Introduction to MATLAB bootcamp

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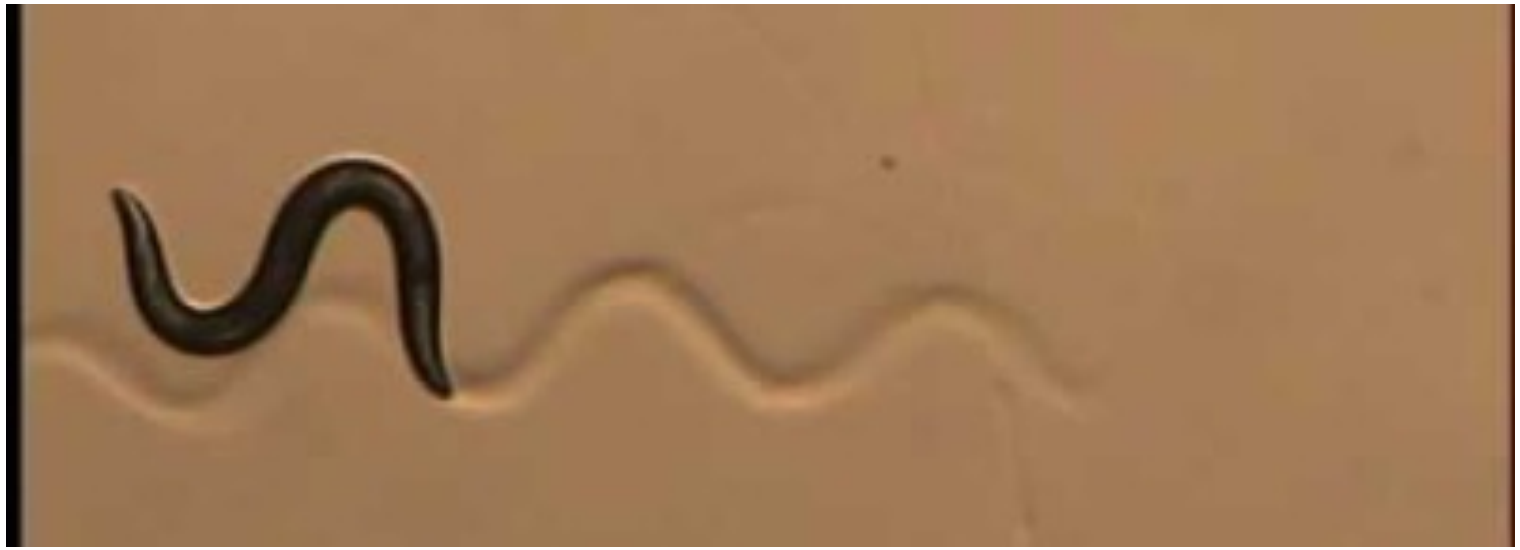
Bootcamp overview

- Meeting time:
  - Wednesday: 1:30 - 3:30 pm
  - Thursday: 1:30 - 3:30 pm
- Zoom link:
- Instructor: Sandeep Kumar (sk35@princeton.edu)
- Weekly assignments: 2-3 hours, assigned Friday, due Tuesday 6pm; ungraded but will receive feedback; weekly code review

