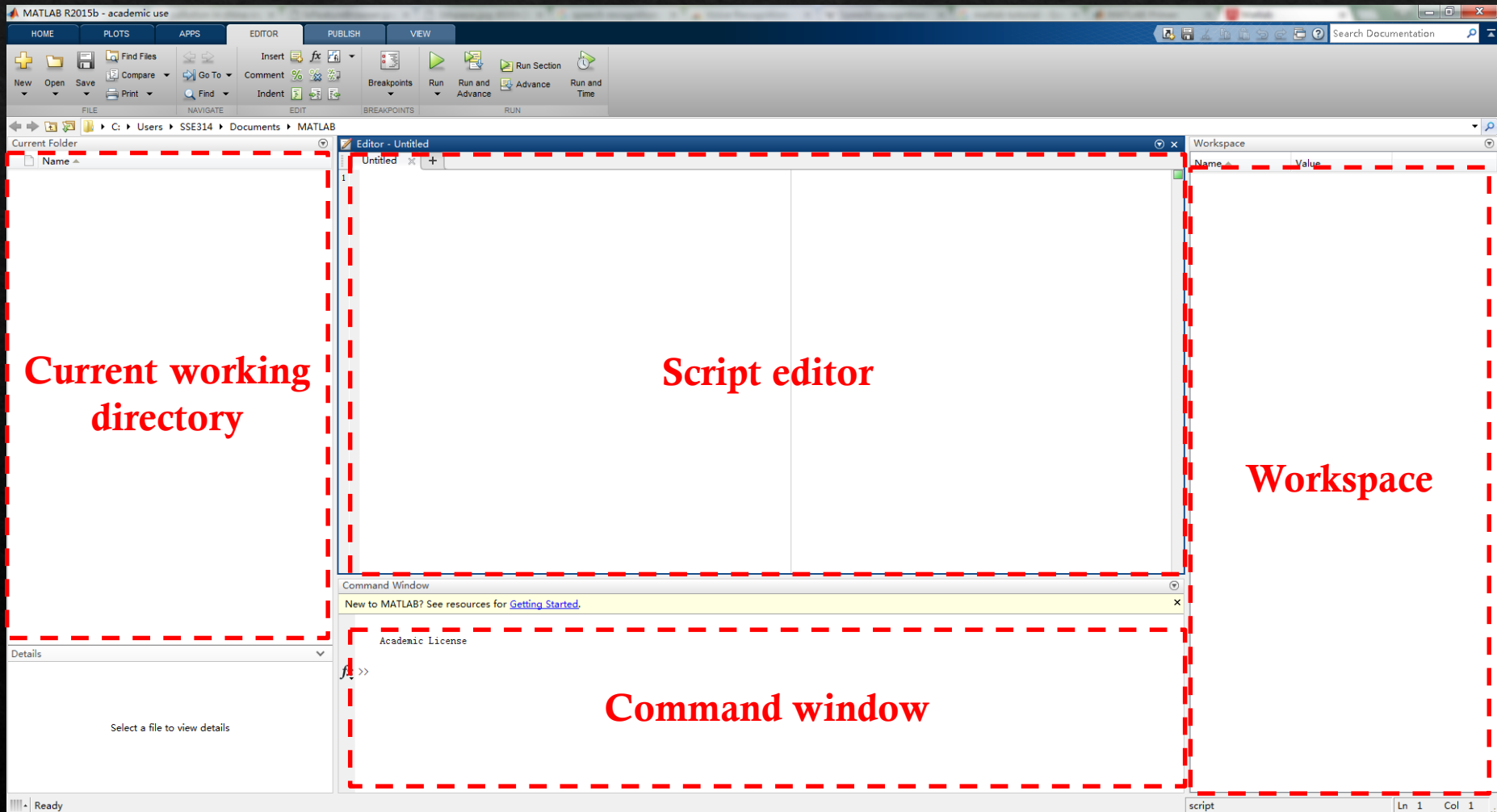


Matlab Tutorial

Development Environment



Commands

◇ Create a variable

```
a = 1
```

```
b = 2
```

```
c = a+b
```

```
d = cos(a)
```

```
sin(a)
```

```
e = a*b;
```

Character Strings

- ◆ Assign a string to a variable

```
myText = 'Hello, world'; % disp(myText);
```

```
otherText = 'You''re right' % disp(otherText);
```

```
f = 71;
```

```
c = (f-32)/1.8;
```

```
tempText = ['Temperature is ', num2str(c), 'C'] % disp(tempText)
```

Calling Functions

◇ Functions

```
A = [1 3 5];  
max(A)
```


Loops and Conditional Statements

- ◇ Within a script, you can loop over sections of code and conditionally execute sections using the keywords `for`, `while`, `if`, and `switch`

```
nsamples = 5;
npoints = 50;
for k = 1:nsamples
    currentData = rand(npoints,1); % create an array with
                                   % random values
    sampleMean(k) = mean(currentData); % mean value
end
overallMean = mean(sampleMean)
```

Matrices and Arrays

◇ Array Creation

```
a = [1 2 3 4] % a row vector
```

```
a = [1 2 3; 4 5 6; 7 8 10] % a square matrix
```

```
z = zeros(5,1) % a column vector containing 5 zeros
```

◇ Matrix and Array Operations

```
a + 10
```

```
sin(a)
```

```
a'
```

```
p = a*inv(a)
```

```
p = a.*a
```

Matrices and Arrays

◇ Concatenation

```
A = [a, a]
```

```
A = [a; a]
```

◇ Array indexing

```
A = magic(4) % a 4*4 magic square
```

```
A(4,2)
```

```
A(8)
```

```
A(4,2) = 17
```

```
A(3,:) 
```

$$A = \begin{bmatrix} 16 & 2 & 3 & 13 \\ 5 & 11 & 10 & 8 \\ 9 & 7 & 6 & 12 \\ 4 & 14 & 15 & 1 \end{bmatrix}$$

