Signals and systems
Bonus project

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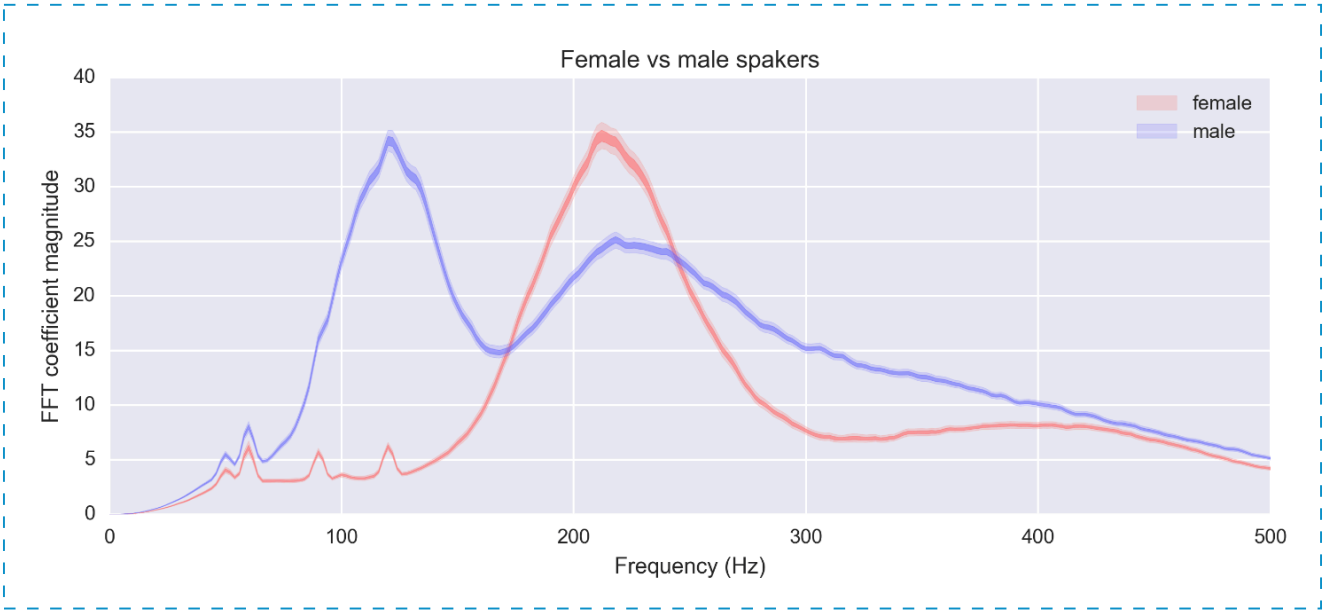
Deadline : 3rd Tir, 1398 [23:55]

- For the matlab problems, provide both these materials:
  - **codes [*.m files]**
  - a simple **report** that includes all plots and screenshots.
- Notice that the project will be **checked by plagiarism detectors**, avoid any similarities.

Project intuition

Typical human speech ranges between 50 Hz and 300 Hz. Most men typically range between 85-180Hz, and most women between 165-255Hz. If we look at a spectrum of audio for English speakers, we get a pretty substantial difference between the genders. This is of course not super surprising to anyone with a pair of ears. [1]



There are numerous techniques used to distinguish between male and female voice with above 99% accuracy. In this project, you need to implement a simple technique that is based on pick frequencies in male/female power spectrums.

Dataset for this project is provided in **voices** folder, voices are manually selected and downloaded from [2], which is intended for accent-related language studies.

Voice samples are 12 mp3 files (thus data and sampling frequency are both provided) from English speakers with American accent, who are all repeating a same nonsense sentence.

Peak frequency is measured as **122 Hz** for male speakers **212 Hz** for females.

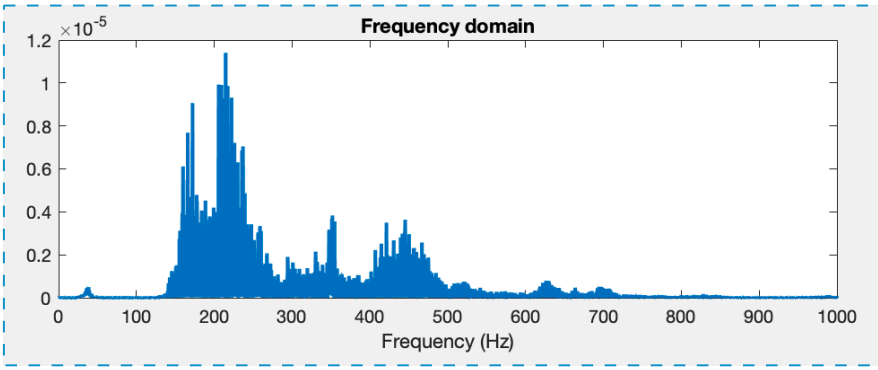
Project definition

Step 1

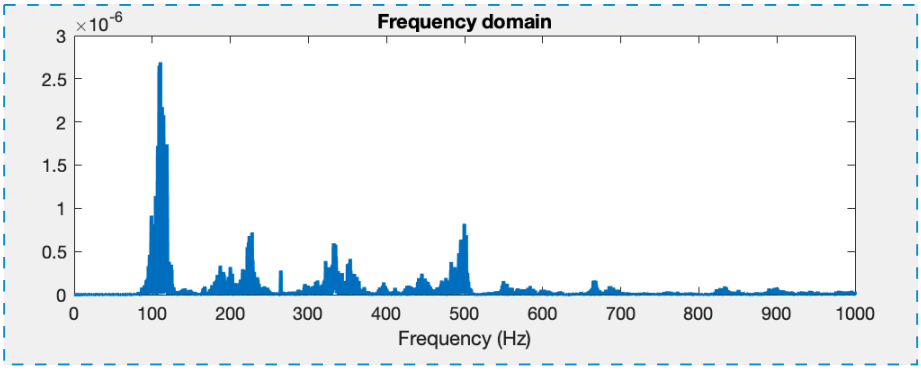
You need to watch the tutorial about **Fourier transform for spectral analysis** [3] that can be downloaded **from here**
Note that **this is a part of your project.**

Step 2

Write a Matlab script which can load an mp3 voice file and plot its power spectrum.
For example, power spectrum for v0.mp3 (a female speaker) will be :



And for v1.mp3 (a male speaker) will be :



Step 3

Write a Matlab function which gets an mp3 file address as input and returns the peak frequency of its power spectrum and using this function, write a Matlab script which gets address of a folder containing unlabeled voice samples and label them with male/female according to mentioned peak frequencies.

Step 4

Propose any methods that can be used to improve the accuracy of our gender recognition system.
Note that **this is a part of your project.**

References

[1] **https://erikbern.com/2017/02/01/language-pitch.html**
[2] **http://accent.gmu.edu**
[3] **https://www.udemy.com/signal-processing/**