

The Model of Internet of Medical Things for Electrocardiography(ECG)

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Literature Review(From Proposal)

Men are generally at greater risk for cardiovascular diseases (Reckelhoff, 2001). The death of people has been increasing rapidly with an increase in death, there are more deaths caused by Non-Communicable Diseases (WHO, 2010). Mostly diseases related to Heart E.g.: Cardiovascular and diabetes diseases (WHO, 2010).

The scholar Jambukia, has tried to identify the issue of arrhythmia in which rhythm of heart rate decrease (Jambukia, et al., 2015). Detecting an arrhythmia is an important aspect for resolving it quickly so that diseases can be cured properly (Jambukia, et al., 2015). The scholar uses the Artificial Neural Network (ANN) (Jambukia, et al., 2015). ECG can be used to detect the issue of chest pain & to detect the abnormal heart rhythm or cardiac abnormalities (Jambukia, et al., 2015). Patient might suffer from heart related problem because of the family history. The heart rhythms can help to know about the problem that might occur like heart attack, and enlargement of heart (Jambukia, et al., 2015). There is high Mortality rate of people because of heart related problem (Jambukia, et al., 2015). The preliminary detection and cure of heart required for those peoples (Jambukia, et al., 2015).

The scholar Bulbul extract the dataset of about 48 patients and their feature. There were sixteen types of diseases were in a trained classis (Bulbul, et al., 2017). The Scholar used a MATLAB for analysis of this diseases (Bulbul, et al., 2017). The two classifier Support Vector Machine and Multilayer Sensor classifiers were used because of good results (Bulbul, et al., 2017).

The Scholar Goovaerts has made an model for making chunk of QRS complex (Goovaerts, et al., 2014). QRS complex features is splinted using variational mode decomposition and phase rectified signal averaging method (Goovaerts, et al., 2014). The scholar makes model of 616 patients using 12 leads (Goovaerts, et al., 2014). By using Support vector method, the scholar achieved the 95.0% accuracy (Goovaerts, et al., 2014).

1.1 Classification Features

Electrocardiography (ECG) is used as a tool to measure the rhythms of heartbeat and to visualize the status of heart (Christov, et al., 2005). There are 10 types of electrode for ECG. Six electrodes for Body, 2 electrodes for hands and 2 electrodes for legs. Mostly, Recording of ECG is done to know the status of heart in future days and to analysis the status of Heart state (Christov, et al., 2005).

ECG plays an important role in an emergency cases, when an operation of takes place the ECG plays an important role to detect an issue in blood circulation and contraction. When there is little change in ECG graph then operation is considered as thoughtful. Classifying the normality and abnormality in real

time scenario is important to track the ECG data (Christov, et al., 2005). The Scholar follows the KNN Classification approach to classify the data (Christov, et al., 2005).

According to the Alarsan's journal (Alarsan & Younes, 2019), this journal proposed an classification of ECG using Machine Learning for extracting its several features (Alarsan & Younes, 2019). The ECG measures the electric activity which occurs in heart. In this journal MATLAB's Libraries and Apache Framework has been used (Alarsan & Younes, 2019). ECG classification were used to properly manage the irregularities in the ECG Signal and to properly identify the types of diseases in the patients' health status. The scholar follows the different classification methods like Decision Tree, Random Forests and Gradient-Boosted Trees. The scholar has taken the dataset of 205,143 records to evaluate the model. By using Gradient-Boosted Trees classification algorithm there was an accuracy of 96.75% and by using Random Forests classification algorithm there was 97.98% accuracy for binary classification. But for multiple classification there was an accuracy of 98.03% from Random Forest.

According to the scholar Marisa (Faraggi & Sayadi, 2019), For extracting features from time series data, the scholar used an Fourier and Wavelet techniques to extract features.

1.2 Remote ECG

According to the journal published by Meenu Singh, Tele-ECG has greater possibilities for rural area in which there are less ratio of trained Medical staffs (Singh, et al., 2014). Tele-ECG can be use for those patients who has been discharged from hospital and has been called for follow up then those tools can be for those patients. That help to provide the status of patients to the medical staffs from co-location (Singh, et al., 2014). Tele-ECG were tested in India's Chandigarh, where 70% of patients where from Normal Heart patients and there were an patient having problems on left ventricular hypertrophy were 9.3% (Singh, et al., 2014). This problem was considered as normal disease for many people. Secondly, people suffering from old myocardial infarction were 5.3%. The patient who was diagnosed from that tools they were high number of people who were satisfied by the diagnosis & its result (Singh, et al., 2014). Tele-ECG is good in many prospective, It can transported easily, it's less costly, and good tools for diagnosis and visualizing of heart diseases. These tools will be good for rural areas (Singh, et al., 2014).

According to a journal published in 2017, Cardiovascular diseases (CVDs) are the cause of cardiac death worldwide (Acharya, 2016). ECG has been portable for recording devices at home or outdoors and sends them to smartphones or desktops (Irfan , 2020). IOT has a wide range of scope as a self-configuring, adaptive, Complex network that interconnects 'things' to the internet using standard communication protocols (Irfan , 2020).

1.3 Summary

In the meantime, we are facing difficulties from many factors. According to the scholar there has been more occurrence of death because of cardiovascular disease. We must cure those diseases timely. We must use proper techniques for filtering features in ECG data. There must a proper provision of ECG technology so that people from remote location can be benefited.

Figure2-1: Causes of Death 1 (Krex, 2015)

There is research gap in those literature review. Most of the scholar mentioned about the feature's extraction from ECG graph, classification and fitting it into Machine Learning model. But there seems to be gap while selecting and training the module. The scholar has mentioned that in case of male ECG dataset.

As the maturity of men increases there is a tiny level of increment of blood pressure & decrement takes place at the age of 70's. But in the context of women faces menstrual cycle & giving birth take place so their blood pressure seems to decrease in 40's ages. Because of weakness and after the age of 45's women menopause takes place. After the increment of age there seems to be increment of blood pressure level. This change of

age and Blood pressure can be viewed in the figure 2-1 (Krex, 2015). So there seems research gap on age, sex. But in the context of Tall people. Their blood level has to be pumped more upper so the heart pulse might be greater than that of short people.

As there is fixed standard for ECG Signal representation, But the Normality of heart difference according to the age, Sex, Height and Weight. There must be different features for verifying the affecting parameters.

There must be proper quantification of features of ECG signals using variational mode decomposition and phase-rectified signal averaging (Goovaerts, et al., 2014).