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```
%{
Main script for MATLAB Project voice_recognition

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In accordance with the completion of UC Davis' EEC 201: Digital Signal
Processing.
%}
clc; clear all; close all;
```

## Collect Training Data

```
numSpeakers = 11;
TrainDir = fullfile('Data','Training_Data');
TrainDataBase = cell(1,numSpeakers);
for i = 1:numSpeakers
    filename = 's' + string(i) + '.wav';
    [audio,Fs] = audioread(fullfile(TrainDir,filename));
    TrainDataBase{i} = {audio,Fs};
end
```

## Build Codebook for each Train Data

```
numClusters = 32;
numFilters = 32;
numCoeffs = 12;
frameDuration = 25;
strideDuration = 10;
% Build classifier and train on TrainDataBase..
classifier = speakerClassifier(numClusters,numFilters,numCoeffs,...
                             frameDuration,strideDuration);
codeBooks = classifier.train(TrainDataBase);
```

## Collect Test Data

```
TestDir = fullfile('Data','Test_Data');
```

---

```

TestDataBase = cell(1,8);
TestCases = [(1:8)',randperm(8)'];
for i = 1:8
    filename = 's' + string(TestCases(i,2)) + '.wav';
    [audio,Fs] = audioread(fullfile(TestDir,filename));
    TestDataBase{i} = {audio,Fs};
end

```

## Classify Test Data

```

[testMatch,err] = classifier.classify(TestDataBase);

% Compute error statistics
accuracy = mean(TestCases(:,2)==cell2mat(testMatch));
fprintf('With Train/Test dataset provided: ');
fprintf('Accuracy = %.1f %% \n',accuracy*100);

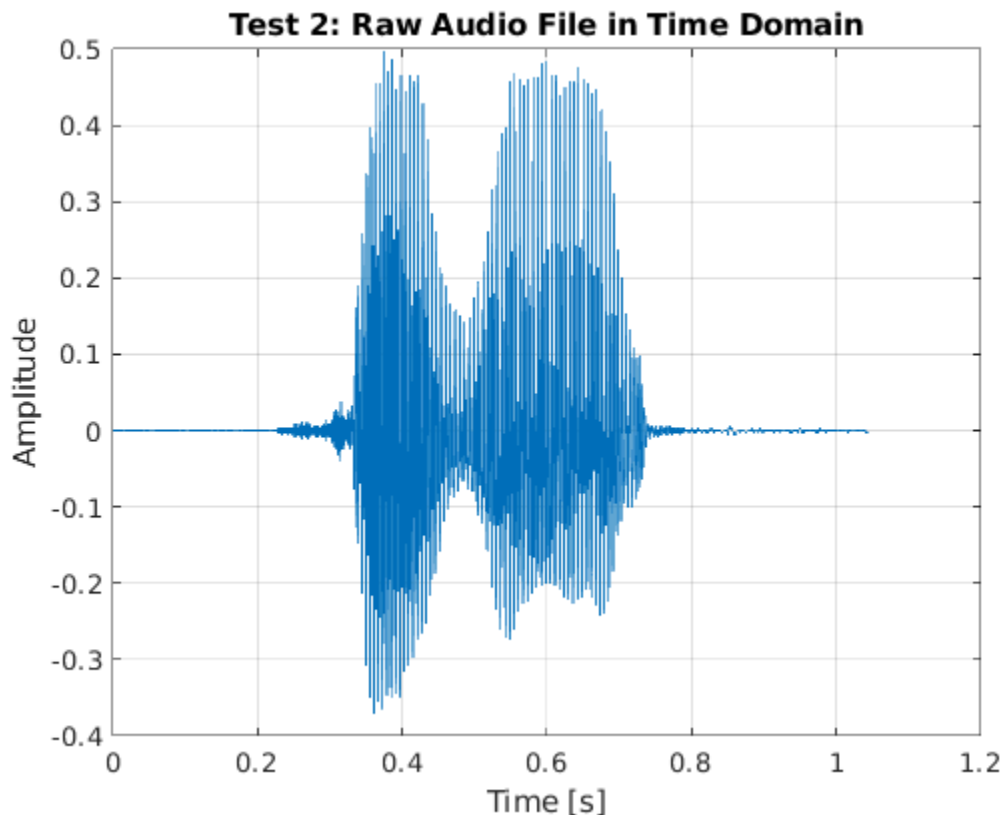
With Train/Test dataset provided: Accuracy = 100.0 %