About me

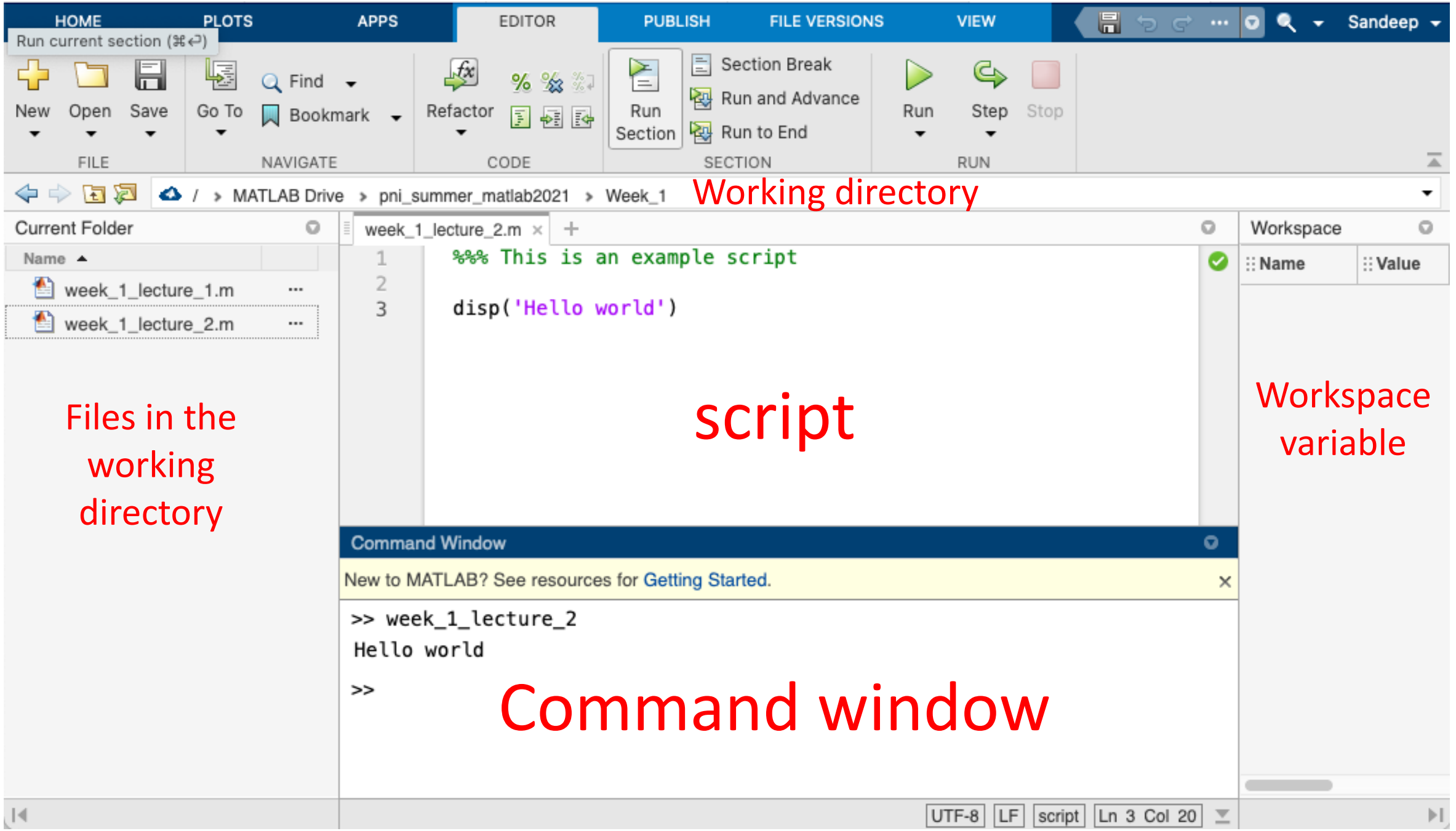
- B.S - M.S. Physics, University of Hyderabad
- M. Eng. Biomedical Engineering, Cornell University
- Research Assistant, Salk Institute for Biological studies, San Diego
- 3rd year graduate student, Princeton Neuroscience Institute
  - Andy Leifer lab

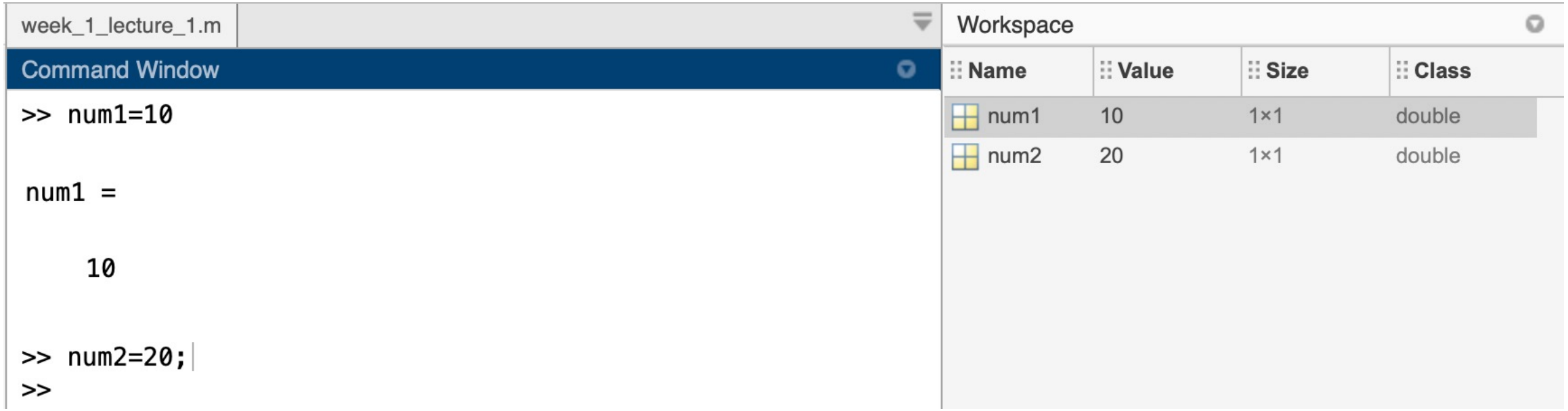


Some other excellent resources to learn MATLAB

Please check these excellent resources:

- Github repo by Mai Nguyen
- MIT Open courseware

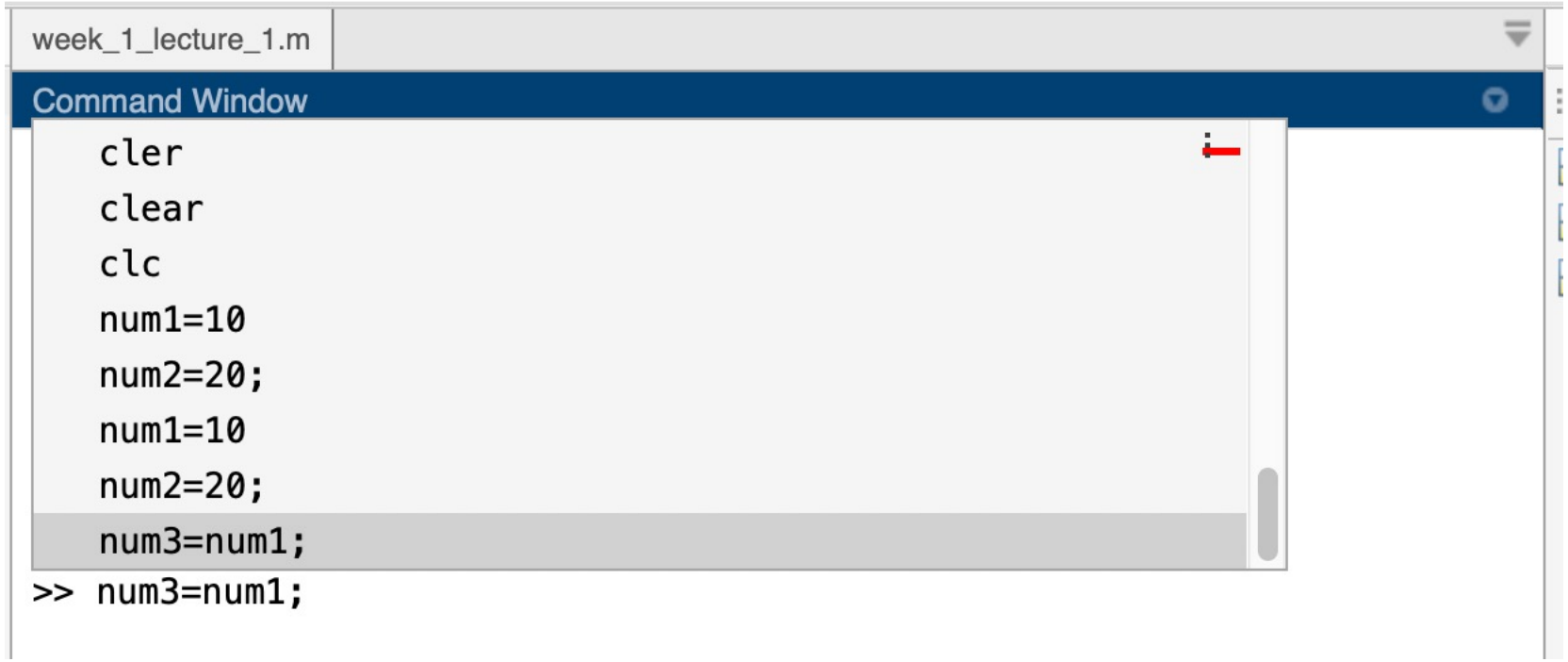

HOME
PLOTS
APPS
EDITOR
PUBLISH
FILE VERSIONS
VIEW
Sandeep
Run current section (⌘↩)
New
Open
Save
Go To
Find
Bookmark
Refactor
Run Section
Section Break
Run and Advance
Run to End
Run
Step
Stop
FILE
NAVIGATE
CODE
SECTION
RUN
/ › MATLAB Drive › pni_summer_matlab2021 › Week_1
Working directory
Current Folder
Name
week_1_lecture_1.m
week_1_lecture_2.m
Files in the working directory
week_1_lecture_2.m
1 %%% This is an example script
2
3 disp('Hello world')
script
Workspace
Name
Value
Workspace variable
Command Window
New to MATLAB? See resources for Getting Started.
>> week_1_lecture_2
Hello world
>>
Command window
UTF-8
LF
script
Ln 3 Col 20



