Computational Probability and Statistics
CIS 2033 Section 002

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LAB Information

- TA
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- Lab Class
  - SERC 206
  - Friday 09:00 am ~ 10:50 am
- Office Hour
  - SERC 303
  - Friday 11:00 am ~ 12:00 am or by appointment

Outline

- Introduction
- Matrix and Array
- Character Strings
- Function
- Plots
- Scripts
- Control Flow
- Help and Documentation

MATLAB

High-Level Language

- Numerical Computation
- Visualization
- Application Development

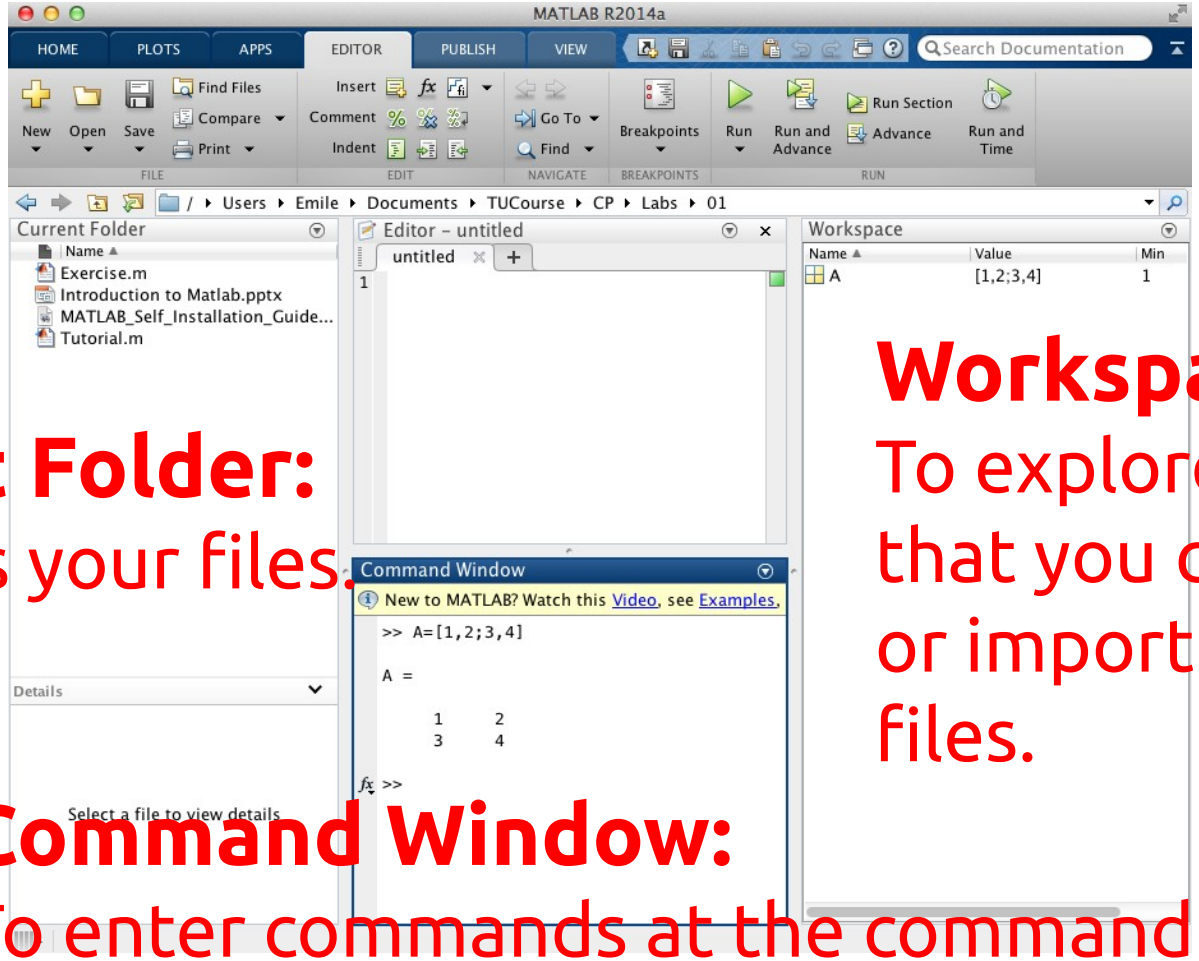
Mathematical Functions

- Linear algebra, statistics
- Fourier analysis, filtering
- Optimization, integration, differential

Development Tools

- Interactive environment
- Built-in graphics
- Integrating with external applications and languages

Layouts



Current Folder:
To access your files.

