



Classification of Normal and Murmur Heart Signals by using the CITFA Algorithm and Deep Learning

Mohammad Hasan Olyaei Torqabeh *, Hasan Jalali, Ali Olyaei Torqabeh

1. Faculty of Electrical Engineering, Sadjad University of Technology, Mashhad, Iran,
[*mh.olyaei123@sadjad.ac.ir](mailto:mh.olyaei123@sadjad.ac.ir)
2. Faculty of Electrical Engineering, Sadjad University of Technology, Mashhad, Iran,
h.jalali144@sadjad.ac.ir
3. Department of Computer Engineering, Faculty of Engineering, Ferdowsi University of
Mashhad, Mashhad, Iran, ali.olyaei@mail.um.ac.ir

Abstract

This paper discusses a new method called CITFA to classify the heart signal into two normal class and murmur class. So far, several methods have been proposed for classifying the heart signal by scientists. This algorithm is based on deep learning and consists of two steps. Firstly, the heart signal is received and then converted to CITFA and used as training data. In the next step, these data are taught to the deep network. The simulation and definition of the deep network is done using Python software. The database used to train the deep network is selected from the “Classifying Heart Sounds Challenge” series. The simulation results show that the proposed method has a precision of 98.79% of the ability to classify the heart signals.

Key words: heart signal, normal, murmur, classification, deep learning, python

1. Introduction

In these days classification of heart sound signals is very important in the world because this classification can provide better clinical information to researcher for analyzing and diagnosing different heart abnormalities. There are many algorithms and methods to classify heart sound signals. In some papers use multi-modal features to classify heart sounds, the heart sound have been classified into three classes namely, normal signal, systolic murmur and diastolic murmur signal [1]. Some paper talked about identifying normal and abnormal heart sounds based on Discrete and continuous Wavelet Transform and random forests, in their study, the classification using item derived from Discrete Wavelet Transform recorded the highest total accuracy for the more noisy samples while Continuous Wavelet Transform did the same for the less noisy samples [2, 3]. Many papers using neural networks in the different ways to classify heart sound signals and some paper using deep neural networks to recognize S1 and S2 heart sound by converting heart sound into a sequence of Mel-frequency