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Health Information Exchange using BlockChain and Cardiac Disease Prediction using Naïve Bayes Algorithm

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Abstract: The interchange of electronic health data across healthcare facilities is made possible via the health information exchange program. There is a potential for data manipulation in this. This article primarily focuses on using "Blockchain," i.e. one of the greatest technologies, to secure medical health data. Blockchain has demonstrated its outstanding qualities in the field of cryptocurrencies like bitcoin and Ethereum. This study employs the Secure Hash Algorithm (SHA), Simple Mail Transfer Protocol (SMTP), and AES Rijndael Algorithm (SMTP). Additionally, using the Naïve Bayes method, we forecast many heart illnesses related to this work.
Keywords: Electronic Health Record(EHR), Health Information Exchange(HIE), Naïve Bayes Algorithm(NBA), Blockchain, Directed exchange, Query-based exchange, patient medicated exchange.

I. INTRODUCTION

For medical institutions all around the world, the massive global aging population and the sharp rise in the number of people with chronic illnesses like diabetes have been and continue to be a serious challenge. Healthcare information exchange (HIE) between health authorities is a major improvement factor for the healthcare industry. Several technological solutions have been proposed and deployed to improve the overall delivery of healthcare services to lessen the burden of chronic diseases. HIE can help researchers better understand clinical trials for particular patients, but it can also help advance scientific knowledge by enabling them to combine data from various trials for analysis. This could help researchers find new understandings and treatments that go beyond what can be inferred from a single study.

There are three different types of Health Information Exchange:

1) *Directed Exchange:* The main healthcare providers can communicate the patient's medical record to another healthcare practitioner directly using this approach. Problems, continuing prescriptions, lab test results, and records of discharge might be found in the medical files. All information sent between the concerned healthcare providers is done so in a safe, encrypted way.
2) *Query-Based Exchange:* This method of exchanging medical information makes it easier to look up and locate readily available clinical sources on a patient. This form is used by healthcare professionals or providers, typically in cases of an emergency or unanticipated care.
3) *Patient-Medicated Exchange:* Patients may control their health care through online access to health information, just like they can manage their finances through online banking. Patients can take an active role in their healthcare by working with professionals or other providers to monitor any health issues, spotting and correcting any inaccurate information, and changing the right billing information.

Heart attack, Angina, and Chest pain are the signs and symptoms of coronary heart disease, one of the cardiac diseases that accounted for around one-fourth of all fatalities in India. There may be 30 million Cardiac disease sufferers in India, 14 million of whom live in cities and 16 million in rural regions. Smoking, lack of exercise, high blood pressure, high cholesterol, an unbalanced diet, elevated sugar levels, etc. all raise the risk of a heart attack. Heart disease can be stopped from becoming worse with early identification and treatment. Medical data mining has been utilized extensively over the past several decades to uncover hidden patterns that may be applied to the clinical diagnosis of any illness dataset. One data mining strategy is classification, which categorizes patients as having a normal or cardiac disease. However, the classification uses all qualities, whether they are significant or not, which may hinder classification performance. One of the dimensionality reduction strategies used to increase accuracy is feature subset selection.

We forecast 16 different heart illnesses in this paper. Age, Sex, Height, Weight, QRS Duration, PR Interval, QT Interval, T Interval, P Interval, QRS, T, P, QRST, J, HR, DI Q Wave, DI R Wave, DI S Wave, DI R' Wave, and DI S' Wave are the 20 parameters that we are using (refer to input attributes mentioned at page 5). Additionally, a prescription will be supplied based on the anticipated outcome.

The scenarios listed below may help to understand the existing HIEs barriers: A patient relocated from Bangalore to Mumbai between the years 2010 and 2020, where he/she currently resides. He/she has a history of alcohol dependence and congestive heart failure dating back to 2012. (in continuous remission since 2012). He/she is admitted to the hospital in an emergency due to shortness of breath while in Chennai. The doctors at the hospital in Chennai must have access to the patient's past medical records from Bangalore and Mumbai. Due to privacy concerns about provider bias, and recent assurances from his current primary-care physician that his distant history of alcohol dependency has no current relevance for the management of his congestive heart failure, the patient chose to share only cardiology data but did not want other healthcare providers to know his/her history of substance abuse. As of right now, the usual HIE procedure will begin with a request to the central repository, followed by a connection to the repository from Bangalore and Mumbai via Regional Gateway Connections. To retrieve EHR data two major obstacles must be overcome for this information exchange to take place: (1) the longer time required for timely access to data from the central repository; and (2) the vulnerability of the patient's history of substance abuse being accessible to the provider against the patient's will. Health information exchange across institutions is hampered by three issues: (1) security and privacy concerns; (2) data breaches brought on by unauthorized access; and (3) data discrepancy between the recipient's data and that of the remote provider's EHR. The prompt and routine exchange of medical information can improve treatment decisions and enable the professionals to. 1) Enhanced diagnosis, 2) Eliminate redundant tests, 3) Avoid using unneeded drugs, and 4) limit readmissions

II. LITERATURE SURVEY

Yan Zhuang, Zon-Yin Shae [1]. In this paper, the author provides a feasible solution to challenges by utilizing the unique features of blockchain. The data of the patient will be kept secured. and cannot be modified by other hackers. The blockchain adapter extracts metadata and hashes the EHR reports in JSON format, then stores this information in a smart contract, and stores the EHR data in the secure database. The methodology used in this paper was Environmental setup, Linkage module, and Request Module. Environmental Setup: To join the blockchain system, each healthcare facility is required to provide at least one node, which can be any computer or a mobile phone; Linkage Module: The healthcare facility's adapter will hash the entire visit record in a JSON file and store the hashing value in the smart contract along with the touchpoint before the EHR data is stored in the secure database. Request Module: The healthcare facility will be assigned with an umbrella account in the blockchain that links to all clinicians involved in the care. All the clinicians could access the patient's records with one-time authentication from the patient. The access history will be recorded to the blockchain and the auditing of individual clinicians' access to the patient's record will be managed by the local access control within the healthcare facility. Advantages are 1) only authorized users were able to access data, 2) Data Consistency, and 3) Patients can control their data. The limitations are 1) each Healthcare facility is required to give at least one node and 2) Scalability Constraints.