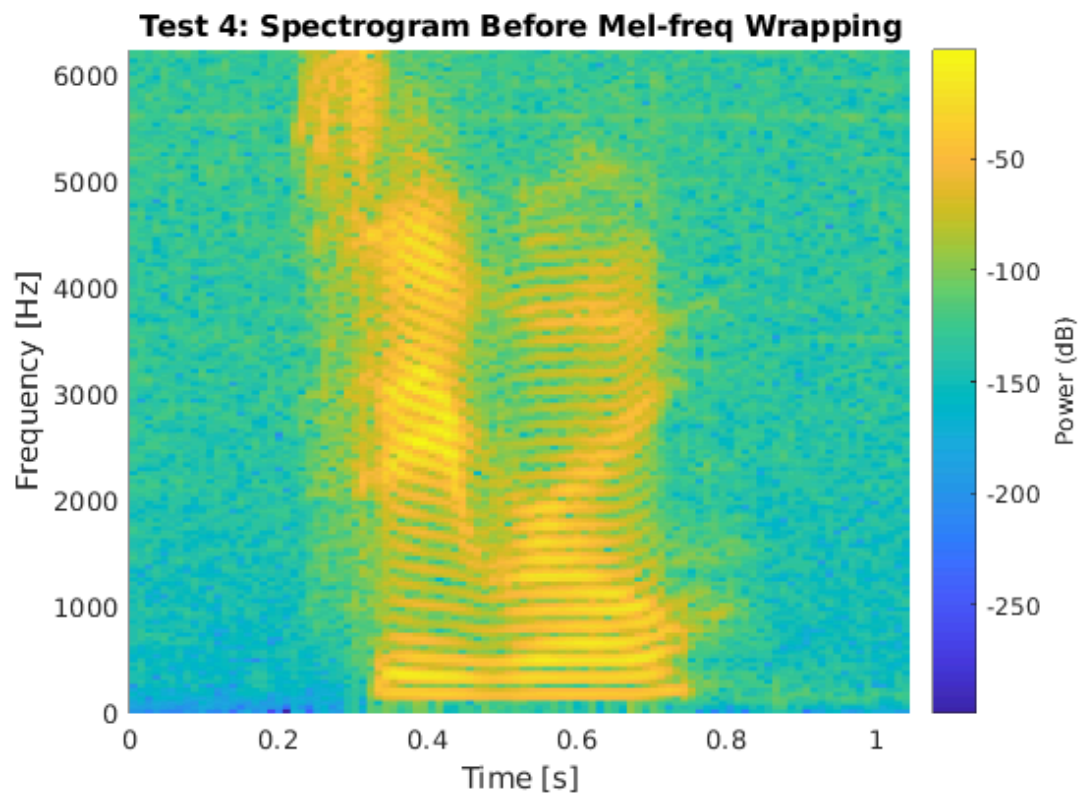
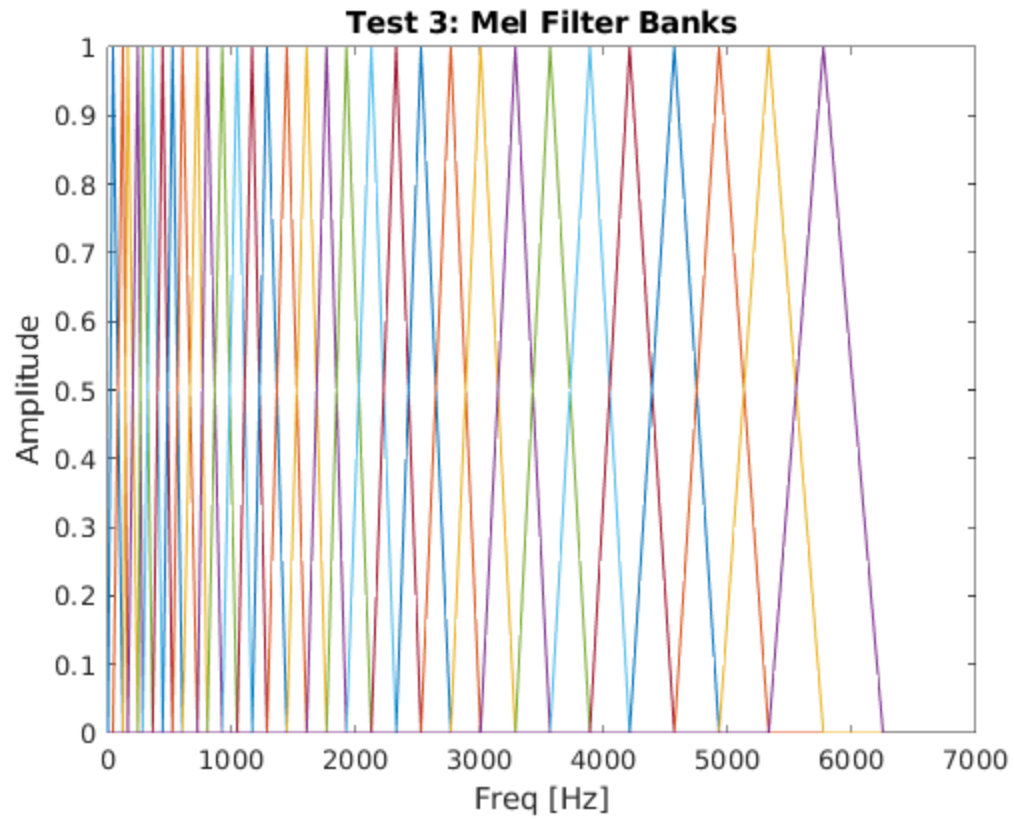
```

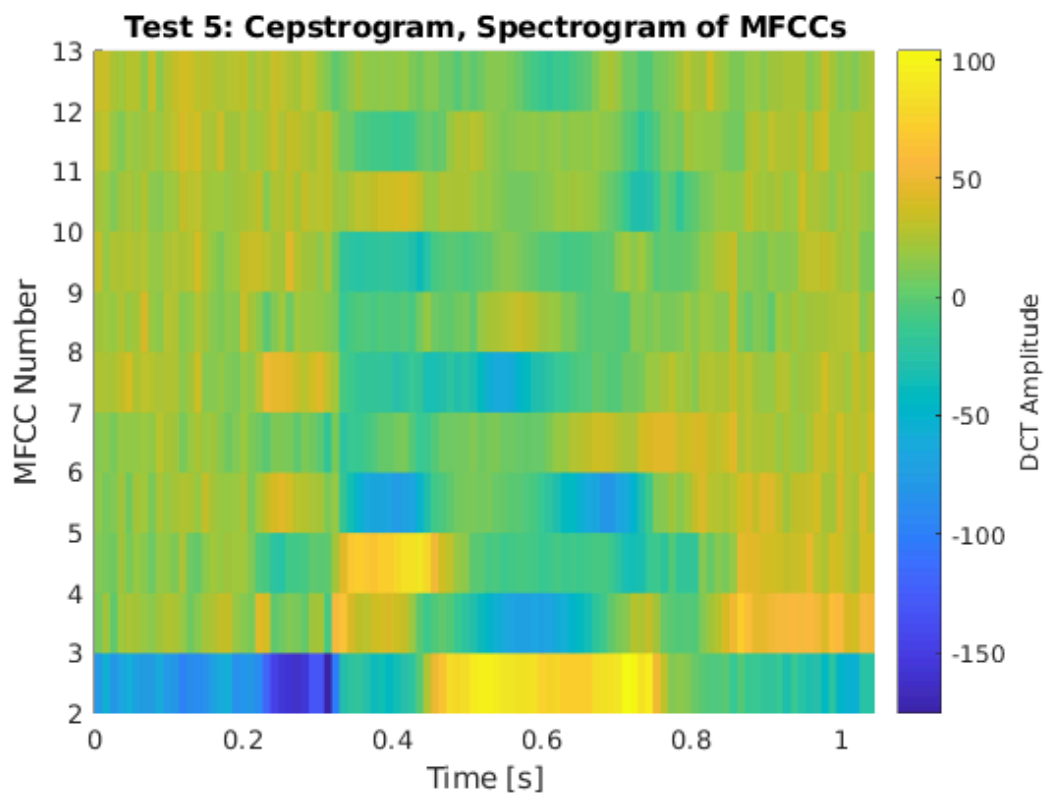
