Heart Murmur Detection of PCG Using ResNet with Selective Kernel Convolution

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

Aims: Heart murmur detection plays a crucial role in the early diagnosis of congenital and acquired heart diseases in children. This study aimed to construct a deep neural network architecture for detecting heart murmurs from PCG recordings. The model was created by the team "fly_h" for the PhysioNet/Computing in Cardiology 2022.

Methods: The PCG signals collected from different auscultation positions were downsampled to 2000Hz, and then a sliding window method was used to clip the signal to 6000 samples. To learn effective features, we constructed a ResNet with selective kernel convolution (SK-Conv). The SK-Conv was embedded into each ResBlock, which adaptively captures multi-scale features using convolution filters of different kernel sizes and applies a channel attention module (similar to Squeeze-and-Excitation) to emphasize the re-presentation of important features. Our model was trained on record-level data and validated on patient-level data. For each patient-level data, it may contain 1-5 PCG recordings, i.e. AV, MV, PV, TV, Phc, and the final prediction result was selected from the corresponding record-level prediction results in the priority order of presence, absence and uncertainty .

Results: Using the scoring metric based on the costs for algorithmic prescreening for human experts for heart murmur identification, we scored 2129 in the unofficial stage.

Conclusion: The proposed Heart murmur detection model performed well on the validation set. Such models may be used to assist physicians in diagnosing.