AI-ENABLED SHELTERED HEALTHCARE MANAGEMENT

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Abstract: At present-day, digital era of technology is emanating in the world in which AI, Big Data, Internet of things, accords a significant stake, from smart cities to smart cars. In the widespread circumstances, like at present, we have to dig away for the formation of smart healthcare execution background. This paper considers the abstraction of AI-enabled and sheltered machines incorporated with healthcare technologies. The authors initiate the concept of smart machines which will support healthcare workers in the management of patients health along with securing the patient's data in healthcare systems using Blockchain technology.

Keywords: Robotics, Artificial Intelligence, Machine Learning, Blockchain, Diffie-Hellman Key Exchange, RSA.

I. INTRODUCTION

1.Internet of Things(IoT):

Internet of things is a distinctive organization of unified featured gadgets, mechanical and computerized machines, items, integrated with software via internet in which individuals are given exceptional identifiers and the facility to shift information over a system to a server without the involvement of third-party or person. IoT unbolted commencements to much significant information through investigation, ongoing field information, and testing[1]. It has a broad range of applications including health management, Smart Cities, Smart Communities, traffic, agriculture, and weather monitoring, etc.

2. Artificial Intelligence:

Artificial intelligence(AI) is a stem of computer science that aspires to grant human intelligence to a machine by training them to formulate decisions resembling humans, for predicting future trends/events, better decision making etc. It has been also re-emerged as a revolution for various sectors of human life, for instance, travelling, home appliances, education, finance, health management etc[2]. Deep learning is a division of machine learning that stimulates machine using algorithms by means of artificial neural networks and learn from huge amounts of information.

3. IoT and AI-Based Healthcare Services and Applications:

At present, various applications of Internet of things and AI-based applications are being implemented, for instance, Wearable Health Devices[3], Wearable Cardiorespiratory Monitoring Stethoscope[4], Earlier cancer detection with AI, Using AI to efficiently diagnose and reduce error, Developing new medicines with AI, Streamlining patient experience with AI, Mining and managing medical data with AI, AI robot-assisted surgery, etc.

4. Blockchain:

In 1991, W. Scott Stornetta and Stuart Haber summarized Blockchain, it is presently the best option for secure data transmission. At present, Health care establishment is using blockchain for securely storing their patients' medical report. When a medical report is produced and approved, it can be inserted into the blockchain as a block, which gives patients the proof and confidence that report can not be misused by anyone. These personal medical reports can be encoded and preserved on the blockchain with a private key, which ensures privacy because these blocks can only be reachable by assured persons.

5. Diffie-Hellman Key Exchange:

Ralph Merkle conceived this key-exchange method and named it Diffie-Hellman after Martin Hellman and Whitfield Diffie. In this method, cryptographic keys can be securely exchanged through a public channel[5][6]. It is the first protocols for public key exchange which was implemented in the cryptography.

Diffie–Hellman implementation is as follows:

1. The A1, A2, A3 agree on the algorithm parameters p and g.
2. The A1, A2, A3 generate their private keys, named a, b, and c.
3. A1 computes g^a and exchanges it to A2.
4. A2 computes (g^a)^b = g^ab and exchanges it to A3.
5. A3 computes (g^ab)^c = g^abc and uses it as a secret.
6. A2 computes g^b and exchanges it to A3.
7. A3 computes (g^b)^c = g^bc and exchanges it to A1.
8. A1 computes (g^bc)^a = g^bca = g^abc and uses it as a secret key.
9. A3 computes g^c and exchanges it to A1.
10. A1 computes (g^c)^a = g^ca and exchanges it to A2.
11. A2 computes (g^ca)^b = g^cab = g^abc and implements it as a secret key.

6. RSA:

Ron Rivest, Adi Shamir, Leonard Adleman (RSA) named this encryption method by their initial letter from their surnames and is the initial public-key cryptosystems which are broadly used for safe data transmission. In this cryptosystem, the public key is used for encryption and decryption is done using a private key which is secretly kept with the receiver represented by Figure 1. RSA is considered secure because of its large prime number factoring difficulty.

Fig 1. RSA Model

II. PROBLEM FORMULATION AND SOLUTION

At present, almost every health-care worker is working overtime spending more time in hospitals and less time at home. Health worker works for the patient's welfare still during the current scenario. Even though, they are aware of the fact that that Covid-19 can be transmitted through respiratory droplets from the infected patent and they are probable of being affected due to the same in future. Even if healthcare workers take all the precautions as prescribed by WHO, still it is highly probable that they might become the host for spreading the virus putting others in danger like their family members, acquaintances, relatives or any other being who came in contact with them. Also, there are countries in the world who are currently facing the concern of healthcare workers dying due to high risk of transmission of the virus, irregular meals, overtime work, and stress.

III. SOLUTION

In this paper we put forward a theory of AI-enabled robotic machine for smart healthcare management[7] that can check vitals of a patients, and saving data accordingly, analyzing behaviours of patients using action recognition[8] and make Intelligent decision by immediately consulting with the doctor through physical media, providing emergency and supportive care, managing time schedule of a patient, direct contacting with the doctor in cases for emergencies and direct face to face virtual/digital checkups and consultation and routine checkups and automated management of e-systems within the hospitals alongside other health workers and solving security problem of data network transmission between smart machine and server, based on the identity authentication technology in blockchain, a data encryption transmission and authentication scheme [9] represented in Figure 2:

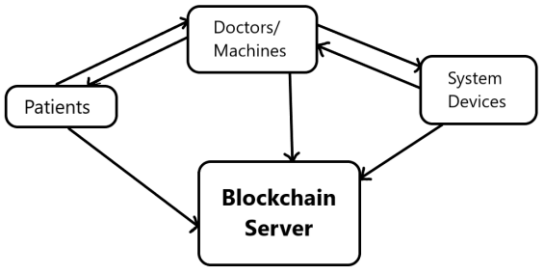

Fig 2. Smart Healthcare Management Environment

Future scope

AI-enabled machines can be really helpful in tackling future pandemic situations by making them faster and efficient for specific purposes in healthcare administration.

IV. CONCLUSIONS

Focusing on Artificial intelligence technology, combined with advanced technologies such as Internet of Things and blockchain, we will construct machines which can sense, analyze, and react. Thereby putting less pressure on healthcare workers and create a revolutionary healthcare administration.

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