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Application of Block-Chain Technology in Healthcare Industry to Pursue COVID 19 Challenges

Mr. Chetan Pawar[1], Prof. S. N. Sawalkar [2]
[1]*PG Scholar,* [2]*Professor, Computer Science & Engineering, Sipna College Of Engineering And Technology, Amravati, Maharashtra, India*

Abstract: ***In the year of 2019 coronavirus (COVID-19) start spreading in China, but at the starting of 2020 the pandemic of COVID-19 disease has uncontrolled spread and adversely affected the whole world. The rapid explosion and worldwide spread shows the constraints of our healthcare systems to handle public healthcare emergencies. an outsized amount of our healthcare system is centralized, so it can't provide important information about patients contact tracing, frauds in vaccination certificates, testing related data and medical supply related data. In such contexts innovative and newest technologies like blockchain have initiate as promising solutions for fighting with such situations like pandemic. By using blockchain technology we will combat pandemics by enabling early detection of patients, ensuring the orders of medical data and maintain reliable medical supply chain during pandemic. This study proposes a narrative innovative approach for handling challenges of (COVID-19) pandemic and contagion. This study proposes a Blockchain-based framework which investigate the chance of utilizing peer-to peer, time stamping, and decentralized storage advantages of blockchain to create a brand new system to verify and detect the unknown infected cases of COVID-19 (SARS COV-2) virus. The framework will enable to make sure citizens in addition as government to predict the infection risk of virus, to provide an efficient system able to support governments, healthcare experts, health related authorities and citizens to require critical decisions regarding infection and infection avoidance. this method consists of Blockchain Platform, Mobile application, closed-circuit television these components works together for detecting unknown infected patients and predict the infection risk of corona virus. to create decisions on vaccination and medical supply.***

Keywords: Covid-19, Blockchain Technology

I. INTRODUCTION

At the ending of year 2019 the Chinese city Wuhan became the primary coronavirus (COVID-19) hotspot, this newly emerged disease was first ignored as pneumonia which affecting the human lungs. After some day's doctors realized that it's not just a standard pneumonia which affecting lungs but it's something newly happened to the patient apart from pneumonia. Patient can't breathe easily they require more amount of oxygen supply. On the opposite hand no. of patients getting increased day by day. Patients increased during a such a rapid way that doctors humble on it period of time. Then researchers found that this is often not simple pneumonia but it's upgraded version of SARS (severe acute respiratory syndrome). After it slow when media reports set out WHO (world health organization) declares that this is often Novel coronavirus disease (SARS-COV-2) that spreading rapidly in persons. The severity of the epidemic was so huge that the planet Health Organization (WHO) was compelled to declare it as an endemic within a month. Nearly the full world goes for facing the situations like imposing lockdowns in countries. That Affects the world economy, insurance, transport, agriculture, tourism and every one the sectors. The scarcity of medical supplies and hospitality capacity has forced government authorities to impose partial or complete lockdown to manage the spread of the infection. With the deadly covid-19 spreading globally, every attempt is being made to confirm help for victims similarly on stop the spread of virus. As governments scramble to handle these problems, technology-empowered solutions can help accommodate the worldwide health related crisis.

Applications of innovative technologies like Blockchain Technology could have the answers in response to coronavirus pandemic crisis. Blockchain technology can support to combat the COVID-19 pandemic like situations by enabling early detection of patients, fast-tracking drug delivery, and providing a consensus on the ordering of the COVID-19 data records. Blockchain technology could be a distributed, decentralized, and immutable record of transactions that are stored on a distributed network of nodes over geographically dispersed locations. The decentralization feature of blockchain technology provides high security and robustness to the info and transactions stored on the blockchain with no possibilities of one point of failure attack. The record of transactions and data stored on the blockchain is transparent to every member within the network that brings trust in reliability and availability of knowledge. The transparency of blockchain-based records is achieved through a decentralized consensus protocol that defines rules for assuring the agreement of all miners on the present status of blockchain. In "Decentralization" technique, which implies that data isn't stored only on one server but is shared among many participants, servers, stores, and websites.

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As a result, health documents added to the blockchain are often accessed by all interested parties like patients, doctors, governments in a very transparent and reliable environment.

