Combining Adaptive Boosting and Sparse Transformer for Multi-channel ECG Signal Classification

Pengfei Fan[1], Yonghao Gao[1], Lihong Qiao[1]
[1]Chongqing Key Laboratory of Image Cognition, Chongqing University of Posts and Telecommunications, Chongqing, China

Cardiovascular disease is caused by heart and blood vessel diseases, and is the disease with the highest fatality rate. Therefore, it is essential to develop an efficient computer-aided diagnosis tool for heart disease. Although the twelve-lead ECG is the standard diagnostic screening basis for many heart disease. However, there is limited evidence to demonstrate the utility of reduced-lead ECGs for capturing a wide range of diagnostic information. The purpose of this study is to develop an algorithm based on the combination of machine learning feature extraction and deep learning, and to diagnose a variety of cardiac abnormalities using electrocardiogram data of twelve-lead, six-lead, three-lead and two-lead. We use a two-branch network structure to extract rich data features for multi-classification tasks. In this model, we design two branches for feature extraction. In one of them, the Adaptive boosting algorithm is used to extract the features of each lead, and the Universal Encoder is introduced to fuse the information of multiple leads. In this branch, the "personality" characteristics and the "commonness" characteristics of each lead are considered simultaneously. The other branch adopts sparse transformer in order to reduce the number of parameters and extract effective features. Finally, the features extracted from the two branches are combined, and then input into the prediction model to perform multiple classification tasks. Our team name is ECG_CQUPT_GF, and Our scores in the unofficial stage are -0.19 (twelve-lead), -0.19 (six-lead), -0.20 (three-lead), -0.19 (two-lead). The results show that the proposed prediction model performs well on the training set.