Lab Assignment 8 – Part 1 Spoken Digit Classification

Objective is to Create Adaboost and GradientBoost Classification models for the problem of "Spoken Digit Classification". Here we work with benchmark dataset at https://github.com/Jakobovski/free-spoken-digit-dataset. This dataset is an equivalent of MNIST digit dataset for audio.

Steps

1. **Dataset:** Download dataset from Github directly to your google colab using "!git clone https://github.com/Jakobovski/free-spoken-digit-dataset.git". The dataset is inside the folder "recordings". Folder contains 2000 audio samples for 10 digits spoken by 4 speakers. Files are named in the following format: {digitLabel}_{speakerName}_{index}.wav Example: 7_jackson_32.wav

2. **Reading Dataset:** Read the audio using any library. File formats in .wav which can be read using any audio library. Extract the STFT features from the audio. STFT (Short Term Fourier Transform) is a frequency feature representation for audio. Since audio samples differ in length, STFT will have differing lengths. This can be handled in either one of the two ways. 1) Standard size of STFT features can be extracted from middle of each audio samples, then that 2D matrix can be flattened or 2) Taking average frequency across time from STFT features.

3. **Training set, Testing set and Labels:** X will contain the STFT features of each audio sample, where Y will contain the target audio class label. Split the dataset (75% training and 25% testing) into training and testing sets with STFT audio features as input, audio class as target label.

4. **Training and Testing Classification Models:** Use **SkLearn** to train a AdaBoost and GradientBoost classification models. Apply trained model on testing set and print the classification evaluation measures.

5. **Playing with model parameters:** change and see the effect of model parameters such as n_estimators, criterion, max_depth, min_samples_split, n_jobs, min_samples_leaf, max_features, random_state, max_leaf_nodes.

6. **Exploration:** Run different classification models such as Logistic Regression, Perceptron, Decision Tree and Random Forest. For all the models print the training accuracy, testing accuracy and running time for testing dataset. Compare the models against each other.