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# Fake Product Detection through QR Code using Blockchain

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**Abstract:** *Fake products are becoming more common in our everyday life, especially in areas like medicines, electronics, and branded goods. This creates serious risks for both buyers and companies. Traditional ways of checking if a product is real are not always reliable, as they can be easily copied or changed. To solve this issue, the project suggests using blockchain technology along with QR codes. Each genuine product will have a unique QR code that links to information safely stored on the blockchain. When someone scans the code with their phone, they can instantly check if the product is real. The data on blockchain cannot be changed, which makes it very secure. It also removes the need for any middleman to confirm the product's details. Companies can update product data at any time, so everything stays clear and up to date. This system makes it easy for regular people to check authenticity in just a few seconds. It also helps companies protect their brand and earn customer trust. Overall, it makes the whole supply chain safer and more honest.*

**Keywords:** Counterfeit products, Product authentication, Blockchain technology, QR code verification, Supply chain security, Immutability, Decentralization, Consumer trust

## I. INTRODUCTION

Counterfeit products pose significant risks to both consumers and manufacturers, affecting industries like pharmaceuticals, electronics, and luxury goods. Traditional product verification methods are increasingly ineffective against sophisticated counterfeiters. This project proposes a blockchain-based solution to combat counterfeiting by integrating QR codes for easy and secure product verification.

Blockchain technology, with its decentralized and tamper-proof architecture, ensures that product data is immutable and transparent. In this system, each product is assigned a unique QR code linked to its record on the blockchain. Consumers can scan the QR code using a mobile application to instantly verify the product's authenticity.

The primary goal of this project is to develop a robust, transparent system that enhances consumer trust by preventing the circulation of counterfeit goods. This solution offers a user-friendly and secure way to verify products, benefiting both consumers and manufacturers

## II. LITERATURE SURVEY

This project proposes a Blockchain-based system to detect fake products by creating immutable records of product information (e.g., origin, batch number) that consumers can verify via a QR code scan. The system includes smart contracts for secure product registration and authentication, reducing counterfeiting risks. Its limitation is that it faces scalability challenges as transaction volume increases, making it harder to manage large-scale data efficiently.[1]

This research focuses on a Blockchain-driven anti-counterfeiting system where products are tagged with unique QR codes linked to Blockchain records. The system allows real-time verification, offering transparent product traceability for consumers. A mobile app enables QR code scanning to confirm authenticity. A limitation of the project is the dependency on consistent mobile app functionality and the requirement for a QR code scanning device, which may limit user accessibility.[2]

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This project uses Blockchain with QR codes for anti-counterfeiting, giving each product a QR code connected to its Blockchain record. Consumers scan the QR code to retrieve verified product data. The system enhances brand protection by detecting counterfeit goods. A primary limitation is that it relies on high data accuracy and secure QR code implementation, which, if compromised, may reduce system effectiveness.[3]

This paper proposes a blockchain-based solution to combat product counterfeiting. It assigns unique digital identities to products and records their lifecycle on a blockchain. The system integrates smart contracts and QR codes/NFC tags for automated and seamless product verification. It ensures transparency and traceability across the supply chain, building trust among stakeholders. The limitations include scalability, compliance issues, and the technical challenges of integrating blockchain into existing systems.[4]

This project leverages blockchain and QR code technology to authenticate products by recording all transactions on a distributed ledger. Customers can verify a product's authenticity by scanning a QR code linked to the blockchain. It emphasizes decentralization and real-time authentication, reducing reliance on third parties. However, adoption barriers, data accuracy issues, and scalability concerns remain key challenges for the widespread implementation of the system.[5]

## III. PROPOSED SYSTEM

The proposed system, **Fake Product Detection through QR Code using Blockchain**, aims to tackle the critical issue of counterfeit goods, a widespread challenge in industries like pharmaceuticals, luxury goods, electronics, and more. Counterfeit products not only pose significant risks to consumer safety but also harm the economic integrity and reputation of brands. Traditional methods of product verification have proven inadequate in an era where forgeries are increasingly sophisticated, leading to a growing need for an innovative, secure, and reliable solution. The integration of **QR codes** with **Blockchain technology** offers a promising answer by enabling a tamper-proof and decentralized approach to product authentication.