Eman m. Abou-Nassar, Abdullah m. Iliyasu [2]. In this paper the author proposed a Blockchain Decentralised Interoperable Trust framework (DIT) for IoT zones where a smart contract guarantees authentication of budgets and an Indirect Trust Inference System (ITIS) reduces semantic gaps and enhances Trustworthy Factor (TF) estimation via the network nodes and edges. DIT Internet of Healthcare Things (IoHT) makes use of a private Blockchain ripple chain to establish trustworthy communication by validating nodes based on their inter-operable structure so that controlled communication required to solve fusion and integration issues are facilitated via different zones of the IoHT infrastructure. The methodology used in this paper was IoT layers and their Components, Cryptographic Algorithms that are used in BlockChain. IoT layers and their Components: The general architecture shows the different layers of our proposed DIT Blockchain IoHT framework. The first layer is dedicated to collecting and processing the information as well as making necessary changes to such data. The second layer comprises gateways and network paths required to transmit the IoT data. The third layer of our framework, also called middleware, consists of interposed sub-layers found between the technology and application levels. Lastly, at the lower end of the architecture, there is an application layer where all the system's functionalities are exported to the end-users. DITrust blockchain for IoHT Model: In this section, they presented the rudiments of the proposed DIT Blockchain framework for healthcare IoHT systems. It is designed to generate reliable cooperative IoT eco-systems (zones) with reliable mutual information integration between its members. In addition, the DIT IoHT framework is capable of decentralized, autonomous, transparent storage of interoperable trustworthy transactions. The Advantage of using this method was Evaluates Security Issues and Interoperability issues.

Yilong Yang, Xiaoshan Li, Nafees Qamar, et al [3]. This paper mainly deals with enabling healthcare professionals to appropriately access and securely share a patient's medical information using a Methodology like MedShare that allows the healthcare providers and administrators to maintain control of their patient data, which is always the primary concern in building a trustworthy environment for exchanging patient information. MedShare's approach to data security begins with storing indices of all patient data in the trusted public cloud of a public healthcare provider. The actual data is stored in the private clouds of the hospitals. The proposed approach includes a two-way authorization process to protect data from cyber-security attacks. EHR sharing request is only permitted and initiated by a doctor internally, and the request must be authorized by the patient and the data provider. The authentication process for doctors is implemented using the Role-based Access Control (RBAC) in the private cloud. The authorization mechanism is achieved by scanning the patient's ID card, which is then authenticated by the public cloud of the Resident Identification Authority (RIA). The advantage of using MedShare preserves patient privacy through a two-way authorization process that collects patient consent before making the data available through the public and private clouds. Limitations are, 1) That its reliability highly depends on the public cloud as EHRs can only be located through the public cloud. 2) The extra costs are needed to implement data transformers from a specific EHR format of a hospital to a unified data format.

Pravin Pawar, Neeraj Parolia, et al [4]. In this paper, they propose eHealthChain a blockchain-based Public Health Information Management System (PHIMS) for managing health data originating from medical IoT devices and connected applications using Methodology like OAuth 2.0 protocol It works by delegating user authentication to the service that hosts a user account and authorizing third-party applications to access that user account. Hyperledger Fabric platform is an open-source blockchain framework hosted by the Linux Foundation. It has an active and growing community of developers. IoT Medical Devices, The IoT enables healthcare providers to extend their reach outside of the traditional clinical setting. This type of patient care leverages connected devices with IoT sensors to offer providers a continuous stream of real-time health data such as heart rate, blood pressure, and glucose monitoring. The advantage is that compared to others it has less complicity for the users. Limitations Sharing personal health data with the external EHR system.

Repaka, A. N., Ravikanti, S. D. [5]. According to this paper predicting heart disease with the help of numerous attributes/symptoms is quite complicated. The present research utilizes the Naive Bayesian - data mining classification technique for effectively enabling heart disease diagnosis and thereby offering appropriate treatment. Supervising different medical factors and the post-operation period stands very crucial. AES encrypts the patients' records/data and saves it in the database. The results reveal that the diagnostic system built successfully predicts the risk level associated with heart disease. This paper provides a cost-effective hold of storing patient heart test results secured by the algorithm and then predicting the type of heart disease using the Naive Bayes algorithm.

III. BACKGROUND

A. BlockChain

Blockchain is a distributed ledger where data may be safely kept, making it impossible for the data to be changed. In other terms, we may characterize it as a platform for decentralized computing and information exchange that enables several authoritative domains to collaborate on logical decision-making. The terms "decentralized" and "distributed" here refer to the fact that each node has an equal priority and distributes its resources among itself. The term "blockchain" itself implies that data (i.e., transactions) will be kept as blocks of data. Each node can view the block, but they are unable to alter it. The hash value linked to a tampered block value changes and the modified block is removed from the network. Every node in the blockchain network receives the most recent blockchain in an average of 12.6 seconds. The Blockchain Network is the underlying technology of bitcoins.

The elements of a Blockchain network are listed below. –

1) *Node:* It keeps a complete copy of all transactions, including log data, encrypted data, hash values, etc. Transactions can be validated, approved, or rejected.
2) *Ledger:* Public ledger is employed in this study since it is transparent and open. Anyone with access to the blockchain network may read or write data on the public ledger.
3) *Wallet:* Public and private key pairs are used to keep a wallet's privacy secure. Because a private key is required to transmit money and decrypt messages, transactions are secure.
4) *Hash:* Using hashing, the data is mapped to a predetermined size. It is crucial to the field of cryptography. In a blockchain network, the input for one transaction is its hash value.

The following are the hash function's properties:

- Collision resistant
- Hiding
- Puzzle friendliness

In this study, a private blockchain is used, and for physicians to access a patient's EHR, they must request permission from the respective patient.

B. AES Rijndael Algorithm

The AES algorithm sometimes referred to as the Rijndael algorithm, is a symmetrical block cipher that transforms plain text into cipher text utilizing keys with lengths of 128, 192, and 256 bits. The AES algorithm is accepted as a global standard because it provides better security compared to other.

To create cipher text, the AES algorithm employs a substitution-permutation, or SP, network with many rounds. Depending on the key size being utilized, the number of rounds will vary. There are 10 rounds for 128-bit key sizes, 12 rounds for 192-bit key sizes, and 14 rounds for 256-bit key sizes. Every one of these rounds needs a round key, but since the method only accepts one key, this key must be extended to obtain keys for every round, including round 0.

