PERFORMANCE APPRAISAL OF VARIOUS HEART DISEASES PREDICTION: A REVIEW

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Abstract : ***The term "heart disease" is frequently used substitutably with the word "cardiovascular disease." This hazardous disorder is become challenging for every individual in our modern society. In medical science, it is very crucial to diagnose but this critical task that must be performed efficiently and effectively. Nowadays Deep learning techniques have become very popular for time series prediction and warning alerts for various heart diseases in order to take timely precautions. In this review paper, we have tried to provide some most recent methods that are used in heart disease prediction viz, LSTM, CART, Neural Network, Naive Bayes.***

IndexTerms - Deep Learning; Time Series Prediction; Neural Network.

I. INTRODUCTION

A circulatory system of the human being is also known as Blood vascular system that contains of a muscular 4- chambered heart. It is a network of closed branching blood vessels and blood in which the fluid which circulates. This circulatory system – human heart, has some chronic disorders that reports a collection of all cicumstances that damages our heart. Disorders under the heart disease parasol include blood vessel diseases, like coronary artery disease; heart pattern complication (arrhythmias); and defects in heart by birth (congenital heart defects), among others.

Determinant conditions are states that make a human being more likely to develop a disease. They can excessively increment the forces that an existing disease will get worsened. Some crucial determinant conditions for heart disease are [1]:

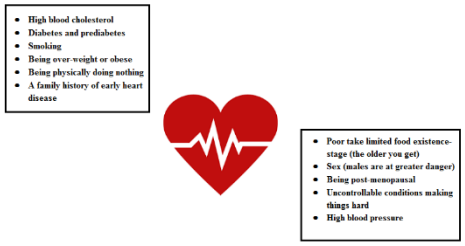

Fig-1: Major determinant conditions for heart Disease.

1.1 MOST COMMON TYPES

A. Coronary artery disease

This disease occurs when veins do not convey blood properly in the heart.

B. Cardiac arrest

Sudden, unpredicted loss of heart function, respire and alertness.

C. Congestive heart failure

This disease occurs when the heart is not pumping properly.

D. Arrhythmia

This is a very rare heart disease. This disease defines the electronic pulse like the movement of the heart.

E. Peripheral artery disease

A circulatory disorder in which narrowed blood vessels reduce blood flow to the limbs.

F. Stroke

Damage to the brain from obtrusion of its blood supply.

G. Congenital heart defect

An irregularity in the human heart that develops before birth.

So, diagnoses & prediction of heart disease earlier is compulsory and treatments for individuals/peoples who are probably going to have a coronary illness and help them have a longer life. A pictorial way of various heart diseases and their predictions using Machine Learning approaches is shown in Fig:2

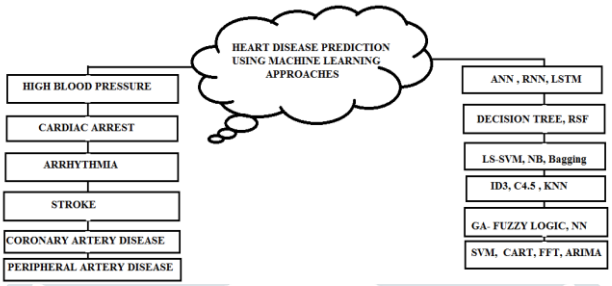

Fig2: Heart disease prediction using various machine learning approaches.

II. REVIEW

Ji.Zhang et.al [1]design a bagging based troupe display is used to anticipate the patient's condition one day ahead of time for creating the last suggestion. A blend of three classifiers artificial neural network, least squares-support vector machine, and naïve Bayes are utilized to develop a group structure. This proposed framework is a promising device for examining time arrangement medicinal information and giving precise and solid suggestions to patients experiencing endless heart infections.

