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USING MACHINE LEARNING, AN INNOVATIVE IOT AND CLOUD COMPUTING BASED HEALTH MONITORING SYSTEM.

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Abstract:

The Internet of Things (IoT) has lately emerged as one of the most popular emerging technologies in the IT sector. The Internet of Things (IoT) is a network of linked, intelligent physical items. Sensors are included into physically connected items and interact with one another through wired or wireless networks. The primary features of IoT are device interconnectivity, smart, dynamic nature, sensing, massive scale, heterogeneity, and security. Database, application, and storage services are just a few of the cloud services that a user may access across a network. Health care is one of the many industries where the Internet of Things (IoT) offers a broad range of field applications for constant monitoring. With the advent of IoT-cloud-based devices, the Internet of Things (IoT) has established itself in sectors that deal with massive volumes of data. The healthcare system is one of the newest applications for the IoT-Cloud. To safeguard the privacy of patient data, several research are carried out. The main issues with the IoT-based cloud-based health system remain to be data security and computational overheads. Utilising patient data from an IoT device to forecast sickness is another difficult task for health systems.

Keywords: IoT, Cloud, Health, Data, Security

1 INTRODUCTION:

The Internet of Things (IoT) is a network of physically connected electronic devices that can gather and send data online. Through the internet, cloud computing offers customers a range of services, including database, networking, and storage. IoT and cloud computing integration may maximise resource storage and performance

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possibilities. Therefore, a front-end for accessing the Internet of Things is cloud computing. By promoting and pushing individuals to utilise linked gadgets like smartphones, wearables, and handheld devices to live comfortably, the consumerization of the healthcare system has exploded. The Internet of Things is a cutting-edge technology that overcomes interoperability barriers to significantly alter the way healthcare is delivered, leading to better outcomes, higher quality, and more accessibility. Infrastructures focused on people are equipped with the Internet of Things to deliver better results. This chapter discusses how safeguarding patient data privacy in health cloud systems depends critically on the Internet of Things (IoT) connected with the cloud.

Through the pooling of computing and storage resources, and then integrating them into the ability to provision on demand based by a pay-per-use system cloud computing is the basis for an evolving model of delivery of services that have benefits of lower expenses. This new characteristics can have an effect on the traditional security, trust and privacy practices, while directly impacting the information technology (IT) strategies. To maintain customers' trust and trust, the benefits of cloud computing -- its capacity to expand quickly, manage data remotely and provide the services of a rapidly changing world can be transformed into obligations. It is imperative to develop new approaches in order to accommodate this rapidly evolving technology because conventional privacy or security procedures (such models agreements) cannot be modified or sufficient in terms of change. This chapter focuses on security, trust, as well as privacy issues related to cloud computing, and suggests solutions. There isn't any specific, definite definition of cloud computing however, it is NIST's (National Institute for Standards and Technology) most commonly used definition of cloud computing is: a cloud computing pool that is reconfigurable to share resources (such as servers, networks applications, storage and other services) which can be swiftly deployed and released without any administration or provider interactions is created by Cloud computing.

The potential market for cloud computing provides a great level of assurance for the success of new businesses (especially within the

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service industry) and is likely to change the way we think about information technologies, infrastructures, models and even services. Companies that pay-as you-go not only cost less, they can also reduce business risks because no major loan is required to set up the infrastructure you need. Based on the regional requirements along with corporate culture, specific market conditions, the shift towards cloud computing could lead to rapid improvement. Even though we're at an early stage technology, cloud computing is beginning to be widely accepted across all over the world. Both governments and companies have a difficult time trying to adopt cloud-based solutions because of the commercial capabilities of the technology as well as its ability to accelerate the pace of growth.

2 LITREATURE SURVEY

The whole of the Indian healthcare system's architecture has been outlined by Chokshi et al. (2016). The eleven layers of the Indian public health system are explored in depth, as are their functions. The layers include rural healthcare professionals, low-income patients, district hospitals, sub-district hospitals, community health centres, and the workforce for these layers. They also include primary health centres (PHCs), the work force for PHCs, sub-health centres (SHCs), and other layers. Each layer's population is growing, from medical schools to the workforce at SHCs. According to Imrana Qadeer (2000), the Indian healthcare system is undergoing a significant transformation across all specialised medical professions. The pressure to transform into a healthy, prosperous society has been increased by the rapidly rising population. According to Garg et al. (2012), both rural and urban areas of India have inadequate healthcare facilities. In addition to the personnel shortage, a critical element to take into account is the lack of technical infrastructure.