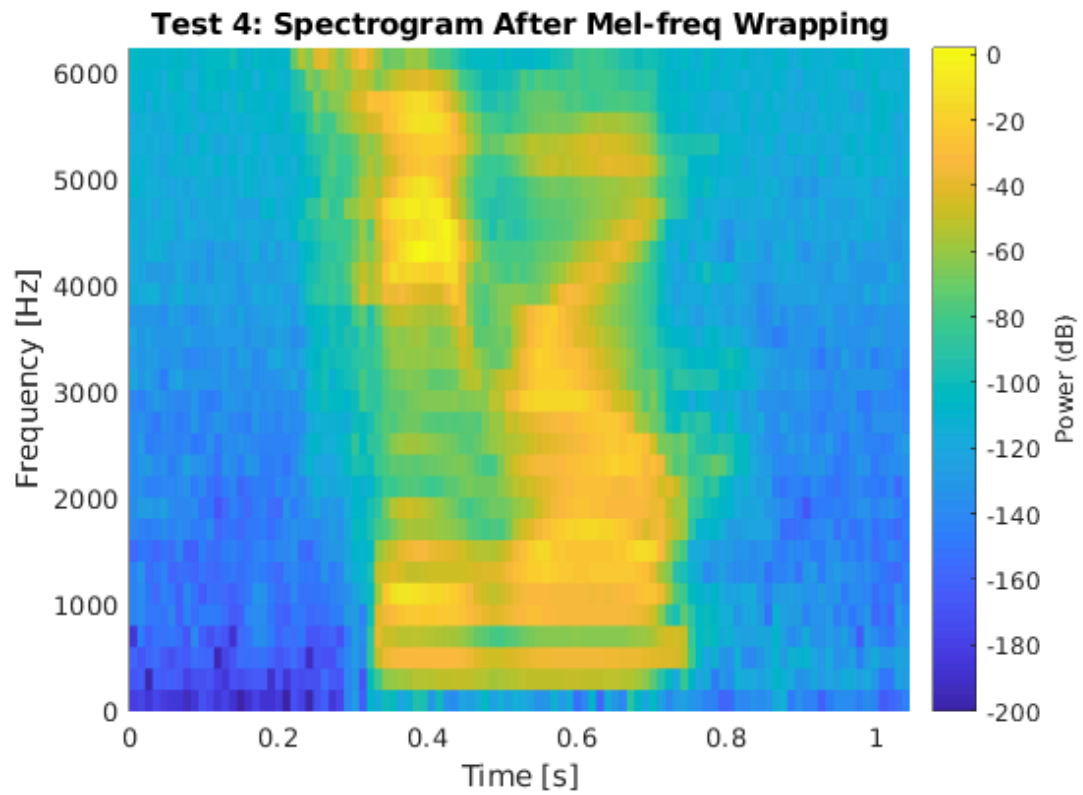
## Test Functionality

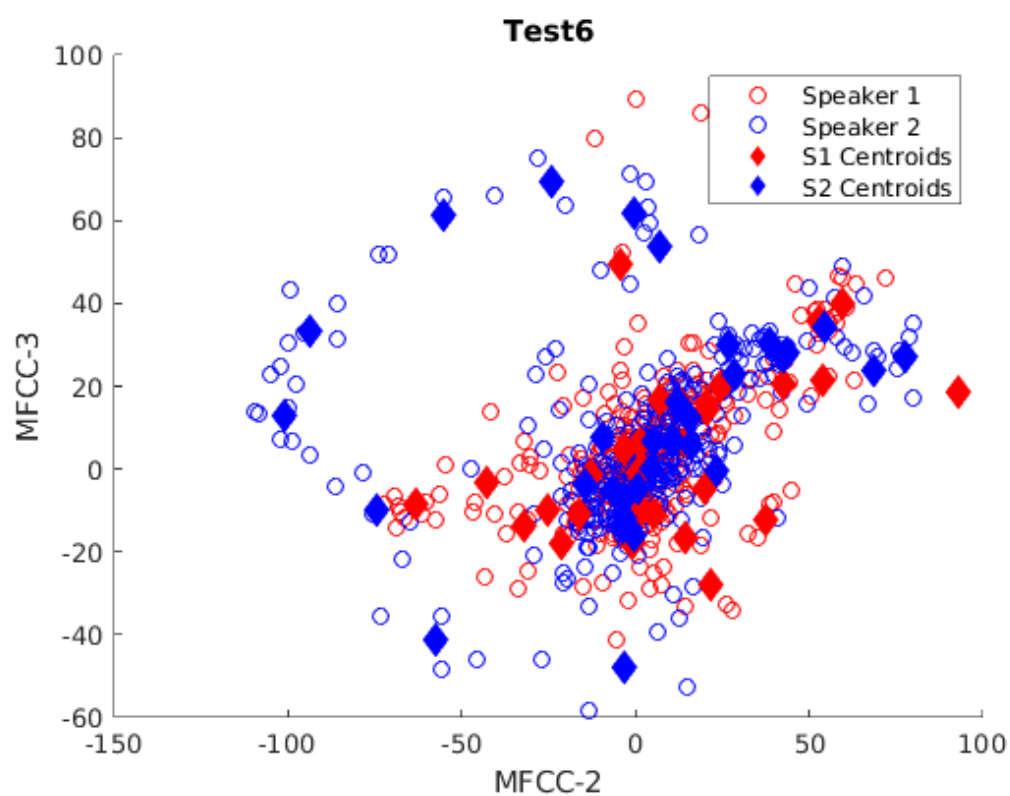
