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Heart And Diabetes Disease Detection Using Adam Optimization Algorithm (Deep Learning)

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ABSTRACT

The application of artificial intelligence system to medical research has the prospective to move forward highly advanced in e-health systems. Healthcare prediction is one of the significant factors in saving human lives in recent years. Heart and diabetes disease is one of the key contributors to human death. In the domain of healthcare systems, there is a rapid development of intelligent systems for analyzing the complicated relationships among huge amount of data and transforming into real information for prediction purpose. With the various techniques and methods developed the heart and diabetes detection systems. Pattern identification from images has become very easier by using machine learning techniques. In this paper proposing the deep learning based Adam optimization algorithm for effective image classification in the precise manner for heart and diabetes diseases detection. The proposed mode evaluated based on the 14 attributes with 2000 patients. Proposed method considers the performance metric as accuracy and precision, recall and F1 measure. Our proposed model achieved validation accuracy as a 92.81% when compare to stochastic gradient descent algorithm.

Keywords: Artificial Intelligence, Data set, Adam Optimization Algorithm, Stochastic Gradient Descent Algorithm, Prediction, Deep learning, Machine learning.

I. INTRODUCTION

The healthcare industry is the multi dimensional with multiple data sources involving in healthcare systems, social media, clinical researchers, government, and health insurers, generating the multi types of data as a massive amount of data.

In the AI technology, computers are learn from previous experiences and data. The amount of data is increasing rapidly so we need to handle the data

efficiently. There is a machine learning is useful for analysis. It is having the more accurate, informative and consistent information of raw data. The main objective of machine learning is enables machines to learn without any programmed. Deep learning is one of the most remarkable advancements in AI very smarter. It is a data processing method that uses a multi layer technique. We are working on the layers and calculated the weight on each and every layer. One layer weight output forward to another layer. Medical technologies are aiding healthcare professionals and experts in the identification of some of the deadliest diseases like heart and diabetes disease detection.

The objective of this paper research is early detection of heart and diabetes disease detection using hybrid deep learning techniques.

- Early detection of heart and diabetes by using the deep learning framework.
- Comparison of existing and proposed approaches.
- Proposed method is evaluating with different performance metrics.

II. LITERATURE SURVEY:

Big data is emerged technologies predominantly in finance, banking, insurance and one of the most promising and interesting areas which can effect significant change is healthcare. Big data is a huge collection of data from different healthcare resources. Those healthcare resources are examination, patient generated health data, laboratory results and medical imaging and inpatient health monitoring.

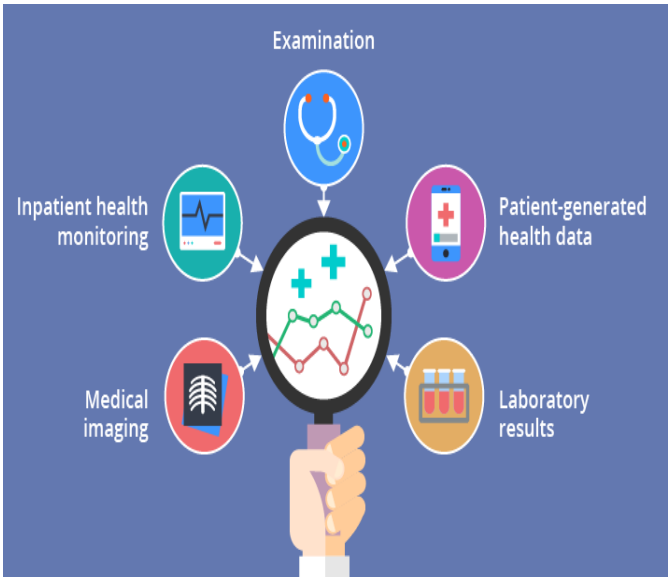

Fig1: Health Data Sources

Big data analytics helps for personalized treatments, evaluations of their effectiveness and a reduction of clinical risk with the through pioneering ways of managing and controlling processes. Big data analytics technologies increase the value of data by transforming it into useful information. Global big data analytics in the healthcare market was expected to grow at a compounded average growth rate of 20.69% between 2015 to 2021. Big data analytics are transforming the way in healthcare is managed and powerful revolution in the knowledge management. The analysis of large amount of data generated by a single patient related to diagnosis, treatment pathways, drugs, medical images, medical devices and laboratory analysis results. The generation of big data analytics information is meaningful and this kind of data is creating the new value of data in the organization of health services. We can get the below advantages based on the big data analytical results.

1. Clinical Decision Support
2. Safeguarding clinical trials
3. Workflow improvement
4. Inpatient alerting
5. Fraud prevention
6. Population health management
7. Patient profiling

Fig 2: Big Data analytical results for organizations improvement

Evidence based medicine is defined and extracted from health data like mostly diagnosis, procedure and treatment. It is a combined with a knowledge base with similar cases and used find a most fitting treatment for each patient. This will helpful to predict and avoid possible risks and all the complications and all the readmission risks.

