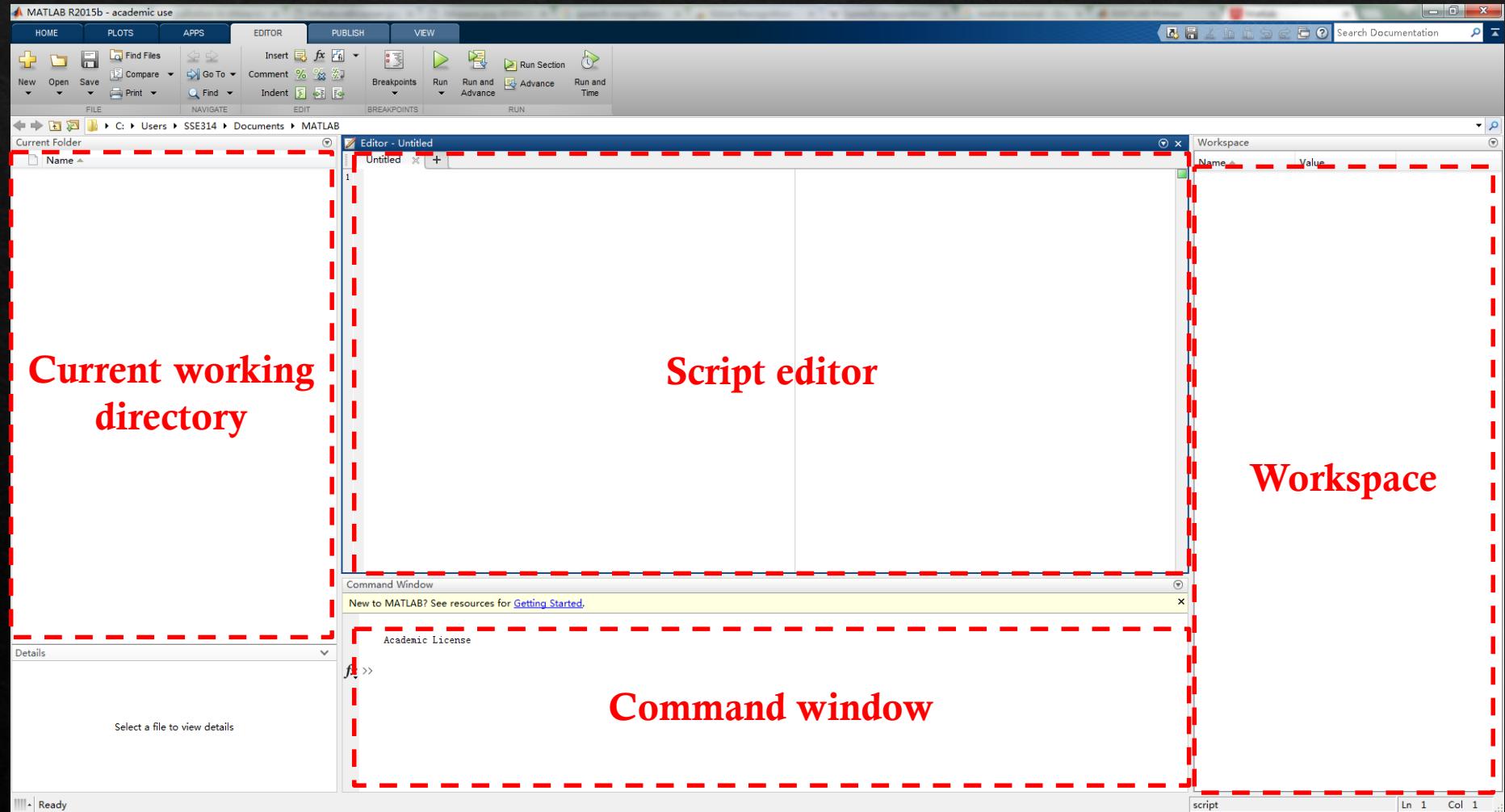


Matlab Tutorial

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

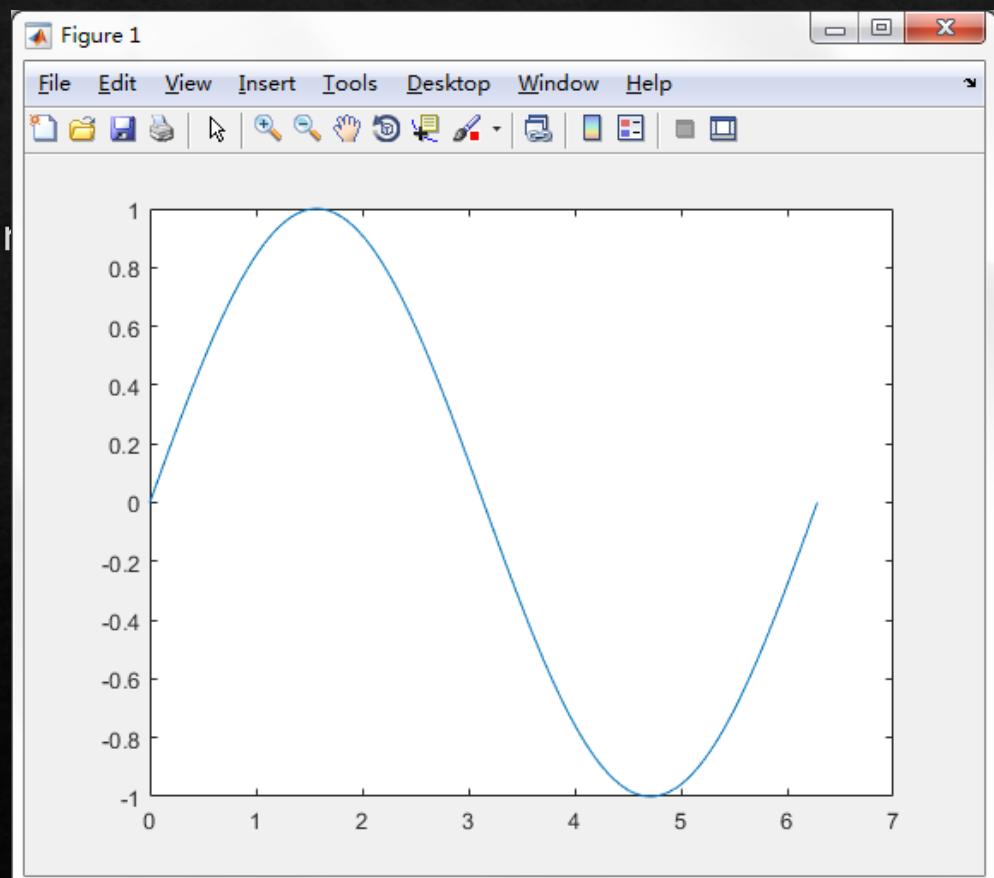
- ❖ Draw a line

```
x = 0:pi/100:2*pi;  
y = sin(x);  
