Project Help File

Introduction

This help file provides a step-by-step guide to implementing emotion recognition from speech using Mel-frequency cepstral coefficients (MFCC) and machine learning techniques in Google Colab. Emotion recognition from speech is a challenging task with various applications such as sentiment analysis, human-computer interaction, and mental health monitoring.

Prerequisites

Before getting started, make sure you have the following prerequisites:

- Basic knowledge of Python programming language.
- Familiarity with Google Colab environment.
- Dataset containing emotional speech samples.

Steps

1. Import Necessary Libraries

In the first step, import the required Python libraries such as librosa for audio processing, numpy for numerical operations, and sklearn for machine learning.

```
#Importing The Dependecies
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import librosa
import IPython.display as ipd
from librosa.display import waveshow
import seaborn as sns
from sklearn.preprocessing import OneHotEncoder,StandardScaler
from sklearn.neural_network import MLPClassifier
from sklearn.model_selection import train_test_split
```

2. Load Dataset

Load the emotional speech dataset. Ensure the dataset contains labeled audio samples and covers a range of emotions such as happy, sad, angry, etc.

```
from google.colab import drive
drive.mount('/content/drive')
```

3. Feature Extraction

Extract MFCC features from audio samples. MFCCs are commonly used in speech processing tasks due to their effectiveness in representing the characteristics of speech signals.

```
def feature_extraction(file) :
  mfcc_features = librosa.feature.mfcc(y=file,sr = sample_rate,n_mfcc = 40)
  mfcc_scaled_feature = np.mean(mfcc_features.T,axis = 0)
  return mfcc_scaled_feature
```

4. Prepare Data

Prepare the dataset for training by extracting MFCC features from each audio sample and splitting it into training and testing sets.

```
X = []
y = []
for audio_file, label in dataset:
    mfccs = extract_mfcc(audio_file)
    X.append(mfccs)
    y.append(label)
X = np.array(X)
y = np.array(y)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

5. Build and Train Model

Build a machine learning model, such as a Multi-Layer Perceptron (MLP) classifier, and train it using the training data.

```
x_traincnn =np.expand_dims(x_train, axis=2)
x_testcnn= np.expand_dims(x_test, axis=2)
x_traincnn.shape, y_train.shape, x_testcnn.shape, y_test.shape
model = MLPClassifier(hidden_layer_sizes=(100,), max_iter=300, random_state=42)
model.fit(X_train, y_train)
```

6. Evaluate Model

Evaluate the trained model using the testing data and calculate the accuracy of emotion recognition.

```
y_pred = model.predict(X_test)
accuracy = accuracy_score(y_test, y_pred)
print("Accuracy:", accuracy)
```

Conclusion

This concludes the implementation of emotion recognition from speech using MFCC and machine learning techniques in Google Colab. Experiment with different machine learning models, feature extraction techniques, and hyperparameters to improve the accuracy of emotion recognition.