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Review of Different Techniques used for Cardio-Diabetic Disease Prediction

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Abstract : **In the modern technological surrounding of this era many people are highly prone to different diseases. These diseases are progressive in nature and need timely assistance and detection to track the growth and spread of the diseases. One such kind of disease is diabetic and heart conditions. Diabetes and cardiac disease are impactful on other parts of the body and need to be traced on priority basis. To detect such kinds of diseases in early stages is important to cure it and survive it as well. To solve the problem, help from technology can be taken. This includes neural network techniques, IOT based systems and devices, Smart devices that gather and feed data to neural networks. This kind of technology helps the doctors by tracing the medical condition of patient or person based on the obtained statistics of the vital parameters gathered by smart systems and devices.In this process large amount of data as well as cost is involved. In this paper review of such different techniques will be carried out. It mainly focuses on different approaches that are used for detection of diabetic and cardiac diseases. Different approaches like fog computing, blockchain implementation, Neural networks, Fuzzy based approaches. Fog computing gives an efficient manner based results for detection and storage of the records related to patients.**

IndexTerms - ***Fuzzy logic, Artificial Neural Network, Convolutional Neural Network, Fog Computing, Cardio-diabetic Diseases.***

I. INTRODUCTION

Medical services patrons are broadly understood in creating enormous volumes of data in various configurations, along with records, monetary papers, clinical test discoveries, imaging tests, and important bodily function appraisals, and so forth. The extensive data set established in medical conditions is extending quickly, with medical services data battling from various issues, with information access, and how data can be extracted from the medical care ability. Disease expectation is one of the fundamental true issues in medical care space. Numerous grouping calculations are utilized to predict the infections precisely. Artificial Neural Network (ANN)a kind of order calculations. Neural Networks and specially artificial ones is an enormously value based computed and equal calibrated with self-versatile and self-adapting capacities, in light of its huge equal design; and requires greater investment to foresee all result. Neural Network isn't suitable in managing such issues, for example, vague and loose information for which issues of vulnerability might happen anytime of the course of characterization like phishing, data theft. By lowering subjectivity and unpredictability in clinical diagnosis, machine learning has the potential to significantly enhance the healthcare system. It has already produced encouraging results in aiding doctors in the diagnosis of pathologies, tumours, uncommon disorders, and cancer. In some tasks, machine learning-based algorithms can even do better than people.

II. DIFFERENT TECHNIQUES USED FOR DIABETIC-CARDIO DISEASE DETECTION.

Fog Node Based processing is a cutting edge figuring model which offers geologically scattered end-clients with the idleness,mindful and exceptionally versatile administrations. The data is promptly saved and analysed closer to information on local sources mist hubs, it is almost as dependable and safe as distributed computing. The Blockchain (BC) innovation has turned into a wonderful, generally progressive, and developing turn of events lately. BT's open stage stresses information insurance and obscurity. It additionally ensures, information is safeguarded and legitimate through the agreement interaction. BC is primarily utilized in cash related trades; presently it will be utilized in numerous areas, including medical services; Author proposes [1] proficient Blockchain-based secure medical care administrations for illness expectation in haze registering. Forecasting takes

cardiovascular disease and diabetes into account. The patient's medical records are at first collected from nodes of type fog and kept which is blockchain based. The patient wellness records are initially grouped using the original rule-based grouping calculation. Finally, using highlight determination based versatile neuro-fuzzy based inference systems (FS-ANFIS)[1], diabetes and cardiac disorders are predicted. An extensive study and analysis were conducted using data from this current reality medical care in order to evaluate the presentation of the suggested system. The presentation of the standard-based grouping is examined using immaculateness and NMI measurements, and expectation execution is done using precision. The results of the exploratory study demonstrate that the author's proposed work effectively forecasts the illness. Compared to the other, the proposed work has a forecast precision of over 81%.

In order to anticipate the heart and kidney difficulties of diabetes clinical information, the author has described ordered classes studied. The proposed Fuzzy based order[11] model is implemented in three stages and anticipates heart and kidney subtleties from diabetic clinical information. The primary stage of preprocessing diabetes clinical data and separating the basic credits to anticipate heart and renal problems is complete. The knowledge about diabetes is then fuzzyfied, and fluffy standards are produced. The developed fluffy standards are arranged using the fluffy order model in the third stage. The expenditure capacity is used to identify the best ordered rules, which are then analysed to anticipate diabetes-related heart and kidney problems.In light of the trial's findings, the prevalence of heart and renal disease among diabetics is high according to the display measurements. The methodology is discovered to have a general precision of 76% in the planned system, 82.07% exactness for disease related to heart risk, and 84.2% exactness in anticipating risk associated with kidney. It can be seen that 34% of the population in the dataset had heart and kidney risk mixed together.