This new technology has been proposed to disable a good range of data-driven areas, including the health field. Additionally, blockchain technology can support well for reliable coronavirus analytics. Collecting COVID-19 data is a vital step of disease analytics. During the info collection, the way to make sure the reliability of collected data is of practical significance to confirm the top quality of COVID-19 data analytics.

II. APPLICATIONS OF BLOCKCHAIN TECHNOLOGY FOR FIGHTING COVID-19:

A. Contact Tracing

The use of personal protective equipment (PPE) by individuals having disclosure to transmittable disease like corona virus can greatly prevent and control the spread of the virus. For instance, during the pandemic caused by COVID-19, the use of PPEs can lead to minimize the exposure of front line healthcare workers to the infected persons.

Examples of PPEs that are primarily used to prevent contact to infected persons or surfaces include gloves, safety goggles, face masks, and protective clothing. During the COVID-19 pandemic, many counties have reported the lack of PPE kits in hospitals due to a lack of a trusted system to present appropriate data about demand and supply of PPE kits. Existing centralized based PPE supply chain management systems are naturally incapable to efficiently trace the data provenance of the PPEs in a trusted and reliable manner. Therefore, determining the source of PPEs along with additional details such as the type of certification of the PPE is challenging.

Blockchain flexibility by the relevant healthcare organizations to control and manage the supply chain of PPE can greatly assist in identifying PPE related frauds.

It can help in building a more resilient supply chain of PPE. Through blockchain-based systems, the participating organizations can validate the authenticity of PPE and identify any sign of PPE tampering or inadequate handling during its shiping. Blockchain technology unchangeable and transparently store all movements, ownership details, and modifications that are happened to the PPE in a distribution.

B. Vaccination

To combat against the emerging COVID-19 pandemic, it's desired to develop effective vaccines against deadly disease caused by COVID-19 virus. to beat the spread of COVID-19 requires successful immunization of humans against the corona virus through the administration of a lively vaccine. this centralized-based vaccination management systems face several challenges respected to the threat of being failing to successfully secure and distribute vaccines, to all or any over the people in countries and breaching the logistics supply chain of vaccines for malicious purposes.

The Blockchain technology can permanently store data associated with various stages, phases, and events of the COVID19 vaccine like development, production, certification, and allotment slots to authorized organizations for immunization purpose. In hospitals, healthcare experts can access blockchain to spot, trace, and verify vaccines data before administering it. It also can be used for notification management purposes (real-time) through lightweight smart contracts. Smart contracts provide opportunities to detect vaccine-related frauds, assure zero downtime, and eliminates the role of third-party services to observe COVID-19 vaccine logistics.

III. RESEARCH RELATED CHALLENGES

A. Cross-platform Communication

Blockchain interoperability feature that allows varying blockchain-based systems to uninterruptedly communicate with each other. It ensures users to see, share, and access information across several blockchain platforms without requiring intermediary assistance. Thus, the blockchain platform’s interoperability support can increase the safety and productivity of system. It also enables a user-friendly experience among multiple-users, presents a contactless and easier smart contract execution environment, provides the opportunity to develop partnerships among participating organizations, and allows smooth sharing of information with each other. Generally, the diversity in technologies and differences in software designs of existing blockchain platforms are the major challenges to create an interoperable blockchain-based system. The difference in supported languages, level of protection for data and transactions in the smart contracts, and recommended agreement protocols makes it challenging to propose generalized interoperability supported solutions. An interoperable platform that hosts services for organizations that are combats the COVID-19 pandemic should provide high security, tolerance, and fast transaction processing.

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B. Data privacy and Security

Data privacy ensures that the clinical trial of data stored on the blockchain technology platform should be invisible to unauthorized persons or organizations. It assures that health data is only shared with authorized organizations (government or authorities) and complies with the terms and conditions as defined in the consent form and GDPR privacy laws. Assuring privacy of clinical trial data through public blockchain platforms such as Bitcoin and Ethereum is challenging as data and transactions are public; whereas, private and consortium platforms such as Hyperledger fabric and Quorum are operated in a controlled environment, thereby preserving the privacy of clinical trial data. While the existing medical passport creation schemes have carefully preserved the privacy of COVID-19 data, there exists certain ethical issues that can affect its adaptability. For example, the effect of blockchain on the environment such as carbon emission due to huge power consumption poses critical challenges that must be given enough attention.

