Analysis of Chronic Disease Prediction Using Big Data Over Cloud Based IoT

S.Yamuna Devi[1],B.Keerthana[2],K.Moorthi[3]
Department of Computer Science Engineering
[1,2] PG Scholar, Jansons Institute of Technology, Coimbatore, Tamil Nadu, India
[3] Assistant Professor, Jansons Institute of Technology, Coimbatore, Tamil Nadu, India.

Abstract- *Internet of Things and Big Data has emerged with massive amount of data which making an elegant relation among those data in various fields and a cloud data management, plays a vital role in this modern hasty world. Physical health and mental health has a momentous impact on the superiority of life. Technology has been improvised to handle enormous amount of patient's data and establishing the proper monitoring of healthcare system in digitized manner. A chronic disease cannot simply be cured by vaccines which can persists over a long period of time. It creates additional activity limitations and have no proper symptoms includes many risk factors. A big historical patient's data has to be stored and proper monitoring to be done on the health parameters which will be maintained and stored in the cloud environment. This paper focuses on various prediction and preventive analysis mechanisms on various correlated chronic diseases and make a regular observation through remote cloud IoT.*

Keywords- Big Data, Internet of Things, Cloud storage, Machine Learning, Artificial Intelligence, Artificial Neural Network.

I. INTRODUCTION

A chronic disease is a state which you can control with treatment for months .It generally cannot easily be cured by medication if it is not found earlier also it tend to become more common with age. Even a new born child is getting affected by those diseases that sometimes lead to death. The foremost chronic diseases in developed countries include cancer such as breast cancer and colon cancer, cardiovascular disease like heart attacks and stroke, cancer , arthritis, diabetes, epilepsy ,seizures and obesity. some of the oral health problems also comes under this.

Heart disease is one of the nation's most leading reasons of death. Health- oriented behaviors such as lack of physical activity, intake of poor nutrition, tobacco use obviously lead to heart disease. Modifying these behaviors is essential for both preventing and controlling heart disease. Cancer is the second most common chronic disease all over the world. Sigmoidoscopy, colonoscopy, and the fecal occult blood test (FOBT) are widely used to detect cancer in its early stages. Lower fiber diet, obesity and alcohol consumption are the factors for the risk. Mammography is used to detect breast cancer in earlier stage.

Smart health monitoring includes the daily physical activities of aged people and as well as in young people with the help of IoT enabled devices. For example, Glucose level, Heart rate level, Monitoring of sports persons activity, obesity (BMI level), body temperature and pressure are the parameters that are to be calculated often by remote physicians in order to reduce the labor-intensive health care monitoring system. A huge medical data that are generated by IoT devices based on the patients health parameters will be stored and manipulated through cloud environment because of high storage capacity.

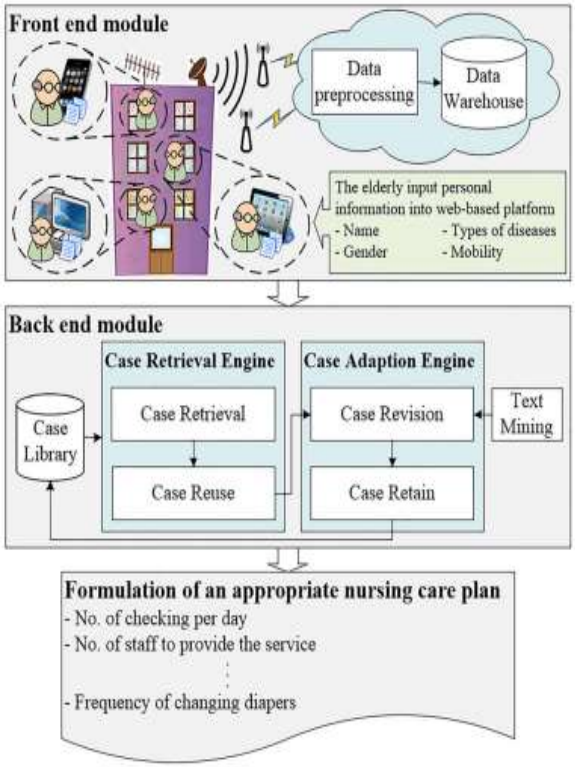
II. LITERATURE SURVEY

2.1 HEALTHCARE MONITORING THROUGH CLOUD BASED IOT:

Liyakathunisa Syed et al[1] proposed a novel smart health care framework for monitoring the physical activities of athletes by placing sensors on chest, wrist and ankle. They remotely monitor the health conditions of old patients in case of Alzheimer's disease by IoT enabled devices. They predicted that the player is active or not with the accuracy of 99.96%.