In this system, each product registered by a manufacturer receives a **unique QR code**, which serves as a digital fingerprint linking to that product's data on a Blockchain network. Upon production, manufacturers register essential details about the product—such as serial numbers, batch information, manufacturing location, and production date—into a secure Blockchain ledger. This information is immutable and stored across multiple nodes in the Blockchain, which guarantees its resistance to tampering or alteration. A QR code generated for each product carries a reference to this Blockchain record, acting as a bridge between the physical product and its digital verification on the Blockchain.

When a consumer or retailer scans the product's QR code, they are immediately directed to its Blockchain-stored data, where they can cross-verify details like product origin and authenticity against the physical product. If the information retrieved does not match the physical product's attributes, or if a duplicate QR code is detected, the system flags the product as potentially counterfeit. This alert allows immediate action, such as reporting the fraud to manufacturers or relevant authorities. Through the immutable and transparent nature of Blockchain, this system not only enhances consumer trust but also serves as a deterrent for counterfeiters.

By implementing **Fake Product Detection through QR Code using Blockchain**, companies can achieve more reliable product tracking, enabling real-time fraud detection and reducing the proliferation of fake products in the market. This approach is especially crucial in sectors where authenticity is paramount, such as pharmaceuticals and luxury goods, ensuring both consumer safety and brand integrity.

## IV. TOOLS AND LANGAUGES USED

**Remix Ethereum IDE**

Remix Project is a platform for development tools that use a plugin architecture. It encompasses sub-projects including Remix Plugin Engine, Remix Libraries, and of course Remix IDE.

Remix IDE is an open source web and desktop application. It fosters a fast development cycle and has a rich set of plugins with intuitive GUIs.

Remix is used for the entire journey of contract development with Solidity language as well as a playground for learning and teaching Ethereum.

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**Ganache**

Ganache is a personal blockchain for rapid Ethereum and Corda distributed application development. You can use Ganache across the entire development cycle; enabling you to develop, deploy, and test your dApps in a safe and deterministic environment.

Ganache comes in two flavors: a UI and CLI. Ganache UI is a desktop application supporting both Ethereum and Corda technology. The command-line tool, ganache-cli (formerly known as the TestRPC), is available for Ethereum development. Ganache is used for setting up a personal Ethereum Blockchain for testing your Solidity contracts. It provides more features when compared to Remix.

You will learn about the features when you work out with Ganache. Before you begin using Ganache, you must first download and install the Blockchain on your local machine.

**Solidity**

Solidity is an object-oriented programming language for implementing smart contracts on various blockchain platforms, most notably, Ethereum. It was developed by Christian Reitwiessner, Alex Beregszaszi, and several former Ethereum core contributors.

Programs in Solidity run on Ethereum Virtual Machine. Solidity is a statically typed programming language designed for developing smart contracts that run on the Ethereum Virtual Machine (EVM).

**MetaMask**

MetaMask is a browser plugin that serves as an Ethereum wallet, and is installed like any other browser plugin. Once it's installed, it allows users to store Ether and other ERC-20 tokens, enabling them to transact with any Ethereum address. By connecting to MetaMask to Ethereum-based dapps, users can spend their coins in games, stake tokens in gambling applications, and trade them on decentralized exchanges (DEXs).

It also provides users with an entry point into the emerging world of decentralized finance, or DeFi, providing a way to access DeFi apps such as Compound and PoolTogether.

MetaMask's open platform also plays a key role in promoting Ethereum-based dApp development for coders and technologists. For developers building a dApp, MetaMask is preloaded with fast connections to Ethereum and several test networks via Infura.

These built-in connections allow developers to begin building a new dApp on Ethereum without the need to set up and run a full network node. This can be helpful for bootstrapped entrepreneurs looking to build immediately, whether they are creating a simple browser-friendly user interface (UI) or a full-fledged, mainnet-ready dApp that will support an entirely new decentralized marketplace.

**Ethereum (ETH)**

Ethereum is a permissionless, non-hierarchical network of computers (nodes) that build and come to a consensus on an ever-growing series of "blocks", or batches of transactions, known as the blockchain. Each block contains an identifier of the chain that must precede it if the block is to be considered valid. Whenever a node adds a block to its chain, it executes the transactions in the block in the order they are listed, thereby altering the ETH balances and other storage values of Ethereum accounts. These balances and values, collectively known as the "state", are maintained on the node separately from the blockchain, in a Merkle tree.

