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# **Signals and systems**

## **Bonus project**



**Dr Rasti**  
**Spring 97-98**  
**Amirkabir University of Technology**  
**(Tehran polytechnic)**

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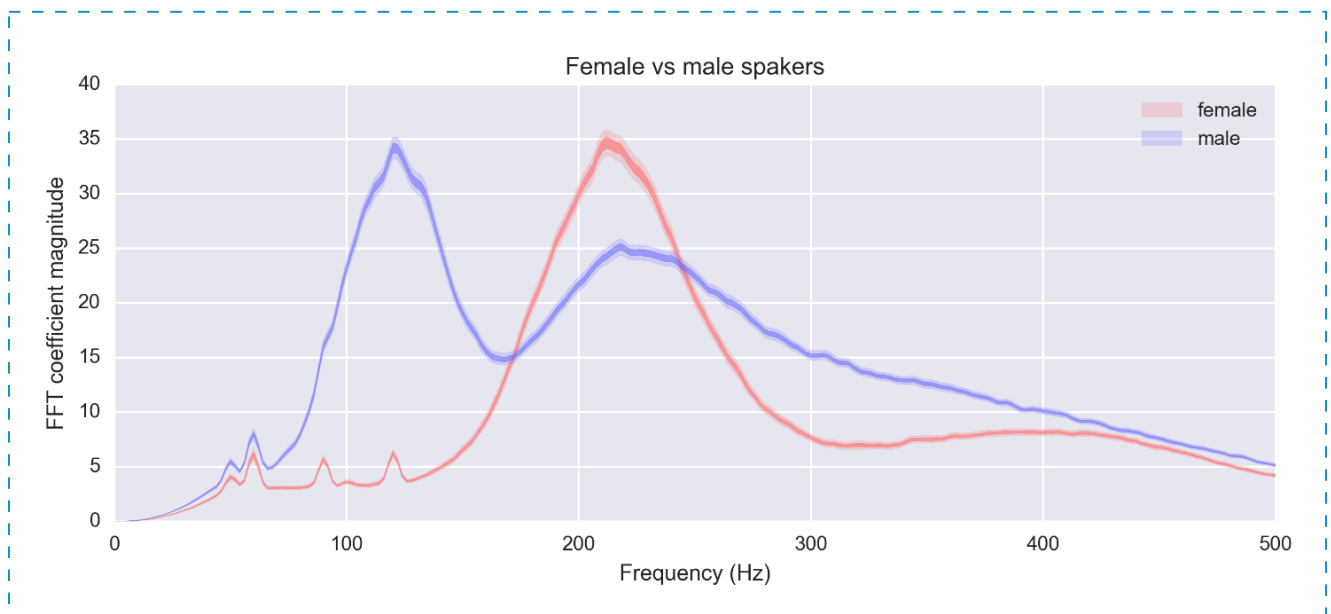
**Deadline : 3rd Tir, 1398 [23:55]**

- 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.

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## 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.

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## Project definition

### Step 1

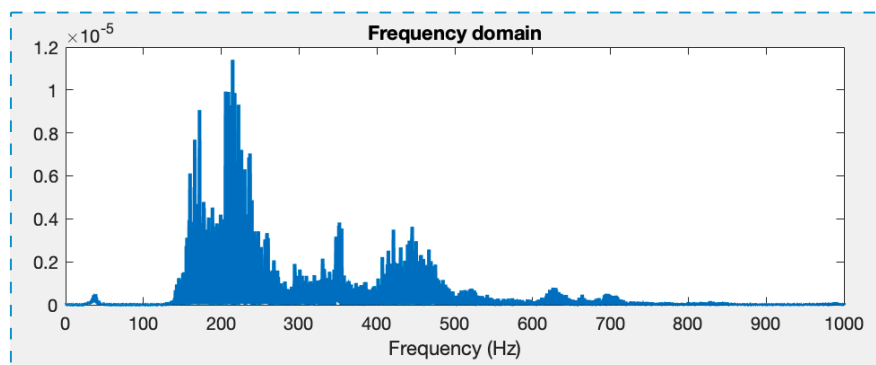
You need to watch the tutorial about **Fourier transform for spectral analysis** [3] that can be downloaded [from here](#)

Note that **this is a part of your project.**

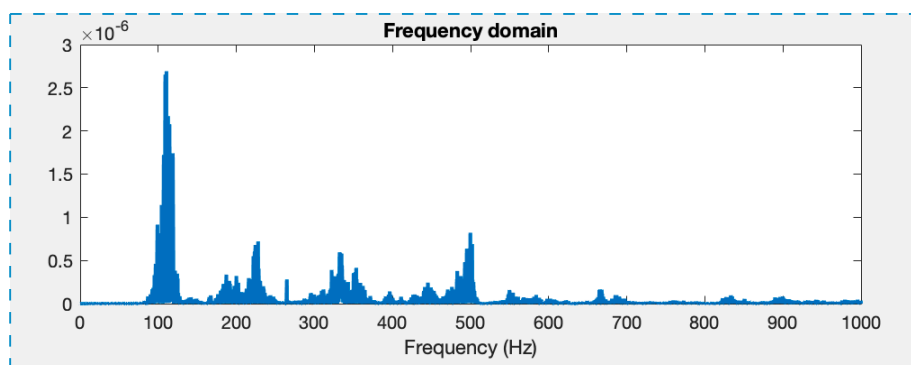
### Step 2

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.**

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## References

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