AKM Jahangir Alam Majumder et al[2],proposed an Energy Efficient Wearable Smart IoT System to Predict Cardiac Arrest. They present a multisensory smart IoT system which collects Body Area Sensor (BAS) data that provides early warning of an impending cardiac arrest. They use signal processing for predicting ECG signals and machine learning techniques for analyzing the collected heart rate values. They created a low power communication channel for connecting IoT enabled devices and smart phone application. Normal and abnormal ECG patterns can be distinguished by non invasive device which provides a high rate of classification correctness. They further enhance the system by adding more sensors like, Galvanic Skin Response (GSR), accelerometer, to the IoT device.

An adaptive clinical decision support system is proposed by Valerie Tang et al[3] for preventing elderly from chronic diseases. They combine the concepts of cloud computing technology and case-based reasoning(CBR) .with these technologies, medical records of the elderly people will be modified by extracting up- to- date medical information .



Figure(1)

Ahmed Abdelaziz et al[4] proposed a model which is used to analyze Chronic Kidney Disease(CKD) using cloud based IoT environment. In this paper they presented a hybrid intelligent model for the prediction of Chronic Kidney Disease by using Linear Regression(LR) for finding the critical factors and Neural Network(NN) for predicting CKD which in turn gives accuracy of 97.8%.

Sivakumar Krishnan et al[5] proposed a system that makes use of Efficient Elman Neural Network Classifier with Cloud supported IoT for maintaining patients data. Sometimes the huge amount of patients data is vulnerable and can be misused by the hackers when the devices are interconnected with cloud environment. Both client side and cloud side authentication is maintained by EEN method. They use Hyper analytic Wavelet Transform(HWT) with Adaptive Noise Cancellation(ANC) method for processing ECG signal and security is ensured by Elliptic Curve Cryptography (ECC) scheme. They use a technique called One Class Support Vector Machine (OCSVM) with IoT enabled devices.

Yixue Hao et al[6] presented a multimodal data-based recurrent convolutional neural network (MD-RCNN) for predicting diseases. This models uses structured and text data of patient. And it can also extract structured and unstructured features in fine-grained manner. Deep Belief Network (DBN) is used to extract and work with some features. They got 96% accuracy on MD-RCNN by experimental works done on medical big data.

Hybrid Real-time Remote Monitoring (HRRM) framework is proposed by Mohammed K. Hassan et al[7] which monitor the patients distantly. The system uses the concept of context awareness. They make use of Patient's Local Module (PLM) that is connected with cloud based IoT sensors. Also they proposed a cloud classification technique for minimizing errors in the imbalanced big dataset. They used Naive Bayes(NB) and Whale Optimization Algorithm(WOA) for better accuracy especially for the patients with blood pressure disorders.

Gayathri Nagarajan et al[8], presented a comparative analysis on six different machine learning algorithms which is used for medical big data. They had taken medical data sets from various resources and made an experiment. The metric chosen is accuracy and computational time of the algorithm. They conducted experiments on different portions of training data. Finally, they concluded that, logistic regression and random forests algorithms are good in accuracy and Naive Bayes performs well in terms of computational time.

Himanshu Kriplani et al[9], proposed a method based on the deep neural network which predicts whether chronic kidney disease is present or not. They implemented a technique called cross validation technique for saving from over fitting. They also found True positive rate (TPR), false positive rate (FPR), Precision, Recall and F measure values by using different algorithms. They have trained a neural network model for predicting the presence of chronic kidney disease which in turn gives highest accuracy.

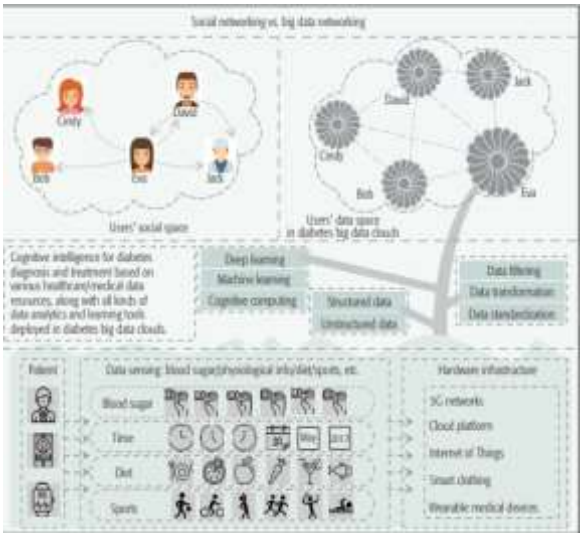
J. Kirubakaran1 et al[10], presented a novel algorithm for liver diseases.They used adaptive ultrasound (AUS) instead of ultrasound (US) images with Hybrid Coupled Dictionary Pairs on Longitudinal Domain (HCDPLD) for discriminating the cirrhotic liver form normal liver. The developed cirrhosis prediction strategy that helps for improving the results of image resolution with the accuracy of 99.82%, Average Peak Signal to Noise Ratio (PSNR) of 3.22 dB and Structural Similarity Index (SSIM) of 0.89 through HCDPLD.