Each node communicates with a relatively small subset of the network—its "peers". Whenever a node wishes to include a new transaction in the blockchain, it sends a copy of the transaction to each of its peers, who then send a copy to each of their peers, and so on. In this way, it propagates throughout the network. Certain nodes, called miners, maintain a list of all of these new transactions and use them to create new blocks, which they then send to the rest of the network.

Whenever a node receives a block, it checks the validity of the block and of all of the transactions therein and, if it finds the block to be valid, adds it to its blockchain and executes all of those transactions.

Since block creation and broadcasting are permissionless, a node may receive multiple blocks competing to be the successor to a particular block. The node keeps track of all of the valid chains that result from this and regularly drops

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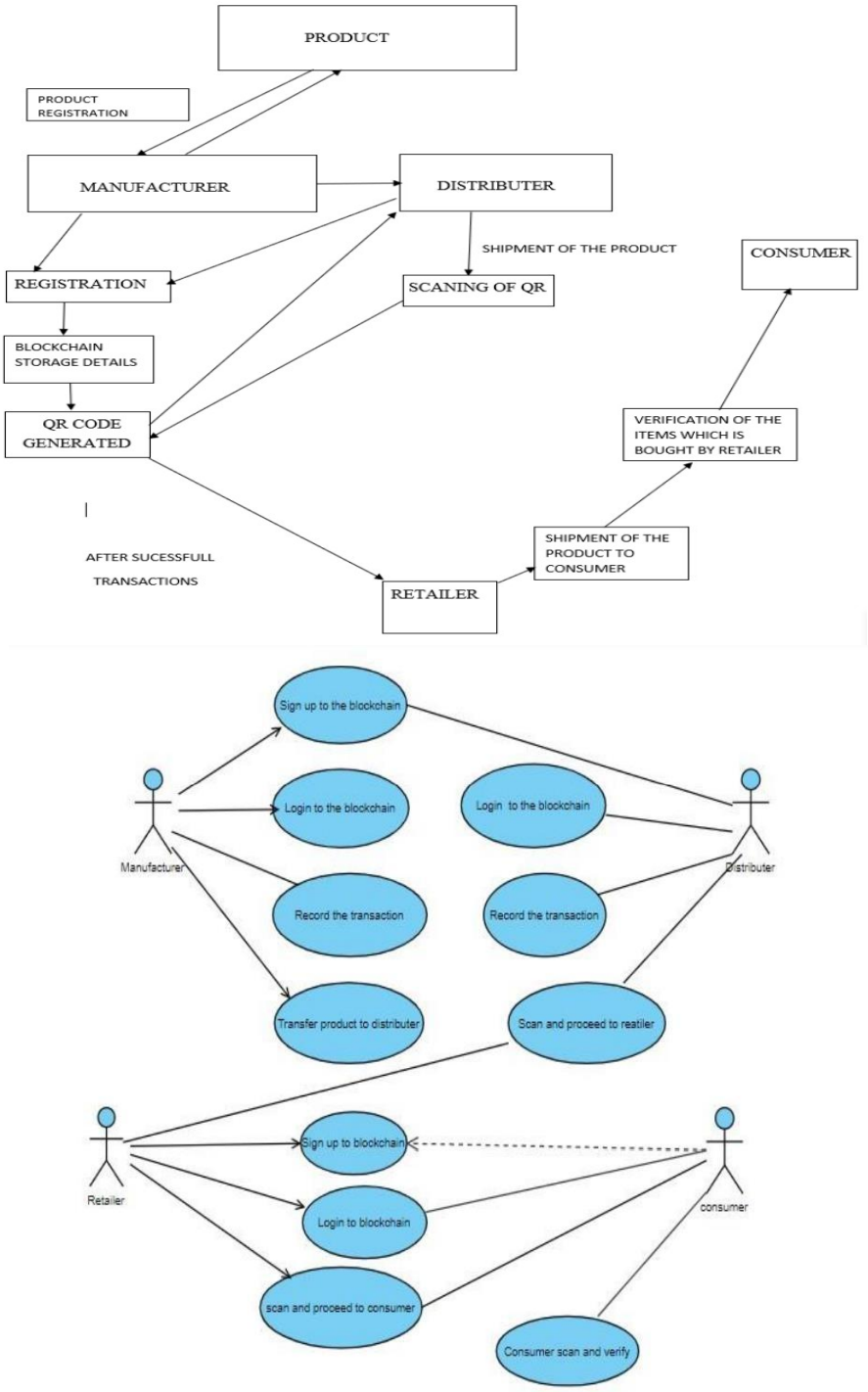
the shortest one. According to the Ethereum protocol, the longest chain at any given time is to be considered the canonical chain.