figure % opens new figure window  
plot(x,y)
```

Draw Lines

- ❖ Draw a line

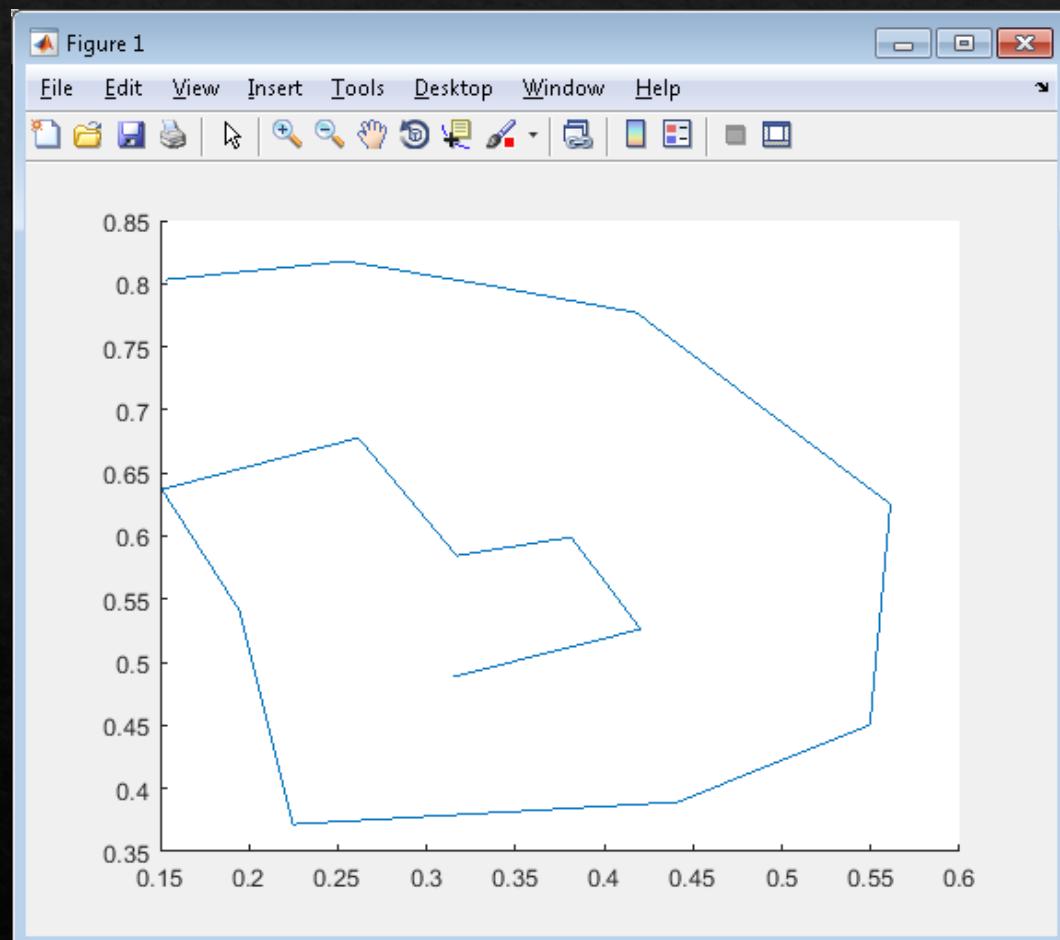
```
x = 0:pi/100:2*pi;  
y = sin(x);  
figure % opens new figure  
plot(x,y)
```