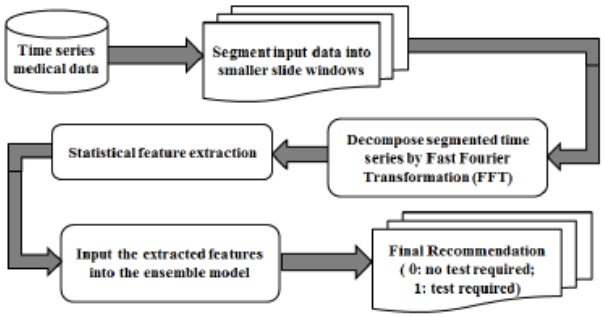

Fig3: An architecture of proposed bagging-based algorithm

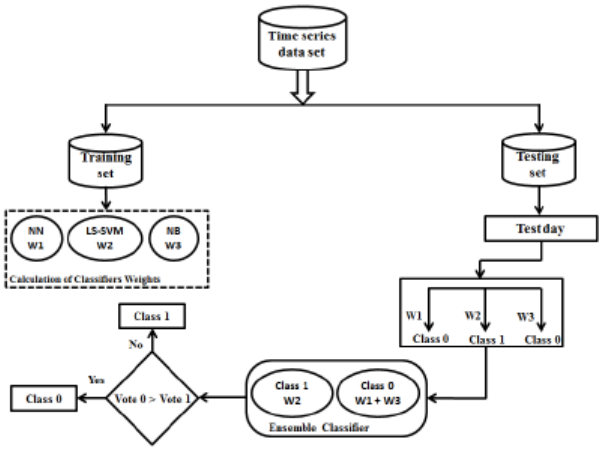

Fig4: An example of using bagging-based algorithm

Fen Miao et.al [2] proposed an improved RSF (iRSF) with a novel split standard and a halting basis for distinguishing progressively exact indicators that can isolate survivors and non-survivors and, in this way, improve segregation capacity. Initial, a weighted log-rank test was utilized to part the hub and can be connected to non-relative risk circumstances to improve the test for a scope of elective theories.

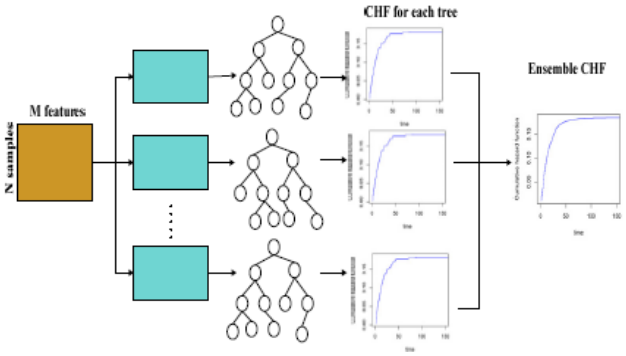

Fig5: Diagram of iRSF algorithm

Bo Jin et.al [3] proposes a successful and strong design for heart disease prediction. The primary commitment of paper is to anticipate heart failure(attack) by utilizing a neural network (i.e., to foresee the likelihood of cardiovascular sickness dependent on patient's electronic restorative data). Specifically, they utilized one-hot encoding and word vectors to demonstrate the analysis occasions and anticipated heart disappointment occasions utilizing the fundamental standards of a long short-term memory model. Assessments dependent on a genuine informational collection show the promising utility and adequacy of the proposed engineering in the expectation of the danger of heart disappointment.

Hochreiter and his team design an LSTM model demonstration. It's a unique RNN method. To fulfill a requirement of long-term memory, the RNN capture of condition/situation of a current concealed layer. The result of the calculation comes in the form of an exponential increment and it shows time, cost of the model. That is a reason RNN is not applicable for long term memory calculations.