**Flowchart:**



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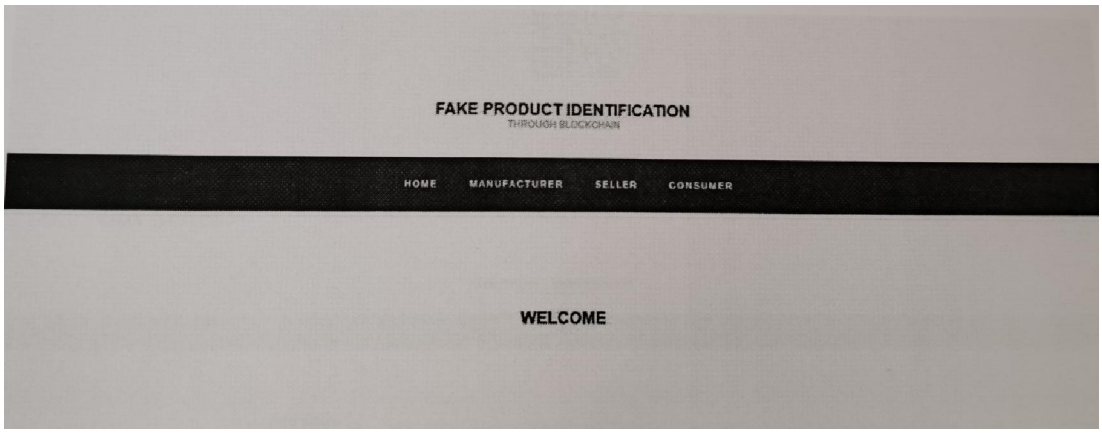
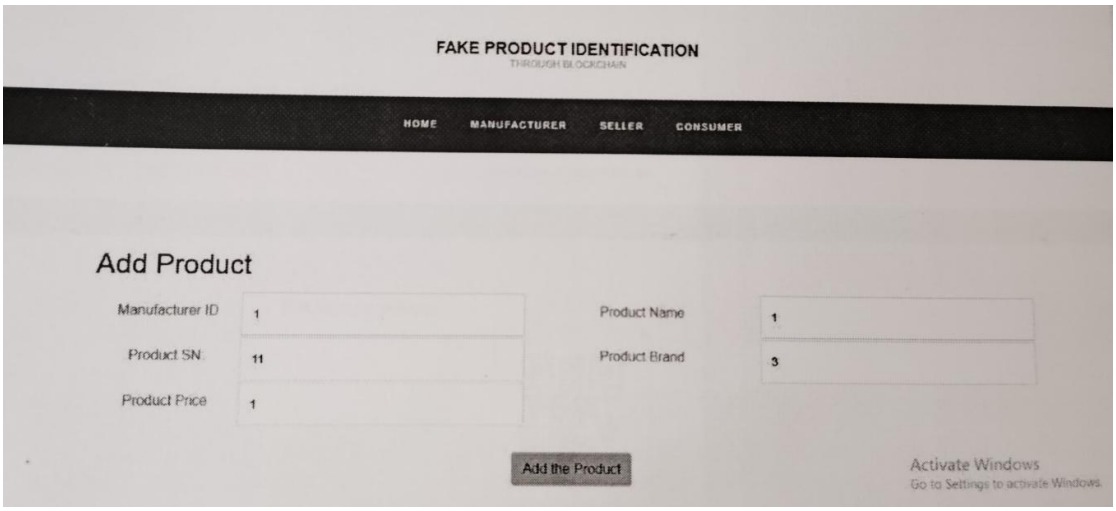
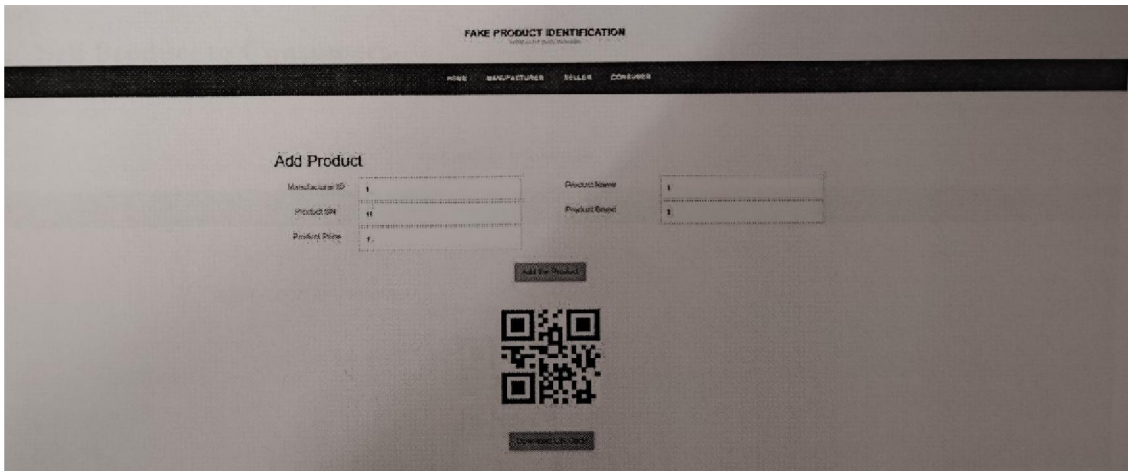
## V. RESULT

