# Neural Network Theory and Applications

Homework Assignment 4

April 10, 2019

Due at April 24, 2019

In this assignment, transfer component analysis (TCA) will be used to deal with cross-subject electroencephalography (EEG)-based emotion recognition. TCA is a typical domain adaptation method that has successfully been applied to dealing with domain shift problems.

Two problems are given below. The [dataset](http://yann.lecun.com/exdb/mnist/) used in this homework is the SEED dataset, which is a public EEG-based three-category emotion recognition dataset.

EEG\_X.mat: DE features for 15 different subjects.

EEG\_Y.mat: Emotion categories for 15 different subjects.

Each subject contains 3394 samples. You need to conduct **leave-one-subject out**

**cross validation** to evaluate the performance of the algorithms. For each time, you need to choose one subject as the target subject (test set) and leave the other 14 subjects as the source subject (training set).

# Problem 1:

Solve the domain shift problem in the given dataset using support vector machines (SVMs). You need to finetune the parameters and only present the best result.

# Problem 2:

Solve the domain shift problem using TCA.

1. You need to implement TCA [1] and use it to solve this problem.
2. Compare the results with problem 1.
3. Alter the latent dimension of TCA and compare the results.

Notice: You can use TCA tools to solve this problem, which could be found in this link: https://github.com/viggin/domain-adaptation-toolbox. You can also implement TCA by yourself.

[1] Pan, S.J., Tsang, I.W., Kwok, J.T., Yang, Q.: Domain Adaptation via Transfer Component Analysis. IEEE Transactions on Neural Networks 22(2), 199-210(2011).