Heart Attack Failure Prediction using IBM Auto AI Service

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ABSTRACT

The diagnosis of heart attack in most cases depends on a complex combination of clinical and pathological data of patient. Because of this complexity, there exists a significant amount of interest among clinical professionals and Researchers regarding the efficient and accurate prediction of heart attack. In this Project , Best algorithm is adopted for prediction of heart attack that can assist the patients and their fellowships in predicting heart attack status of the patient based on their daily ECG records, Blood pressure values, Blood sugar values, Cholesterol values and general parameter such as age, sex of the patient and the system is implemented in IBM Watson Platform.

Problem definition

The Survey says that 12 million deaths occur worldwide every year due to the Heart diseases. Heart Attack remains the biggest cause of deaths for the last two decades .There are number of factors which increases risk of Heart disease some of the important factors are Blood pressure, Blood Sugar, Cholesterol and also due to the Family history of heart disease, Obesity, Lack of physical exercise and also due to poor clinical decisions.

Objective

Because not only human intelligence is enough for proper diagnosis and number of difficulties will arrive during diagnosis of heart disease such as result will be less accurate, and it take more time for prediction . Hence to overcome this problem, now a day's many computer related technology and machine learning technology are used to develop software to assist the doctors in making decision of heart attack in the early stage and it is very useful for the health care industries. The diagnosis of heart attack depends on clinical and pathological data called as data sets (i.e.) the set of data or information which contains the patient reports. In this project Experiments have been performed using IBM Watson Platform and its automated services.

Need for proposed system

In this project we designed the proposed system with best algorithm choosen by Watson Platform AI Auto Service which will provide efficient result on the prediction of heart attack. In case of algorithm X, The most commonly used networks consist of an input

layer, a single hidden layer and an output layer. The input layer size is set by the type of pattern or input that the network wants to process. The major factors for predicting the heart attack such as ECG, Blood pressure, Blood sugar, cholesterol values are given as the input to the input layer of the Neural Network with the weights for every link and then the output of the input layer is given as the input for the hidden layer were the sigmoid function, $f(x) = 1/(1+e^{-x})$ is applied on the hidden layer. The output of the hidden layer is passed as input for the output layer where it performs the sigmoid function. The difference between the target output and computed output is evaluated and the error is rectified and corrected by adjusting the weights. In case of Algorithm Y, assume a topological structure among the cluster units. There are various cluster units m, arranged in a one or two dimensional array, and the input signals are n.The weight vector for a cluster unit serves as an paradigm of the input patterns associated with that cluster. During the self organization process, the winner unit is determined by matching the cluster unit whose weight vector matches the input pattern most closely (typically, the square of the minimum Euclidean distance, D(j) as per the algorithm) is chosen as the winner unit. The winning unit and its neighboring units (the network structure of the cluster units) update their weights. The weight vectors of neighboring units are not, in general similar to the input pattern. For example, for a linear array of cluster units, the neighborhood of radius R around cluster units J consists of all units j such that $\max(1,J-R) <= j <= \min(J+R,m)$.

Electro Cardio Gram (ECG)

An **electrocardiogram** (EKG or ECG) is a test that checks for problems with the electrical activity of your heart. An EKG shows the heart's electrical activity as line tracings on paper. The spikes and dips in the tracings are called waves. The heart is a muscular pump made up of four chambers.

The heart has four chambers: two atria and two ventricles.

- The right atrium receives oxygen-poor blood from the body and pumps it to the right ventricle.
- The right ventricle pumps the oxygen-poor blood to the lungs.
- The left atrium receives oxygen-rich blood from the lungs and pumps it to the left ventricle.
- The left ventricle pumps the oxygen-rich blood to the body.

Normally, the heartbeat starts in the right atrium in a group of special heart cells called the sinoatrial (or sinus) node. These cells act as pacemaker for the heart.

The heart's pacemaker sends out an electrical signal (impulse) that spreads throughout the heart along electrical pathways. These pathways transmit the signal from the upper to the lower chambers of the heart, which causes the heart muscle to contract. Regular, rhythmic electrical signals keep the heart pumping blood to the lungs and the body.