Matrices and Arrays

◇ Deleting Rows and Columns

```
A(:, 2) = [] % A is a 4*3 matrix
```

$$A = \begin{bmatrix} 16 & 3 & 13 \\ 5 & 10 & 8 \\ 9 & 6 & 12 \\ 4 & 15 & 1 \end{bmatrix}$$

Draw Lines

◇ Draw a line

```
x = 0:pi/100:2*pi;
```

```
y = sin(x);
```

```
figure % opens new figure window
```

```
plot(x,y)
```

Draw Lines

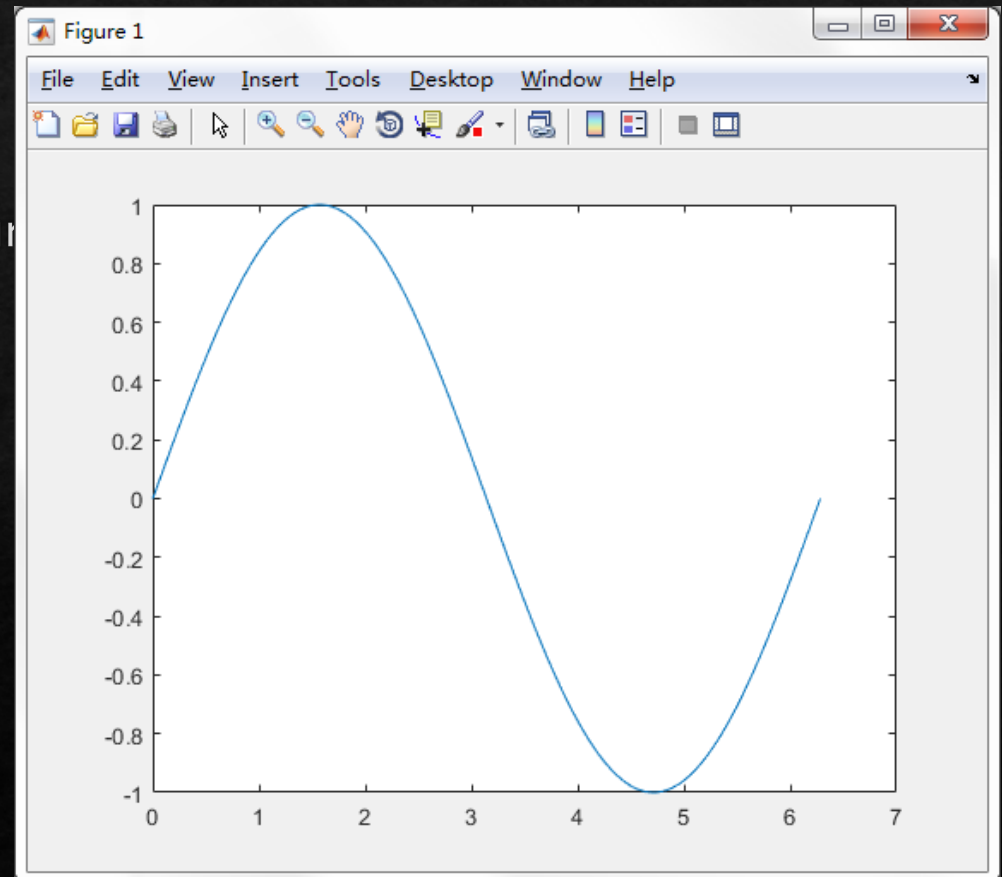
◇ Draw a line

```
x = 0:pi/100:2*pi;
```

```
y = sin(x);
```

```
figure % opens new figure
```

```
plot(x,y)
```



Draw Lines

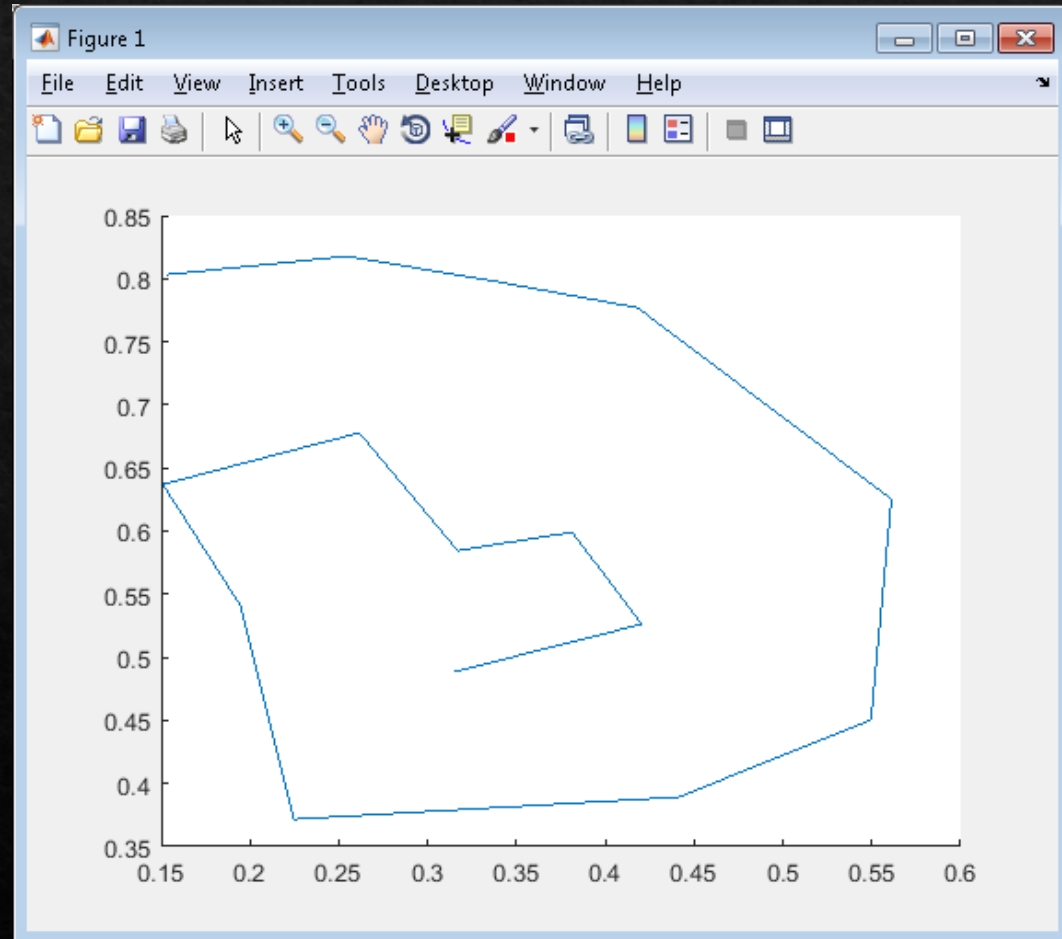
◆ Draw a line

```
figure;
```

```
[x, y] = getline;
```

```
line(x,y);
```

```
% press Enter
```

