An Early Myocardial Infarction Detection System Using Complex Artificial Intelligence

Gundrala, Abhinav

Myocardial Infarctions are major cardiovascular emergencies that can severely weaken the heart or even cause heart failure if they are not treated in a timely manner. Myocardial Infarctions are also very difficult to diagnose due to the silent symptoms that can occur. As of now, there are no existing solutions that can diagnose Myocardial Infarctions (MI) in a portable setting while keeping a high level of accuracy. The goal of the project was to create a portable system that was both accurate and low cost to detect an early MI. To achieve both accuracy and portability, a wearable ECG system was developed. All heartbeats are not alike and are varied person to person. To counteract this variability while keeping a high level of accuracy, an Artificial Neural Network (ANN) was developed and trained to detect abnormal heartbeats that could signify an MI. This ANN was adjusted for overfitting and pruned so that it could be ported to a Raspberry Pi. This Linux based computer runs python scripts that collect the ECG data, apply pre-processing algorithms including an FFT and classify each heartbeat using the local neural network. This system was heavily optimized using multithreading and other software techniques to reduce the total run time from collection to classification of each heartbeat on the Raspberry Pi. The training of the ANN occurs on the cloud therefore the training resources did not affect the local classification system on the Raspberry Pi. The entire system was trained and tested using the PTB diagnostic ECG database within Physionet which includes real ECG data from MI patients. After training and testing, the portable system achieved an average 92% accuracy while remaining low cost. This system can be applied to the detection and prevention of other diseases.

Awards Won:

Third Award of $1,000