Diagnosis support is processing symptoms, lab results and patient history details to suggest possible conditions and procedures to confirm the disease and it will assists in achieving timely treatment, balanced length of stay and positive health outcomes.

Safeguarding clinical trials can be used earlier clinical trials data to develop the improved trial design and identify the eligible patient verdict. Providers can match the prospective treatment with fitting patient better and reduces trial failures and negative health outcomes.

Quality Assurance teams are evaluating the performance of health data analytics and understand the clinical processes better and that will help for care quality. Health care analytics will provide better procedures, primary and secondary diagnosis information to initiate the process for effective and efficient patient recovery process.

Inpatient alerting is mainly the monitor the patient health continuously and provide warn health specialists about positive and negative trends. These results will give the patient recovery information and automatically takes the decision and also save the patient efficiently.

It is regarding fraud prediction. Healthcare organizations need to reduce the improper billing and avoid erroneous or fraudulent claims. These issues are for risking reputation and financials. Transactional data with claims and billing records need to analyzed and find out the required patterns and identify the fraudulent patterns and other irregularities.

Many patients are extremely busy due to their tight schedule and they are ignoring to see the doctors and even they are ignoring the recurring symptoms for an extending length of time. Large numbers of individuals are facing the death health problems due to late detection of diseases. Medical diagnosis is a form of problem solving and it is a crucial and significant issue in the current world. Illness diagnosis is converting the observational evidences into disease names.

Predictive analytics models are playing vital role in a medical profession in modern environment. Currently volume of the data is increasing from wide range of desperate and incompatible data sources. We are facing so many challenges for storing the massive large amount of data and process the same with current storage systems.

We are processing health concerning symptoms experienced in particular population for recognize the patterns. These patterns are going to useful for medical treatment. This way we are providing as a medical services over a specified time interval.

Daily health services are generates the enormous amount of data and it is very complex for analyzation and provides the decisions on the same in the form conventional manner. Using machine learning and deep learning, the data can be analyzed efficient and provide efficient insights information. We will provide the benefits in diagnosis, prognosis, therapy and clinical workflow.

We can develop the new technologies using deep learning and machine learning techniques and it

help to improve the health individuals via prediction of future events. This will help to enhance the healthcare facilities. All the prediction algorithms are going to utilized for clinical treatment decisions in all dimensions.

III.PROPOSED SYSTEM

In this paper proposing the early detection of heart diseases and diabetes by using the deep learning and machine learning techniques. In this paper mainly focus on to predict the heart diseases and diabetics by applying the machine learning and deep learning techniques and also perform the classification on the datasets by using the different classifiers. First of all we would need to analyze the data sets as a build analysis phase. Once it is complete, evaluate the analysis results and generate the model and then perform the feature selection and data pre-processing steps. We are going to extract the features and framing the idea and defines whether that person presence the disease or not like heart or diabetics. Finally we are going to analyze the models data by applying the different techniques for prediction. Here mainly convolutional neural network are using for prediction of heart diseases.

The system process starts with the collection of patient data. We will enter into the data preprocessing phase after collection of huge amount of data. Data preprocessing step mainly take place to fill the missing values and create the efficient data sets. We may going to apply some more preprocessing techniques and prepare the efficient data sets here. Apply the data cleaning process and generate the training and testing datasets. Training data set can be used for training of the model on the convolutional neural networks algorithm. Testing dataset can be used for evaluating the performance of proposed model. Finally the proposed model or system is categorize the data into disease or healthy.

3.1 PROPOSED ARCHITECTURE

The dataset of heart and diabetes can be used for proposed methodology implementation and analysis. Data preprocessing is a step to removes the ambiguous data from collected dataset. We can process further to remove the missing and duplicate values from collected datasets. After remove all the ambiguous and missing and duplicate values and created the training model data. We are proposing Deep convolutional neural network mechanism for heart and diabetes disease classification using binary attribute based classification. Binary attribute is classified as 1 for patients having heart and diabetes disease and 0 for patient is not having the heart and diabetes disease. We have completely total 8 dense layers and creating the deep convolutional neural networks. We can apply the binary attribute classification in each and every layer for classification of patients. We can apply the linear function in all the layers for identify the density and improving the learning rate as well. Loss function can be used and calculate the cross entropy. We can set the some value for better classification and identify the dropout rate successfully.