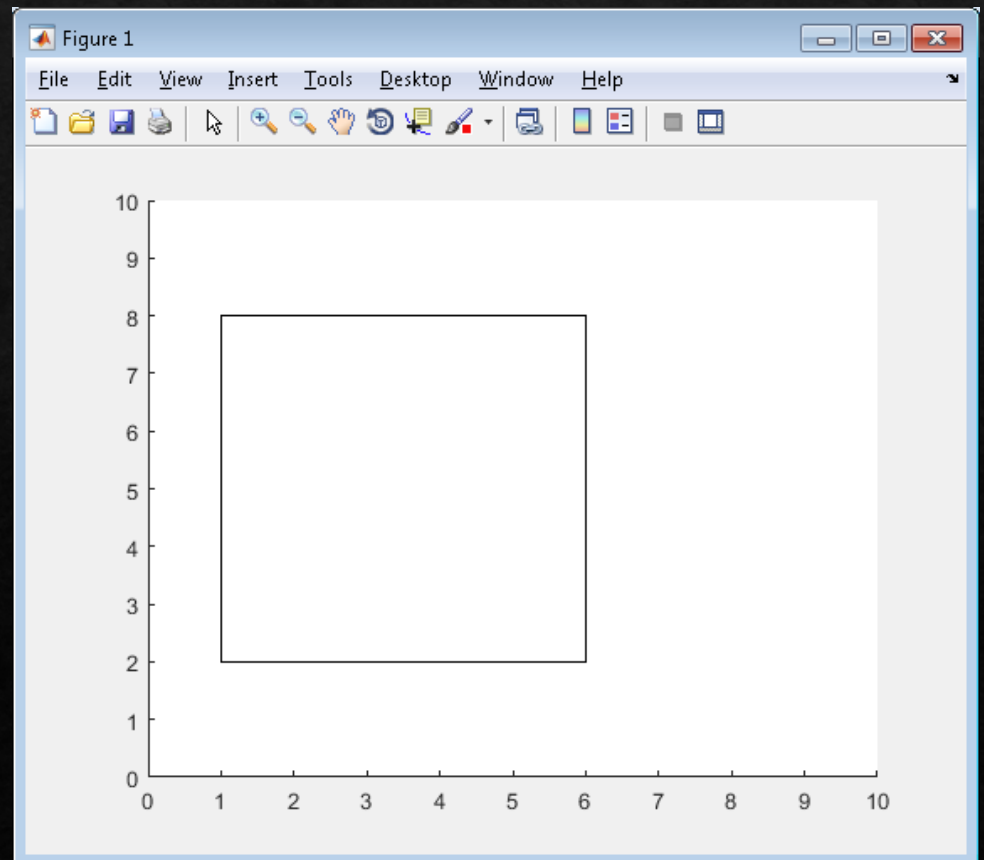


Draw A Rectangle

◇ Rectangle('position', pos)

```
rectangle('Position',[1 2 5 6])
```

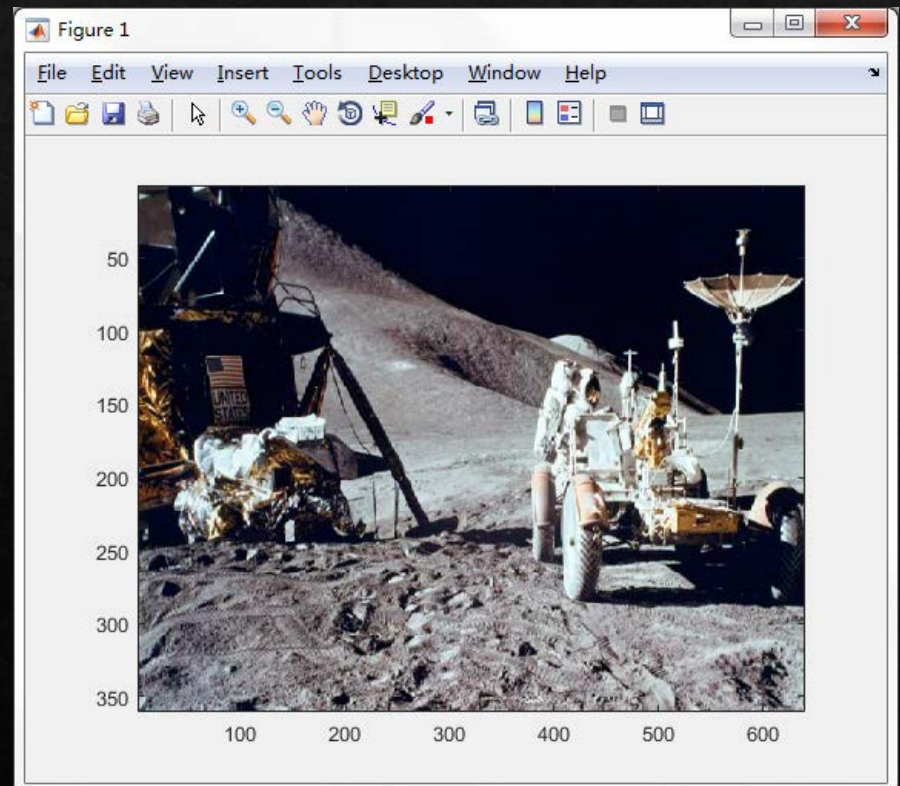
```
axis([0 10 0 10])
```



Load An Image

◇ Example

```
A = imread('moonwalk.jpg');  
image(A);
```