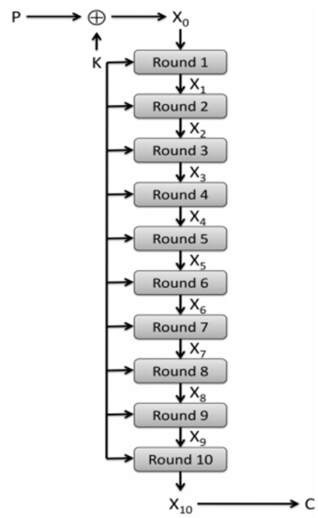

Fig 1: Working AES rijndael algorithm.

C. SHA Algorithm

The National Security Agency developed SHA-2 (Secure Hash Algorithm 2) in 2001 as a replacement for SHA-1. The SHA-256 algorithm is one variant of SHA-2. A 256-bit value is produced using the patented cryptographic hash algorithm SHA-256.

Data is changed into a safe format during encryption so that it cannot be read unless the receiver possesses a key. The data may be as big as you like when it's encrypted, and it's frequently the same size as unencrypted data. Contrarily, with hashing, data of any size is converted to data of a specific size. For instance, SHA-256 hashing would reduce a 512-bit string of data to a 256-bit string.

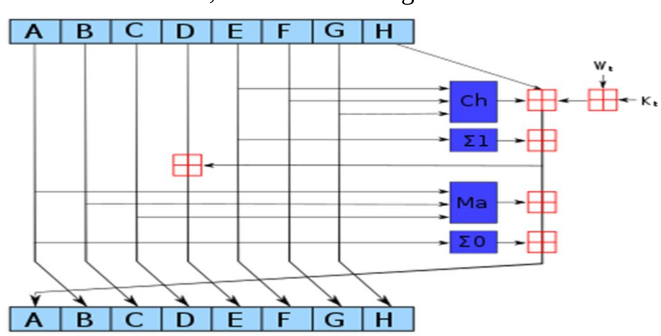

Fig 2: One iteration in an SHA-2 family compression function. The blue components perform the following operations: The bitwise rotation uses different constants for SHA-512. The given numbers are for SHA-256. The red is an addition modulo 232 for SHA-256 or 264 for SHA-512.

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D. Naïve Bayes Algorithm

The Naive Bayes algorithm is a supervised learning method for classification issues that is based on the Bayes theorem. It is mostly employed in text categorization with a large training set. The Naive Bayes Classifier is one of the most straightforward and efficient classification algorithms available today. It aids in the development of rapid machine learning models capable of making accurate predictions. Being a probabilistic classifier, it makes predictions based on the likelihood that an object will occur. Spam filtration, Sentimental analysis, and article classification are a few examples of Naive Bayes algorithms that are often used.

The Bayes theorem, commonly referred to as Bayes Rule, is used to calculate the likelihood of a hypothesis given certain previous information. The conditional probability determines this.

The Bayes theorem's formula is as follows:

$$P(A \mid B) = (P(B|A) * P(A)) / P(B)$$

In the above formula:

1) P(A|B) is Posterior probability: Probability of hypothesis A on the observed event B.
2) P(B|A) is Likelihood probability: Probability of the evidence given that the probability of a hypothesis is true.
3) P(A) is Prior Probability: Probability of hypothesis before observing the evidence.
4) P(B) is Marginal Probability: Probability of Evidence.

Input attribute used in the paper

- Age in year
- Gender (male:1, female: 0)
- Height in cm
- Weight in KG
- QRS duration represents the time for ventricular depolarization. The duration is normally 0.06 to 0.10 seconds
- P R interval is the time from the beginning of the P wave (atrial depolarization) to the beginning of the QRS complex (ventricular depolarization). The normal PR interval measures 0.12-0.20 seconds (120-200 milliseconds)
- Q T Interval: The QT interval on the surface ECG is measured from the beginning of the QRS complex to the end of the T wave. Thus, it is the electrocardiographic manifestation of ventricular depolarization and repolarization.
- T interval: The interval from the beginning of the QRS complex to the apex of the T wave is referred to as the absolute refractory period.
- QRS: The QRS complex is the main spike seen in the standard ECG. It is the most obvious part of the ECG, which is visible. The QRS complex represents the depolarization of ventricles. It shows the beginning of systole and ventricular contraction.
- T: The T wave on an electrocardiogram (ECG) represents typically ventricular repolarization
- P: The P wave and PR segment is an integral part of an electrocardiogram (ECG). It represents the electrical depolarization of the atria of the heart.
- QRST interval (Q–T interval) in the electrocardiogram, the length of time between ventricular depolarization (the Q wave) and repolarization (the T wave); it begins with the onset of the QRS complex and ends with the end of the T wave.
- J: The J point denotes the junction of the QRS complex and the ST segment on the electrocardiogram (ECG), marking the end of depolarization and the beginning of repolarization.
- HR is an electrocardiogram (ECG) test that measures the electrical activity of the heart. A normal resting heart rate is 60 to 100 beats per minute.
- DI Q Wave: Q wave indicates that the net direction of early ventricular depolarization (QRS) electrical forces projects toward the negative pole of the lead axis in question
- DI R and R’ Wave: The R wave is the first upward deflection after the P wave. The R wave represents early ventricular depolarisation.
- DI S and S’ wave: The S wave signifies the final depolarization of the ventricles, at the base of the heart.

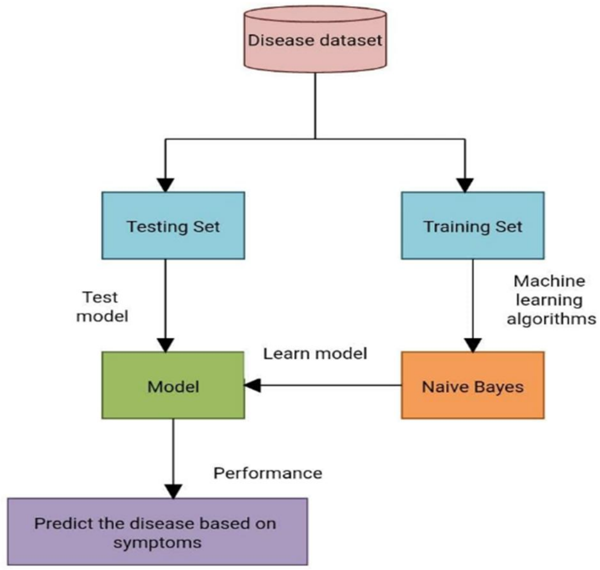

Fig 3: working of Naïve Bayes Algorithm.