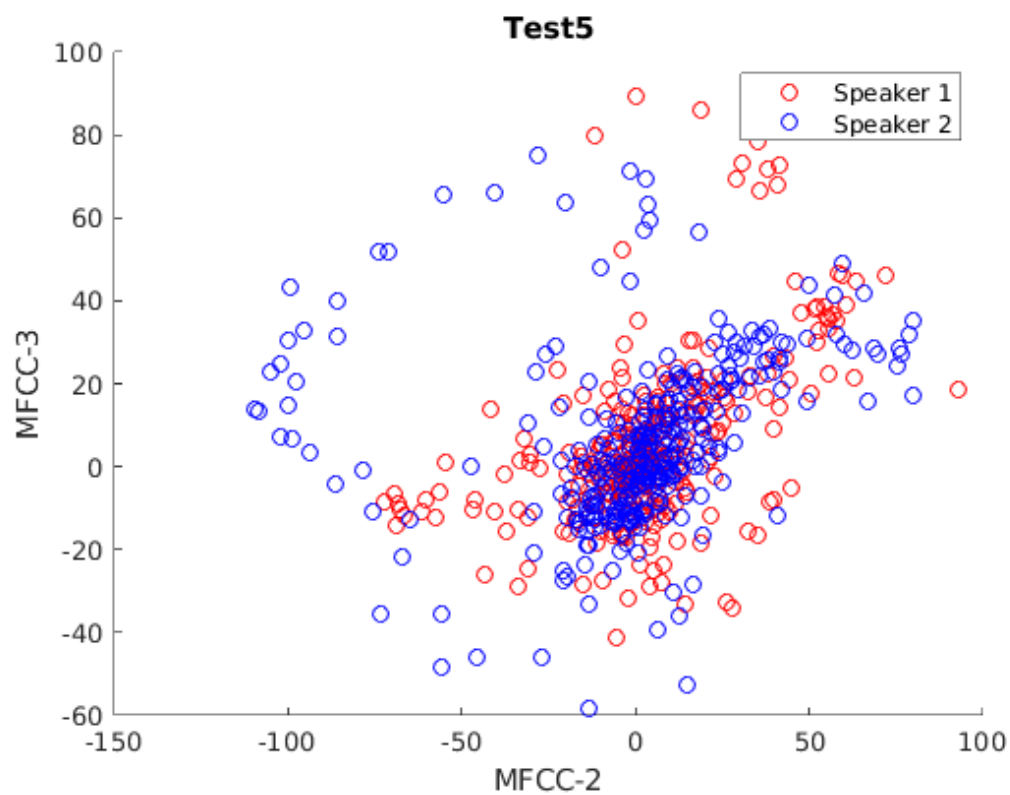
```
classifier.test(TrainDataBase)
```

*Test 2: There are 20.48 ms of speech in 256 samples.*









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## Test with New Voices (roommates)