Load Images

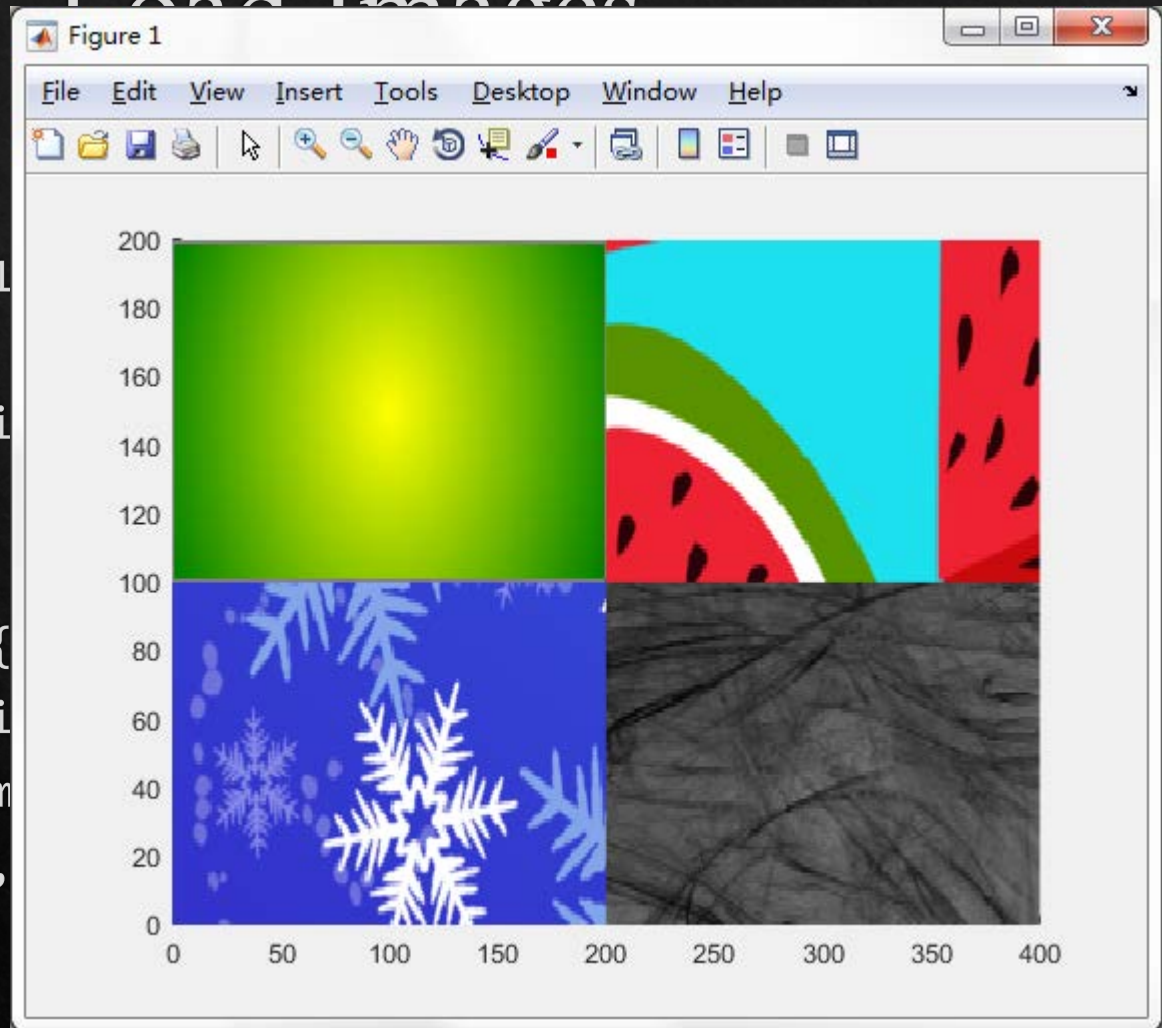
◇ Example

```
img = cell(4,1);
for i = 1:4
    img{i} = imread(['bg' num2str(i) '.png']);
end
hold on; % draw images in the same figure
image(0,0,img{1});
image(200,0, img{2});
image(0,100,img{3});
image(200,100,img{4});
```