E. *Amazon Web Server(AWS)*

The Entire data that is collected will be stored using the AWS server so that the framework can be run parallelly over different systems at the same time. In this paper, the different users such as system managers, hospital staff, clinicians, and patients can use the application at the same time over the different systems.

IV. METHODOLOGY

A. *Health Information Exchange.*

The HIE module contains three modules they are: 1) Environmental setup 2) Linkage Module 3) Request Module

1) *Environmental setup:*

To join the blockchain system, each healthcare facility is required to provide at least one node, which can be any computer; These nodes need to take the following steps to build a “blockchain adapter” to communicate with the system:

a) Deploy the appropriate "Genesis block" (the blockchain's first block).
b) Build an RPC server (Remote Procedure Call) that can connect to servers outside the adapter and secure EHR databases inside the healthcare firewall facility.
c) Create an external receiving database to house information gathered from all other healthcare facilities' blockchain adapters.

The working of the aforementioned technique is illustrated in Fig. 2 below.

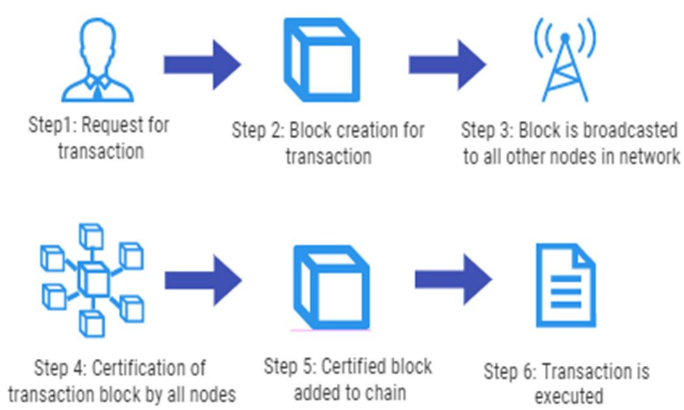

Fig 4 BlockChain Creation

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2) *Linkage Module:* When the EHR data is prepared for a patient's visit, the healthcare facility's adapter will hash the whole visit record and store the hashing value in the smart contract along with the touchpoint before the EHR data is stored in the safety database. The data decryption phase will employ the hashing value to check for data consistency. After final decryption, any alteration of the data—initiated by the healthcare facility adapter intentionally or unintentionally will result in mismatched hashes and security alerts. This, rather than the smart contract code or the data held inside the smart contract, is available by all users after the smart contract is placed onto the blockchain. The blockchain also returns a smart-contract address and an application binary interface (ABI). The touchpoints may be kept safe, unchangeable, anonymous, and simple to search by patients and authenticated professionals by using the smart contract to store them.
3) *Request Module:* In some circumstances, such as an emergency room visit where numerous physicians are involved in the patient's treatment, it is unrealistic for patients to authorize each of the professionals once they have been admitted to a healthcare institution. The hospital will be given an overarching account in the blockchain that connects to all of the clinicians working on the case. With the patient's one-time authentication, all providers could access the patient's records. The access history will be stored on the blockchain, and local access control within the healthcare institution will be in charge of managing the auditing of each clinician's access to the patient's information. Through biometric authentication or a web-based Graphical User Interface (GUI), the patient can add the facility's umbrella ID to the "allowed list." The clinician's proxy ID should be automatically populated into the GUI after the patient and the clinician provides biometric information to authenticate the system. Through the clinicians' GUI, only the clinicians covered by this umbrella ID can view the patient's data.

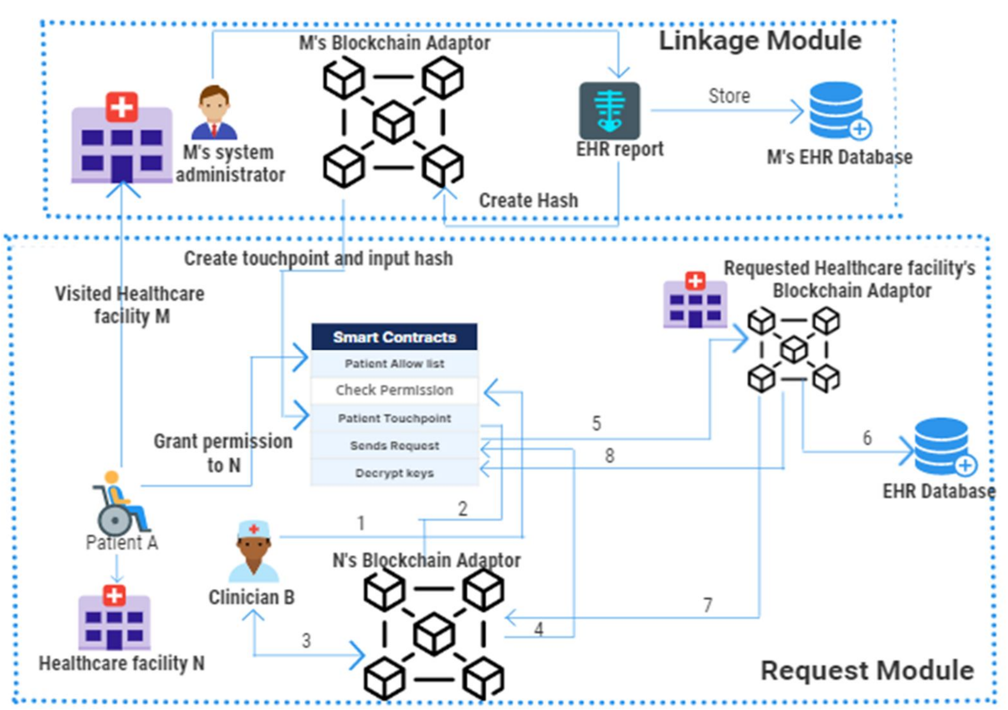

Fig 2: System Architecture: 1. Check permission for Access A's record. 2. Sends touchpoints to adapter 3. Select touchpoint through GUI. 4. Sends requests for selected records. 5. Sends a request to the remote healthcare facility. 6. Query request records. 7. Sends encrypted data stored into receiving database. 8. Sends decrypt keys.