Workspace:
To explore data that you create or import from files.

Command Window:
To enter commands at the command lines, indicated by the prompt (>>).

Matrices and Arrays

- ALL MATLAB variables are multidimensional arrays
  - Array Creation
    - Using square brackets
      - Column separation: a comma (,) or a space
      - Row separation: a semicolon
    - Using function
      - ones: entry of 1s
      - zeros: entry of 0s
      - rand: entry of random numbers (0, 1)
- Matrix and Array Operations
- Concatenation

Matrices and Arrays

- ALL MATLAB variables are multidimensional arrays
  - Array Creation
  - Matrix and Array Operations
    - Transpose ‘
    - Standard operation + - * / %
    - Element-wise operation .* ./ .^
  - Concatenation

Matrices and Arrays

- ALL MATLAB variables are multidimensional arrays
  - Array Creation
  - Matrix and Array Operations
  - Concatenation
    - With square brackets ([ ])
      - Horizontal concatenation with commas
      - Vertical concatenation with semicolons

Array Indexing

- To access selected elements of an array
  - To use a single subscript that traverses down each column in order
  - To specify row and column subscripts
    - One element: A(m, n)
    - Multiple elements:
      - A(start : step : end, column)
      - A(row, [i, j, k])

Character Strings

- A sequence of characters enclosed in single quotes
  - assign a string to a variable
  - use two single quotes within the definition if the text includes a single quote
- Concatenation
  - With square brackets as concatenate numeric arrays
- Convert numeric values to strings
  - num2str
  - int2str

Functions

- Equivalent to *subroutines* or *methods* in other programming languages
  - To call a function, enclose its input arguments in parentheses
    - If there are multiple input arguments, separate them with commas
  - Return output from a function by assigning it to a variable
    - When there are multiple output arguments, enclose them in square brackets
  - To call a function that does not require any inputs and does not return any outputs, type only the function name

Plots

- Two-dimensional line plots with the plot function
  - Label the axes
  - Add a title
  - Specify additional properties (e.g., line width, color, the marker, etc.)
  - Add plots to an existing figure by using the hold function
  - Display multiple plots in different subregions of the same window using the subplot function

Scripts

- A file with a .m extension containing
  - multiple sequential lines of MATLAB commands
  - function calls
- To run a script
  - Save the file in the current folder and type its name at the command line
  - Run scripts from the Editor by pressing the **Run** button
- Comments
  - To describe the code
  - Add comments whenever you write code
  - Using the percent (%) symbol

Control Flow

- Conditional statements, loop and

`if, elseif, else`	Execute statements if condition is true
`for`	Execute statements specified number of times
`parfor`	Parallel for loop
`switch, case, otherwise`	Switch among several cases based on expression
`try, catch`	Execute statements and catch resulting errors
`while`	Repeatedly execute statements while condition is true

`break`	Terminate execution of for or while loop
`continue`	Pass control to next iteration of for or while loop
`end`	Terminate block of code, or indicate last array index
`pause`	Halt execution temporarily
`return`	Return to invoking function

Help and Documentation

- Supporting documentation
  - Includes examples
  - Describes the function inputs, outputs, and calling syntax

- To access this information
  - From the command line
    - Open it in a separate window using the doc command
    - Display it at the command window by using the help command
    - Display function hints (the syntax portion of the function documentation) in the Command Window by pausing after you type the open parentheses for the function input arguments
  - Access the complete product documentation by clicking the help icon