C. Slow Adoption of Blockchain Technology

COVID-19 has affected the social life, as well as business rules, and well-being of individuals, countries, and communities in various ways. The Blockchain technology has bounded up to deal with the affairs that are related to the health of individuals by proposing digital contact tracing solutions. So, the further research is required to propose standards, governance rules, and laws for blockchain technology to improve its adaptability by the participating organizations to fight against the COVID-19 pandemic like situations.

IV. DIAGRAMS

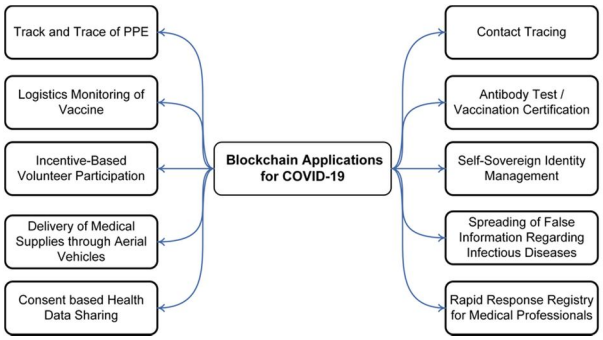


Fig. 1. Opportunities for Blockchain to combat COVID-19 pandemic.

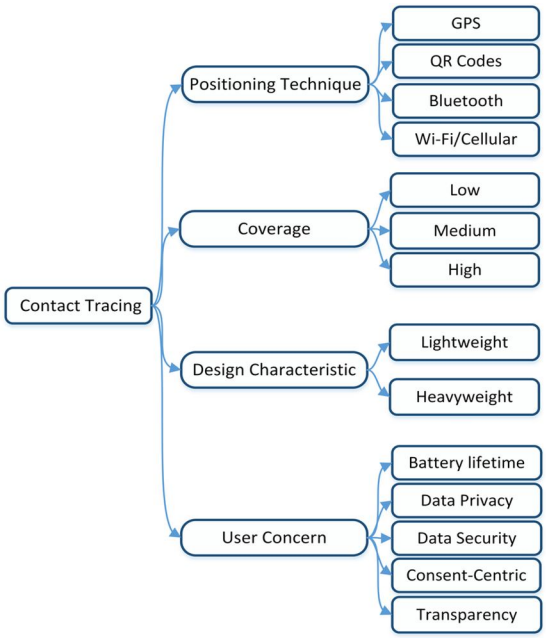


Fig. 2. Design for digital contact tracing solutions.

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V. LITERATURE REVIEW

Paper Title: Blockchain and COVID-19 Pandemic: Applications and Challenges
Author Name: Raja Wasim Ahmad, Khaled Salah, Raja Jayaraman, Ibrar Yaqoob, Samer Ellahham, and Mohammed Omar
In this paper they present the high-level design of three blockchain-technology-based systems to enable the governments and medical experts to efficiently handle health emergencies like pandemic caused by COVID-19. They discuss the important ongoing blockchain-based research project to demonstrate the adoption of blockchain technology for the COVID-19 pandemic. Finally, they identified and discuss future research challenges along with their key causes and guidelines. In this paper, they discussed in detail that how the emerging blockchain technology features and benefits can be leveraged for fighting against the COVID-19 pandemic like situations. They explored that the potential blockchain technology applications are mainly the healthcare emergency perspective to discuss the key role that blockchain technology can play vital role during the COVID-19 pandemic situation. They identified that the key requirements of the participating organizations, governments to develop blockchain-based systems for healthcare emergency services to combat the COVID-19 pandemic. They discussed existing blockchain-based systems that are developed recently to implement diverse services related to data privacy assurance, remote COVID-19 testing, seamless digital contact tracing of affected patients, and remote outpatient health monitoring. They identified and presented several research challenges that hinder the successfully implementation of blockchain technology for healthcare, medical expert emergency services during the COVID-19 pandemic situation [1].

