

# A Scalable and Secure Medical Data Storage and Sharing System

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## ABSTRACT

For the past couple of years, the medical data has been stored in centralized systems which is not the ideal storage technique since all data can be altered, stolen, or even used for evil purposes and, furthermore, the data cannot be safely shared with other doctors and hospitals in case of patient's transfer, change of state or country, in addition, patient's health status cannot be tracked and the patient's medical history is unknown. Therefore, powerful decentralized technologies and expertise can help provide better health information and help doctors and patients to better understand the situations before and after treatment, and do more research based on immutable and trusted data. One of the proposed solutions is storing and securing data on the blockchain which is less scalable, slow and expensive. Introducing a scalable, robust medical data storage and sharing system based on AI/ML, IoT, IPFS, and blockchain.

## Key words

AI/ML, IoT, Blockchain, IPFS, health data.

## I. INTRODUCTION

People's health data is the most valuable and important thing that most people seem to neglect. In early 2020 the world faced a very strange virus, people's past health data became vital and a large number of people have been dying during the covid-19 pandemic. No robust system was implemented to trace people's health information at a global scale, today it becomes impossible to historically know the patient's past health status when crossing borders or states.

Safe treatment and future research rely on useful, immutable, globally shareable and trusted data. Storing data on a centralized system is high risk and can only be part of one organisation whereas the patient can go to any hospital in any country or state. In addition, the victim may not be able to explain clearly their past treatment result with more detail using the medical terms, what kind of treatment they went through before and for which cause.

This paper will be taking advantage of interplanetary file systems, blockchain, Internet of Things (IoT), Artificial Intelligence and Machine Learning (AI/ML) to build a global, distributed healthcare data storage and sharing system.

## II. PROPOSED ARCHITECTURE

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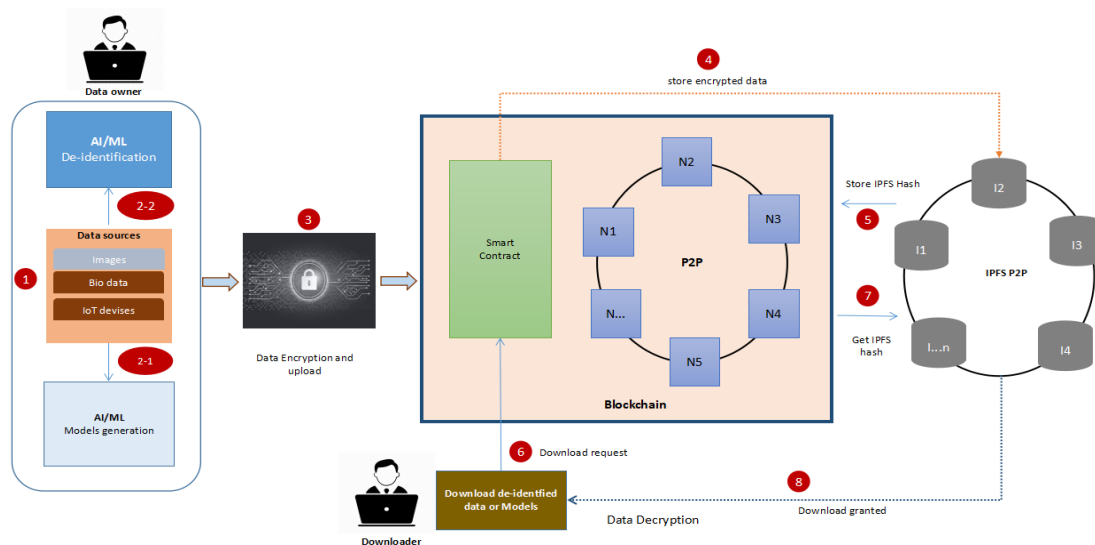


Fig. 1. distributed healthcare data system architecture

### Architecture description

#### 1. Data collection

This layer will play the role of collecting all the data from different sources such as sensors, databases and all medical devices.

2-1 AI/ML to train and generate models from the data. This layer will collect all the data, clean them and apply machine learning to create models that can be sold or given freely on the platform to improve research and invention.

2-2 AI/ML to de-identify the patient's data. User data is precious, machine learning will be applied to hide the patient's identity linked to the data, then it will be shared with other institutions. The data can help any organisation to understand different medical issues related to different patients and build smart systems.

3. Encrypt data and upload it to IPFS via the smart contract. Data de-identification is not enough to secure the patient's data, another layer of security has to be implemented during data transfer. At this stage the data is gathered, encrypted and sent

4. The smart contract checks the privileges, if the person is allowed to upload the data then the encrypted files (de-identified data, models) will be

5. The IPFS returns a hash of the uploaded files that will be stored safely on the blockchain.

6. The person in need of the de-identified data and models can request for download.

7. If the person is allowed to download the data, the smart contract validates the request and interacts with the IPFS to trigger the download process, if not an error will be occurred

8. The data is decrypted and shared with the user.

### III. CONCLUSION

In this paper we proposed a fast and secure medical data sharing system based on blockchain, machine learning and Internet of things technologies, the feasibility study was done and proved that this solution is the most reliable, however the implementation will be done in the future version of this paper. The study shows that once the system is deployed, all medical data will be safely shared and stored across multiple computers in the network using the blockchain technology.

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