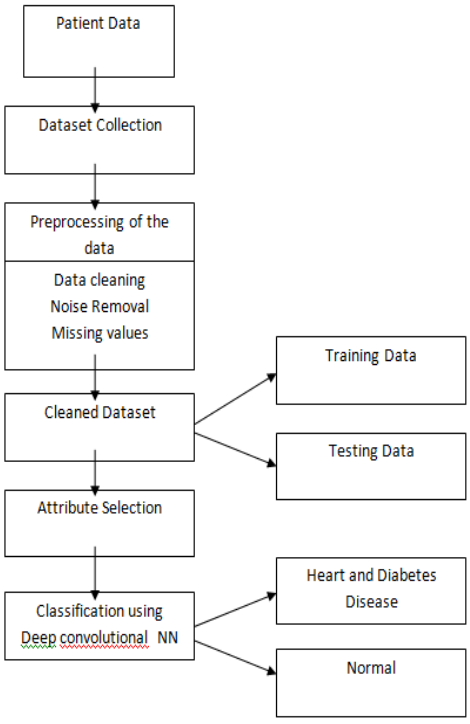

Fig3: Proposed Architecture

3.2 Adam Optimization Algorithm:

Adam optimization algorithm is an additional room to stochastic gradient descent. This stochastic gradient descent algorithm has been adopted recently all the deep learning applications in computer vision and natural language processing.

Adam is completely when compare to classical stochastic gradient descent algorithm. Stochastic gradient descent algorithm maintains a single learning rate (termed alpha) for all weight updates and it is not change during training, however Adam Optimization algorithm is maintained the learning rate for each network weight per parameter and separately adapted as learning unfolds. This algorithm computes individual adaptive learning rates for different parameters from estimates of first and second moments of gradients.

Adam is combining the two algorithms for extension; those algorithms are Adaptive gradient algorithm and Root mean square propagation algorithm. These two algorithms are helps to improve the performance on the algorithms and also controlling the non stationary algorithms. The initial value is moving the average and beta1 and beta2 values are close to 1.0 result in a bias of moment estimates towards zero.

IV.RESULTS AND DISCUSSION

The dataset contained a 14 number of attributes. Those are Age, Gender, Chest Pain, Cholesterol level, Resting blood pressure, Fasting blood sugar, MaxHR , Rest ECG, Exercise-induced angina , Old peak, Slope, Vessels, Thalassemia and Heart and diabetes disease. Before starting the experiment, the dataset need to be prepared. Dataset may have some irregularities and noise were found in the dataset, we need remove before used these data for experimentation. Firstly preprocessing step is going to takes place for removing the anomalies by replacing the missing values with mean values. Preprocessing step proceeds with categorical data into numeric data. Once the improvised dataset is generate, dataset is dividing into training and testing dataset. Training data is used for training classifier generated by using the proposed model. The model classified the data into two binary classes: 1 for patients suffering from Heart and Diabetes Disease, and 0 for patients having no heart and diabetes disease. The computed prediction accuracy by the model was 92.81%.

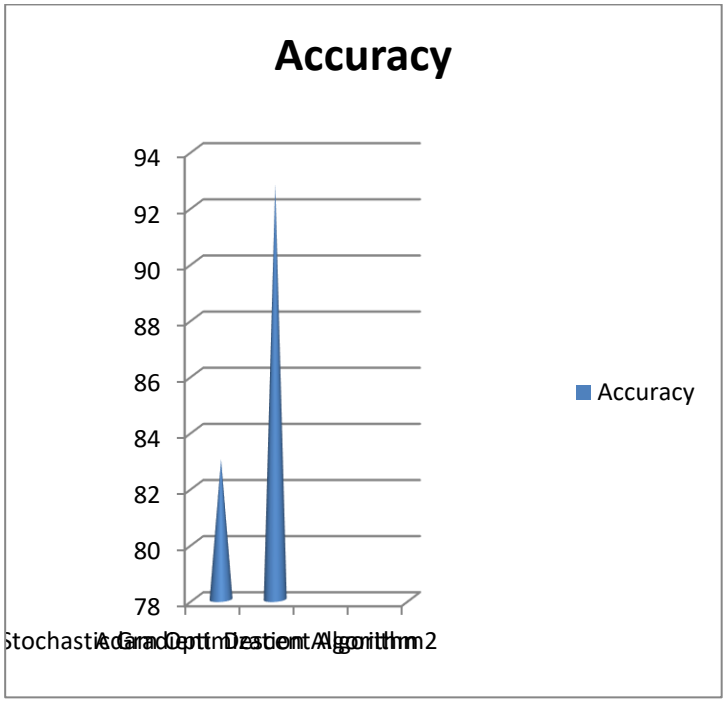

Fig4: Comparison results between existing and proposed algorithms

V.CONCLUSION

The prediction of heart and diabetes disease detection in early stage can prevent many human deaths. The use of an Adam optimization algorithm can help to doctors in detecting of heart and diabetes diseases efficiently. We have applied the algorithm on the dataset collected which is contained 14 attributes and 2000 patients. The proposed system is evaluated and achieved the accuracy as a 92.81%.

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