

1D Convolutional Neural Network for Detecting Ventricular Heartbeats

A. A. Suárez-León and José R. Núñez

Abstract

This paper shows a novel approach for detecting ventricular heartbeats using a 1D Convolutional Neural Network (1D-CNN). The algorithm input is the raw ECG signal, i.e., no signal pre-processing nor feature extraction are involved. The output of the 1D-CNN is filtered using a combination of linear and nonlinear filters to produce the final output. The MIT-BIH arrhythmia database was used for both algorithm training/tuning and evaluation. The assessment methodology followed the interpatient paradigm, where the algorithm was trained and evaluated using independent subsets. The performance of the proposed method was evaluated for two tasks; QRS detection, and heartbeat classification. QRS detection resulted in a sensitivity of 99.0% and a positive predictivity of 96.5%. The performance assessment of the ventricular ectopic beat detection resulted in a sensitivity of 85.8% and a positive predictivity of 64.5%. Although there is still room for improvement, the results suggest that convolutional neural networks are a promising approach for building heartbeat classifiers.

Keywords: ECG, 1D-CNN, heartbeat classifier