Lab 3: Frequency Domain Representation

You are going to create two functions

plotAudioFreqDomain() - *plots either a linear or log spectrogram (frequency domain) representation of an audio signal with a specified window size*

plotAudioFunc() – *calls* plotAudio2() to *plots the waveform (time domain) representation of an audio signal* and plotAudioFreqDomain() *either a linear or log spectrogram (frequency domain) representation of an audio signal with a specified window size*

1) In cell 1: import the necessary libraries

2) In cells 2 copy plotAudio2() from echo.ipynb

3) In cell 3: create a function called plotAudioFreqDomain() that inputs
- an audio signal (sig)
- the audio signal's sampling rate (sr)
- the title for the plot (title)
- the window size of the spectrogram to be used for the n_fft argument when calling librosa.stft() (winSize)
- the type of spectrogram, 'linear' or 'log', to be used for the y_axis argument when calling librosa.display.specshow (specType)

and plots a spectrogram (frequency-domain) of the inputted audio signal
use the code in frequencyDomain.ipynb as a guide for creating this function

4) In cell 4 create a function that called plotAudioFunc() that inputs
- an audio signal (sig)
- the audio signal's sampling rate (sr)
- the title for the plot (title)
- the window size of the spectrogram (winSize)
- the type of spectrogram (specType)

The function will
- call plotAudio2()
- call plotAudioFreqDomain ()
  F CREATE plotAudioFreqDomain() AS DESCRIBED IN STEP 3
  G ADD TO THIS FUNCTION SO THAT IT ALSO CALLS plotAudioFreqDomain()

to plot waveform (time-domain) and spectrogram (frequency-domain) representations of the signal.

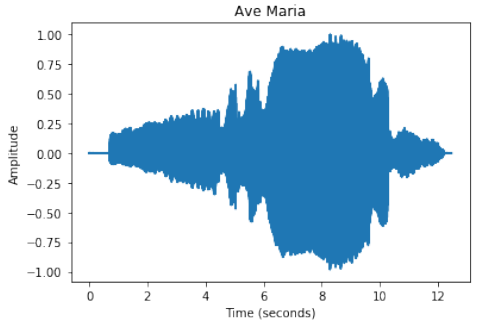
5) In cell 5: use librosa.load() to open avm.wav and use IPython.display.Audio() to play it

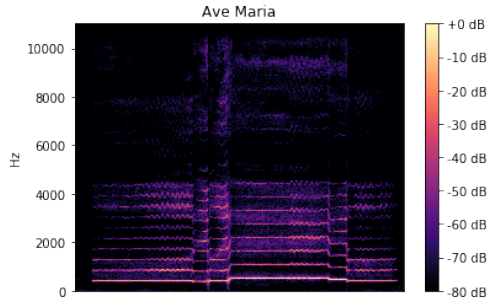
```
sig , sr = librosa.load('imc2023/audioFiles/avm.wav')
```

6) In cell 6: call plotAudioFunc() with the following arguments

```
title = 'Ave Maria'
winSize = 2048
specType = 'linear'
```

This should generate the following plots



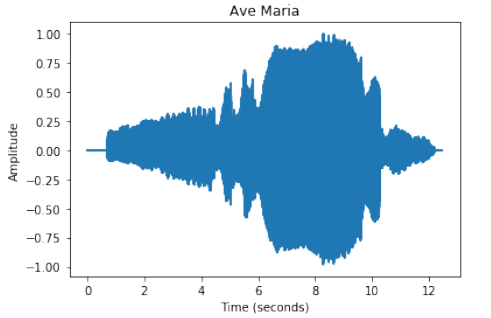


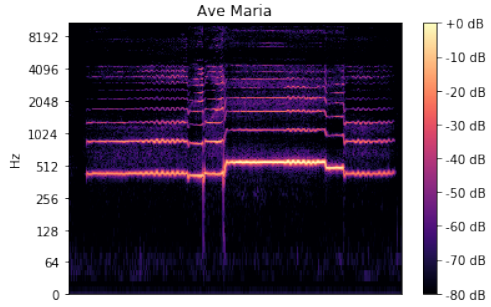
I

7) In cell 7: call plotAudioFunc() with the following arguments

title = 'Ave Maria'
winSize = 2048
specType = 'log'

This should generate the following plots

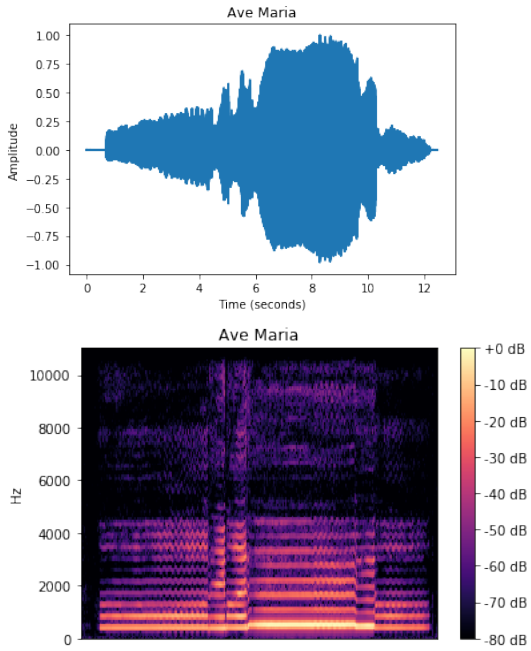




J 8) In cell 8: call plotAudioFunc() with the following arguments

title = 'Ave Maria'
winSize = 256
specType = 'linear'

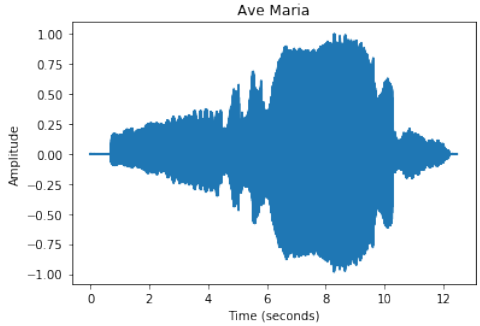
This should generate the following plots

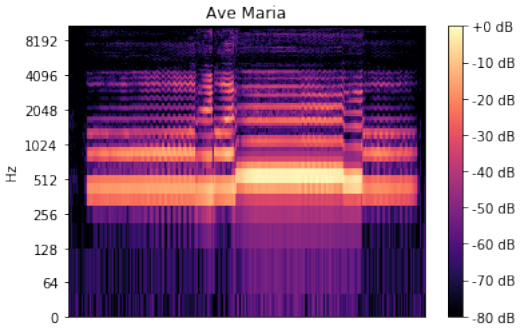


K 9) In cell 9: call plotAudioFunc() with the following arguments

title = 'Ave Maria'
winSize = 256
specType = 'log'

This should generate the following plots




Ave Maria
8192
4096
2048
1024
512
256
128
64
0
Hz
+0 dB
-10 dB
-20 dB
-30 dB
-40 dB
-50 dB
-60 dB
-70 dB
-80 dB