LSTM Based Classification with ECG and Frequency

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Cardiovescular diseases (CVD) still remain the prevalent cause of death worldwide. A decades lasting trend of declining CVD mortality has decelerated. Accessability of diagnosis is one of the key tasks for improvement of the global CVD problematic. This master thesis is a contribution to the task of CVD diagnosis in scope of this Challenge.

The core of our classifier is a recurrent neural network with a single layer of Long Short Term Memory (LSTM) units. Upstream R-peak detection is applied to obtain peak centered, uniform data frames. In addition to the raw ECG data, frequency-domain information is generated by wavelet transformation and processed by a separate neural network. A final merging linear layer combines the results of both networks and outputs a vector of disease class predictions.

The modular architecture allows for adding additional features to the base architecture if proven worthy, such as information from previous heart beats in order to assist training of diseases that do not light up in each heartbeat. Furthermore, specialised networks for single-class prediction can be included and their outputs merged with the predictions of the two main networks. These small supporting networks are trained individually and stay unchanged during the main model training.

Preliminary Results

	$F_2 - score$	$G_2 - score$
Challenge	0.266	0.086
Own System	0.4 - 0.5	0.15 - 0.2

The unofficial phase entry of the model shows an F- and G-score of only 0.266 and 0.086 repecticvely. On our local training and test data the relation of the two scores are similar, but with higher values reached. However, these scores are preliminary and result from an early version of the model with neither R-peak detection nor the frequency domain network implemented.