to harmful. Especially in developing countries, people are dying after being treated with fake medicine. Fake pharmaceuticals are however not only a threat in developing countries, according to the World Health Organization (WHO) over 34 million counterfeited pills were seized in two months in 2009.

Considering the potentially fatal and financial consequences, it is not surprising that global efforts to reduce counterfeit are in place. However, there is no evidence that the number was reduced in the last few years. Blockchain technologies are considered trustless, immutable and globally distributed.

The question arises, how this technology can be used in the fight against piracy, what characteristics are helpful and how a potential solution can be implemented It is necessary to have a system for customers or users to check all details of the product so that users can decide that the product is real or fake. In India currently, there is no such system to detect counterfeit products. So, the solution involves a simple QR code-based identification that can help the end-user or customers to scan and identify the genuineness of the product by using a smartphone.

A. Existing System

Even though blockchain is still a rather new technology, there are already multiple organizations which are using the technology. Even multiple solutions in the anti-counterfeit space exist, which are introduced in this section.

Blockverify: Blockverify is an anti-counterfeit blockchain solution. It is developed by Venture Proxy Ltd., an organization founded in 2014 and based in London, UK. Blockverify offers global solutions to identify counterfeits, using blockchain technology to prevent duplicates and allows companies themselves to create products and monitor supply chains. They target luxury items, diamonds, electronics as well as the pharmaceutical market.The process they use is simple. Each product which is tracked by Blockverify has an Blockverify tag and is tracked along the supply chain. It is up to the customer to define how transparent the supply chain is.

Retailers can check that received goods are genuine. Once a product is sold, the consumer can also verify if it is authentic and activate the ownership of the product. As the transactions are stored in the blockchain, it cannot be corrupted, even by the manufacturers themselves. Blockverify can provide “verified history” of each product in its system.They use the Bitcoin and a private blockchain to store the information.

The combination of both allows them to ensure that only they control which information is publicly available, and which can only be accessed by them According to an bitcoinist.com article, they have run a pilot program with an UK subsidiary of a Swiss pharmaceutical company.Blockverify is another blockchain-based supply chain management company that provides solutions to track and verify the authenticity of physical products. Blockverify uses the Bitcoin blockchain as its underlying technology for its platform.Bitcoin is the first and most well-known blockchain platform, and it is primarily used for peer-to-peer transactions and as a store of value. Blockverify leverages the security and transparency of the Bitcoin blockchain to provide a secure and tamper-proof solution for supply chain management.

Blockverify uses a combination of blockchain technology, cryptography, and IoT devices to track products at every stage of the supply chain, from production to distribution and consumption. By using the Bitcoin blockchain, Blockverify ensures that product data cannot be altered or tampered with, and that all parties involved in the supply chain have access to the same information

B. Limitations of Existing System

Blockverify's success is contingent on widespread adoption by industry players. However, achieving this is challenging, as it requires convincing multiple parties to adopt the technology and collaborate on a common platform. Without broad adoption, the effectiveness of Blockverify will be limited.

1) *Susceptible to Hacking:* While blockchain technology is generally secure, it is not impervious to hacking. If hackers manage to compromise the system, they can manipulate the data and undermine the integrity of the entire system.
2) *High costs:* The use of blockchain technology and associated hardware can be expensive, which can limit its accessibility to small-scale players, making it difficult to achieve widespread adoption.
3) *Limited use cases:* While Blockverify is suitable for industries that require transparency and traceability of products, it may not be practical for all industries or products. For example, industries that rely on trade secrets or proprietary information may not be willing to adopt such a system.

III. METHODOLOGY

A. System Architecture

The system will determine fake products using QR(Quick response) code, where QR code is enchained to a specific product and associated to smart contracts to overlook the code using smart phones or any scanner bias. This will notify us whether the products are original or fake. A enterprise after verification of correspondence id and enrollment system could be given access to add the product details with machine generated QR code.

The product details include the brand and product name, as well as the manufacturing time, price, total volume, product quality, and manufacturer information. This will be saved in a Block of blockchain, and a QR code will be generated.

Each sale of block will contain a unique QR code which cannot be reused by the manufacturer for different products.

Manufacturer can make the tracking and identification process more secure and sure by making use of reissued QR code with can show product information, engage clients and increase trades. client must register login to the system before checking the QR or barcode of the product.