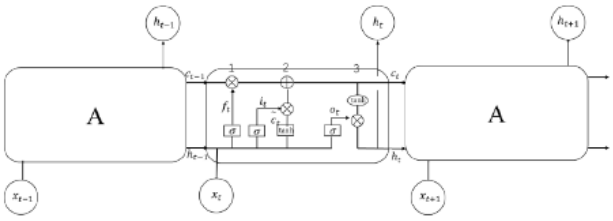

Fig6: a structure of LSTM model

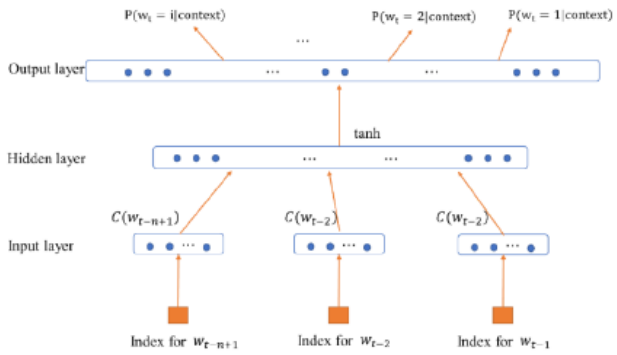

Fig7: A multilayer neural network language model

Afef Mdhaffar et.al [4] presents a novel wellbeing examination approach for heart failure prediction/ expectation. It depends on the utilization of complex occasion preparing (CEP) innovation, joined with measurable methodologies. CEP motor procedures approaching wellbeing information by executing edge-based investigation rules. Rather than having to physically set up limits, our novel factual calculation naturally figures and updates edges as indicated by recorded chronicled information.

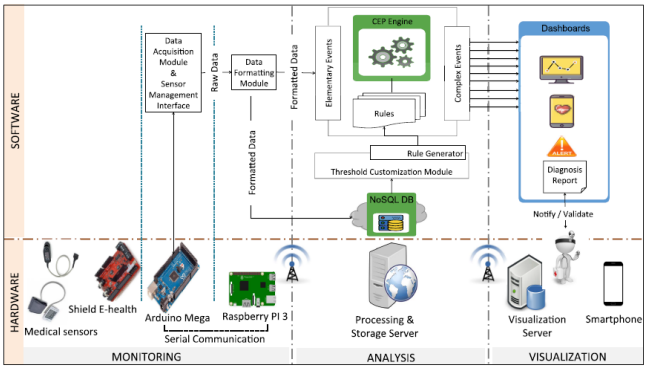

Fig8: An architecture of CEP4HFP

Chryses et.al [5] The heart phonocardiogram is breaking down by utilizing Ensemble Empirical Mode Decomposition (EEMD) joined with kurtosis highlights to find the proximity of S1, S2 and concentrate them from the recorded information, framing proposed HSS conspire, to be specific HSS-EEMD/K.

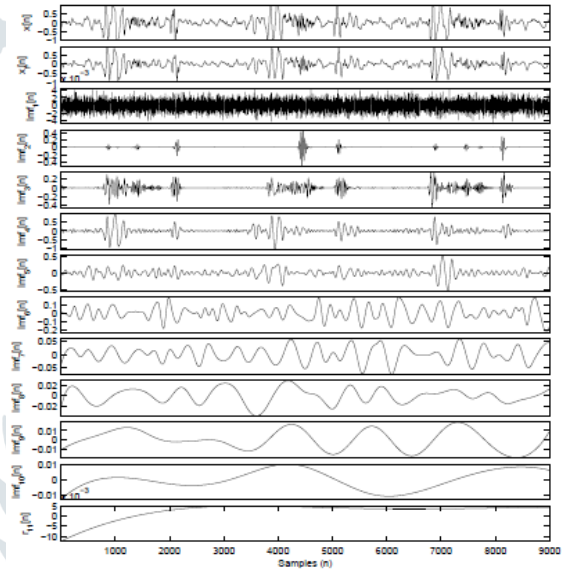

Fig:10 A block diagram of HSS_EEMD/K.