### I. HOME WINDOW




### II. ADD PRODUCT AND GENERATE QR CODE



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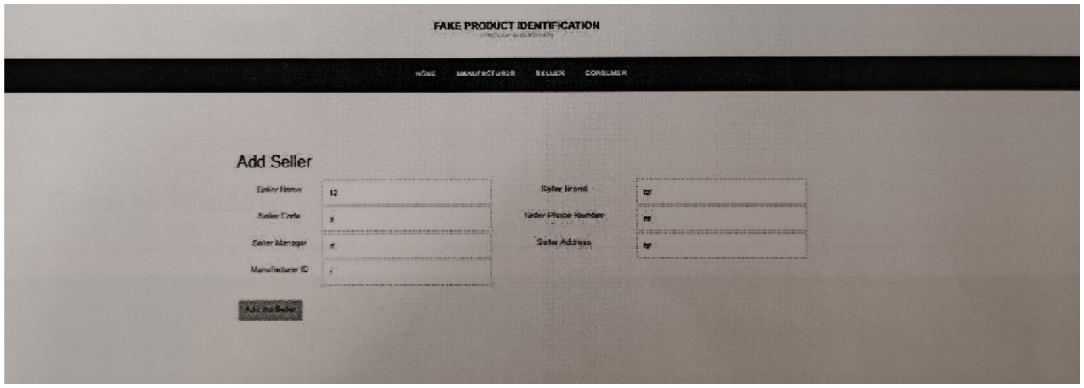
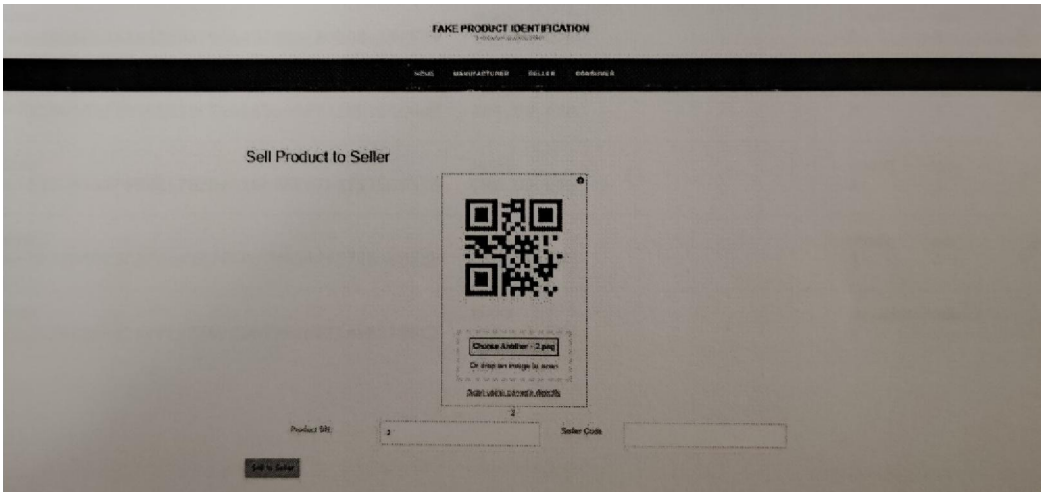
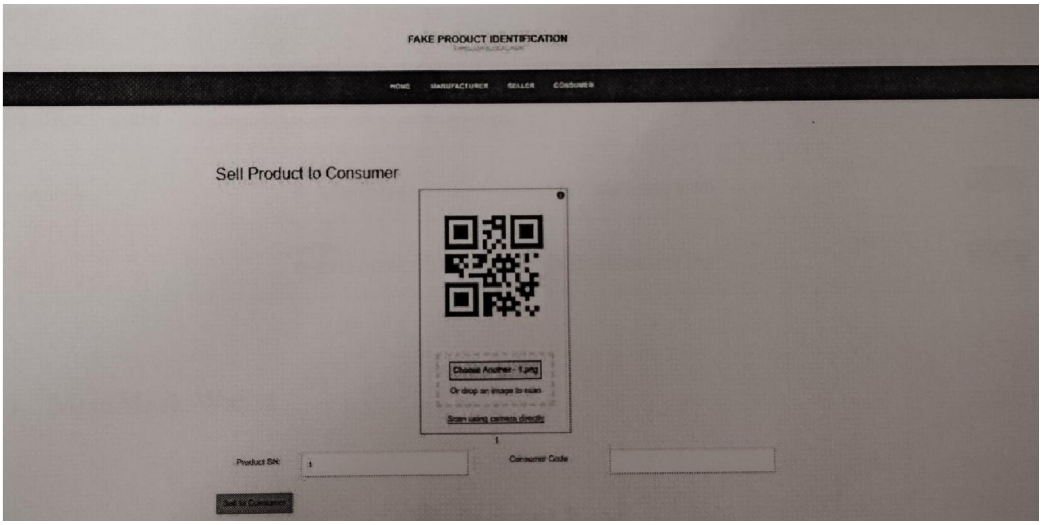
### III. ADD SELLER