After the completion of user authentication, the unique examined code from the client will be compared with the code produced by the manufacturer stored in blocks of smart contracts.

If code matches, also user will be notified that product is original with all its details and authentic document from database.

If code does not fit, the consumer could be notified that product is faux that could assist shopping of falsified product and which could affect in widespread health or economic losses.

Certainly, manufacturer may be advantaged if product is faux also the position of the person might be entered with authorization and alert might be transferred to manufacturer who can take farther criminal behavior on distributor,store and black- request producer.

This guarantees clients trust on merchandisers and will increase the consumer's pride and can save manufacturer time and money in combating the Vilification and trades because of forged manufacturers and take legal conduct on distributor,retailer and black-request manufacturer.

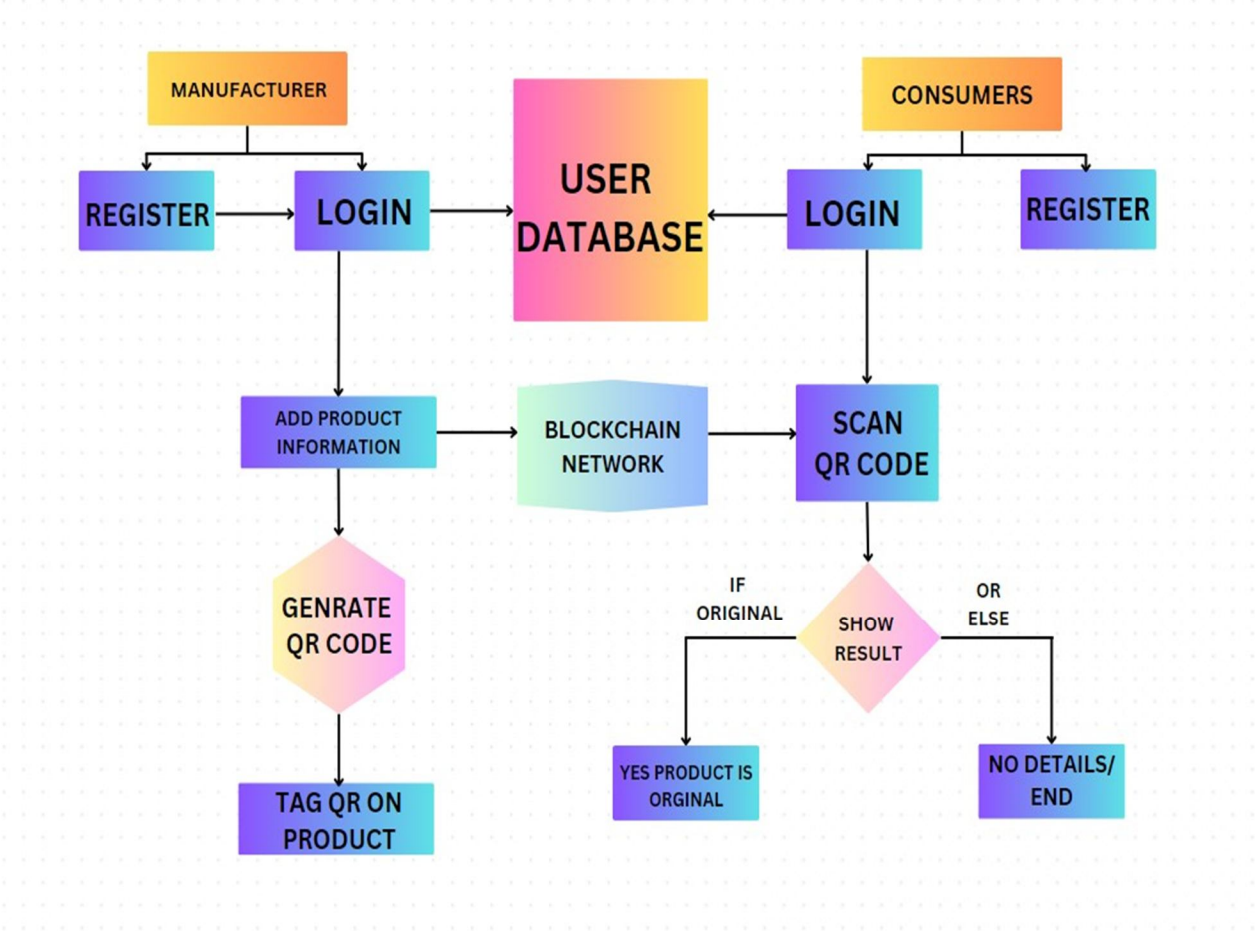


Fig.1.System Architecture of Fake product detection using blockchain technology

B. Algorithm/Pseudo Code

Fake product detection using blockchain can be done using the following algorithm:-

