Assignment 3

due to 31.12.2019

1.Submission Instructions

1.1 Practical Part

a)You are allowed to use the following Python packages: *numpy*, *glob*, *scipy.stats*,*librosa*.
b) Use python 3.7
c) Name your main code as ex3.py

Good Luck!

2. Questions

2.1 Practical Part:

In this exercise you will implement your first word recognizer using the KNN algorithm. Your algorithm will recognize the digits 1 - 5. For that, You will implement the KNN algorithm, where the distance metric should be the L2.

2.2 Dataset:

1. You are provided with five labeled examples for each class ['one', 'two', 'three', 'four', 'five'] to use as your training set. For the prediction set you are provided with 250 unlabeled examples. Each file is exactly 1 second long.

   Implement the k-nearest neighbor classifier using euclidean distance.

   You should generate a file named: 'output.txt', with the predictions for each predicted file using euclidean distance and k=1. The output file should be constructed as follows:

   For example,

   0c01329d-f96c-4de2-86b9-430b19e3f112.wav - 2
   211c5507-57e4-4f2d-878e-d2ec64a08060.wav - 1

   Our representation in this exercise will be the Mel-frequency spectrum (MFCCs). In order to extract these features and load the wave files, you will use a python package called 'librosa', using the following lines of code:

   ```
   import librosa
   y, sr = librosa.load(f_path, sr=None)
   mfcc = librosa.feature.mfcc(y=y, sr=sr)
   mfcc = stats.zscore(mfcc, axis=1) # Normalization
   ```

   The dimensions of the MFCC object should be (20, 32), meaning 20 MFCC features over 32 time steps. A more detailed explanation of the MFCC can be found here: [artical] , and an intuitive explanation can be found here: [blog].

2. In this exercise the best preformed result is given by setting k to be 1 (one nearest neighbor). What could be the reason to choose such a small hyper-parameter? (hint: think about Voronoi diagram and the features representation)