ECG Classification Model Based on Multi-scale Network

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Aims: Electrocardiogram (ECG) is a non-invasive physical examination method, which records the electrical activity of the heart by electrodes placed on the surface of the human body.Standard 12-lead ECG has been widely used to diagnose various cardiac abnormalities.The automatic detection and classification of cardiac abnormalities can help doctors diagnose more and more recorded ECGs.The main aim of this study is to develop an automated computer aided diagnostic (CAD) system that can expedite the process of arrhythmia diagnosis, as an aid to clinicians to provide appropriate and timely intervention to patients.

Method: Based on the method of convolutional neural network, we innovatively proposed a model that can process input signals of unequal length. The model does not require any form of preprocessing on the ECG signal before it is applied to the classification. Each lead is used for feature extraction, and finally the features of all leads are fused together for final classification. The most important thing is that we use one-dimensional SPPnet to achieve the unity of the feature length, thereby avoiding the problem of information loss caused by filling or cropping the signal. The model can automatically identify 9 types of 12-lead ECG rhythm / morphology abnormalities.

Results: In the first stage of the unofficial competition, our proposed model got $F_\beta = 0.77$, $G_\beta = 0.56$, and an average score of 0.66. As of the time we submitted the manuscript, we ranked 87rd.

Conclusion: The method we proposed can fuse feature information of different scales and has a good application prospect in the clinical diagnosis of ECG.