One of the emerging areas in software engineering is data-based mining. It has the ability to manage a sizable dataset with a variety of trademarks. It is currently used in all fields, including clinical. agricultural work, etc.The use of information mining techniques has greatly increased in recent years since it was necessary to expect information in order to make quick decisions. It is quite challenging to accurately predict at random from large review data. One appropriate arrangement that is based on calculations is characterising and noticing them. In paper[5], a calculation is suggested that makes use of grouping in view of trees as well as the flexible SVM technique.Pre-handling under testing SMORT, which helps in information trimming, was used in the proposed engineering. On a diabetic dataset, the methodology is examined using the tool named “WEKA” and contrasted with RF that is tree based,J-48 approaches. The result that was seen shows how effective the proposed computation is as compared to the traditional approach to handling diabetes data and extracting valuable characteristics from it.

Diabetic Retinopathy (DR), a condition that significantly impairs vision or causes considerable vision loss, is one of the most complex aspects of diabetes. Evaluation of images has emerged as a crucial tool in modern clinical science for providing unmistakable evidence of illness. As a result, the author has put forth a computer model that depends on the retinal image and brain structure to predict the status of diabetic retinopathy (DR)[2]. Component extraction and characterisation stages make up the suggested computational model. By identifying blood vessels and micro aneurysms, the author was able to isolate the best highlights from complex fundus images during the highlight extraction stage. The Kaggle Community provided the Diabetic Retinopathy dataset for this exploration effort. They have finally used CNN to predict diabetic retinopathy (DR). The suggested . The proposed system, achieves 95.41% precision.

When all else are equal, diabetes mellitus has grown to be a serious medical problem for people today. The prognosis of this kind of sickness is the main problem. It can be observed that diabetes mellitus may very well be reversed if it is discovered in its early stages. Therefore, early diagnosis of diabetes mellitus is important. The possibility of early diabetes mellitus identification is made possible by a number of techniques. A combination of three distinct methodologies used for early diabetes mellitus identification are provided in paper[14]. These three methods are case-based thinking, neural networks from artificial intelligence, and fuzzy logic[14]. Recognising diabetes mellitus in its early stages is discovered to be possible by combining these several approaches.The advantage of using these frameworks is that, when compared to other techniques, the precision of expectation rate is higher.

One of the most common infections in the world is diabetes mellitus. A common side effect of this infection is type diabetes peri neuropathy (DPN), which is distinguished by a numbness of senses in several areas of the legs. A few research shown that technique(DPN) may have created using a person's plantar strain data. In paper[3], the Tekscan F-Scan Research Software was used to collect data on plantar tension, which was then quantitatively examined and used to create several machine learning classifiers. The findings demonstrate that hilter kilter plantar stacking is indicative of the parameter based disparities in the workers' both side feet. The left foot of the diabetes groups also displayed a significant difference in the boundary length of contact time (LT).The two most significant exactnesses for the right foot dataset's grouping calculations were SVM (91.91% precision) and MLP (89.82% accuracy). Gaussian Process Classifier (GPC) had the highest precision (90.11%) for the left foot, whereas MLP, KNN, and Random Forest classifiers scored 87.42%, 84.66%, and 75.31%, respectively. The top-performing classifiers for both the left and right datasets were then subjected to hyperparameter optimisation, which rectify and propagate the classifier execution to 91.91% and 94.74% for techniques of MLP and SVM respectively.While performing an unscrambling, homomorphic verified encryption allows inferred calculations on plaintexts using ciphertext comparison without compromising security and provides the correctness of the calculation and the resulting plaintext of the calculation. However, due to its remarkable usefulness, homomorphic validated encryption's security concepts are rather unclear, no attempt has ever been made to create homomorphic in whole verified encryption.

Author[7] has suggested effective, secure healthcare services based on Blockchain for the fog computing illness prediction. The cardiovascular and Diabetes diseases were taken into account when making forecasts. Data on patient health was initially collected from fog nodes and stored on a blockchain. The clustering technique novel rule-based was initially used to group the patient health records. In order to predict diabetes and cardiovascular diseases, a feature selection-based adaptive neuro-fuzzy inference system (FS-ANFIS) was employed.A thorough definition of the fog was presented in the study [8], taking into account a wide range of technologies, including cloud computing, sensor networks, peer-to-peer networks, network virtualization features, and configuration management strategies. They outline the primary difficulties that this potentially ground-breaking technology amalgamation must overcome. A situation where a sizable number of diverse, unavoidable, and self-governing PCs associate and hypothetically collaborate with the organisation to carry out capacity and preparation tasks without outsider interference is referred to as a system character. These exercises could help with basic organisational operations or new developments and apps working in a sandboxed environment".Author [9] introduced Mobile Fog, a high-level programming approach for upcoming widely distributed, massive, and latency-sensitive Internet applications. The author looked at use cases for the programming paradigm utilising connected car and camera network apps to show the effectiveness of Mobile Fog. To evaluate the effectiveness of the applications, they also used simulation.

