Blockchain-based Intelligent Data-Management for Healthcare (BID4Health)

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Abstract

Blockchain is a new technology that provides a unique opportunity to tackle major challenges in health care and biomedical research, such as enabling data sharing and integration for patient-centered care, data provenance allowing verification authenticity of the data, and optimization of some of the health care processes among others. The goal of this minitrack is to provide an opportunity to exchange, discuss, and debate the approaches and systems using the blockchain technology to connect the globally distributed data in order to enhance the healthcare data management.

1. Motivation

Evolving processes of healthcare data digitization have led to the creation of big volumes of sensitive personal data stored online in multiple formats and representations. Once these data are properly combined, they can be leveraged by data analytics and machine learning techniques [1] to advance the medical, pharmaceutical, sports, and other domains of healthcare-related research and applied medicine. Blockchain - an emerging distributed ledger technology - is increasingly used for building applications concerned with trust, accountability, and transparency [2, 3, 4]. Blockchain provides a unique opportunity to facilitate and enhance healthcare data management including stringent privacy requirements. Consequently, the interest in the application of blockchain to manage healthcare data is growing rapidly[4, 5].

However, the quest for healthcare systems that employ blockchain technology and can guarantee privacy, security, scalability, and efficiency continues[6]. Moreover, the decentralization and data replication that lie in the core of the blockchain technology have wide-ranging implications for collaborative data analytics, machine learning techniques, privacy and security models, and other issues relevant to the use of information and

communication technologies for health [7].

2. Relevant topics

Blockchain technology increasingly attracts attention in multiple healthcare-related contexts, and gives a "promise" to address various inefficiencies of healthcare-related processes. However, existing blockchain platforms can offer only limited capabilities and solutions from technical, legal, and social perspectives. Therefore, before the mass adoption of blockchain-based healthcare data management, further research in the following areas is necessary.

1. Use-case scenarios and correctness of employing blockchain: Motivations, advantages, and disadvantages when applying blockchain in healthcare. Blockchain and intelligent healthcare data management (machine learning and natural language processing techniques for clinical decision support, data analytics): use-case scenarios, systems, technologies, data types: genomic data, electronic/patient healthcare records (EHP/PHR), data from wearable devices, etc. Reproducibility of medical research using blockchain technology. Break-glass procedures for granting emergency access to healthcare data using blockchain. Optimization of the pharmaceutical supply-chain and clinical trial processes using blockchain technology.

2. Technical aspects: Privacy and security of intelligent healthcare data management on blockchain. Design of on- and off-chain data structures and interaction mechanisms between the ledger and off-chain storage.

3. Compliance with standards, laws, and regulations: Interoperability of healthcare data when integrating blockchain-based systems into clinical data flows (e.g., interfacing, support of HL7 standards). Achieving compliance with HIPAA and the EU General Data Protection Regulation when designing blockchain-based intelligent systems.

4. Social perspectives Barriers and acceptance of new technologies (i.e., artificial intelligence, blockchain) in healthcare. Social implications of using blockchain

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and intelligent data management in healthcare: enabling patient-driven healthcare.

3. Conclusion

Employing blockchain technology in healthcare is a rapidly developing research area and various approaches have already been proposed. Nevertheless, there are multiple open questions related to the technology, legislation, adoption, and conformance with the laws and regulations [8]. Resolving these questions requires systematization of existing challenges and prior work, debating and evaluating different approaches, setting up a more profound research agenda and further collaborations, thus paving a way towards improving healthcare using state-of-the-art innovative approaches.

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