CSE 499.11

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Related works

MedEase:

Our main goal is to build an online medical health care system which is centralized. Revolutionize healthcare with our cutting-edge blockchain-based medical web application. This innovative platform securely stores patients' medical records, treatment histories, and diagnostic reports on a tamper-proof blockchain, ensuring data integrity and privacy. Patients can seamlessly grant healthcare providers access to their records, streamlining the treatment process and reducing administrative hurdles. The decentralized nature of the blockchain guarantees that medical data remains under patients' control, enhancing trust and compliance with data regulations. With real-time updates and secure sharing capabilities, our application empowers both patients and medical professionals, fostering a more efficient and patient-centric healthcare ecosystem.

Blockchain Technology for Electronic Health Records

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9739765/#:~:text=The%20method%20combines%20IoMT%20(Internet,protecting%20the%20privacy%20of%20users.

- Although electronic health records (EHR) are more efficient, secure and reduce data redundancy than traditional paper-based medical records, they still have shortcomings like poor interoperability and unresolved privacy issues. Blockchain could potentially solve these shortcomings. Blockchain has advantages of decentralization, data transparency, and privacy and security.
- This paper discusses how many blockchain-based EHR studies tried to overcome the shortcomings of EHR and addressed the issues of interoperability and privacy.
- The paper explains how different services like MedRec, Ancile, OmniPHR, MeDShare work.
- The paper then discusses the computational operations of blockchain and its limitations.

This is simply a review paper on some blockchain-based EHR management services. We aim to take guidance from this paper to come up with solutions to overcome the shortcomings of the existing systems.

MeDShare: Trust-less Medical Data Sharing Among Cloud Service Providers Via Blockchain
https://www.researchgate.net/publication/318666875_MeDShare_Trust-less_Medical_Data_Sharing_Among_Cloud_Service_Providers_Via_Blockchain

A blockchain-based system called MeDShare that addresses the issue of medical data sharing among medical big data custodians in a trust-less environment.

The main points of the paper are as follows:

- MeDShare uses blockchain technology to address these challenges. It uses smart contracts to track the behavior of the data and revoke access to offending entities.
- By implementing MeDShare, cloud service providers and other data guardians will be able to achieve data provenance and auditing while sharing medical data with entities such as research and medical institutions with minimal risk to data privacy.

However, they are storing data in cloud services, which is less secure compared to our proposed solution which is

IPFS. Moreover, sharing data among multiple hospitals is not possible in this system compared to ours where data can be shared with any registered hospital after taking the patient's consent.

MedRec: Using Blockchain for Medical Data Access and Permission Management
https://people.cs.pitt.edu/~babay/courses/cs3551/papers/MedRec.pdf

- The current electronic medical record system is centralized and is controlled by a single entity, like the hospital
- Records are stored in separate systems that are not connected to each other, the records possess security risks, and have lack of patient control.
- The MedRec system addresses these challenges by using blockchain technology. In a blockchain based system, data is stored in blocks that are linked together in a chain.
- The MedRec system also gives patients more control over their medical data.

They have used a public blockchain, meaning anyone with access to that block can see the hashes of the EMR chunks. Our system will be built using a private blockchain which means no outsider will be able to get access to the block, thus, making it more secure. Additionally, in our system, the files will be stored in IPFS which is a more secure and environment friendly solution.

MedicalChain
https://medicalchain.com/en/
https://cryptoslate.com/introduction-medicalchain-blockchain-electronic-health-records/

- Medicalchain is an electronic health record platform powered by a dual blockchain, smart contracts and their own cryptocurrency, "MedTokens".
- The Medicalchain platform is a closed and private blockchain. The structure is provided by Hyperledger Fabric and it is used to manage the storage of and access to health records.

Although the storage mechanism works similarly as our planned system, our system plans a more environment-friendly solution which is using IPFS. Moreover, this system is only used to store and retrieve records and does not include other services like booking an appointment.

Blockchain-Based Healthcare Platform for Secure Personalized Data Sharing
https://www.researchgate.net/publication/351921320_A_Blockchain-Based_Healthcare_Platform_for_Secure_Personalised_Data_Sharing

The paper discusses a blockchain-based platform for sharing medical data in a secure and personalized way. It describes the proposed blockchain-based platform for sharing medical data. The platform consists of the following components:

- A private blockchain: The private blockchain is used to store the medical data. The blockchain is maintained by a group of authorized participants, such as healthcare organizations and patients.
- Smart contracts: Smart contracts are used to control access to the medical data. Smart contracts are self-executing contracts that are stored on the blockchain. They can be used to define who has access to the medical data and what they can do with it.
- A data encryption scheme: The medical data is encrypted before it is stored on the blockchain. This helps to protect the confidentiality of the information.

Although this solution works well, storing large amounts of data on blockchain is not recommended since it uses a high amount of energy. In our planned system, we will be using IPFS to store the files, and use private blockchain to store the hash of the file.

Electronic Health Record Monitoring System and Data Security Using Blockchain Technology
https://www.researchgate.net/publication/358356059_Electronic_Health_Record_Monitoring_System_and_Data_SecurityUsing_Blockchain_Technology

This paper discusses a blockchain based EHR.

- the patients must first visit the hospital for a doctor's consultation.
- Both the patient and the doctor must have a network account. A new patient must first register an account and fill out his or her profile's primary information. After filling out the form, the doctor will search the network for his or her information and consult with the patient
- the hospital will update the patient's information on the blockchain network after checking with the doctor. So, all the processes are connected to the blockchain network with websites
- In this paper, we created a website that benefits both patients and physicians since we are using blockchain technology to guarantee the confidentiality of medical data. Our website has distinct profiles for physicians and patients. They may establish their own account under the patient profile by providing a unique address, name, and age. This one-of-a-kind address will be generated from the genesis block and cannot be entered into anyone's profile. The owner's unique address is totally confidential and will stay completely safe in our network.
- All of the patients' submitted records will be kept on our local server (Ganache). The records are kept in the form of hashed strings containing the data. Additionally, each file will have a unique Uniform Resource Locator (URL) that will be shown in the patient's profile. There will also be an option for patients to give physicians access to their medical records. After being granted access, physicians will be able to see their records in their profile. To get access to features such as uploading, viewing, or modifying data.
- Doctors, on the other hand, may create a profile using their name and a unique address. They may see their name, unique address, and a list of patients who have given the doctor permission to read their files after signing in.