Paper Title: A critical review of emerging technologies for tackling COVID-19 pandemic
Author Name: Elliot Mbunge, Boluwaji Akinnuwesi, Stephen G. Fashoto, Andile S. Metfula, Petros Mashwama
In this paper they geared towards the providing a comprehensive review of technologies like blockchain are tackling COVID-19 with emphasis on the features, challenges, and country of domiciliation. Their results show that performance of the emerging technologies like blockchain isn't yet stable because of lack of enough COVID-19 dataset, inconsistency in a number of the dataset available, aggregate of the dataset because of contrasting information, missing data, and noise. the protection and privacy of people's health information isn't totally guaranteed and warranted. Thus, further research is required to impower the present technologies like blockchain and there's a powerful requirement for the emergence of a sturdy computationally intelligent model for early medical diagnosis of COVID-19. Despite all the numerous progress within the application of emerging technologies like blockchain in compacting COVID-19 pandemic, there's still a requirement for further implementation of those technologies for detecting, monitoring, diagnosing screening, surveillance, mapping, tracking, and creating awareness. The size, availability and accessibility to COVID-19 data improve performance, GIS concepts, and applications. Future work should specialise in strengthening the present technologies like blockchain and there's a robust need for the emergence of a strong computationally intelligent model for early medical diagnosis of COVID-19 affected patients. instead of the long run work should specialize in the moral framework and acceptable use of emerging technologies when tackling COVID-19 pandemic while observing the protection and privacy of people's important data. [2]

Paper Title: Blockchain for COVID-19: Review, Opportunities, and a Trusted Tracking System
Author Name: Dounia Marbouh, Tayaba Abbasi, Fatema Maasmi, Ilhaam A. Omar, Mazin S. Debe, Khaled Salah, Raja Jayaraman & Samer Ellahham
In this paper they reviewed various blockchain applications and opportunities in fighting against the COVID-19 pandemic situation and develop the tracking system for the COVID-19 data collected from various sources. They proposed that, implement and evaluate a blockchain-based system using Ethereum smart contracts and oracles to trace reported data associated with the amount of latest cases found, deaths, and recovered patient cases obtained from trusted sources. They present detailed algorithms that capture the interactions between stakeholders within the networks. They present security related analysis and also the cost incurred by the stakeholders, and that they highlight that the challenges and future directions of their work. Their work demonstrates that the proposed solution is economically feasible and ensures data integrity, security, transparency, data traceability among everywhere the stakeholders. They presented an answer addresses the issues faced within the current pandemic situation crisis, like miscommunication, data manipulation, and single point of failure. As well as, it mitigates malicious activities because of its inherent cryptography security measures of blockchain technology systems. The smart contract code is created publicly available in GitHub. They present a close analysis to compute the transaction costs incurred by stakeholders when interacting with the smart contract. They presented security related analysis per integrity, accountability, authorization, non-repudiation, and resilience to common

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styles of cyberattacks, including DDoS attacks. As future work, they aim to expand the smart contract functionalities and develop DApps to enable participants to interact with Ethereum smart contracts effectively. [3]

VI. CONCLUSION

In this paper, we've presented the state-of-art survey on the use of blockchain technology to fight against the coronavirus (COVID-19) epidemic. we discussed that how the emerging blockchain technology features and benefits could also be leveraged for combating the COVID-19 pandemic. We explored the blockchain applications from mainly the healthcare emergency to debate the key role that blockchain can play during the COVID-19 pandemic situation. We identified that key requirements of the participating organizations to develop blockchain-based systems for healthcare emergency services to combat the COVID-19 pandemic. We discussed existing blockchain-based systems that are developed recently to empower diverse services related to data privacy assurance, mobile COVID-19 testing, contact tracing, and remote outpatient health monitoring. We identified and presented several research challenges that hinder the successful implementation of blockchain applications for healthcare emergency services during the COVID-19 pandemic.

