

Automatic Heart Murmur Detection Using a Convolutional Neural Network

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Aim: Cardiovascular diseases are one of the main causes of death in the world. Cardiac auscultation provides a cost-effective way for heart state monitoring. The goal of PhysioNet/Computing in Cardiology Challenge 2022 was to identify murmurs in heart sound recordings from multiple auscultation locations using a digital stethoscope. Our team HearHeart developed a light-weighted convolutional neural network (CNN) to detect heart murmur directly from each unsegmented heart sound recording.

Methods: Each heart sound signal was set to a fixed duration of 15 s by randomly cropping longer signals or zero-padding the shorter signals. 128 Mel-Spectrograms were extracted from the recordings. Two augmentation methods were applied to increase training samples and avoid overfitting in the training process. One was the injection of Gaussian noise into raw signals and the other one was spectrogram augmentation to randomly mask blocks of frequency bands and time steps on Mel-Spectrograms. We combined deep features from a light-weighted CNN model with four layers and hand-crafted features like the zero-crossing rate to detect murmurs. Besides, weighted loss function was applied to deal with the data imbalance.

Results: We achieved a challenge score of 529 on a 5-fold cross-validation and 560 on the hidden test data, placing 20 out of 167 entries in the unofficial phase.

Conclusion: The proposed model performed well on the validation data and hidden test data, which could improve the efficiency of heart murmur detection with cardiac auscultation.