An ECG is done to:

- Check the heart's electrical activity.
- Find the cause of unexplained chest pain or pressure. This could be caused by a heart attack, inflammation of the sac surrounding the heart (pericarditis), or angina.

Find the cause of symptoms of heart disease. Symptoms include

- Find out if the walls of the heart chambers are too thick.
- Check how well medicines are working and see if they are causing side effects that affect the heart.
- Check how well mechanical devices that are implanted in the heart, such as pacemakers, are working. These devices help to control the heartbeat.
- Check the health of the heart when other diseases or conditions are present. These include high blood pressure, high cholesterol, cigarette smoking, diabetes, and a family history of early heart disease.

Then the Pictorial representation of Electro Cardio Gram (ECG)is described in Fig (a)

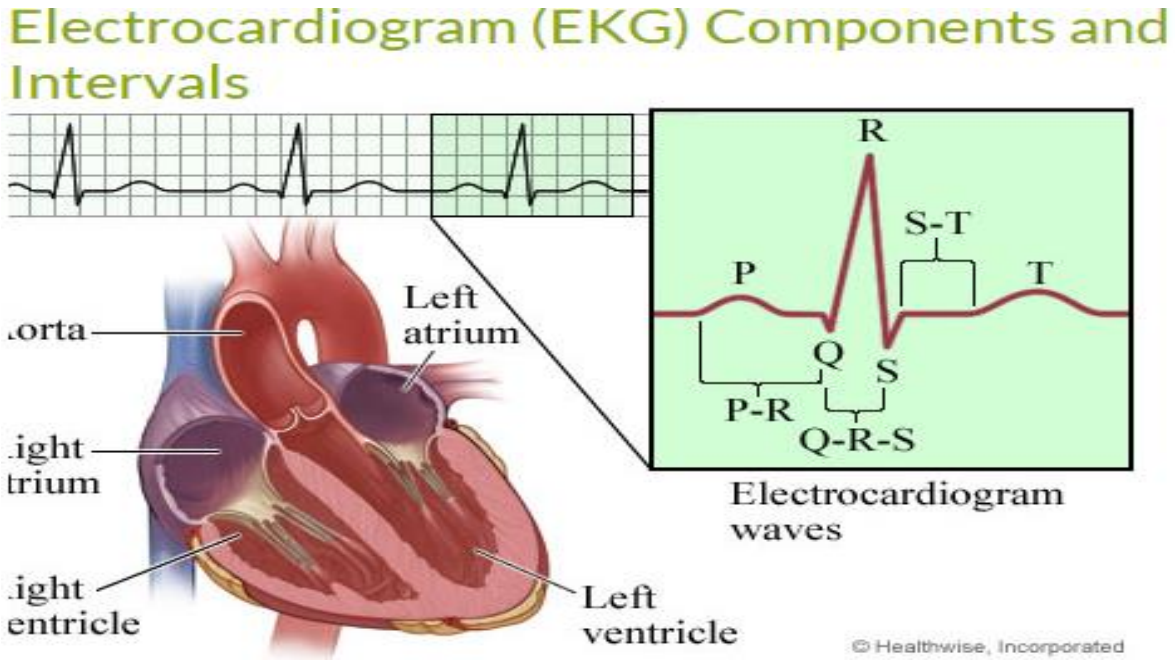


Fig (a) Pictorial representation of Electro Cardio Gram (ECG)

Then the Pictorial representation of Electro Cardio Gram (ECG) waves is described in Fig (b)