The coverage and quality aspects of basic healthcare in India are summed up by Nirupam Bajpai & Sangeeta Goyal (2004). They claim that the Indian government spends a relatively little portion of its GDP on basic healthcare. More money must be invested and a more sophisticated medical infrastructure must be developed for public health care as more people in the nation live in poverty. Ranganayakulu Bodavala

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(2002) also covered the use of ICT in Indian healthcare from a variety of angles. Telemedicine is the first ICT technique applied in healthcare in India. The second involves creating centralised disease-specific databases, where patient information, treatment data, and follow-up information are stored for future use.

The effects of cultural factors on Indian healthcare have been compiled by Roger et al. (2011). The main variables taken into account to forecast the difficulties in creating the healthcare infrastructure and delivering services include psycho-social factors, cultural beliefs, social norms, symptoms connected to a particular culture, and gender-dependent attitudes. Siddharudha talks about the Family Centred Approach (FCA). The difficulties in PHCs have been addressed by Shivalli et al. (2015). The issues are resolved using the knowledge gained in urban settings. To enhance cleanliness and immunity, FCA uses family-level health education. FCA is put into practise under the direction of physicians and healthcare professionals. The outcome of this strategy increased awareness among those from the families who took part in this event. Additionally, in order to improve knowledge and belief, social, cultural, and religious variables are scientifically understood. There are several problems that arise that have an impact on the health care system whenever the medical sector is enhanced or changed.

3 PROPOSED METHOD:

The application of IoT across a variety of industries is increasing because of its easy and reliable characteristics. Since the advent of cloud-based IoT gadgets, IoT is notably developed to process massive volumes of information. Health-related systems are one of IoT's most innovative applications. Numerous tests are being conducted to protect the data of patients. The main issues facing the health cloud-based IoT continue to be data security as well as computational overhead. The use of patient information collected from IoT sensors to predict sickness is a different challenge for health care systems. To effectively protect and anticipate illness in health care systems, such as the IoT Health Cloud system over patients' data, a unique homomorphic encryption using the random diagonal and elliptical curvature cryptography paired with multinomial smoothing

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naive Bayes (HERDEMSNB) strategy is recommended within this section. Many healthcare applications, including remote site patient monitoring, patient condition detection, etc., may be solved using various medical sensors. IoT devices make it simple to identify patient ailments, and sensors, medical equipment, and other elements contribute to the creation of the IoT ecosystems in the medical field. Diabetes is a chronic illness that affects a number of organs in the human body. According to the International Diabetes Federation, the current 382 million cases of diabetes will have doubled by 2035. Early diagnosis is necessary to monitor diabetic illnesses

Some important participants have been identified, and a basic plan has been drawn. To prevent any unsettling inclusion of false material, the search was limited to useful instructional records, alliance profiles, and reports, as well as credit reference books. As several manufacturers and organised professionals have shown, a proper review always saw and followed the ethical requirements to guarantee that the assessment techniques are not detrimental to any particular, local industry.

This study activity has kept control over the ethical needs in this evaluation, such as data authenticity, by using the certified examination's examine assessment conditions. The expert has also acknowledged that he does not approach the assessment problem asymmetrically, but rather completely and correctly examines it to transmit object bits of information. This is done to ensure data and evaluation consistency. The last sentence of the study methodology and data gathering procedures will guide us through the process of creating a measurement for evaluation engineering. It involves developing a theory to help an expert write a report on a problem area that is investigated using a speculative framework that outlines the issue's basis.

RE-ENCRYPTION OF PROXIES

There are several Proxy Re-encryption types that may suit a range of applications with various features. User X can authenticate User Y via Unidirectional Proxy Reencryption, but User X is unable to access User Y's ciphertexts. With non-interactive proxy re-encryption, X can create a key for Y without Y having to become involved. A same ciphertext may be encrypted

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numerous times with the help of multi-use proxy re-encryption so that it can be read by several users. The tighter type of non-transitive proxy re-encryption permits multiple delegations. We strive to share health data across entities through non-interactive proxy re-encryption.