Load Images

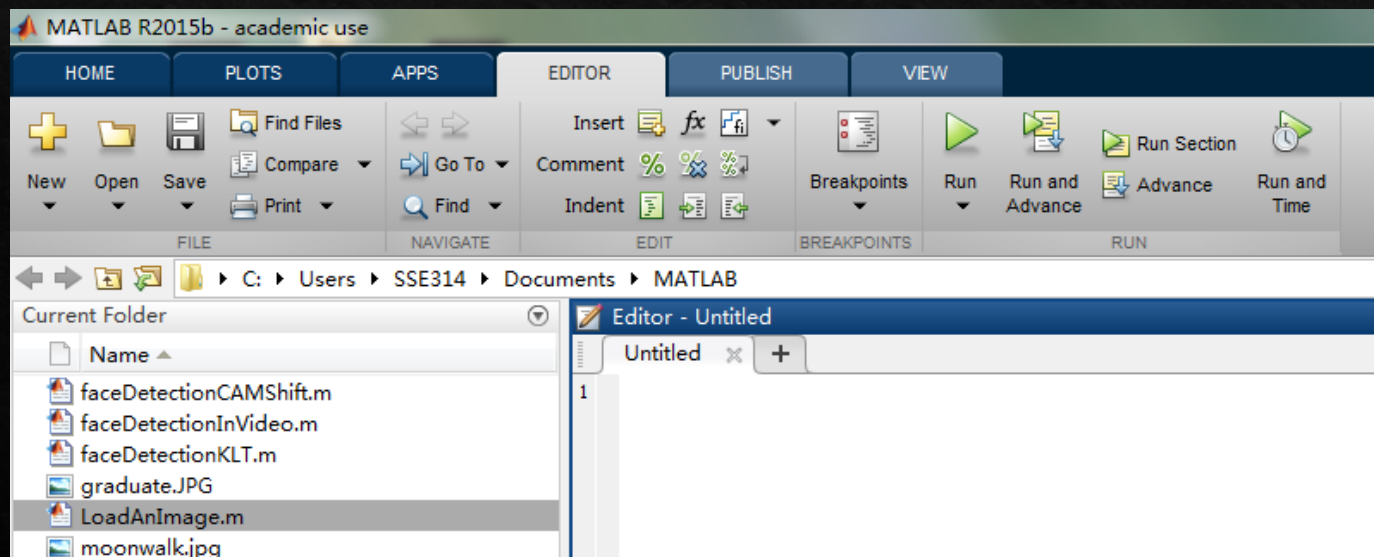
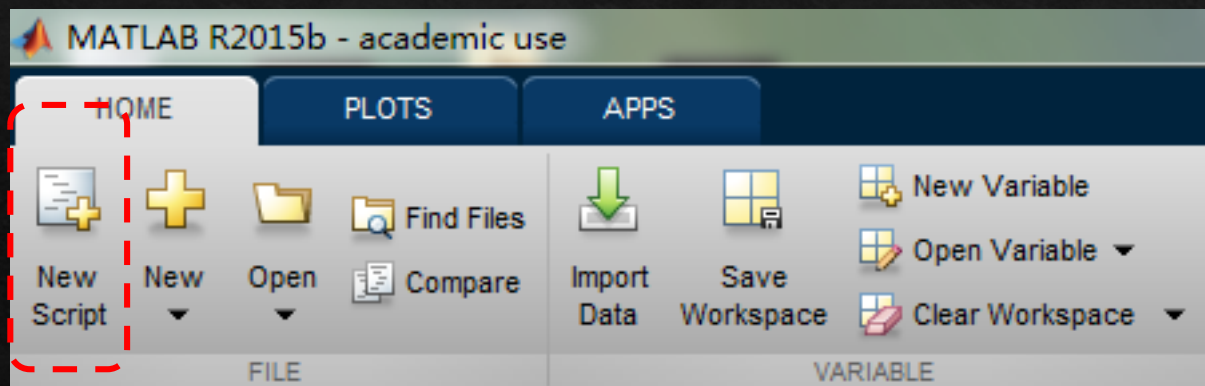
◇ Example

```
img = cell(4,1)
for i = 1:4
    img{i} = imread('img' + i + '.png')
end
hold on;
image(0,0,img{1});
image(200,0, img{2});
image(0,100, img{3});
image(200,100, img{4});
```



