Time Series Analysis - Week 1

Introduction
This is a *voluntary* mini-project that aims to get you started using Matlab. You complete it on your own and you *do not* need to hand in anything after completing it; it is just meant to get you started.

Before you begin:

- View the online videos related to stochastic vectors and stochastic processes, as well as read chapters 1, 2, and 3.1-3.3 in the course textbook.
- Install Matlab on your computer and download the data files from the course webpage.

Task 1
Load the data file `fa.wav` into Matlab. To do this, you need to start the program, and type[1]:

```
[y,Fs] = audioread('fa.wav');
```

This will store the signal in the variable `y`, whereas the signal's sampling rate is stored in `Fs`. The data file is the sampled speech of a female voice saying *"Why were you away a year, Roy?"*. Plot the signal using the command `plot`. Can you tell which part of the signal constitutes which word? If you like, you can listen to the signal by using the command `sound`.

Task 2
Now, extract about 200 samples from one of the vowels and plot the result. Examining the signal, the result should appear periodic – in fact, tonal audio is often modelled as a sum of sinusoids. Use the function `acf` provided on the course webpage and plot the results. Can you determine the main periodicity in the vowel? Which frequency does this periodicity correspond to? Hint: recall Example 3.8 in the textbook.

Task 3
As you may know from other courses, one often estimates the power spectral density to get a better feeling for the frequency content of a signal. Can you determine the fundamental frequency of the vowel better this way? Do you get a better estimate if you zeropadd the signal? Hint: recall Example 3.16 in the textbook.

[1] If you are unsure of how any command works, you can always type `help text`, where `text` denotes the command you wish to learn more about. You may need to change directory to reach the file, or use the command `addpath` to include the file location in the path.