VII. ACKNOWLEDGEMENT

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[2] DINH C. NGUYEN 1, (Member, IEEE), MING DING 2, (Senior Member, IEEE), PUBUDU N. PATHIRANA 1, (Senior Member, IEEE),AND ARUNA SENEVIRATNE 3, (Senior Member, IEEE) 1School of Engineering, Deakin University, Waurn Ponds, VIC 3216, Australia 2Data61, CSIRO, Eveleigh, NSW 2015, Australia 3School of Electrical Engineering and Telecommunications, University of New South Wales (UNSW), Sydney, NSW 2052, AustraliaCorresponding author: Dinh C. Nguyen (cdnguyen@deakin.edu.au)

[3] Mohamed Torky1,* and Aboul Ella Hassanien2.* 1 Faculty of Computer and Information Systems, Islamic University in Madinah, KSA 2 Faculty of Computers and Artificial Intelligence, Cairo University, Egypt * Scientific Research Group in Egypt (SRGE), Egyp

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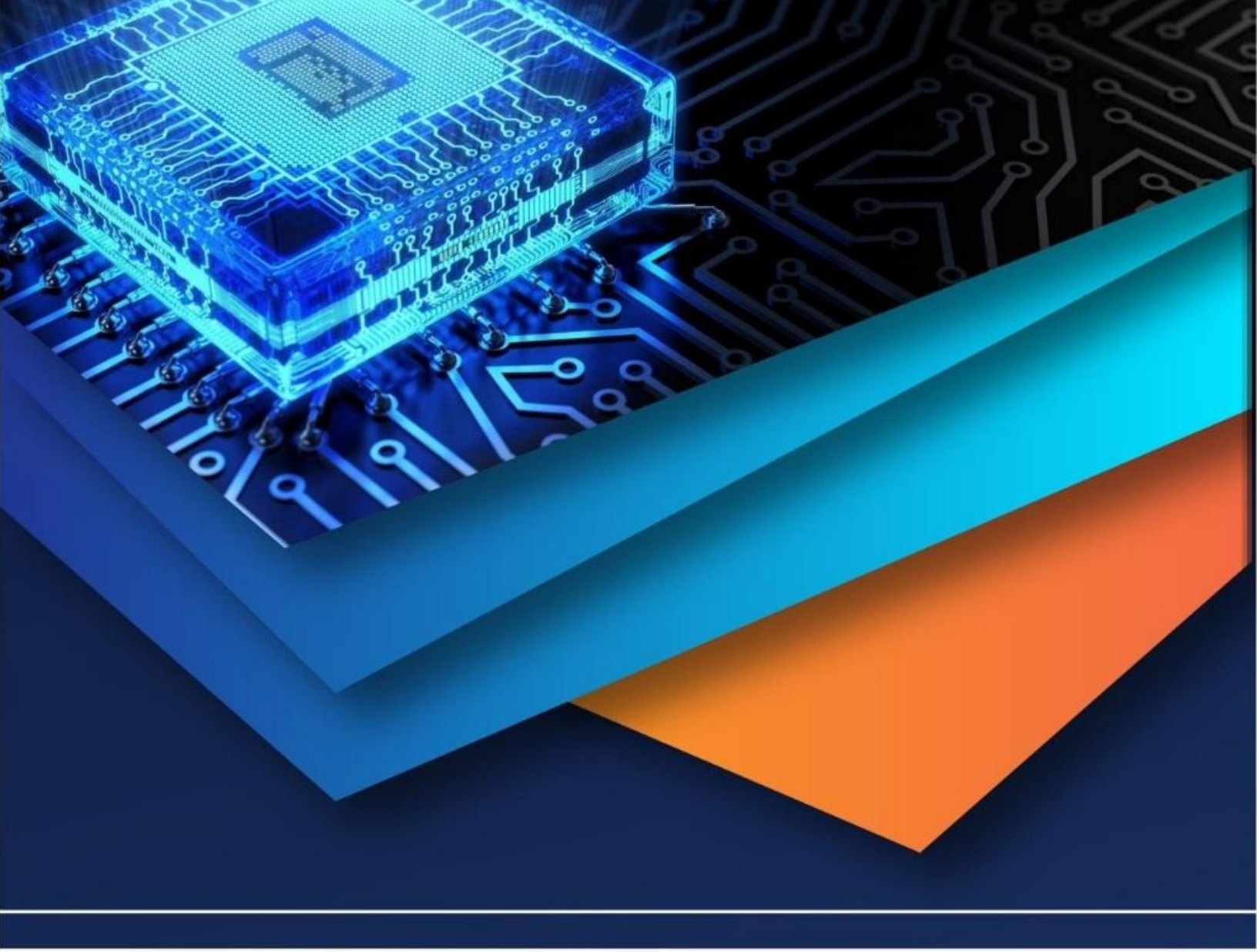
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