B. *Cardiac Disease Prediction*

We are also forecasting the types of cardiac diseases. The Prediction Module will be integrated into the Doctor's Login using the Naive Bayes algorithm so that the user can use it for research. Following is how the NBA operates: Data for training and data for testing will be separated from the dataset. The algorithm will then receive training data, and the model will receive test data. The model then makes a disease prediction using the input parameters physicians will then propose a medication depending on the predicted illness.

V. WORKING

The system working is as follows.

The major goal of our work is to safeguard patient EHR data and put it in a blockchain ledger. The AES Rijndael Algorithm will be used to encrypt the stored data, while SHA256 is applied to provide hash values for the blockchain. The data is labeled as tampered with if there is any discrepancy in the hash values. The physicians can restore the data if it is flagged as tampered with by using the "record recover" option. By selecting "Record Recover," the system locates another blockchain model that contains identical encrypted information that has been saved in another database and copies that information to the original blockchain. This will enable record recovery and ensure the security of patient data.

A. System Manager

Options available on the system manager's dashboard include adding hospitals and departments. The department name and other details will be recorded when creating a department. Additionally, while adding a hospital, essential information such as the hospital's name, address, contact information, and email address should be provided. Following a successful registration, the hospital's credentials will be transmitted through SMTP protocol to the email address provided.

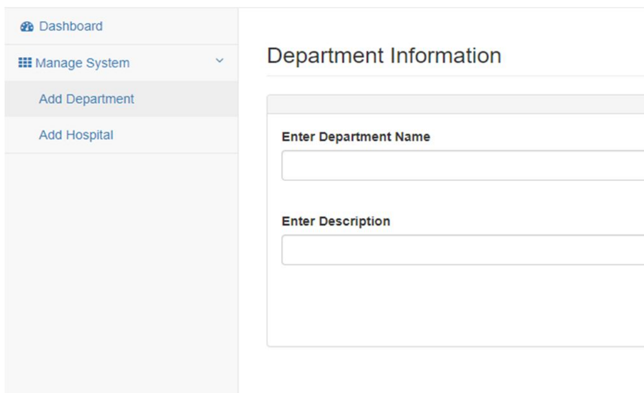

Fig 4: System Manager Dashboard

B. Doctor Dashboard

The doctor uses the patient ID to find the patient on the Patient Therapy page in the doctor's dashboard, and then prescribes a treatment based on a later-searchable Keyword. The "Patient Treatment and Prescription" Section's treatment data will be encrypted using the AES Rijndael Algorithm and kept in Blockchain as encrypted data.

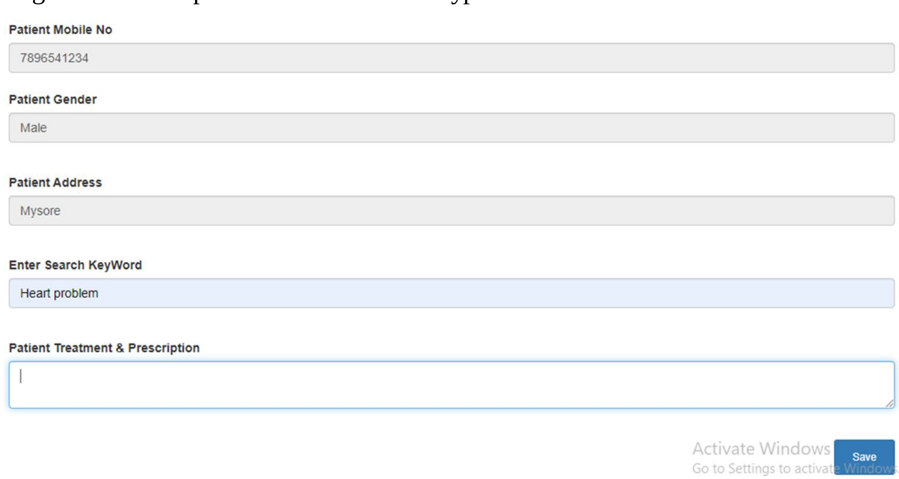

Fig 5: Giving Treatment based on Keyboard

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SlNo	DoctorId	PatientId	SearchKey	LogDate	PHV	CHV	ED
1	260472	483449	Heart p...	14-06-...	000	7ad5d3905d8...	vSa2DzR0UPouYlNk1UMBvFvVVZbDLxmvnKxOw...
2	260472	483449	Heart p...	14-06-...	7ad5d3905d86...	2d3daac1cb1...	pdx44Ge59nEwT2wa+8D21NSaERuPVP3HWdzv...
3	446977	647611	Heart p...	18-06-...	2d3daac1cb16...	20f1ddfbf7a0...	WPesSOFZmVOkEa7NdtihiiL6SL7Os3EiXaOSKfn...
4	722610	465259	Otoscle...	18-06-...	20f1ddfbf7a07...	7ab642f7af33...	oNA+vYt0cZf+YHPK8ukpHzbSom0OMaRvhRC8...
5	551042	215832	Heart p...	18-06-...	591c0ec353fd...	[illegible]	[illegible]
6	722610	647611	Heart p...	27-06-...	15f3f814bfe5a...	[illegible]	[illegible]
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

591c0ec353fdacaf07ef930944391454a5d19bbbaf76c89e8a555ead1e7baec

Fig 6: BlockChain Model

Fig 6. describes the blockchain model, which will be kept in the database. The blockchain table contains information such as DoctorID (the doctor who administers the treatment), PatientID (the patient who received the treatment), Search Key (a keyword associated with the disease), Log Date (the date of the treatment), Previous and Current Hash Value (for determining the blockchain's data integrity), and Encrypted data (for storing encrypted treatment data).

