

Transfer Learning in Heart Sound Classification using Mel spectrogram

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Congenital heart illnesses impact roughly 1% of newborns, and they are a significant cause of morbidity and mortality in a variety of serious situations, including progressive heart failure. Phonocardiogram (PCG) studies can reveal crucial clinical information about heart malfunction caused by congenital and acquired heart disease. The 23th PhysioNet/Computing in Cardiology Challenge 2022 aims to develop computer tools for detecting the presence or absence of murmurs from multiple heart sound recordings from multiple auscultation locations.

The database consists of 3163 PCG recordings from 942 patients from one or more prominent auscultation locations: pulmonary valve (PV), aortic valve (AV), mitral valve (MV), tricuspid valve (TV), and other (Phc). For each patient, recordings were unified labelled as subject label (three classes: present, absent, unknown). Mel spectrograms were generated from up to 30 seconds per recording and reshaped at input of pre-trained AlexNet. The last three layers of AlexNet were modified to suit the task as multilabel classification. The database was split into 80% for training and 20% for validation. The database appeared imbalanced, and the class with small number of data entries was over-sampled proportionally before training. The preprocessing and classifier were implemented in Matlab R2022a. For subjects with more than one recording, outputs of the classifier for each recoding were then integrated with customised possibility thresholds optimised to the challenge scoring system.

Our team “Leicester Fox” successfully ran all 5 entries in the unofficial phase. Our best entry for the unofficial phase of the PhysioNet/CinC 2022 competition received a Challenge Score of 539.591 on full data, ranking at 13th out of 166. Transfer learning and neural networks approaches showed potential application for murmurs detection using PCG.