```
roommatesDir = fullfile('Data','Roommates');
[roomTest,roomTrain] = loadRoommatesData(roommatesDir);

roomClassifier = speakerClassifier();
[~] = roomClassifier.train(roomTrain);
[roomMatch,err1] = roomClassifier.classify(roomTest);

% Compute error statistics
accuracy = mean([1:4]'==cell2mat(roomMatch));
fprintf('With roommate dataset: ');
fprintf('Accuracy = %.1f %% \n',accuracy*100);

With roommate dataset: Accuracy = 100.0 %
```

## Test Rejection Ability

```
TestDir = fullfile('Data','Test_Data');
TestDataBase = cell(1,8);
for i = 1:8
    filename = 's' + string(i) + '.wav';
    [audio,Fs] = audioread(fullfile(TestDir,filename));
    TestDataBase{i} = {audio,Fs};
end
numClusters = 8;
numFilters = 32;
numCoeffs = 11;
rejector = speakerClassifier(numClusters,numFilters,numCoeffs);
[~] = rejector.train(TestDataBase);
[rejectMatch,err2] = rejector.classify(TrainDataBase,40);

% Compute error statistics
expected = {1;2;3;4;5;6;7;8;"No match found";"No match found";"No
    match found"};
correct = 0;
for i = 1:length(rejectMatch)
    try
        correct = correct + (expected{i} == rejectMatch{i});
    catch
    end
end
accuracy = correct/length(rejectMatch);
fprintf('With rejection: ');
fprintf('Accuracy = %.1f %% \n',accuracy*100);

With rejection: Accuracy = 100.0 %
```

## Notch Filters to test Robustness of Model

```
correct = 0;
for i = 1:100
```

---

```

r = rand;
f1 = r-0.005;
f2 = r+0.005;
if (f1 < 0)
    f1 = 0.0001;
end
if (f2 > 1)
    f2 = 0.9999;
end
f = [f1 f2];
[b,a] = butter(6,f,'stop');
%collect filtered test data
TestDir = fullfile('Data','Test_Data');
FilteredDataBase = cell(1,8);
TestCases = [(1:8)',randperm(8)'];
for i = 1:8
    filename = 's' + string(TestCases(i,2)) + '.wav';
    [audio,Fs] = audioread(fullfile(TestDir,filename));
    audiof = filter(b,a,audio);
    FilteredDataBase{i} = {audiof,Fs};
end
[testMatch,err] = classifier.classify(FilteredDataBase);
% Compute error statistics
accuracy = mean(TestCases(:,2)==cell2mat(testMatch));
if (accuracy == 1)
    correct = correct + 1;
end
end
fprintf('Number of Correct results with Notch Filters: %d\n',correct);

```

*Number of Correct results with Notch Filters: 49*

## Train/Test and Evaluate on voxCeleb Audio Dataset

```

voxPath = fullfile('Data','voxCeleb');
rng(100);
[celebTest, celebTrain] = loadVoxCeleb(voxPath,1);

% Uncomment to reduce the number of speakers
% celebTest = celebTest(1:3);
% celebTrain = celebTrain(1:3);

celebClassifier = speakerClassifier();
[~] = celebClassifier.train(celebTrain);
[celebMatch,celebErr] = celebClassifier.classify(celebTest);

% Compute error statistics
accuracy = mean([1:length(celebTest)]'==cell2mat(celebMatch));
fprintf('With voxCeleb dataset: ');
fprintf('Accuracy = %.1f %% \n',accuracy*100);

```

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*With voxCeleb dataset: Accuracy = 20.0 %*

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