In Query-Based Exchange, a doctor in a crisis can view patient information without getting in touch with the patient. The database is given in Fig. 7 below, and it contains a complete record of all accessible information. RRId stands for Record Request ID, ID for the doctor who submitted the request, SLNo for the blockchain whose data was requested, Access Key for the OTP that the system sent to the doctor for verification, and Status for the record's approval, rejection, or pending status

RRId	Id	SlNo	RDate	AccessKey	Status
2	260472	2	14-06-2022	6161	Approved
3	260472	1	14-06-2022	4943	Approved
4	446977	3	18-06-2022	4501	Pending
5	446977	3	18-06-2022	7491	Pending
6	446977	1	18-06-2022	2318	Approved
7	722610	4	18-06-2022	5333	Pending
8	722610	1	18-06-2022	5072	Pending
9	722610	3	18-06-2022	1347	Pending
10	551042	5	18-06-2022	4344	Approved
11	551042	5	18-06-2022	3005	Reject
12	722610	6	27-06-2022	6429	Pending
13	722610	3	27-06-2022	2392	Pending
14	722610	6	27-06-2022	4984	Pending
15	722610	5	27-06-2022	1305	Pending

Fig 7: Accessed record stored in Database

Clinicians ask patients for their EHR in directed exchange and patient-medicated exchange. The patient will get the access requests and may decide whether to accept or reject them depending on their interests. The doctor can access the record on the View Patient dashboard if the request is granted.

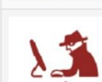
Doctor Name	Patient Name	Treatment Date	Status		
Dr Chandra	poiop	14-06-2022 22:59:34		Request	Record Recover
Dr Chandra	poiop	14-06-2022 23:00:13		Request	Record Recover
dr vishnu	altaf	18-06-2022 19:46:36		Request	Record Recover
Dr shankar	Rani	18-06-2022 21:12:56		Request	Record Recover
DR Ram	altaf	27-06-2022 22:58:31		Request	Record Recover

Fig 8: Request sending portal

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C. Patient Dashboard

The patient will log into their system and either approve or reject the request based on their interests. The request information includes details like the name of the doctor who requested the data, the date of the request sent by the doctor, and they can approve/reject button.

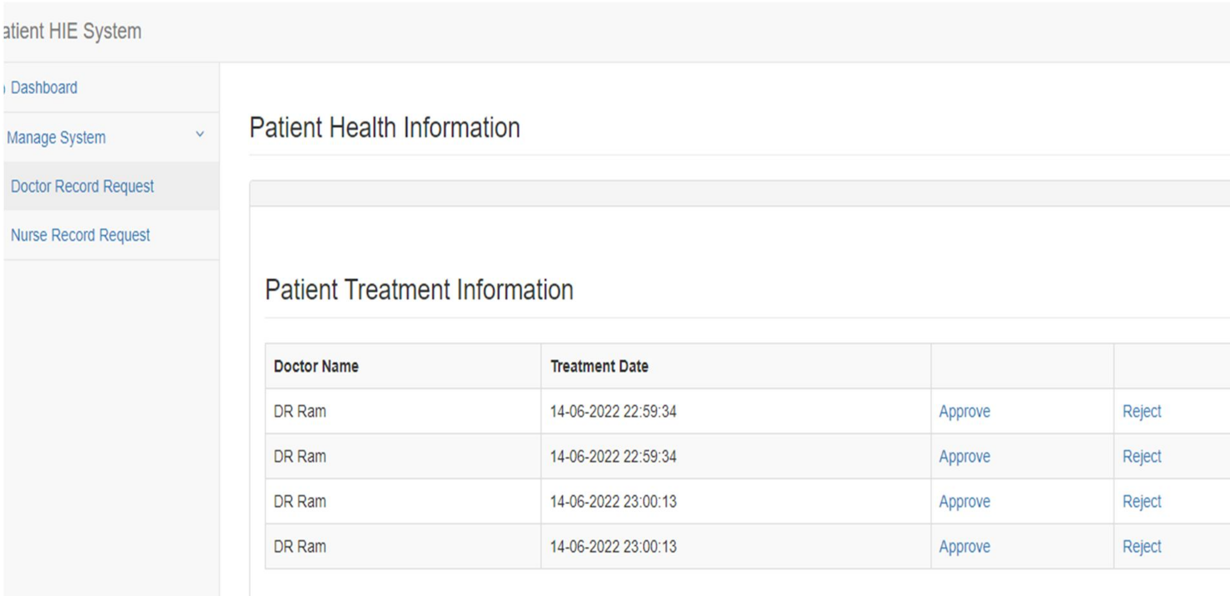

Fig 9: Patient Request Approval Dashboard

D. Cardiac Disease Prediction

A further module of the existing system, which predicts 16 different forms of heart illness, is dedicated to doing so. Age, Sex, Height, Weight, QRS Duration, PR Interval, QT Interval, T Interval, P Interval, QRS, T, P, QRST, J, HR, DI Q Wave, DI R Wave, DI S Wave, DI R' Wave, and DI S' Wave are the 20 characteristics that will be used to predict the outcome. And based on the outcome, a medication suggestion will be given. Users can input various ECG data to receive a forecast of heart illness.

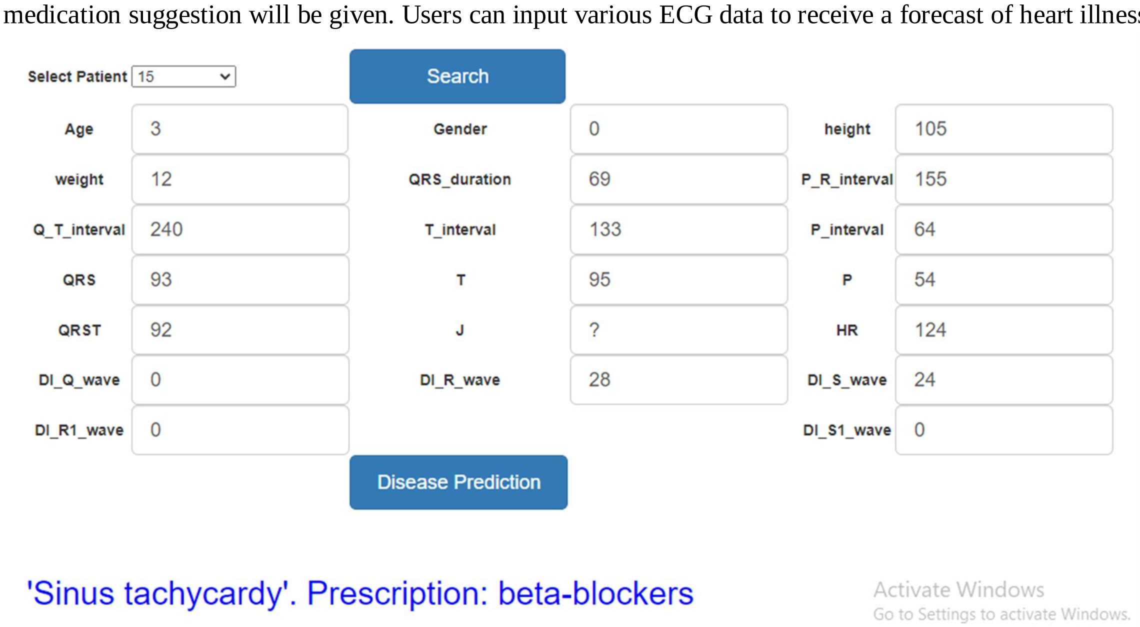

Fig 13: Based On the result Prescription will be Printed on the screen.