A paper[10] suggested the idea of fog computing at the smart gateway for remote patient health monitoring in smart homes. The suggested paradigm made use of cutting-edge methods and services at the edge of the network, including notification systems, distributed storage, and embedded data mining. The fog layer used an event-triggering-based data transfer mechanism to process the patient's real-time data. The patient's temporal health index was used to examine negative events using the temporal mining concept.An inventive blockchain-based agreement was given by author [11] to enable secure clinical sensor research. The author created a company based on the Ethereum standard that makes use of a blockchain in a private base with sensing devices that connect to a portable computer that summons intelligence and keeps track of every action on the Blockchain.

To properly discriminate the progression of Alzheimer's disease, mild cognitive impairment, and normal control patients, an effective segmentation and classification technique has been proposed[12]. To conduct segmentation, a hybrid segmentation methodology was developed using graph-cut methods and K-means clustering. For classification analysis, the clustered regions were labelled based on their featuresThey were additionally sorted as should be expected intellectually disabled, stable gentle intellectually hindered, moderate gentle intellectually weakened, or Alzheimer's infection utilizing the game hypothesis classifier.

Table 1.1 Different techniques for Diabetic Cardiac disease Detection

Technique	Algorithm Used	Observation	Findings
Blockchain Based Fog Computing [1]	Edge-Ward Algorithm	Secure healthcare services for disease prediction	No hybrid clustering or classification combined with security improvement
Convolutional Neural Network [2]	Convolutional Neural Network	Diabetic Retinopathy was carried for diabetic eye detection	Static dataset was used . System was not tested on by using Dynamic dataset.
Machine learning Classifier[3]	Support Vector Machine Algorithm	Diabetes Mellitus disease prediction	No encryption was provided for the patient data.
Machine learning Classifier[5]	Support Vector Machine Algorithm	Diabetic Disease prediction using tree structure for characteristic analysis	Pruning of information was not effective and caused data loss.
Blockchain Based Fog Computing [7]	Neuro-Fuzzy Inference system(FS-ANFIS)	Detention of diabetic and cardiac disease.	Cost optimization was not considered as multiple fog nodes were unnecessary included.
Fuzzy Classification [11]	Fuzzy Logic Algorithm	Fuzzy rule classification helps in detecting critical diseases.	Big data takes time to process and predict diseases.
Advance Tree Adaptive Data Classification [15]	Binary Decision Tree algorithm.	Advantage of binary tree helps in determining the exact results.	Data in different formats cannot be processed

From above literature review and different techniques following are the findings:

- No hybrid clustering or classification combined for security improvement
- Systems are tested for static dataset ,but not tested for real data
- No encryption was provided for the patient data.
- Pruning of information was not effective and caused data loss.
- Cost optimization was not considered as multiple fog nodes were unnecessary included.
- Big data takes time to process and predict diseases.
- Data in different formats cannot be processed

So there is a need of system to overcome above limitations. The proposed system will be designed for detection of diabetic cardio disease which includes:

1. Clustering techniques are used for Feature classification obtained after Neural network implementations. Single techniques like SVM, K-means, and fuzzy logic techniques have their own pros and cons. It is possible to club two different classifications techniques and create an efficient classification technique. We can integrate SVM and Fuzzy Logic together to obtain more efficient results.
2. Binary Tree implementation takes in different type of data formats. But it is unable to identify mixed formats of data . Big data approaches, which may be used to analyse and categorise the data, can be utilised to help overcome this obstacle

III. Conclusion

This paper mainly focuses on different approaches that are used for detection of diabetic and cardiac diseases. Different approaches like fog computing, blockchain implementation, Neural networks, Fuzzy based approaches etc. Fog has been studied for computing approach gives an efficient manner based results for detection and storage of the records related to patients on fog node. Fuzzy based computing applies its interoperable systematic approach that helps in creating a network of the results and giving out the needed detection metrics. Neutral network based approaches have given a feature extraction based approach extracts features and detects the areas responsible for evolution of the disease. It is found that early stage detection of diabetic and Cardiac diseases is possible due to this kind of technological advancement. We examined systems that used Blockchain Based Fog Computing, Fuzzy Classification, Advance Tree Adaptive Data Classification, and Neural Networks.We need to have a system that gives a feature extraction system that will help medical providers with accurate prediction of patient stage and state from distance virtually and carry the diagnosis.

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