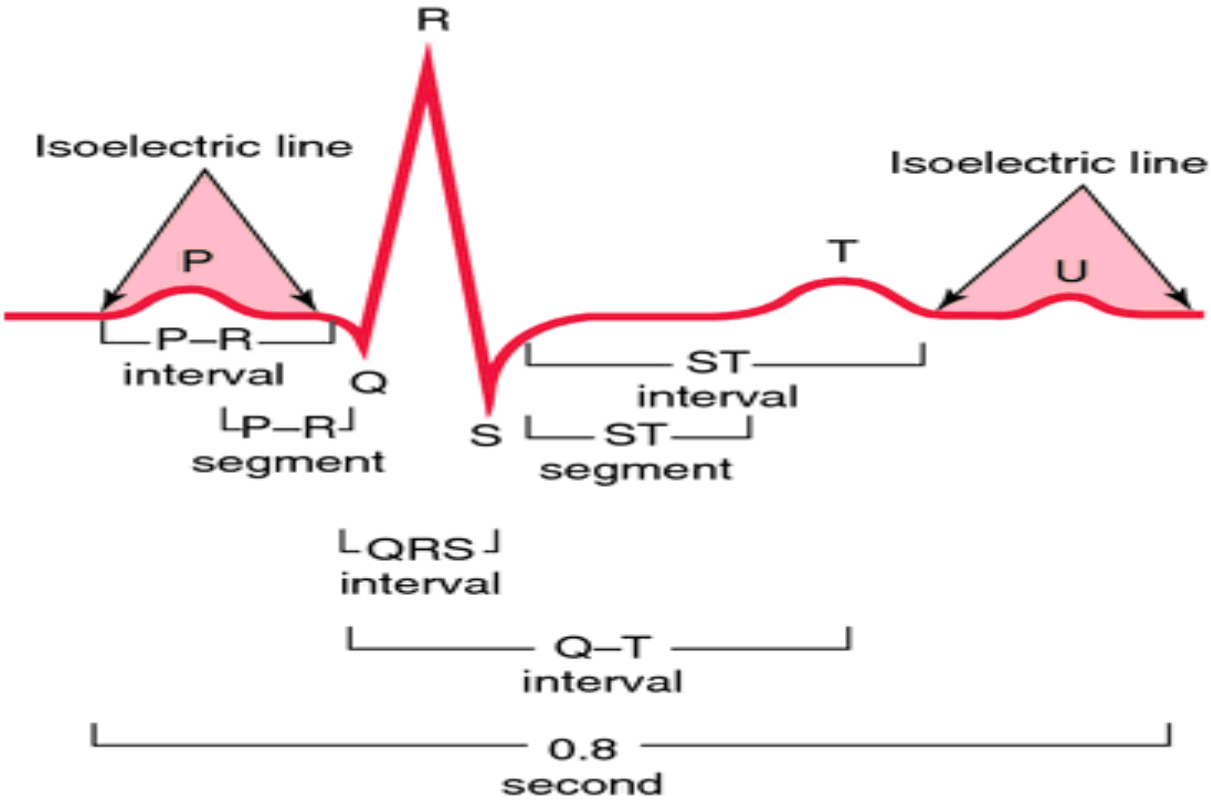


Fig (b) Wave representation of Electro Cardio Gram (ECG)

HEART DISEASE ANALYSIS TABLE:

SL.NO	Dimension	Abbreviation	Transformation Condition
1	Age (in years)	Age	1:<20, Child, 2:20-40, Young, 3:40-60, Middle, 4:60-80, Old, 5:80-100, Too Old
2	Sex	Sex	1:male, 0:female
3	Resting blood pressure(mm Hg)	trestbps	1:<80, Normal, 2: 80-100 Medium, 3:>100,
4	Serum cholesterol (mg/dl)	Chol	1:<200, Normal, 2: 200-400, High, 3:>400, Severe
5	Fasting blood sugar (mg/dl)	Fbp	0: < 120, 1: > 120

Table c Heart disease analysis table

LITREATURE SURVEY

Comparative Study of Back Propagation Learning Algorithms for Neural Networks Saduf, Mohd Arif Wani Dept.of Computer Sciences University of Kashmir Srinagar, j&k, India.

Back propagation[6] method is a technique used in training multilayer neural networks in a supervised manner. The back propagation method, also known as the error back propagation algorithm, is based on the error correction learning rule; it is most often used learning algorithm in neural networks as it deals with continuous data and differentiable functions for both single and multilayer models. Slower convergence and longer training times are the disadvantages often mentioned when the conventional back propagation algorithm is compared with other competing techniques. Over years many improvements and modifications of the learning algorithm have been reported to overcome these shortcomings.