This is how you define a variable:

1) Here we created a new variable num1 and assigned it a value of 10
2) Note that the information always transfer from right to left! (try num1=num2; and see what is the new value of num1)
3) Observe that once you assign values to the variables they appear in the workspace
4) Can you tell the effect of using semicolon (;) at the end of command line?

Helpful tips for MATLAB



1) You can press up arrow and select any of the previous commands.

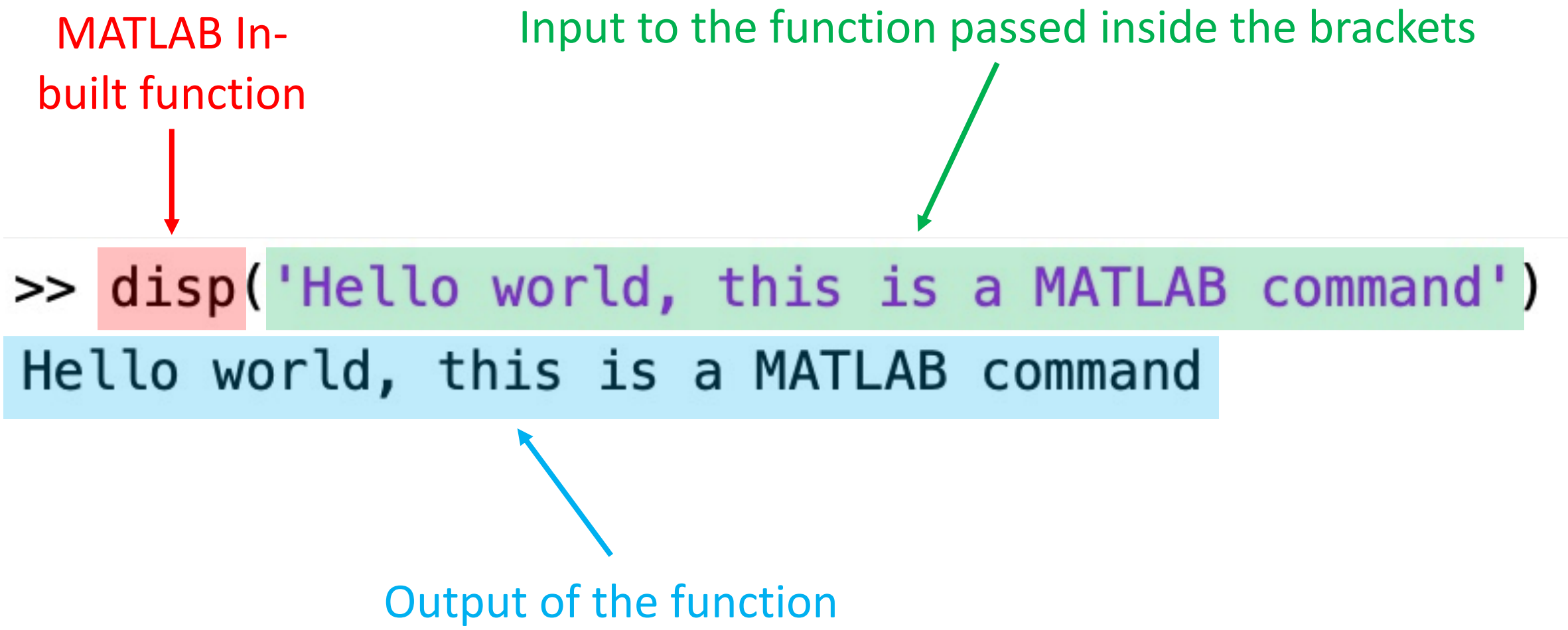
2) You can autocomplete the name of a variable by pressing on tab key

clear, clc, close all

- clear %%% it removes all the elements from workspace
- clc %%% it clears the texts in the command window
- close all %%% it closes all the figures (will be useful later in the bootcamp)

