Department of Computer Science   University of Bristol
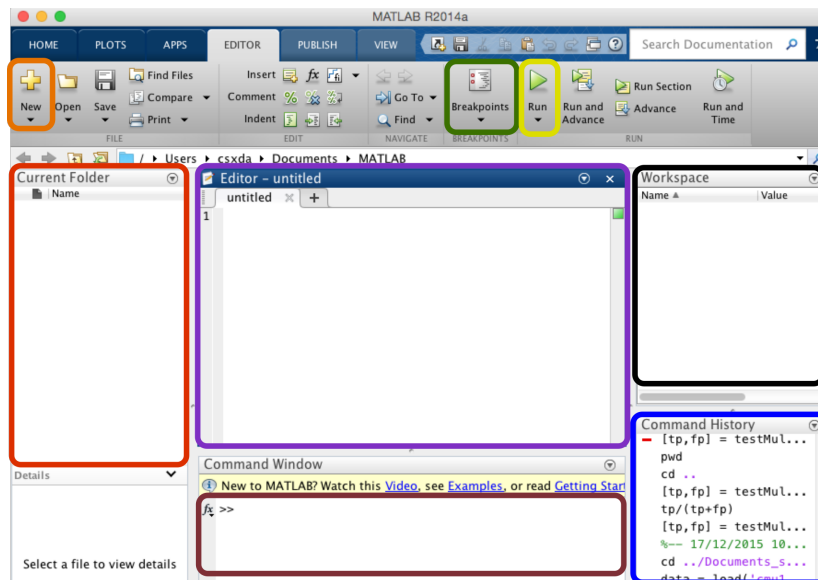
COMS21202: Symbols, Patterns and Signals

Lab 1: Introduction to Matlab (Part I)

NOTE: You will need to refer to the Matlab help pages to complete most of these examples.

1. To open matlab, follow the instructions on:

   https://www.cs.bris.ac.uk/Teaching/Resources/COMS21202/tutorials/csdept/matlab-labs.html

2. Familiarise yourself with the Matlab graphical interface

- Red: current folder in which you're operating. New scripts will be stored in this folder
- Orange: Create new script or function
- Yellow: Run the currently in-focus script (note: doesn't work for functions that require parameters - these should be run from the command line with the relevant parameter values)
- Green: Breakpoints - allowing you to interrupt the running of your function to debug
- Violet: Script Editor
- Brown: Command line (i.e. Terminal)
- Black: Workspace (i.e. memory) where you can check the values of the variables, and even change them at runtime if you introduce breakpoints to your code
- Blue: Command History - list of all commands you previously ran

3. Try to use Matlab as a simple calculator:

   - 2 + 2 + 7 * 7 + 10 / 3.3
   - 2 ˆ 10 (exponentiation)
   - sqrt(16)

4. Place your answers into variables: x = (3*5)^2
   Run the commands in quiet mode by adding a semicolon at the end: x = (3*5)^2;

5. Matlab stands for "Matrix Laboratory". Create a matrix in matlab Ex.

   A = [2 3; 3 -1; 5 6]

   B = [5 2; 8 9; 2 1]

   Write the following operations in Matlab

   $C = 3A$

   $C = A + B$

   $C = AB^T$

   Also try to: concatenate A and B into a bigger matrix in the horizontal and vertical dimensions

6. Think about how you would have performed the above operations using C++. Can you see any advantage in using Matlab? Think about the types of data that can benefit from this behaviour.

7. Calculate the dimensions of the matrices A, B
   Note: what's the difference between `size` and `length` commands
   Discuss how you can retrieve the smaller dimension of the matrix.

8. On your created matrices A and B, calculate the mean, sum, and variance of the data (using matlab commands `mean, sum, var`).
   What is the difference between: mean(A), mean(A,2), mean(A(:))
   Discuss your answers with your lab partner and check with a lab assistant if you are not sure

9. Load the file data.dat available on the lab's webpage into a matrix D your matlab. Check the size of the file.

10. Plot the first two columns of the matrix D in your matlab, then plot the last three columns as a 3D scatter plot. Study the axis properties of the figure, and learn how to label the axes, change the limits, add grids, change the markers' shape, size and colour.

11. Compute and display a histogram of the values in the first column of your matrix.

12. Generate a random sequence of 1000 numbers from $N(0, 1)$ using the matlab command `randn`. Compute and display the histogram of the sequence based on 100 bins between -5 and 5 using the command `hist`.

13. Save the generated sequence onto a text file.

14. Generate a random sequence of 100 numbers from a uniform distribution using the matlab command `rand`. Compute and display the histogram.
    Discuss with your partner the difference between the `rand` *and* `randn`.