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Age	sex	height	weight	QRS_duratior	P-R_interval	Q-T_interval	T_interval	P_interval	QRS	T	P	QRST	J	HR	I_Q_wav	I_R_wav	I_S_wav	I_R'_wav	I_S'_wav	Result
2	75	0	190	80	91	193	371	174	121	-16	13	64	-2	?	63	0	52	44	0	0	8
3	56	1	165	64	81	174	401	149	39	25	37	-17	31	?	53	0	48	0	0	0	6
4	54	0	172	95	138	163	386	185	102	96	34	70	66	23	75	0	40	80	0	0	10
5	55	0	175	94	100	202	380	179	143	28	11	-5	20	?	71	0	72	20	0	0	1
6	75	0	190	80	88	181	360	177	103	-16	13	61	3	?	?	0	48	40	0	0	7
7	13	0	169	51	100	167	321	174	91	107	66	52	88	?	84	0	36	48	0	0	14
8	40	1	160	52	77	129	377	133	77	77	49	75	65	?	70	0	44	0	0	0	1
9	49	1	162	54	78	0	376	157	70	67	7	8	51	?	67	0	44	36	0	0	1
10	44	0	168	56	84	118	354	160	63	61	69	78	66	84	64	0	40	0	0	0	1
11	50	1	167	67	89	130	383	156	73	85	34	70	71	?	63	0	44	40	0	0	10
12	62	0	170	72	102	135	401	156	83	72	71	68	72	?	70	20	36	48	0	0	3
13	45	1	165	86	77	143	373	150	65	12	37	49	26	?	72	0	40	28	0	0	1
14	54	1	172	58	78	155	382	163	81	-24	42	41	-13	?	73	0	72	0	0	0	10
15	30	0	170	73	91	180	355	157	104	68	51	60	63	?	56	0	92	0	0	0	6
16	44	1	160	88	77	158	399	163	94	46	20	45	40	?	72	0	80	0	0	0	1
17	47	1	150	48	75	132	350	169	65	36	45	68	40	?	76	0	48	0	0	0	1
18	47	0	171	59	82	145	347	169	61	77	75	77	75	?	67	0	48	0	0	0	10
19	44	0	169	80	109	128	382	195	60	-34	112	154	7	?	63	20	80	0	0	0	16
20	34	0	170	73	94	186	373	224	125	90	52	60	77	?	83	0	44	36	0	0	14
21	31	1	160	54	95	161	407	168	83	10	48	39	30	?	67	0	52	36	0	0	10
22	56	1	164	65	90	164	420	381	99	-8	153	41	0	?	79	0	72	0	0	0	2
23	51	1	160	83	96	147	400	301	82	-37	172	-5	-67	160	71	0	60	0	0	0	2
24	53	0	175	85	85	157	408	172	91	-52	16	54	-32	?	51	0	92	0	0	0	6
25	35	1	164	94	85	200	385	174	74	48	35	15	39	?	62	0	52	32	0	0	10
26	62	1	163	60	80	185	354	166	107	-2	3	40	-1	?	75	0	56	16	0	0	1
27	45	0	175	80	94	163	401	159	106	-57	-8	70	-48	?	53	0	60	0	0	0	6
28	75	1	156	55	73	159	350	138	99	-18	60	57	-1	?	89	0	64	0	0	0	4
29	69	1	160	71	75	156	322	172	105	18	8	70	14	?	98	0	36	36	0	0	5
30	30	1	158	57	73	137	369	143	77	30	-18	36	20	?	67	0	72	0	0	0	1
31	41	1	159	55	78	228	429	130	94	63	76	77	68	?	53	0	40	0	0	0	6
32	39	0	172	76	103	147	356	162	80	11	9	55	9	?	73	0	48	40	0	0	10
33	24	1	163	53	92	157	370	142	68	64	45	62	59	?	64	20	60	0	0	0	16

Fig 14: Training Dataset

With their consent, the patient's cardiac data will be gathered and saved as shown in fig 14. The information here will be utilized for more cardiac research. The gathered information will be utilized to train the machine learning model and forecast heart illness. The training data will be used to produce the testing data, and four different types of splits will be performed. The split is 90:10, 80:20, 70:30 and 60:40. And we are receiving 91% accuracy for 60:40 ratio. Each split's outcome will be forecasted. The accuracy of each sample will then be printed each time to demonstrate the accuracy of the machine learning model.

SlNo	Result
1.	1
2.	10
3.	1
4.	1
5.	1
6.	1
7.	1
8.	10
9.	10
10.	10
11.	10
12.	1
13.	1
14.	10

Fig 15: Predicted Output using Testing data

The results for each subject whose data was gathered during the test are displayed above in fig. 15. And after the prediction of each splits the accuracy of correctly classified information will be displayed over the screen.

VI. CONCLUSION AND RESULT

A blockchain-based healthcare information exchange system guarantees reliable assessments of patients' health, generates fresh ideas, and promotes the transition to value-based treatment. Blockchain technology can bring about significant improvements in proper safety, quality of vaccinations, medications, diagnostics, and treatment processes. These changes are made possible by increased transparency, security, and ease of access to information. Making use of this technology will have wide-ranging effects on healthcare ecosystem stakeholders.