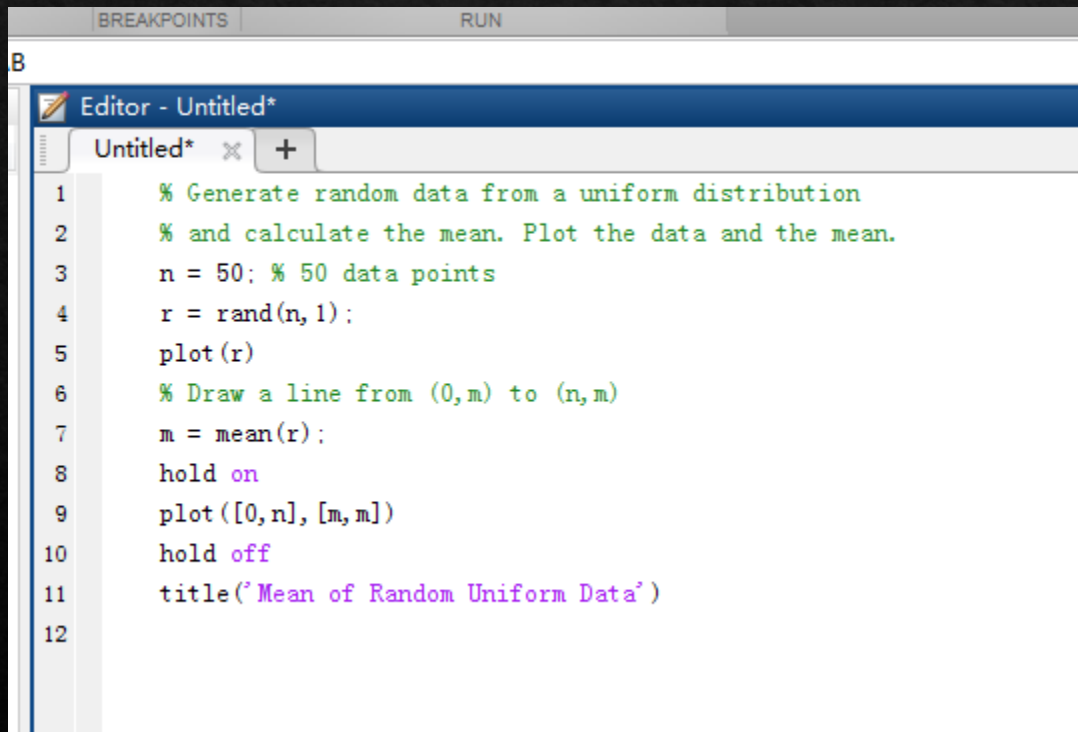
Programming and Scripts

- ◇ Create a new script



Programming and Scripts

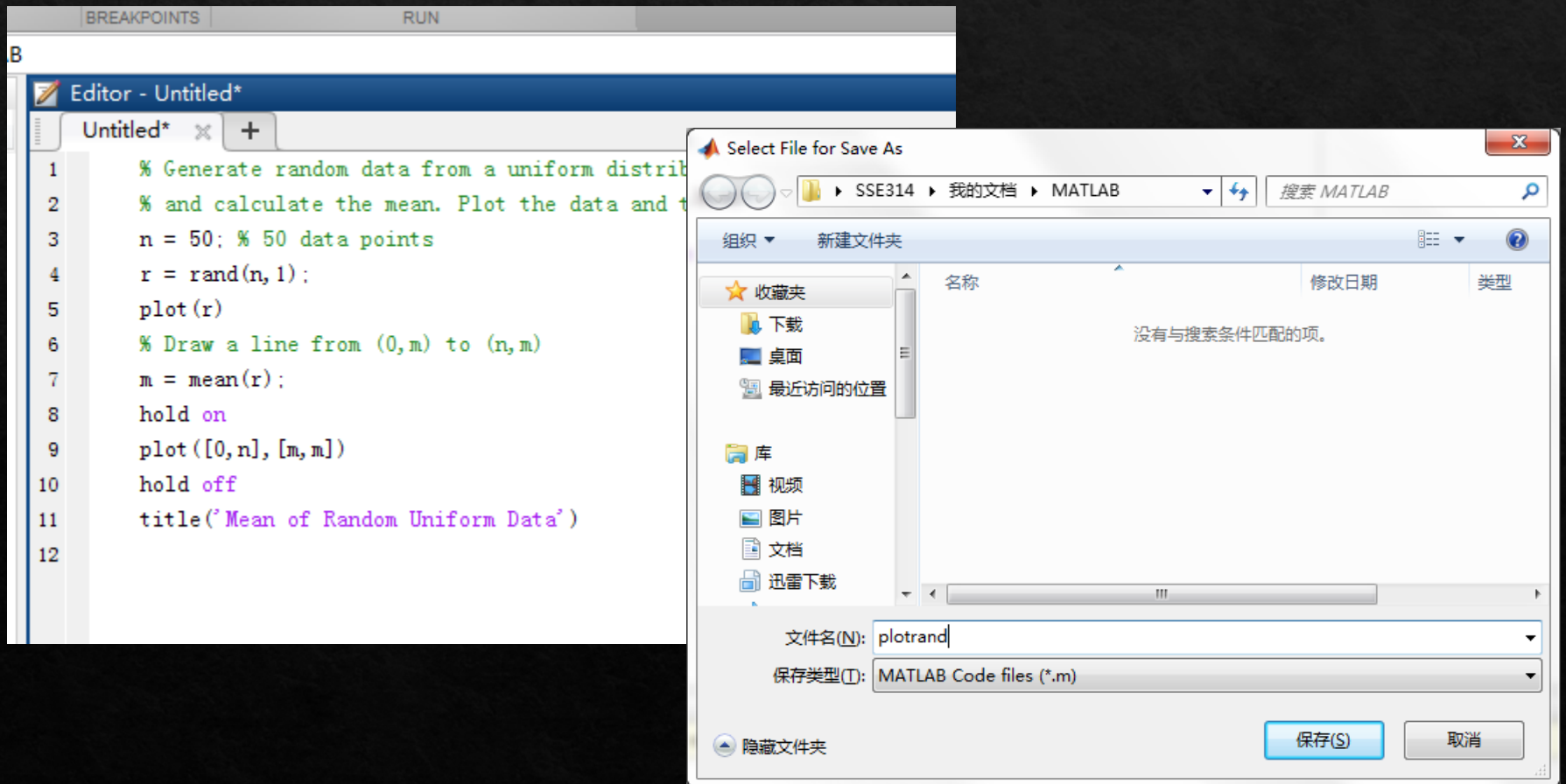
- ◆ A sample script



```
B
Editor - Untitled*
Untitled* x +
1 % Generate random data from a uniform distribution
2 % and calculate the mean. Plot the data and the mean.
3 n = 50; % 50 data points
4 r = rand(n,1);
5 plot(r)
6 % Draw a line from (0,m) to (n,m)
7 m = mean(r);
8 hold on
9 plot([0,n],[m,m])
10 hold off
11 title('Mean of Random Uniform Data')
12
```


Programming and Scripts

- ◆ Save the script



Programming and Scripts

- ◇ Run the script

The image displays the MATLAB R2015b - academic use interface. The top ribbon includes tabs for HOME, PLOTS, APPS, EDITOR, PUBLISH, and VIEW. The VIEW tab is active, and the Run button (a green play icon) is highlighted with a red dashed box. Below the ribbon, the script editor shows the following code:

```
6 % Draw a line from (0,m) to (n,m)
7 m = mean(r);
8 hold on
9 plot([0,n], [m,m])
10 hold off
11 title('Mean of Random Uniform Data')
12
```

