

## Time Series Analysis - Mini-project 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<sup>1</sup>:

```
[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 (optional)

As you may know from other courses, and as you learned when you could not resist reading chapter 3.6 while you were at it, 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.

### Comment:

Please feel free to ask the teaching assistants about the tasks during the tutorials.

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<sup>1</sup>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.