Project Design Phase-I
Proposed Solution Template

Date	9-October-2022
Team ID	PNT2022TMID14702
Project Name	Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representation
Maximum Marks	2 Marks

Proposed Solution Template:

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	According to the World Health Organization (WHO), cardiovascular diseases (CVDs) are the number one cause of death today. Over 17.7 million people died from CVDs in the year 2017 all over the world which is about 31% of all deaths, and over 75% of these deaths occur in low and middle-income countries. Arrhythmia is a representative type of CVD that refers to any irregular change from the normal heart rhythms. There are several types of arrhythmia including atrial fibrillation, premature contraction, ventricular fibrillation, and tachycardia. Although a single arrhythmia heartbeat may not have a serious impact on life, continuous arrhythmia beats can result in fatal circumstances. In this project, we build an effective electrocardiogram (ECG) arrhythmia classification method using a convolutional neural network (CNN), in which we classify ECG into seven categories, one being normal and the other six being different types of arrhythmia using deep two-dimensional CNN with grayscale ECG images. We are creating a web application where the user selects the image which is to be classified. The image is fed into the model that is trained and the cited class will be displayed on the webpage.
2.	Idea / Solution description	In our project we classify ECG into seven categories, one being normal and the other six being different types of arrhythmia using deep two-dimensional CNN with grayscale ECG images. By transforming one-dimensional ECG signals into two-dimensional ECG images, noise filtering and feature extraction are no longer required. This is important since some of ECG beats are ignored in noise filtering and feature extraction. In addition, training data can be enlarged by augmenting the ECG images which results in higher classification accuracy. Data augmentation is hard to be applied in 1-d signals since the distortion of 1-d ECG signal could downgrade the performance of the classifier. However, augmenting two-dimensional ECG images with different cropping methods helps the

		CNN model to train with different viewpoints of the single ECG images. Using ECG image as an input data of the ECG arrhythmia classification also benefits in the sense of robustness.
3.	Novelty / Uniqueness	When compared to other existing models our ECG arrhythmia classification result indicates that detection of arrhythmia with ECG images and CNN model can be an effective approach to help the experts to diagnose cardiovascular diseases which can be seen from ECG signals. Our proposed scheme achieved 0.989 AUC, 99.05% average accuracy, 99.57% specificity, 97.85% average sensitivity, and 98.55% average positive predictive value.
4.	Social Impact / Customer Satisfaction	Our solution will be very helpful in the hospitals where they can analyse the arrhythmia in a very quick way with more accuracy even a person with less knowledge about the analysing of the arrhythmia also can able find the type of fibrillation occurred to the patient. ECG arrhythmia classification method can be applied to the medical robot or the scanner that can monitors the ECG signals and helps the medical experts to identify ECG arrhythmia more precisely and easily.
5.	Business Model (Revenue Model)	The main target of our solution is analysing the arrhythmia in a quick and efficient way. So our target organisations are hospitals and research centres where we visit the hospitals and explain them about the benefits of our object and also by posting some ads of our product on internet. So that they can aware of the importance of this solution and use it.
6.	Scalability of the Solution	Our solution can be integrated or upgraded for further future hence the solution can be modified for any upgraded version