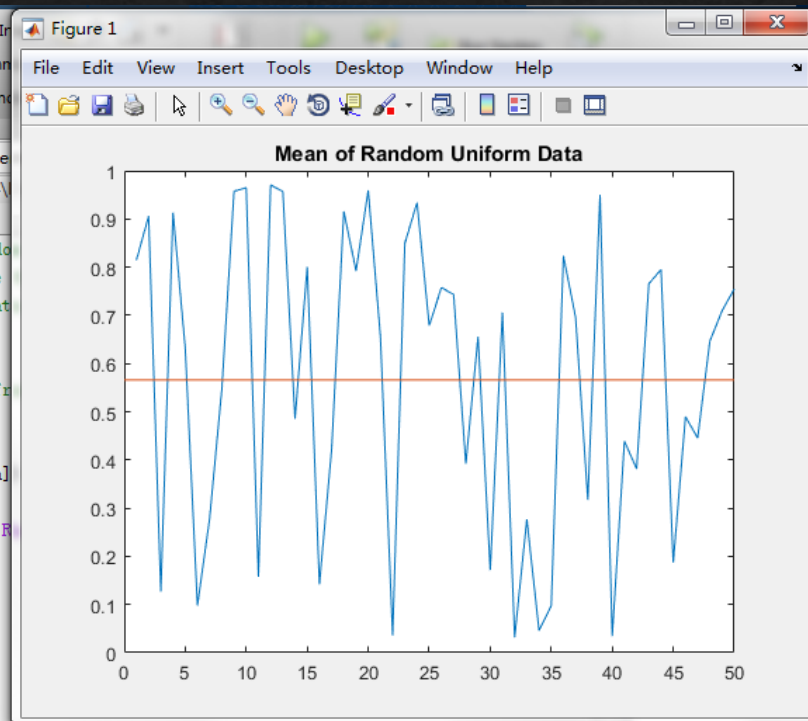
A file explorer window is open in the foreground, showing the current directory. The file name field contains 'plotrand' and the save type is set to 'MATLAB Code files (*.m)'. The window also shows a search bar with the text '没有与搜索条件匹配的项。' (No items match the search criteria).

Program

◆ Run the script

```
BREAKPOINTS RUN
Editor - Untitled*
Untitled* x +
1 % Generate random data from a uniform
2 % and calculate the mean. Plot the dat
3 n = 50; % 50 data points
4 r = rand(n,1);
5 plot(r)
6 % Draw a line from (0,m) to (n,m)
7 m = mean(r);
8 hold on
9 plot([0,n],[m,m])
10 hold off
11 title('Mean of Random Uniform Data')
12
```

```
Users \ SSE314 \ Document
Editor - C:\Users\SSE314\
plotrand.m x +
1 % Generate random
2 % and calculate
3 n = 50; % 50 data
4 r = rand(n,1);
5 plot(r)
6 % Draw a line fr
7 m = mean(r);
8 hold on
9 plot([0,n],[m,m])
10 hold off
11 title('Mean of R
12
```



```
Command Window
New to MATLAB? See resources for Getting Started.
Academic License
>> plotrand
fx >>
```

文件列表:

- 图片
- 文档
- 迅雷下载

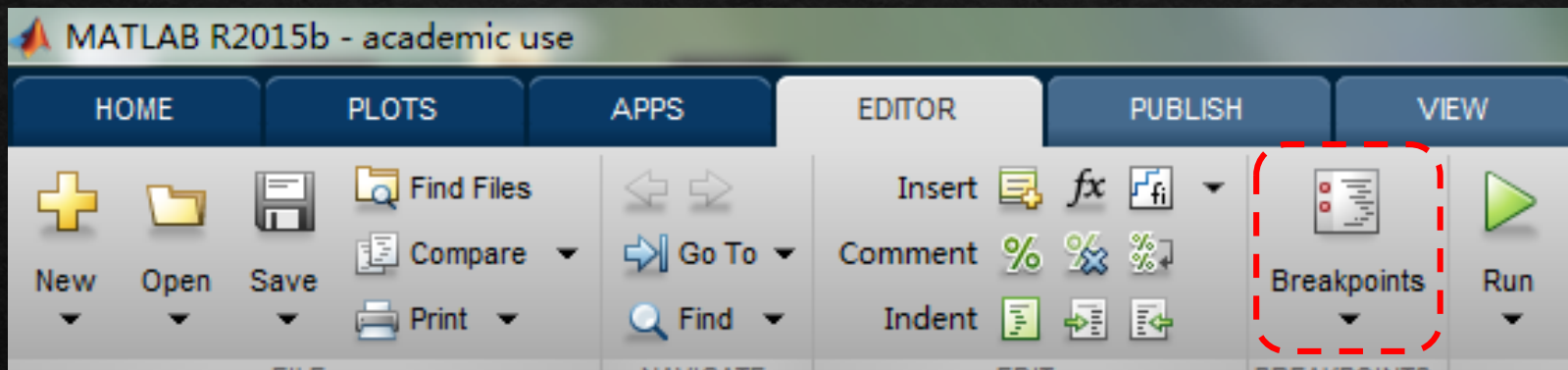
文件名(N): plotrand

保存类型(T): MATLAB Code files (*.m)

