

# Neural Network Theory and Applications

## Homework Assignment 4

April 19, 2018

Due at May 2, 2018

In this assignment, the LSTM neural network will be used to deal with an emotion classification problem.

Two problems are given below, the dataset used in this homework is part of the SJTU Emotion EEG Dataset (SEED), i.e. a three-class classification problem and the features extracted from emotional EEG signals. The dataset can be downloaded from this link.

Four files are provided in this homework: three .npz files and one .npy file. Both .npz files and .npy files can be loaded with `numpy.load`. An example code of loading data is as shown in Figure 1. Three .npz files are data collected from three subjects.

```
import numpy as np

zip_data = np.load('filename.npz')
files_in_zip = zip_data.keys()
print(zip_data[files_in_zip[0]].shape)

array_data = np.load('another_file.npy')
print(array_data.shape)
```

Figure 1

Please refer to link <http://bcmi.sjtu.edu.cn/~seed/description.html> to read more about the experimental procedure. During the experiment, the participants were required to watch fifteen movie clips of different emotion categories.

There are 15 numpy ndarray files in every .npz file, corresponding to 15 movie clips. Each numpy ndarray is of shape  $(62 * n * 5)$ , where 62 is channel number,  $n$  is sample number, and 5 is frequency bands. In this homework, you should first reshape numpy ndarrays from  $(62 * n * 5)$  to  $(n * 310)$ , i.e. we will use 310 dimensional features in both Problem 1 and Problem 2.

The .npy file “label.npy” contains label information for fifteen movie clips.

### Problem 1:

Building LSTM classification models individually, i.e. you are required to build one model for each of the three .npz file provided. The features from first 9 movie clips should be used as training data, and data from the rest 6 clips should be used as test data.

During watching movie clips, emotions of subjects would change with time.

LSTMs are suitable to capture this temporal information.

You should design the structure of the network: number of hidden layers, LSTM time steps, batch size, epoch number, and so on.

## **Problem 2:**

EEG signals are different for different people, and this might cause trouble in building an universal emotion model for different people.

In this task, you are required to build an LSTM model with all .npz files provided, and compare the classification results with results in Problem 1.

The training data in this problem should be the concatenation of the training data in Problem 1, and the test data should be the concatenation of the test data in Problem 2.