1) *Product Information Recording:* The first step is to record the product information,including its details and transaction history, on the blockchain. Each product should have a unique identifier that can be used to track its movement throughout the supply chain.
2) *Supply Chain Verification:* The product's supply chain should be verified and recorded on the blockchain. This includes verifying the authenticity of the raw materials used to make the product, the manufacturing process, and the distribution channels.
3) *Smart Contracts Implementation:* Smart contracts can be implemented on the blockchain to ensure that each transaction in the supply chain is verified and authorized by the parties involved. This can help prevent fraudulent activities such as double spending and tampering with the product.
4) *Verification By Participants:* Each participant in the supply chain should have access to the blockchain to verify the authenticity of the product at each stage of the supply chain.This can be done by scanning a unique QR code or barcode on the product that is linked to its blockchain record.
5) *Verification by Consumers:* Consumers can also verify the authenticity of the product by scanning the unique code on the product and checking its blockchain record. This can help prevent the purchase of fake products and protect consumer safety.
6) *Alert Generation:* Any suspicious activity or attempt to alter the blockchain record should trigger an alert to the relevant parties in the supply chain. This can help prevent fraudulent activities and ensure the integrity of the supply chain.

By implementing this algorithm, manufacturers and consumers can ensure the authenticity of products and prevent the purchase of fake or counterfeit products.

IV. TECHNOLOGY STACK

Our decentralized asset marketplace was developed using cutting-edge technologies and tools that help to ensure secure and reliable transactions. We used a combination of blockchain technology, smart contracts, and web development tools to create adecentralized platform that provides users with a secure and user-friendly experience.

1) *VS Code:* A code editor used for writing and editing smart contract code, developing and testing the front end, managing and deployingcode to the blockchain network.
2) *Solidity:* Solidity is a specialized programming language specifically created for writing smart contracts on the Ethereum blockchain. It isdesigned to be compatible with other blockchain platforms that utilize the Ethereum Virtual Machine (EVM). With Solidity, developers can define the rules and logic that govern the behaviour of decentralized applications (dApps) and execute them on the Ethereum network.
3) *Smart Contract:* A smart contract is a self-executing program with a set of rules and conditions encoded in computer code that operates on a blockchain network. It utilizes blockchain technology's decentralized and distributed ledger to enforce the terms of the contract,removing the need for intermediaries and providing a trustless system.
4) *Ethereum:* Ethereum is a decentralized and open-source blockchain platform that revolutionized the world of blockchain technology. Itprovides a robust infrastructure for the development and deployment of dApps.
5) *Ganache:* Ganache is a private Ethereum blockchain environment that allows to you emulate the Ethereum blockchain so that you can interact with smart contracts in your own private blockchain.
6) *Meta Mask:* A browser extension that serves as a digital wallet for Ethereum-based cryptocurrencies and tokens, allowing users to securelystore, send, and receive payments for buying and selling.
7) *Web3.js:* A JavaScript library used to create a user-friendly interface that interacts with the Ethereum blockchain by connecting the frontend to the network and allowing for interaction with smart contracts deployed on the blockchain.
8) *Node.js:* Node.js is a large and active community, which means that developers have access to a wide range of libraries, tools, and resources that can help them build their applications faster and more efficiently. This community also contributes to the ongoingdevelopment of Node.js, which means that the platform is constantly evolving and improving.

V. RESULTS

A. Outcomes

Blockchain technology can be used to create a tamper-proof system for detecting fake products. Here are some potential outcomes of using blockchain for fake product detection:

1) *Increased Trust:* Consumers can trust the authenticity of the products they buy, knowing that they can trace the origin of the product and verify its authenticity on the blockchain.
2) *Better Brand Protection:* By using blockchain to track and verify the authenticity of their products, companies can protect their brand reputation from being tarnished by counterfeit products.
3) *Improved Supply Chain Visibility:* Blockchain can provide complete transparency across the supply chain, allowing companies to track their products from manufacturing to distribution. This can help identify and eliminate counterfeit products at any stage of the supply chain.
4) *Cost Savings:* By eliminating the need for intermediaries and reducing administrative costs, blockchain can help reduce the cost of product authentication, which can benefit both consumers and producers.
5) *Compliance with Regulations:* Blockchain can help companies comply with regulatory requirements related to product authentication and traceability. This can help avoid costly fines and penalties and maintain a good relationship with regulatory bodies.