按钮: 隐藏文件夹, 保存(S), 取消

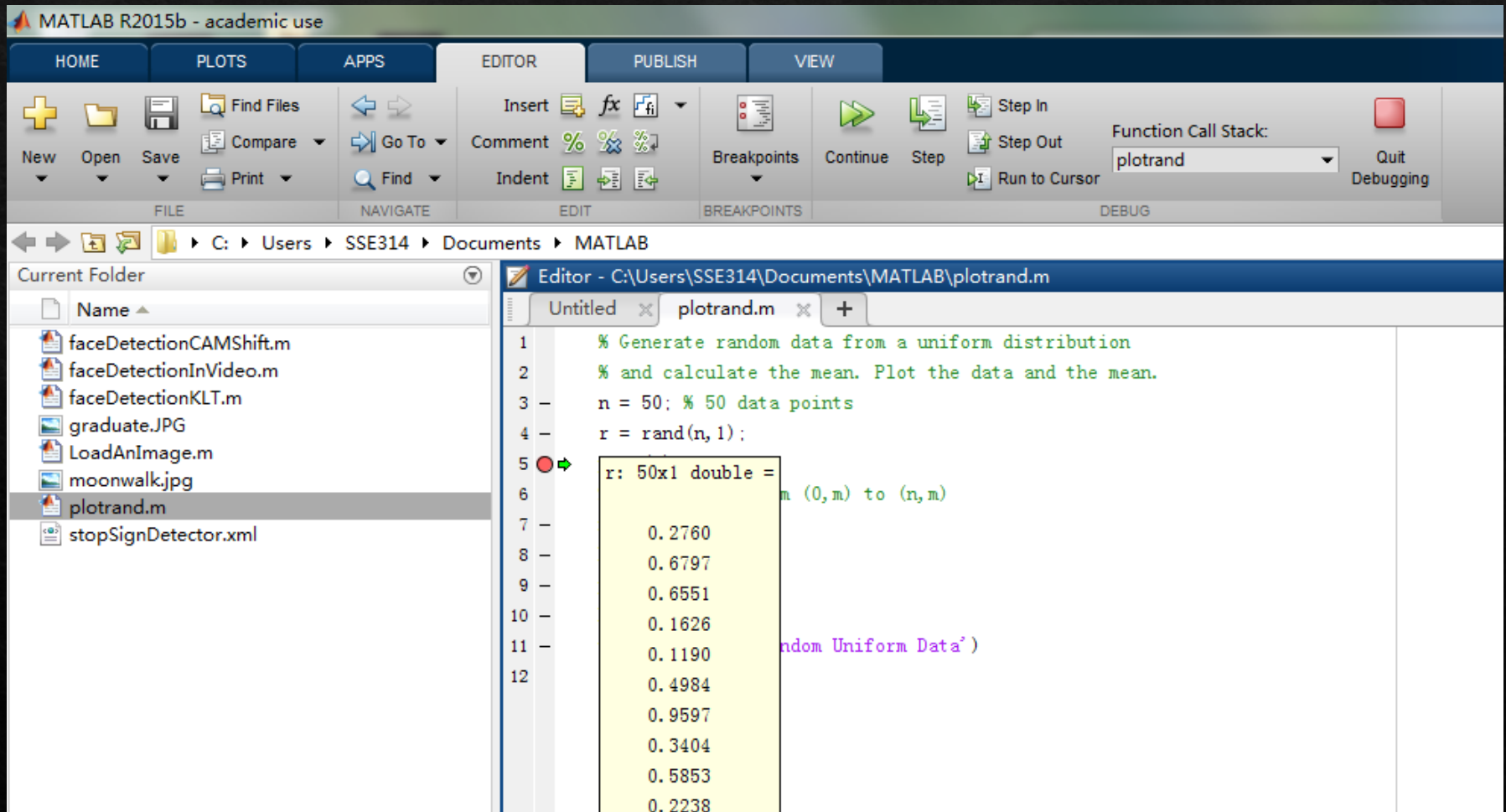
Programming and Scripts

- ◇ Set a breakpoint



Programming and Scripts

◆ Set a breakpoint



The image shows the MATLAB R2015b interface with the Editor tab selected. The current folder is C:\Users\SSE314\Documents\MATLAB. The editor window displays the script plotrand.m with the following code:

```
1 % Generate random data from a uniform distribution
2 % and calculate the mean. Plot the data and the mean.
3 - n = 50; % 50 data points
4 - r = rand(n, 1);
5 - r: 50x1 double =
6 - 0.2760
7 - 0.6797
8 - 0.6551
9 - 0.1626
10 - 0.1190
11 - 0.4984
12 - 0.9597
    0.3404
    0.5853
    0.2238
```

A red circle with a green arrow indicates a breakpoint is set on line 5. The output of the script is displayed in a yellow box, showing a 50x1 double array of random uniform data points. The Function Call Stack shows plotrand.

Programming

◆ Set a breakpoint

MATLAB R2015b - academic use

HOME PLOTS APPS EDITOR PUBLISH VIEW

New Open Save Find Files Compare Print Find Go To Comment Indent Breakpoints

FILE NAVIGATE EDIT BREAKPOINTS

C:\Users\SSE314\Documents\MATLAB

Current Folder

- faceDetectionCAMShift.m
- faceDetectionInVideo.m
- faceDetectionKLT.m
- graduate.JPG
- LoadAnImage.m
- moonwalk.jpg
- plotrand.m
- stopSignDetector.xml

Editor - C:\Users\SSE314\Documents

```
1 % Generate random data f
2 % and calculate the mean.
3 n = 50; % 50 data points
4
5
6
7
8
9
10
11
12
```

Breakpoint menu:

- Evaluate Selection
- Open "r"
- Help on Selection
- Cut
- Copy
- Paste
- Select All

Documents ▸ MATLAB

Editor - plotrand.m

r 50x1 double

	1	2	3
1	0.2760		
2	0.6797		
3	0.6551		
4	0.1626		
5	0.1190		
6	0.4984		
7	0.9597		
8	0.3404		
9	0.5853		
10	0.2238		
11	0.7513		
12	0.2551		
13	0.5060		
14	0.6991		
15	0.8909		
16	0.9593		
17	0.5472		
18	0.1386		
19	0.1493		
20	0.2575		
21	0.8407		
22	0.2543		
...			

Workspace

Name	Value
n	50
r	50x1 double

Command Window

Exercise

1. Run previous examples
2. Finish the following tasks:

Task 1:

- ◇ Draw an oval; ($x = a \cos(\theta)$ $y = b \sin(\theta)$)

Task 2:

- ◇ Load a series of images;
- ◇ Display one image each time and change to the next image when the right mouse button is clicked;
- ◇ Mark out all the faces in different images by dragging rectangles;
 - ◇ hint: `getrect; strcmp(get(gcf,'SelectionType'),'alt')`