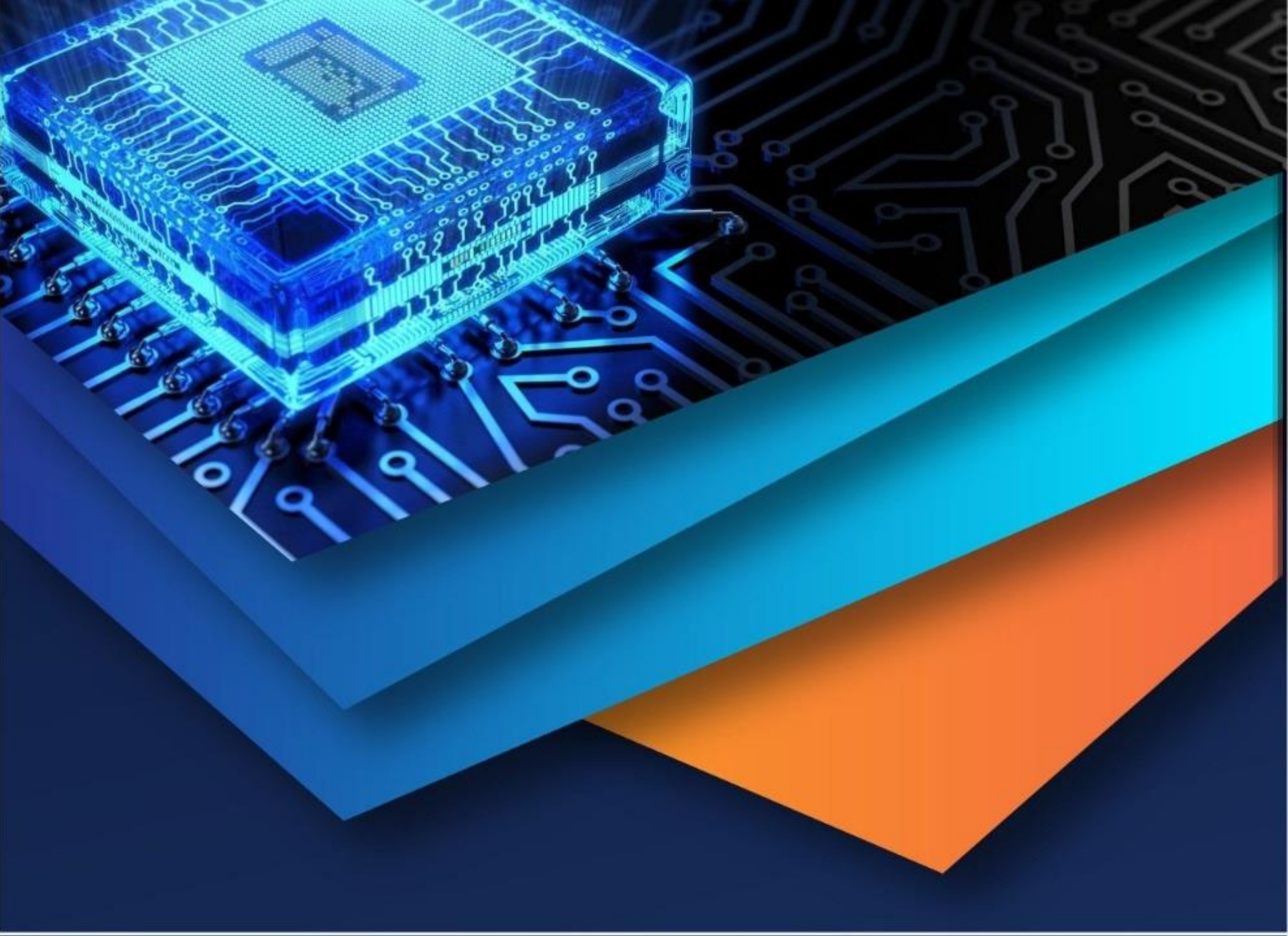
This research examined the present situation of medical information from many angles. A blockchain-based health information system has been created, and the data is saved on an Amazon AWS web server using the AES encryption technique before being decoded at the terminals. SHA256 is being used to generate a hash key for the blockchain and check the integrity of the data. In this framework, three types of exchange have also been achieved. Based on the needs of medical mining, the naive Bayes classification technique has been implemented, and its key aspects have been emphasized. We experimentally demonstrate its appropriateness to the challenges in the medical arena in comparison to other techniques based on the experimental results. The experimental result has received 91% accuracy for a 60:40 split where 60% of training data and 40% of testing data were used and shows that NB is better than the compared approaches on most of the used medical data sets. The system also gives the suggestion of prescription based on the result predicted during the emergency purpose. This project can be used by other doctors to read and validate the patient's details and provide the suggestion as a prescription which will be predicted by the Naive Bayes algorithm

VII. FUTURE WORK

Work on adding a feature to the health information system so that in the future, patients themselves will be able to enter their symptoms and obtain a general idea of the ailment they have. Future functionality includes the ability to purchase medications from a reputable pharmacy, which will make the system easier to use and assist patients in finding high-quality medications. A credit-based system of grading the physicians that would raise their responsibilities to society as a whole and keep them in check It is suggested that this system be maintained open so that patients may choose their providers based on information.

REFERENCES

[1] Yan Zhuang, Zon-Yin Shae, Yin-Wu Chen, and Chi-Ren Shyu, "A Patient-Centric Health Information Exchange Framework Using BlockChain Technology" IEEE, pp- 2169 – 2176, 2019.
[2] Eman m. Abou-Nassar, Abdullah m. Iliyasu, Passant m. El-kafrawy, oh-young song, Ali Kashif Bashir and Ahmed a. Abd el-Latif, "DITrust Chain: Towards Blockchain-Based Trust Models for Sustainable Healthcare IoT Systems" IEEE, pp- 11223 – 111238, 2020.
[3] Yilong Yang, Xiaoshan Li, Nafees Qamar, Peng Liu, Wei Ke, Bingqing Shen and Zhiming Liu, "Mindshare: A novel hybrid cloud for medical resource sharing among autonomous healthcare providers." IEEE, pp- 46949 – 46961,2018.
[4] Pravin Pawar, Neeraj Parolia, Sameer Shinde, Thierry Oscar Edoh and Madhusudan Singh "eHealthChain—a blockchain-based personal health information management system" Springer, 2021.
[5] Repaka, A. N., Ravikanti, S. D., & Franklin, R. G., "Design and Implementing Heart Disease Prediction Using Naive Bayesian", ICONIC, 2019.
[6] Kaled salah, m. Habib ur Rehman, Nishara Nizamuddin, and Ala al-fuqah, "Blockchain for AI: Review and Research Challenges" IEEE pp-10127 – 10149, 2018.
[7] Emeka Chukwu and Lalit Garg "A Systematic Review of Blockchain in Healthcare: Frameworks Prototypes and Implementations", IEEE, pp- 21196 – 21214,2020.



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