A Back-Propagation network consists of at least three layers of units: an input layer, at least one intermediate hidden layer, and an output layer. Typically, units are connected in a feed-forward fashion with input units fully connected to units in the hidden layer and hidden units fully connected to units in the output layer. The input pattern is presented to the input layer of the network. These inputs are propagated through the network until they reach the output units. This forward pass produces the actual or predicted output pattern. Because back propagation is a supervised learning algorithm, the desired outputs are given as part of the training vector. The actual network outputs are subtracted from the desired outputs and an error signal is produced. This error signal is then the basis for the back propagation step, whereby the errors are passed back through the neural network by computing the contribution of each hidden processing unit and deriving the corresponding adjustment needed to produce the correct output. The connection weights are then adjusted and the neural network has just “learned” from an experience. Once the network is trained, it will provide the desired output for any of the input patterns. The change in the weights may be done at the time each input vector is presented. This is known as sequential mode of training. The change can also be averaged and weights can be changed after all the input vectors are applied. This type of training is called batch mode of training.

Self Organizing Map view:

Heart Disease Diagnosis Using Multiple Kohenen Self Organizing Maps, Volume: 03. SOM [3] is unsupervised learning, the training of the network is entirely data-driven and no target results for the input data vectors are provided. An ANN of the unsupervised learning type, such as the self-organizing map, can be used for clustering the input data and find features inherent to the problem. SOM topology consists of two layers of units: Input: *n* units (length of training vectors), Output: *m* units (number of categories). Input units fully connected with weights to output units. For the Intra-layer ("lateral") connections, Within output layer is defined according to some topology and No weight between these connections, but used inalgorithm for updating weights. This KSOM has a feed-forward structure with a single computational layer arranged in rows and columns. Each neuron is fully connected to all the source nodes in the input layer. The aim is to map from this to a low dimensional spatially discrete output space, the topology of which is formed by arranging a set of neurons in a grid.

Importance of ECG

Ketaki N.Patil, P.C.Bhaskar, "Transmission of Arm Based Real Time ECG for Monitoring Remotely Located Patient "international journal of Research in Engineering and Technology eISSN: 2319-1163, pISSN: 2321-7308, Volume: 03 Issue: 04, Apr-2014.

ECG [5] monitoring is the most widely used technique for providing ambulatory cardiac monitoring for capturing rhythm disturbances. A traditional ECG monitor can record up to 24 hours of ECG signals and the recorded data is subsequently retrieved and analyzed by a clinician. Due to the short duration involved and the unknown context within which ECG signal is captured; reliable interpretation of the recorded data is always a challenge. The risk factor of heart attack is when there is drastic changes in the ECG waves hence the prediction of heart attack can be accurate on using the patient ECG record.