Draw Lines

- ❖ Draw a line

```
figure;  
[x, y] = getline;  
line(x,y);  
% press Enter
```

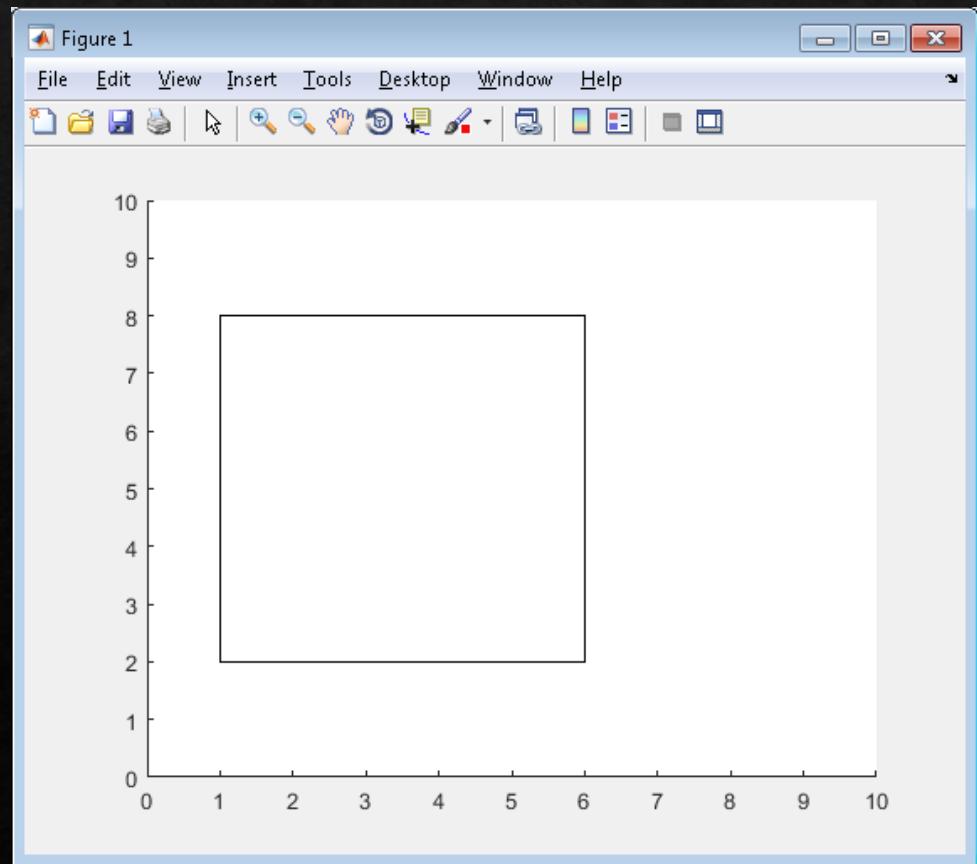


Draw A Rectangle

- ❖ `Rectangle('position', pos)`

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

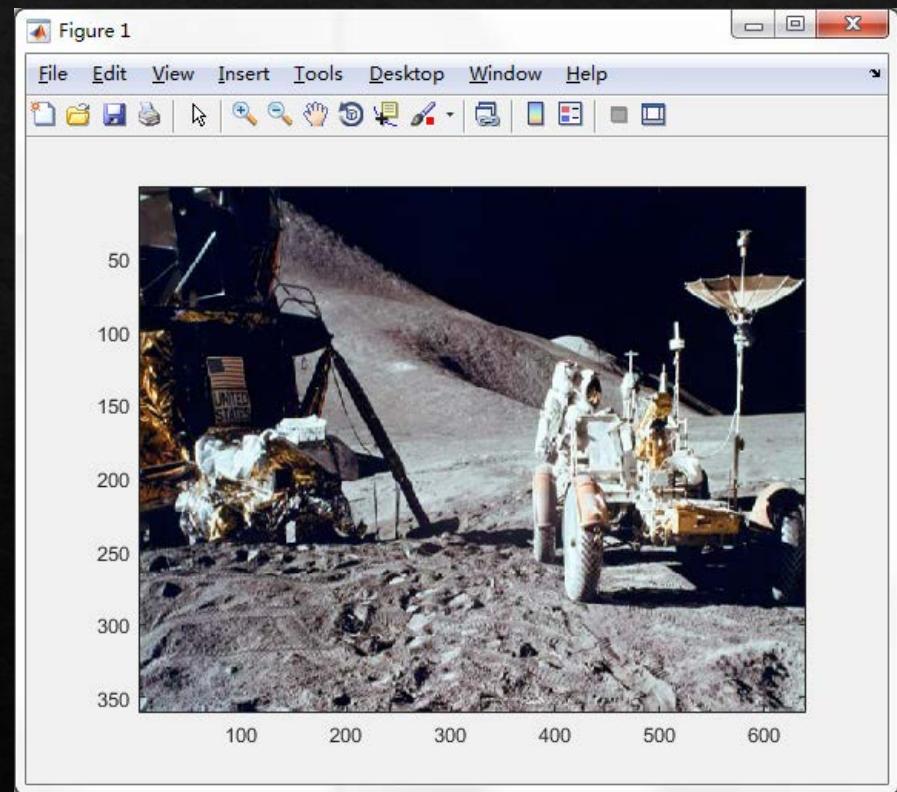
