

# MATLAB Assignment 9

Spring 2020, Section A

Please submit this homework as a *.m* file, with suppressed output. Remember that all lectures and homeworks may be found at [github.com/guybaryosef/ECE210-materials](https://github.com/guybaryosef/ECE210-materials). Homework is due by the end of the semester to [guybymatlab@gmail.com](mailto:guybymatlab@gmail.com).

**1. Dipping your toes:** In this question we will be attempting to predict stock prices. More specifically we will download a *csv* file that contains Google's stock value as a time series, for which you will build an AR model and then use it for forecasting. Remember that an AR model has the equation:

$$X(t) = \delta + \sum_{n=1}^p \alpha_n r(t-n) + v_t \quad (1)$$

- A *csv* file, which stands for 'comma separated variable', is a file format used to store data into a spreadsheet, with the columns separated by commas and the rows separated by new-line characters. To begin this problem, download and import the file called *GOOG.csv* from: [github.com/guybaryosef/ECE210-materials/tree/master/homeworks/hw9](https://github.com/guybaryosef/ECE210-materials/tree/master/homeworks/hw9). In this file you will find the adjusted closing value of Alphabet's stock (GOOG) over the past year. For simplicity, you can ignore the dates associated with the values (weekends and certain holidays will result in skipped days), and we will instead treat each day as an equal-distanced time step.
- Run a least squares fit on the time series to find the AR coefficients of an AR model of order 10 (**Hint:** You can either check out MATLAB's built-in functions or look back at lesson 10 for a way to code this). Notice that to be able to do the linear regression, you will need to start the model-parameters-count number of steps into the time series, thereby shrinking the actual input by this number.
- Using the AR model found in the previous section, use equation (1) to forecast the next 10 days of activity. Unfortunately, if you look at the actual stock over those future 10 days, you will see that your forecasting was... slightly less than accurate. Not to fret! This is was just an example; an opportunity to dip your toes into the world of quantitative finance.

**2. Now walk it out...** You can think of a random walk as a running (cumulative) sum of i.i.d. random variables. In the 1-dimensional case, the next value in the series is the current value plus or minus 1, based on a probability distribution.

- Generate 50 1-D random walks, each with the probability of stepping 1 or  $-1$  equal (50% - 50%), each with a total of 300 steps.
- Plot the random walks you generated all on top of one another. There is no need for a plot legend.

- c. Now repeat parts (a) and (b) for a random walk where the probability of  $+1$  is 75% and the probability of  $-1$  is 25%. Is there a difference between these results and your previous plot?