Liaqat Ali et.al [6] study shows that there are numerous different automatic decision support systems which work on ANN (artificial neural network) for finding heart disease prediction in previous models and algorithm. Mostly these methods focus on only preprocessing features. So, they focus on both enhancement of features and exclusion of the problems impersonated by the predictive methods (an i.e. problem related to overfitting and underfitting) A performance parameter increase and gives an accurate result if overfitting and the underfitting problem are solved for training data set and test data set. Irrelevant features and bad network configuration are a cause of overfitting the training data set. Liaquat Et.al propose an X^{2}-DNN model to remove irrelevant features by using Deep Neural Network. They show a difference between ANN and DNN. According to them, this proposed model gives 93.33% accurate results for the prediction of heart disease.

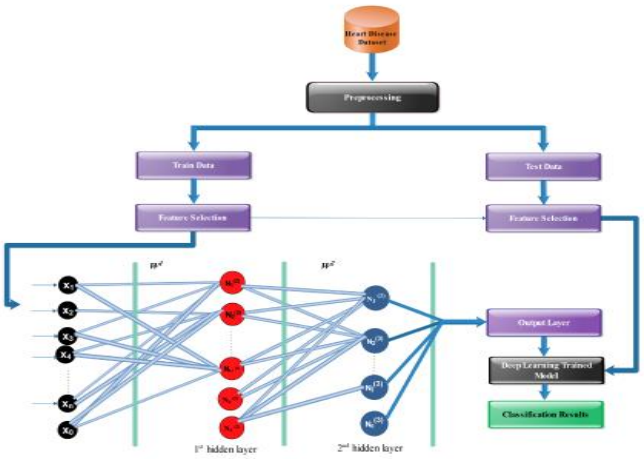

Fig 11: Block diagram of X^{2}-DNN model

Minas.A.Karolis et.al [7] Design a model based on a data mining system for heart disease-related risk factors. They mainly focus on to reduce coronary heart disease (CHD). They investigated different risk parameters before and after a CHD event like a history of hypertension, diabetes, high-density lipoprotein, low- density lipoprotein, cholesterol, etc. To achieve the goal of this algorithm they choose a decision tree classification technique and C4.5 method for designing a decision tree. A classification/characterization is the handling of finding a lot of models (or capacities) those define and recognize information classes. They utilize Classification systems/methods of data mining with the decision tree.

A decision tree basically trees type structure with node, the root node, branches, and sub-nodes. A decision tree classification technique has two types of data set namely training and test data. First, one is used to implement a model or classifier and the second dataset is used for testing of implemented model. According to the proposed algorithm it anticipates from CHD risk factors.

There are some popular prediction methods like:

A. CART:

CART represents Classification and Regression Trees. CART is one of the famous techniques for structure choice tree in the AI people group [13][28]. It was created by [Bierman and his team. At 1984] and is portrayed by the way that it develops binary trees, specifically every interior hub/node must be precisely 2 active edges, every one of which presently endeavors to part in a similar way as the root hub/node. The parts are chosen to utilize the Gini index.

B. Bayesian classifier:

A Bayesian classifier is a measurable classifier. This classifier is used for prediction with probabilities.

C. Fuzzy logic:

Fuzzy logic is a set of a rule-based classification system. It improves all the problems of crisp and rule-based classifiers.

D. Association rule mining:

This is an imperative & active field of data mining researcher. One strategy for association rule mining, called associative classification/characterization, comprises of two stages. In the primary advance, affiliation guidelines are produced utilizing an adjusted form of the standard affiliation rule mining calculation known as A prior. The second step builds a classifier dependent on the affiliation rules found.

E. LSTM:

LSTM stands for Long short-term memory, which is a family of neural network specifically a recurrent neural network. LSTM are capable of learning order dependence in sequence prediction problems. They can also have some behaviors to manage complex problem domains like machine translations, speech recognition, pattern recognition and many more.

A basic LSTM unit has a following components-

1- A cell
2- An input gates
3- An output gate and
4- A forget gate

Long short-term memory (LSTM) networks are well-suited to classify, processing and have an intellectual property of making prediction based on time series. They are always working on a conditioned by a past experience of the networks input.