- I usually include all these commands at the beginning of each matlab script

First MATLAB command



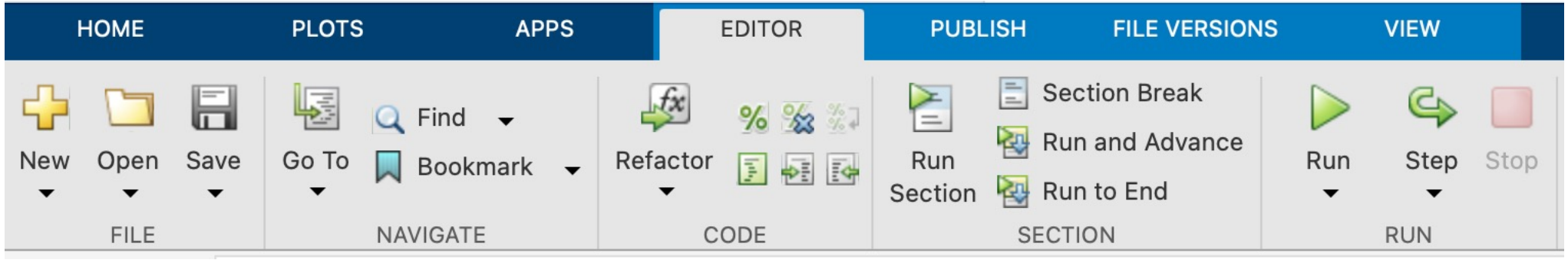
Help function in MATLAB

Command Window

```
>> help disp
 disp Display array.

    disp(X) displays array X without printing the array name or

    additional description information such as the size and class
name.

    In all other ways it is the same as leaving the semicolon off an

    expression except that nothing is shown for empty arrays.


    If X is a string or character array, the text is displayed.


    See also formattedDisplayText, sprintf, num2str, format, details.


    Documentation for disp

    Other functions named disp
```

Running your MATLAB script

1. Running from command window
2. Run section
3. Run and advance
4. Run to end
5. Run



Assigning values to variables

- a=5;
- a+2

- What is the new value of a?
- How can you increase the value of variable ‘a’ by 2?

Calculation using variables

- volume= length x width x height
- length=2;
- width=5;
- height=7;
- volume=length*width*height;

- How will you print the value of the variable volume?
- How will you print the value of the variable volume and width together?

Using MATLAB editor

week_1_lecture_1.m

```
1   %%% week_1_lecture_1 code
2   %%% This code will calculate the volume of a cube
3
4   %%% input variables from the user
5   length=2; %%% length
6   width=5;  %%% width
7   height=7; %%% height
8
9   %%% Calculating volume
10  volume=length*width*height;
```

1) Any line of code which begins with % is considered as comment and is not executed by MATLAB.
2) Using %% will divide the code into sections (very helpful)
3) Adding comments at the very top of the code will be displayed when you use help filename.m

Predefined values and variables in MATLAB

Expression	Description
`pi`	The number π up to 15 significant digits.
`i, j`	The complex number $\sqrt{-1}$.
`inf`	Represents the mathematical Infinity concept, for example, a result of division by zero.
`NaN`	Stands for Not-A-Number. Represents the result of a meaningless mathematical function, like $0/0$.
`clock`	Contains the current date and time in the form of a 6-element row vector: year,month,day,hour,minute,second.
`date`	Contains a string representing today's date.
`eps`	Stands for **epsilon**. It represents the smallest number that can be represented by your MATLAB software.
`ans`	A special variable that MATLAB uses to store the result of MATLAB's command line.

https://www.cdslab.org/matlab/notes/values-variables-types/variables/index.html

Keywords in MATLAB

- MATLAB has pre-defined keywords such as while, for, if, parfor, global etc.
- You cannot use these keywords as a variable e.g. you cannot use while=1;
- To see the complete list of keywords, enter iskeyword in the command window.
- Also, try not to use MATLAB functions as variable names. For e.g. avoid use mean=4, sin=20;

Time taken by MATLAB to execute a code

```
22    %%
23    tic
24    exp(500)
25    toc
26
```

Command Window

```
>> tic
exp(500)
toc

ans =

  1.4036e+217

Elapsed time is 0.034693 seconds.
>>
```

MATLAB tells the time to execute a command between tic and toc

Infinity and NaN (Not a number)

- Inf: Inf is the outcome of division by 0 (e.g. 1/0) or overflow when the result is too large (e.g. exp(1000))

- NaN: MATLAB uses NaN to represent the numbers which are not real or complex. e.g. 0/0, Inf/Inf

- Usually in experiments/data analysis, the missing data points are represented by NaN.

https://www.mathworks.com/help/matlab/matlab_prog/infinity-and-nan.html