```
axis([0 10 0 10])
```



Load An Image

❖ Example

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



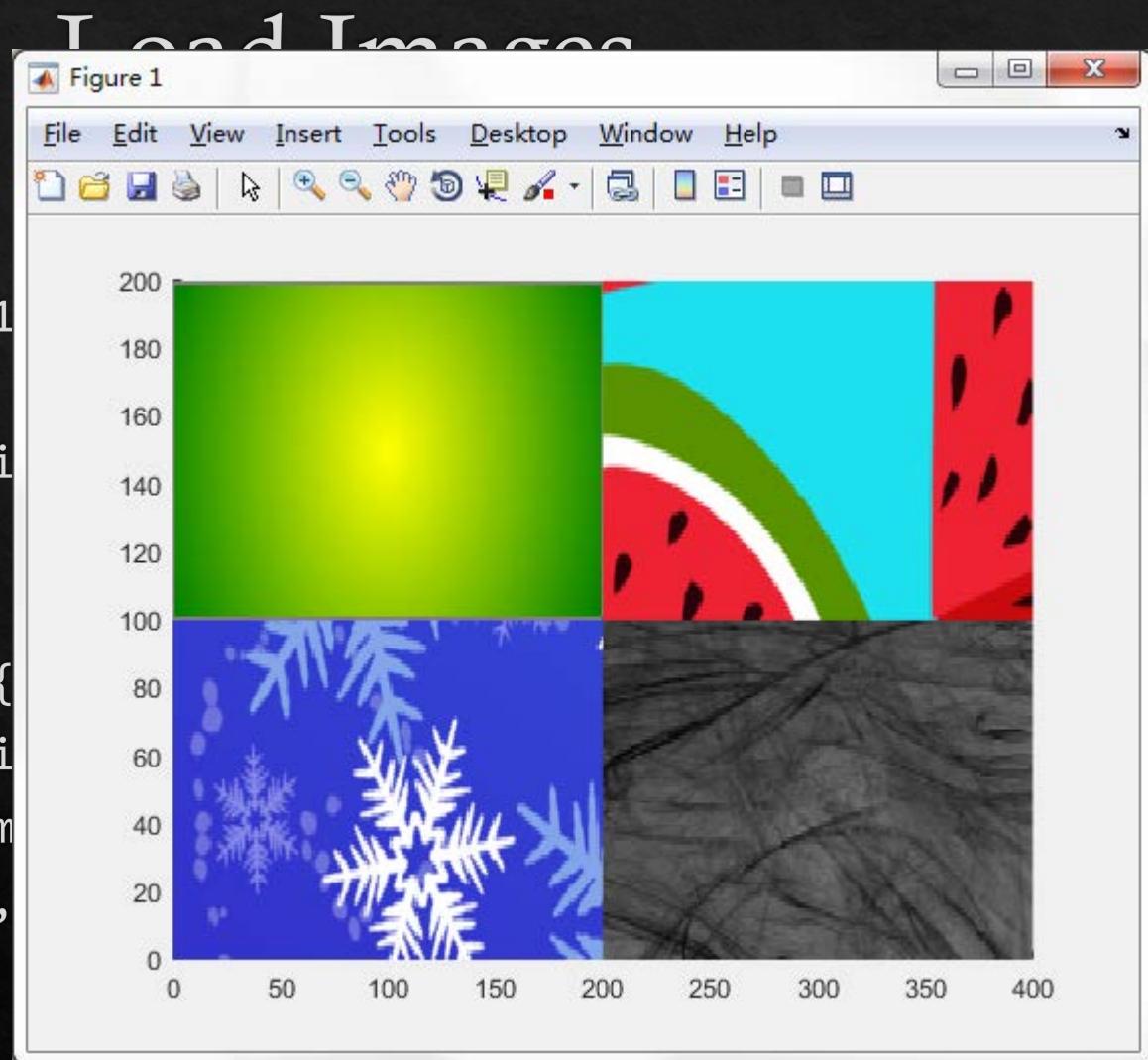
Load Images

❖ 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});
```

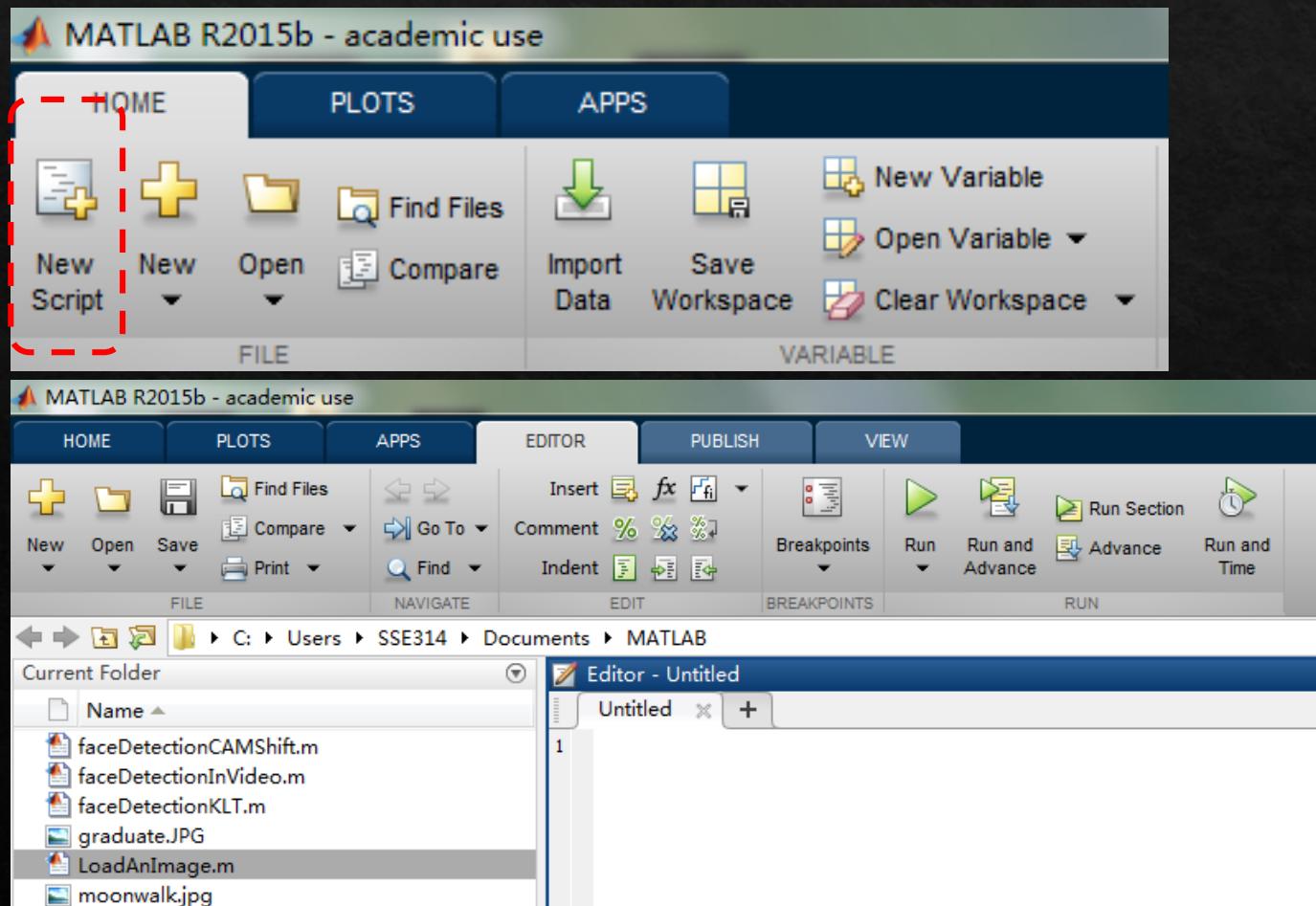