III. CONCLUSION AND FUTURE WORK

Heart disease is the maximum communal illness that leads to death in our biosphere conferring to World Health Organization (WHO) intelligences, especially in under progressing nations. All medical experts do not have equal information and ability to make an precise result, in which some specialists give a poor practical decision that primes people to hazardous conditions. To control this complications to forecast of the occurrence of diseases is needed. This paper provides a brief analysis about current procedure for healthier decision making by via various algorithms and feature selection methods. In the future work we are trying to develop an algorithm for predicting the incidence of heart disease for early instinctive examination and short time reclaim results that aid to give the standard facilities and decrease expenses to save the mortal of individuals.

REFERENCES

1. Ji Zhan, R. Lafta, X.Tao, Y. LI," Coupling a Fast Fourier Transformation With a Machine Learning Ensemble Model to Support Recommendations for Heart Disease Patients in a Telehealth Environment", IEEE Access, vol.5,pp.10674-10685,2017
2. Fen Miao, Y.P.Cai, Y.X.Zhan," Predictive Modeling of Hospital Mortality for Patients With Heart Failure by Using an Improved Random Survival Forest" IEEE Access, vol.6,pp.7244-7254,2018.

3. Bo Jin, C.Che , Z. Liu," Predicting the Risk of Heart Failure With EHR Sequential Data Modeling" IEEE Access, vol.6,pp.9256-9261,2018.
4. A.Mdhaffar, I.B.Rodriguez, K.Charfi," CEP4HFP: Complex Event Processing for Heart Failure Prediction", IEEE Transaction, vol.16,pp.1536-1241,2017
5. C.D.Papadaniil, L.J.Hadjileontiadis, "Efficient Heart Sound Segmentation and Extraction Using Ensemble Empirical Mode Decomposition and Kurtosis Features", IEEE Journal of Biomedical and health Informatic,2013
6. Liaqat Ali," An Automated Diagnostic System for Heart Disease Prediction Based on _2 Statistical Model and Optimally Configured Deep Neural Network", IEEE access, vol.7, pp-34938-34945,2019
7. M.A.Karaolis, "Assessment of the Risk Factors of Coronary Heart Events Based on Data Mining With Decision Trees", IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE, VOL. 14, NO. 3,pp-559-566 MAY 2010
8. F. M. Bianchi, E. De Santis, A. Rizzi, and A. Sadeghian, "Short-term electric burden estimating utilizing reverberation state systems and PCA decomposition," IEEE Access, vol. 3, pp. 1931_1943, 2015.
9. J. Pati, B. Kumar, D. Manjhi, and K. K. Shukla, "An examination among ARIMA, BP-NN, and MOGA-NN for programming clone development forecast," IEEE Access, vol. 5, pp. 11841_11851, 2017.
10. Y.- T. Su, Y. Lu, M. Chen, and An.- A. Liu, "Spatiotemporal joint mitosis discovery utilizing CNN-LSTM arrange in time-slip by stage differentiate microscopy pictures," IEEE Access, vol. 5, pp. 18033_18041, 2017.
11. G. Zhu, L. Zhang, P. Shen, and J. Melody, "Multimodal motion acknowledgment utilizing 3-D convolution and convolutional LSTM," IEEE Access, vol. 5, pp. 4517-4524, 2017.
12. G. P. Zhang, "Time arrangement anticipating utilizing a crossover ARIMA and neural system show," Neurocomputing, vol. 50, pp. 159_175, Jan. 2003.
13. G. M. Jenkins and A. S. Alavi, "Some parts of demonstrating and estimating multivariate time arrangement," J. Time Ser. Butt-centric., vol. 2, no. 1, pp. 1_47, 1981.