A paradigm change in the healthcare sector is occurring towards the use of technology to provide people with healthcare-related services. The importance of exchanging private health information among the many parties involved in the healthcare system, including physicians, lab technicians, insurance providers, medical researchers, and other healthcare professionals, is highlighted by this. The public healthcare system in India is understaffed, and there are no suitable technology solutions to reduce the burden of the physicians. To overcome the problems with processing health data, we developed our system, A Secure Electronic Health Record Sharing and Analytics Framework (SEC-EHRSAF).

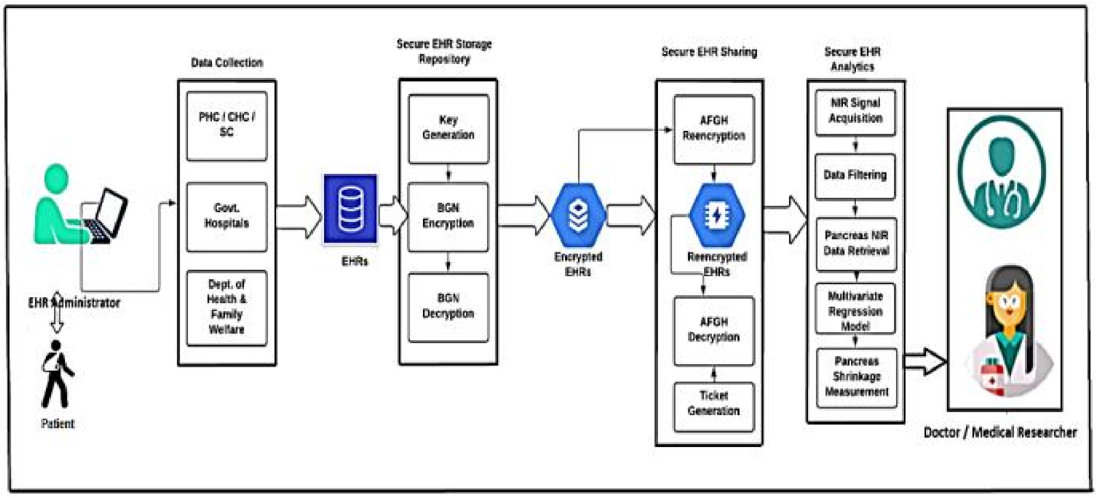

Figure 3.1 Architecture of SEC-EHRSAF

4 EXPERIMENTS AND RESULTS

The suggested HERDE-MSNB framework's key generation time is contrasted with that of already-in-use mechanisms like VPKE-HE and VMKD16. Table 3.2 displays a comparison of critical generation times.

The Keygen time analysis comparison demonstrates that the suggested approach outperformed the current technique by a significant margin. Similar to the current approach, the key creation process takes longer as the number of data owners rises. The

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production of the key requires much less time than the current models since the diagonal matrix comprises three sets of input values.

Table 4.1: Time comparison for key generation

Number of Data Owner	HERDE-MSNB (Seconds)	VPKE-HE (Seconds)	VMK DO16 (Seconds)
1000	6	8	18
2000	10	13	38
3000	15	20	51
4000	21	30	70
5000	25	35	90