VI. CONCLUSION

A. Conclusion

In conclusion, using blockchain technology for fake product detection can be an effective solution to tackle the problem of counterfeit products in the market. The immutable nature of the blockchain ensures that every transaction and product information is recorded and cannot be altered, providing transparency and traceability in the supply chain. Blockchain technology is known for its security and privacy protection with easy access to large information through data processing over a distributed network. Blockchain has gained immense popularity in the financial world and falls under the fintech category, meaning finance and technology. Companies have started adopting it at a very fast pace due to its useful features. Blockchain has proven to be a great tool for identifying and eliminating counterfeit products in the supply chain or retail sector. The proposed system will allow users to easily identify and collect information about the product they want to check. This will help users to make a better choice in the market and they can trust the seller and the manufacturer. They no longer need to rely on third parties to verify the authenticity of the product, which will give them a smooth and risk-free experience. In addition, manufacturers have less to worry about counterfeit products in the market and can better use their customers' feedback to improve their service. It also allows them to avoid economic losses and easily track the product they have launched. If the blockchain can create stability and increase customer confidence in the market, it can boost a country's economic growth tremendously and protect it from large losses due to fraud. Overall, blockchain technology can prove to be a lifesaver for businesses, providing a new system for commerce that is more secure and user-friendly.
Overall, the adoption of blockchain technology for fake product detection can increase consumer trust, protect brand reputation, and ultimately lead to a more secure and reliable supply chain.

B. Future Scope

The Future work of the system can be proof of code simplicity which can indirectly increase consumer’s trust because of distributed Applications. It can be difficult on the manufacturer side to add all the details of the products manufactured so instead of manually Adding the products details, data can be extracted using company’s API which can increase efficiency and manufacturer friendly.QR code is not hackable but information in it can be copied or known to generate similarly QR code as well as print out of QR code Works well to scan and retrieve information so in order to overcome this secure graphic QR code can be used that if when QR code Is photocopied then it will lose information due to the ink smearing. These copy detection pattern or secure graphic is a digital Image with optimal design to lose information when copied and it is printed irreversibly. Customer when found the product is Counterfeited then system should able to show the same products but original from different sites with price differences to improve usability, efficiency and effectiveness of the system.
Applications of Fake Product Detection using Blockchain are:

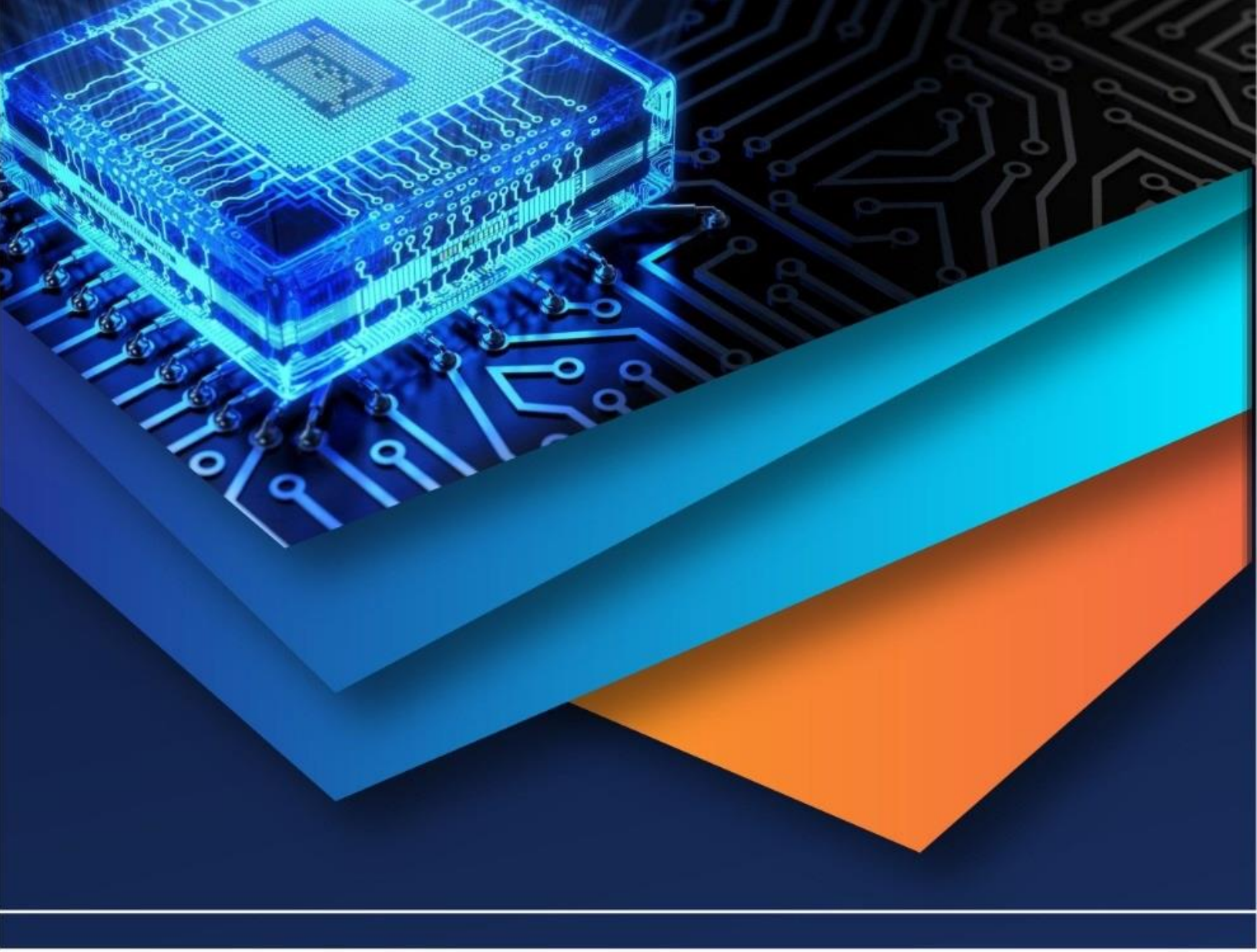
1) *Luxury Goods:* The luxury goods industry faces significant challenges with counterfeit products. Implementing blockchain-based solutions can enable customers to verify the authenticity of luxury items such as watches, handbags, and jewellery, providing assurance and confidence in their purchases.
2) *Pharmaceuticals:* The pharmaceutical industry is vulnerable to counterfeit drugs that can have detrimental effects on public health. Blockchain can be used to track and verify the entire drug supply chain, ensuring the authenticity of medications and preventing the distribution of counterfeit or substandard products.

3) *Food and Beverages:* Blockchain can enhance food safety by enabling traceability and transparency in the supply chain. It allows consumers to verify the origin and quality of food products, ensuring they are not exposed to fake or adulterated goods.
4) *Electronics and Consumer Goods:* Blockchain-based solutions can help combat counterfeit electronics and consumer goods, such as smartphones, gadgets, and high-end consumer electronics. Consumers can verify the authenticity of these products and ensure they are purchasing genuine items.
5) *Art and Collectibles:* The art and collectibles market can benefit from blockchain for verifying the authenticity and provenance of artworks and collectible items. Blockchain can create an immutable record of ownership and transaction history, preventing the circulation of fake or stolen art.
6) *Supply Chain Management:* Implementing blockchain for fake product detection enhances supply chain transparency and accountability across various industries. It enables stakeholders to track and verify the movement of goods, ensuring they are authentic and conform to quality standards.
7) *Online Marketplaces:* E-commerce platforms can leverage blockchain to combat fake products. By integrating blockchain-based verification systems, online marketplaces can provide customers with a means to authenticate products before making purchases, reducing the risk of counterfeit goods.
8) *Cosmetics and Personal Care Products:* Blockchain-based solutions can be utilized to verify the authenticity and safety of cosmetics and personal care products. Customers can scan product codes or labels to access information about ingredients, manufacturing processes, and quality assurance.
9) *Brand Protection:* Blockchain provides an effective tool for brand protection against counterfeiting. Companies can utilize blockchain to establish a secure and verifiable record of their products, making it difficult for counterfeiters to produce fake goods under their brand.

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