14. R. G. Dark colored, "Exponential smoothing for anticipating request," Oper. Res., vol. 5, no. 1, pp. 145_145, 1957.
15. G. E. P. Box, G. M. Jenkins, and G. C. Reinsel, Linear Nonstationary Models Time Series Analysis), the fourth ed. Hoboken, NJ, USA: Wiley, 1976, pp. 93_136.
16. S. Hochreiter and J. Schmidhuber, "Long momentary memory," Neural Comput., vol. 9, no. 8, pp. 1735_1780, 1997.
17. F. A. Gers and J. Schmidhuber, "Recurrent nets that time and tally," in Proc. IEEE-INNS-ENNS Int. Joint Conf. Neural Netw. (IJCNN), vol. 3. Jul. 2000, pp. 189_194.
18. J. Chung, C. Gulcehre, K. Cho, and Y. Bengio. (2014). "Observational assessment of gated intermittent neural systems on grouping displaying." [Online]. Available: https://arxiv.org/abs/1412.3555
19. G. E. Hinton, "Learning conveyed portrayals of ideas," in Proc. eighth Annu. Conf. Cognit. Sci. Soc., vol. 1. 1986, pp. 47_61.
20. Y. Bengio, R. Ducharme, P. Vincent, and C. Janvin, "A neural probabilistic language show," J. Mach. Learn. Res., vol. 3, pp. 1137_1155, Feb. 2003.
21. C. Buckley and E. M. Voorhees, "Retrieval assessment with deficient data," in Proc. SIGIR, 2004, pp. 25_32.
22. N. Tangri et al., "A prescient model for the movement of endless kidney malady to kidney disappointment," JAMA, vol. 305, no. 15, pp. 1553_1559, 2011.
23. R. Sukkar, E. Katz, Y. Zhang, D. Raunig, and B. T. Wyman, "Disease movement demonstrating utilizing shrouded Markov models," in Proc. Annu. Int. Conf. IEEE Eng. Medications. Biol. Soc., Aug./Sep. 2012, pp. 2845_2848.
24. J. Zhou, J. Liu, V. A. Narayan, and J. Ye, "Modeling illness expert gression through perform various tasks learning," NeuroImage, vol. 78, pp. 233_248, Sep. 2013.
25. Y.- Y. Liu, H. Ishikawa, M. Chen, G. Wollstein, J. S. Schuman, and J. M. Rehg, "Longitudinal displaying of glaucoma movement utilizing 2-dimensional constant time shrouded Markov show," in Proc. Int. Conf. Prescription. Picture Comput. Comput.- Assisted Intervention. (MICCAI), Nagoya, Japan, 2013, pp. 444_451.
26. P. Schulam and S. Saria, "A system for individualizing expectations of malady directions by misusing multi-goals structure," in Proc. Adv. Neural Inf. Procedure. Syst. (NIPS), Montreal, QC, Canada, 2015, pp. 748_756.
27. X. Wang, D. Sontag, and F. Wang, "Unsupervised learning of sickness movement models," in Proc. Knowl. Revelation Data Mining (KDD), New York, NY, USA, 2014, pp. 85_94.
28. E. Choi, N. Du, R. Chen, L. Melody, and J. Sun, "Constructing malady system and fleeting movement show by means of setting touchy Hawkes process," in Proc. Int. Conf. Information Mining (ICDM), Atlantic City, NJ, USA, Nov. 2015, pp. 721_726.
29. N. Hammerla, J. Fisher, P. Andras, L. Rochester, R. Walker, and T. Ploetz," PD sickness state evaluation in naturalistic situations utilizing profound learning," in Proc. AAAI, Austin, TX, USA, 2015, pp. 1742_1748.
30. Z. C. Lipton, D. C. Kale, C. Elkan, and R. Wetzell. (2016). "Learning to determine to have LSTM repetitive neural systems."
31. Karpathy and L. Fei-Fei, "Deep visual-semantic arrangements for creating picture depictions," in Proc. PC. Vis. Example Recognit. (CVPR), Boston, MA, USA, 2015, pp. 3128_3137.
32. K. Cho et al., "Learning phrase portrayals utilizing RNN encoder-decoder for measurable machine interpretation," in Proc. Observational Methods Natural Lang. Procedure. (EMNLP), Doha, Qatar, 2014, pp. 1724_1734.