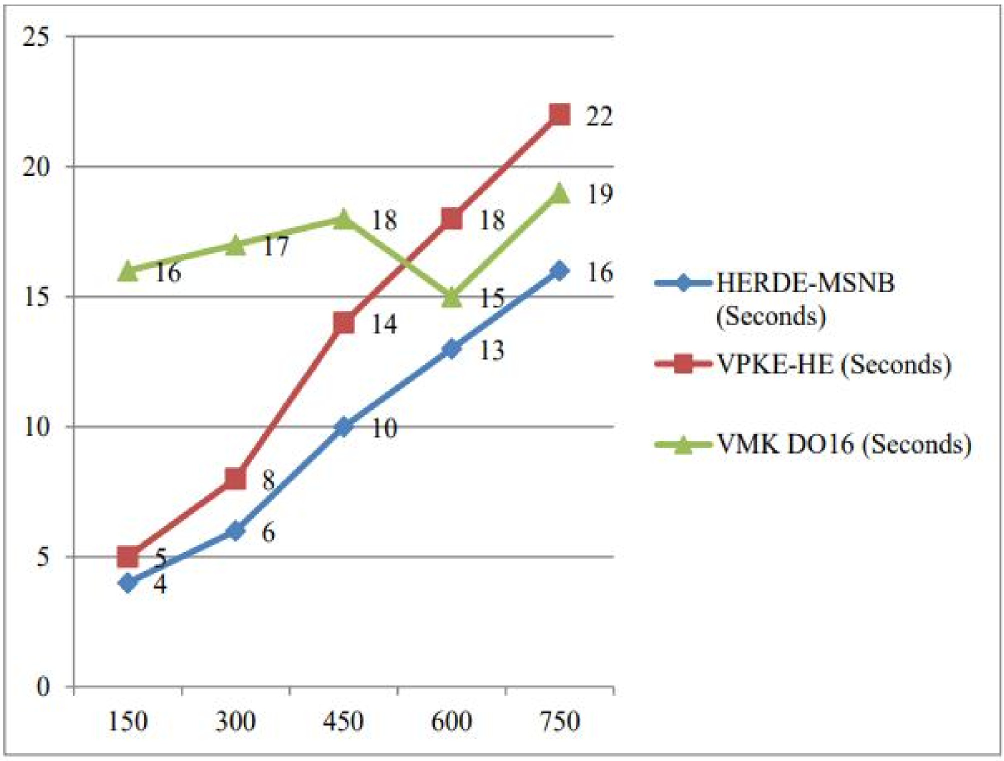

Figure 4.1 Comparison of Key Generation Time

Table 4.2 Comparison of Heart disease Prediction

Algorithm	Heart Disease Prediction (Percentage)			
	Accuracy	Sensitivity	Specificity	F-measure
KNN	74.81	78.47	70.63	76.87
RF	81.48	82.47	80.17	83.55
MLP	82.22	84.46	79.51	83.89
MSNB	92.59	93.33	91.67	93.33

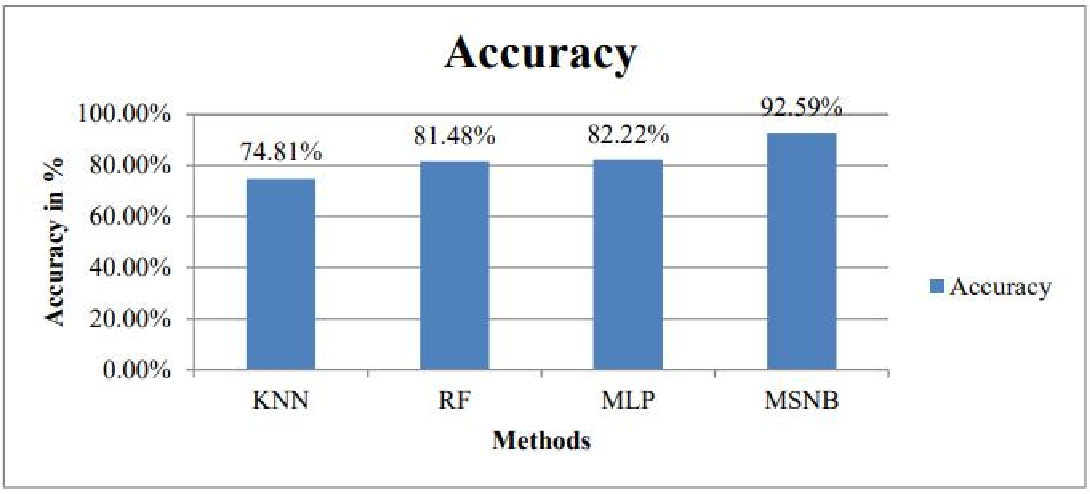

Figure 4.2 Heart Disease Prediction performance in terms of Accuracy

5 CONCLUSION:

The security framework and the prediction framework are two separate frameworks that make up the HERDE-MSNB architecture that is being presented. The suggested method is applicable to cloud-based IoT health systems. In the suggested design, IoT devices first gather patient data. Using the HERDE method, the patient data and keywords may be encrypted. The cloud server is uploaded with the encrypted patient data. In order to accurately assess the patient's ailment, the doctor decrypts the patient's data and gives it to the MSNB prediction model. Through web GUI, the interface between IoT, cloud, and the medical professional is formed. Utilising the UCI dataset, the performance of the suggested system is assessed. As a result, patient data is encrypted and decrypted using security framework, and patient illness is predicted using a prediction model. According to the analytical study, the

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polynomial time O(nk) HERDE encryption method is suggested. The decryption algorithm's temporal complexity is O (T). The query search's time complexity is O (m), According to the performance study, the suggested security model's query processing time and key generation cost are both superior than those of the current model. The suggested MSNB prediction model accurately predicts diabetes with 88.93% precision and heart disease with 92.59% effectiveness.

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