2.2NUTRITION DIET DATA ANALYSIS:

Jangam J. S. Mani et al[11] presented a PCUDD framework in which NHANES data sets(nutrition based data) are processed through multinomial logistic regression, LDA,SVM and random forest algorithms. PCUDD attain 87% of accuracy for diet data. They use Appache Flume and Hadoop Distributed File System for data processing and storage management.

2.3 ADVANCEMENT IN TECHNOLOGIES FOR DISEASE PREDICTION AND HEALTH CARE MONITORING:

Min Chen et al[12] presented a wireless 5G architecture model for managing the chronic diabetic disease .They combined the technologies such as big data, cloud computing, wearable 2.0,machine learning for the predictive analysis on the collected data. They made a 5G smart diabetes test bed that consists of smart clothing, smart phone and cloud storage management for effective diagnosis and suggestions for a long time. Their architecture consists of three layers such as the sensing layer, personalized diagnosis layer and data sharing layer.



Figure(2)

Blood glucose device is used to collect blood glucose level of individuals. Users diet data and physical activity data will also be collected. They will further interface smart app with cloud and made analysis through that app.

John A. Savino and Rifat Latif et al[13] presented a paper that concentrates on the future hospitals and the various mechanisms and facilities which are evident-based and data-driven. Clinical Command Centers (CCC) and Electronic Health Records (HER) with real time data will rule the future hospitals. Patient Empowerment will become essential one. They discussed about various advanced techniques which makes use of AI-based algorithm.

2.4SECURE MEDICAL DATA STORAGE MANAGEMENT THROUGH IOT- BASED CLOUD:

Malathi D et al[14], presented a model that uses hybrid reasoning- based methodology for predicting diseases . Fuzzy set theory, k-nearest neighbor and case-based reasoning techniques are combined that helps to yield enhanced prediction results by statistical evolution methods. Privacy-Aware Disease Prediction Support System (PDPSS) using Paillier Homomorphic Encryption is used for securing sensitive information from malicious threats.

Arun Das et al[15] presented a system for preventing vision loss due to age-related macular degeneration (AMD) by using scalable cloud based teleophthalmology architecture via the Internet of Medical Things (IoMT) for patients wear a head-mounted camera (OphthoAI IoMT headset) for sending their retinal fundus images to the secure and private cloud drive storage for personalized disease severity detection and predictive progression analysis. They have used a AMD-ResNet convolution neural network with 152 layers for analyzing the images to detect and control AMD disease. They also used A temporal Long-Short Term Memory (LSTM) deep neural network for precision medicine and AMD predictive progression and achieved sensitivity and specificity of 94.97±0.5% and 98.32±0.1% correspondingly.

III. PROPOSED WORK

This paper introduces a model for predicting the possibility of chronic diseases. If the user already had been suffered with any of the chronic disease, we check for some other disease due to the diseases that already present. So, we will find the possibility and risk factors for diseases based on the relativity between the diseases. To find those risk factors, big medical data of the health parameters of all types such as blood pressure ,Hemoglobin ,heart rate ,Sugar, Glucose ,RBC,WBC and platelet cells count, Various Hormone levels, Urea in the blood, various minerals and nutrition levels in the blood are to be measured by IoT enabled devices in the certain intervals. All those data are integrated together and to be stored in the cloud environment.

Various health parameters are taken as input and will feed to the system. We use Linear Regression(LR) and Artificial Neural Network(ANN) model to categorize the health parameters based on Integrated Medical Record(IMR) whose variation may cause to more than one chronic diseases. Those parameters are monitored in a frequent interval and the

values are taken and compared. Based on the comparison and analysis results possibility of diseases for the patient will be found. If the particular patient is susceptible to many diseases, the level of treatment will vary. The patient may be prevented from many health issues by early detection. Medical errors can be avoided.

IV. CONCLUSION

This paper summarizes various machine learning algorithms and technologies that helps to manipulate medical big data. In addition it aims to find the relative possible chronic diseases that may occur due to presence of some other diseases that were already present. Personal Health Record(PHR) will be evaluated.

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