### IV. SELL PRODUCT TO SELLER




### V. SELL PRODUCT TO CONSUMER



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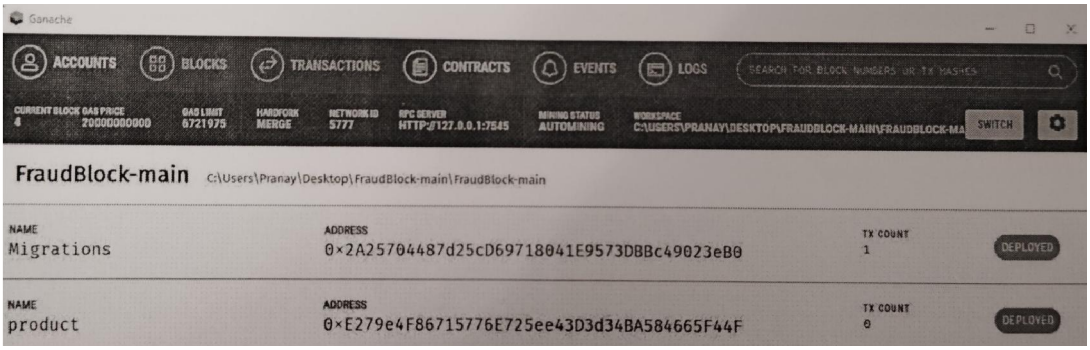
## VI. GANACHE WINDOW


## VII. DEPLOYED CONTRACTS




## VIII. METAMASK WALLET



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## VI. CONCLUSION

The project "Fake Product Detection through a QR Code using Blockchain" offers an innovative solution to the growing problem of counterfeit goods. By combining blockchain technology with QR codes, it creates a secure and transparent method for verifying product authenticity. The decentralized nature of blockchain ensures that product data is immutable and tamper-proof. Unique QR codes assigned to each item allow consumers to instantly access product information. This enables informed purchasing decisions and boosts consumer trust. The system overcomes the flaws of traditional verification methods with real-time, user-friendly checks. It has strong potential for use in industries like pharmaceuticals, luxury goods, food safety, and e-commerce.

## VII. ACKNOWLEDGMENT

We are profoundly grateful to Dr. Rajesh Kadu for his expert guidance and continuous encouragement throughout to see that this project rights its targets since it commencement to its completion.
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At last we must express our sincere heartfelt gratitude to the all staff members of Computer Engineering Department who helped us directly or indirectly this course of work.

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