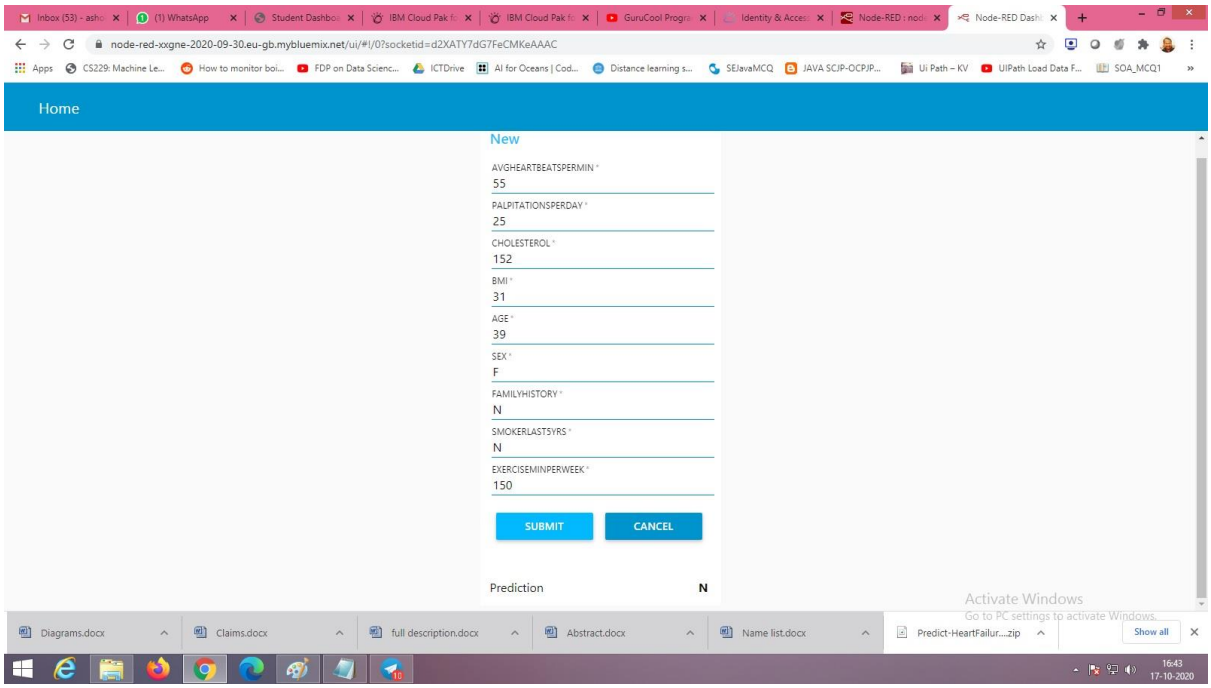
CONCLUSION AND FUTURE WORK

Heart Attack is one of the leading causes of death worldwide and the early prediction of heart disease is important. The computer aided Heart Attack Prediction System helps the physician as a tool for Heart Attack Prediction. Some Heart Attack Prediction System is reviewed in this project. From the analysis, it is concluded that, IMB Watson Auto AI Service plays a major role in Heart Attack Prediction. Neural Network Architecture is anticipated to be the best architecture for Heart Attack Prediction in early stage and the good performance of the system can be obtained by preprocessed and normalized dataset.

A prototype Heart Attack Prediction System is developed using neural network architectures (i.e) Auto AI techniques. The system extracts hidden knowledge from the historical details of the patients such as ECG report, Blood Pressure, Blood Sugar, Cholesterol, Troponin test reports. The models are trained and validated against the test dataset. These are the most effective model to predict the patients with heart disease and appeared to be the new proposed technique Probabilistic Neural Network Architectures. While using the neural network architectures it will provide more accurate prediction of Heart Attack. The System is user friendly and also gives more accuracy (87%). And so the Heart Attack prediction system using IBM Watson AI Auto Service can be further enhanced and expanded in future through IBM IOT and Smart Devices and this will be more useful in Medical Field.

APPENDIX -1

SCREENSHOT



SYSTEM RRQUIREMENTS

Platform	:	IBM Watson
Services	:	Auto AI + Machine Learning Instance
User Interface	:	Node RED

REFERENCES

[1]Daniel Larose, Discovering Knowledge in Data: An Introduction to Data Mining, Wiley, Hoboken, NJ, 2005.

[2]MA.Jabbar, B.L.Deekshatulu and Priti Chandra.: An evolutionary algorithm for heart disease prediction, ICIP, CCIS 292 PP 378- 389, Springer-Verlag (2012).

[3]Heart Disease Diagnosis Using Multiple Kohenen Self Organizing Maps, Volume: 03.

[4]B.Jyosthna, R.GiriPrasad, "Medical Emergency Assistance System using GSM", International Journal of Scientific Engineering and Research (IJSER) SN (Online): 2347-3878, Volume 1, Issue 1, September 2013.

[5]Ketaki N.Patil, P.C.Bhaskar, "Transmission of Arm Based Real Time ECG for Monitoring Remotely Located Patient "international journal of Research in Engineering and Technology eISSN: 2319-1163, pISSN: 2321-7308, Volume: 03 Issue: 04, Apr-2014.

[6]Comparative Study of Back Propagation Learning Algorithms for Neural Networks Saduf, Mohd Arif Wani Dept.of Computer Sciences University of Kashmir Srinagar, j&k, India.

[7]A.Indhu, V.Nithya, D.Sujithra, M.Ashok,"A BPN based heart attack prediction system using ULK(Unified Learning Kit)- International Journal of Modern Trends in Engineering and Research,Volume: 03 Issue: 02,Feb-2016.