Progress Report

Basically, we built a feature extractor based on the VGG16 neural network. For now, the dataset we are using is ECG5000[[1]](#footnote-2), which has 5 classes in total. However, there are only very few data samples in class 3, 4 and 5 . Below I will introduce the two main steps of our algorithm.

Firstly, we need to transform each 1D time series ECG signal into an image with three channels. Specifically, we use three different transformation methods, Markov Transition Field(MTF), Recurrence Plots(RP), Gramian Angular Summation Field(GASF), to obtain three one-channel images respectively. And then, we combine them together as the input image of our feature extractor.

Secondly, we utilize parts of the powerful VGG16 neural network to extract feature vectors from the input images. As a feature extractor, it outputs the vector from the first fully-connected layer in the shape of 1x4096 for each ECG signal. Afterwards, we exploit T-SNE to visualize the outputs of a subset of 500 samples from ECG5000. For better results, we also use PCA to reduce dimensions of these feature vectors before T-SNE implemented.

As you can see, from these preliminary results, the class 1 and class 2 have relative distinguishable distribution against each other. Therefore, we are confident that we are able to find a good decision boundary between these two classes of ECG signals. Next step, we are going to do fine-tuning of VGG16 neural network with more ECG signals and looking forward to get a good enough prediction accuracy.

1. http://timeseriesclassification.com/description.php?Dataset=ECG5000 [↑](#footnote-ref-2)