Prediction of Coronary Artery Blood Flow Abnormalities Using MultiCNN-BiLSTM Model with Magnetocardiogram

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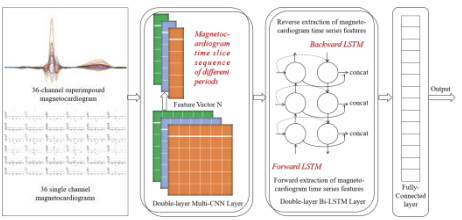
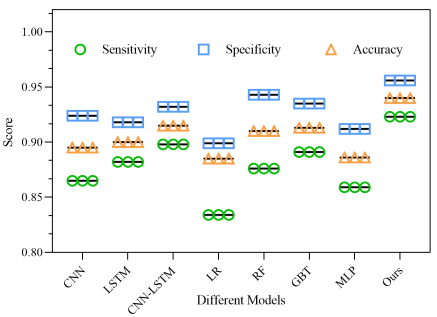
The utility of magnetocardiography (MCG) analysis in detecting blood flow abnormalities is hindered by the accuracy limitations of current models. In this study, we propose an image-based MCG signal classification method employing the MultiCNN-BiLSTM model to differentiate between normal and abnormal blood flow patterns. Initially, MCG time series data from various cardiac cycles are segmented and concatenated to thoroughly investigate and analyze the periodic trends in cardiac blood flow.



The diagram illustrating the structure of the MultiCNN-BiLSTM model.

Subsequently, a combination of sliding window and CNN techniques is utilized to extract significant features from the time series data, thereby capturing the interrelationships among variables. Furthermore, BiLSTM is employed to further extract features, and the features derived from CNN and BiLSTM are integrated via a fully connected layer, culminating in the final prediction output.

Prediction results of different methods



In order to mitigate the overfitting issue encountered in 2D networks, we initiate an AlexNet-like network utilizing weights pretrained on ImageNet. Evaluation conducted on the MCG database reveals that our proposed approach achieves an accuracy level of 94.5%. Additionally, the predictive efficacy of the MultiCNN-BiLSTM model introduced in this study surpasses that of three deep learning models and four machine learning models trained using extracted features.