❖ Example

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



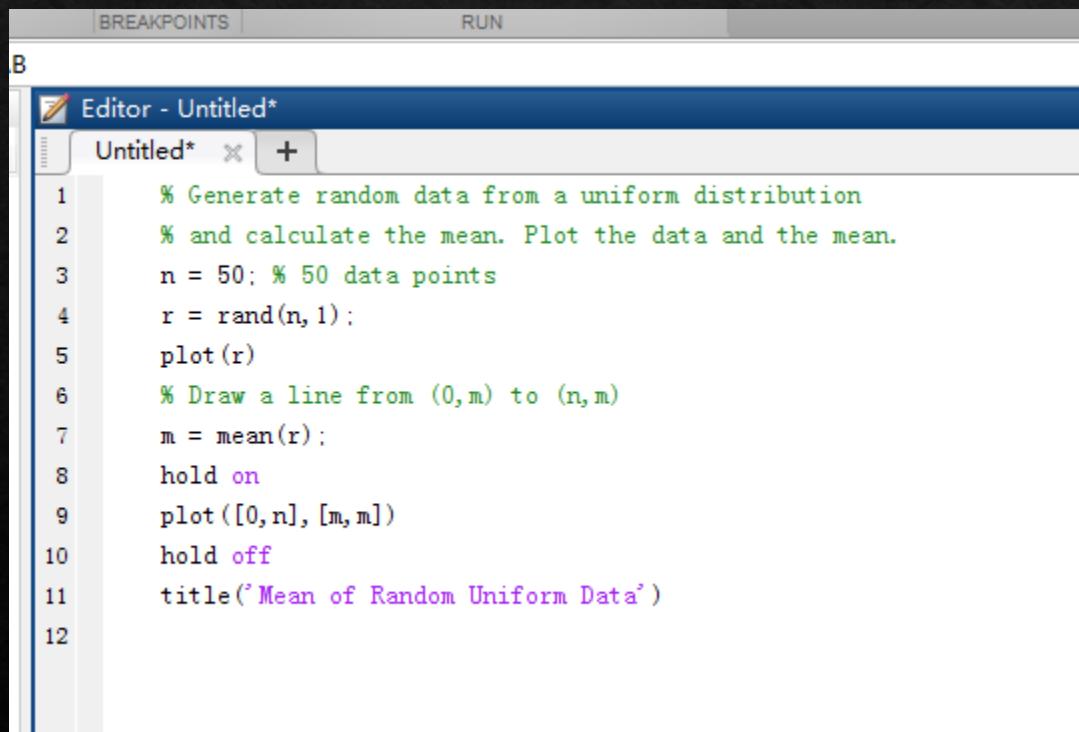
Programming and Scripts

- ❖ Create a new script



Programming and Scripts

- ❖ A sample script

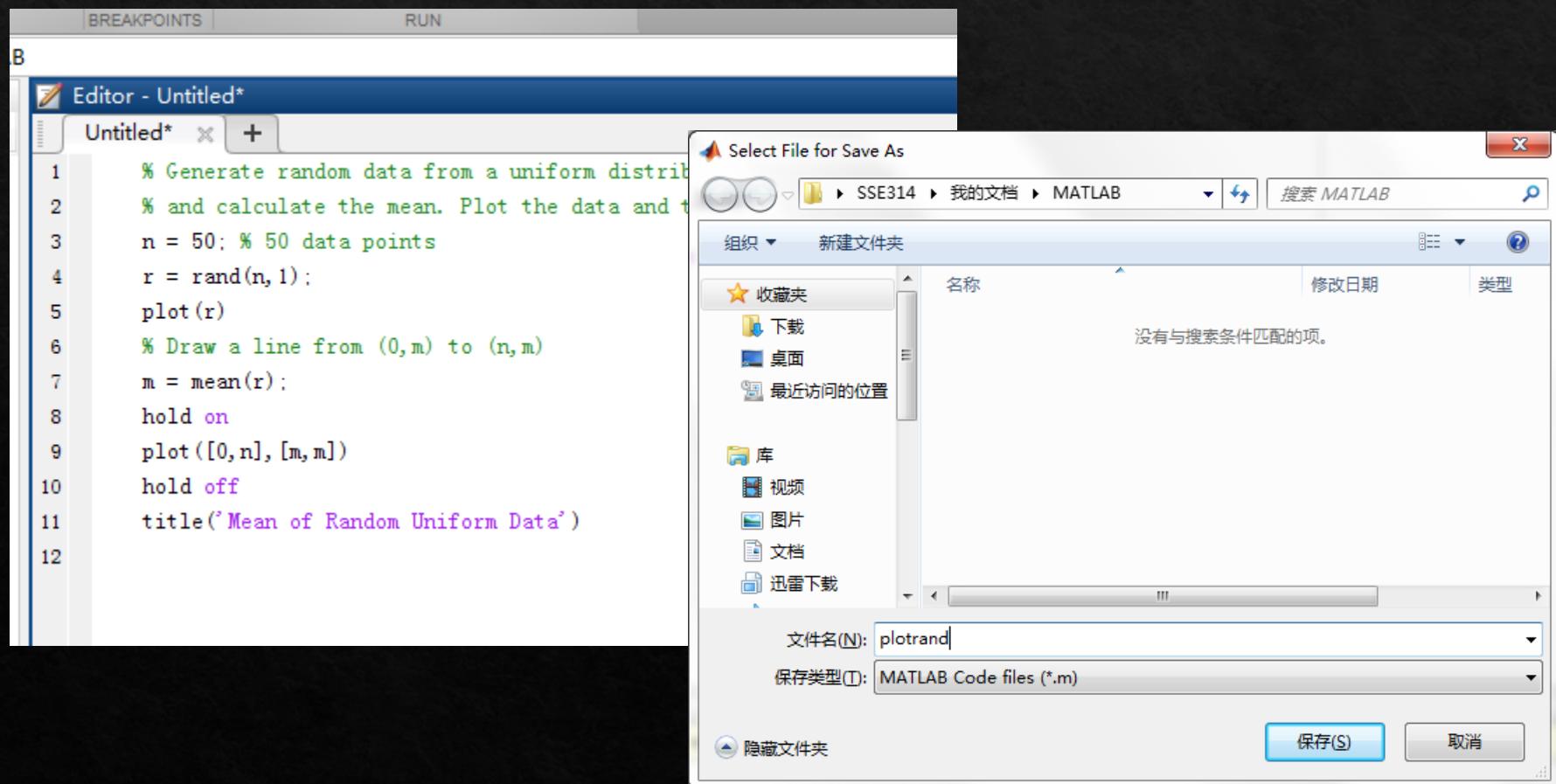


The screenshot shows a MATLAB IDE interface with a dark theme. At the top, there is a menu bar with 'BREAKPOINTS' and 'RUN' tabs. Below the menu is a toolbar with a 'B' icon. The main area is titled 'Editor - Untitled*' and contains a single tab labeled 'Untitled*'. The code in the editor is as follows:

```
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
```

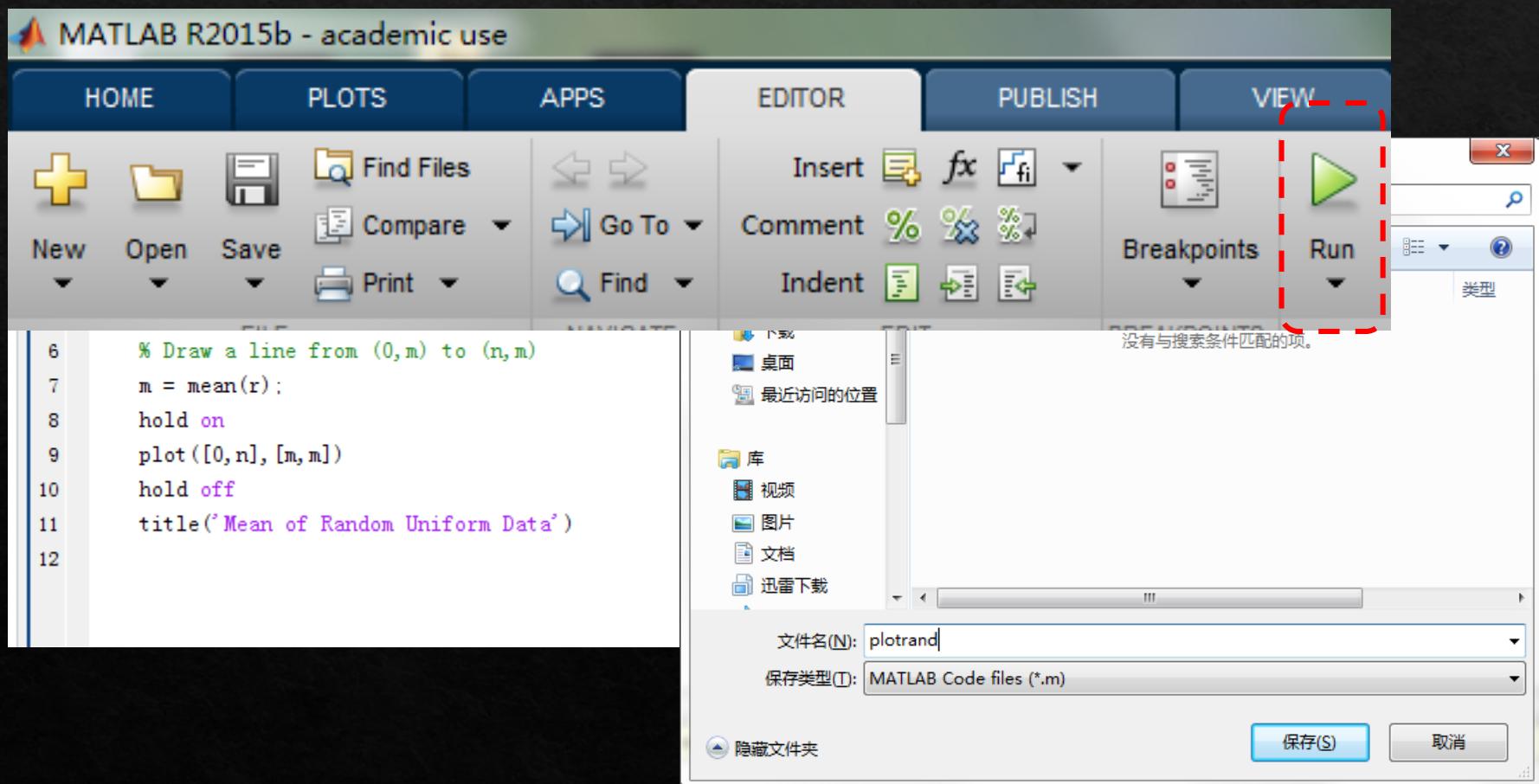
Programming and Scripts

- ❖ Save the script



Programming and Scripts

- ❖ Run the script



Program

- ❖ Run the script

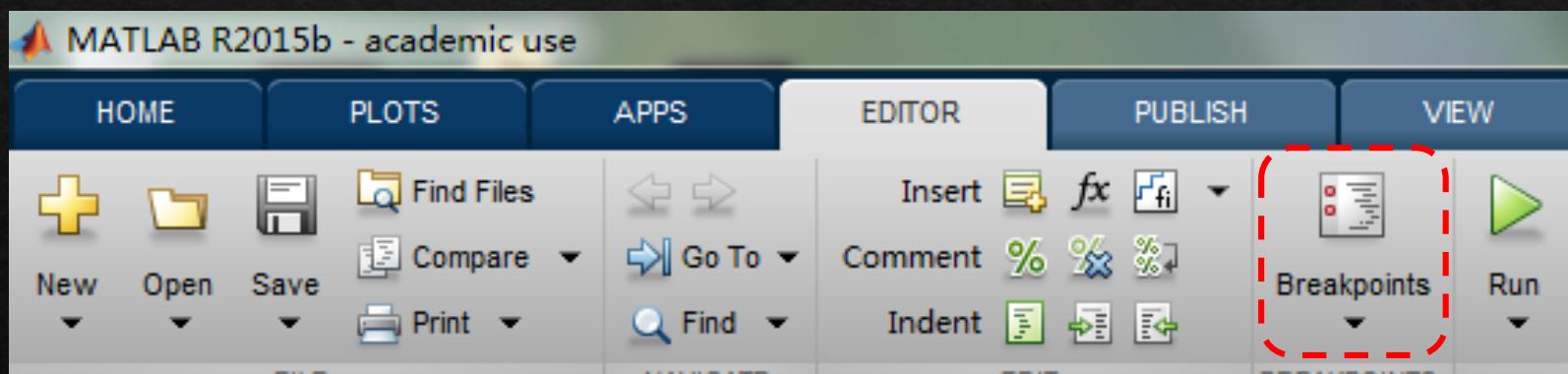
The screenshot shows the MATLAB environment with the following components:

- Editor - Untitled***: A code editor window containing the following MATLAB script:

```
1 % Generate random data from a uniform
2 % and calculate the mean. Plot the data
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')
```
- Figure 1**: A plot titled "Mean of Random Uniform Data". It shows a blue line plot of 50 random uniform data points. A horizontal red line represents the mean of the data, which is approximately 0.55.
- Command Window**: Displays the command `>> plotrand`.
- Save As**: A file dialog box is open, showing the file name as `plotrand` and the save type as `MATLAB Code files (*.m)`.

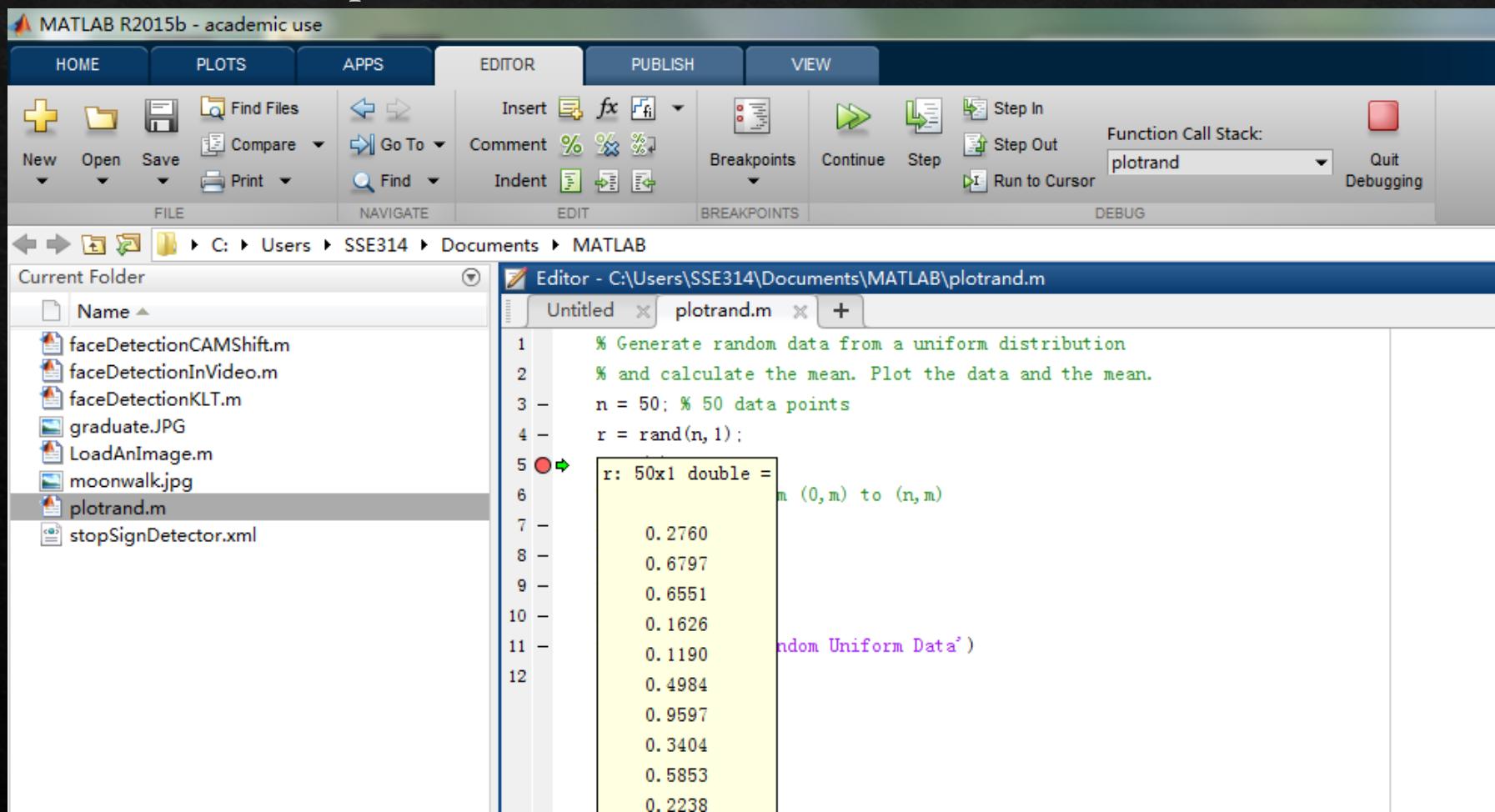
Programming and Scripts

- ❖ Set a breakpoint



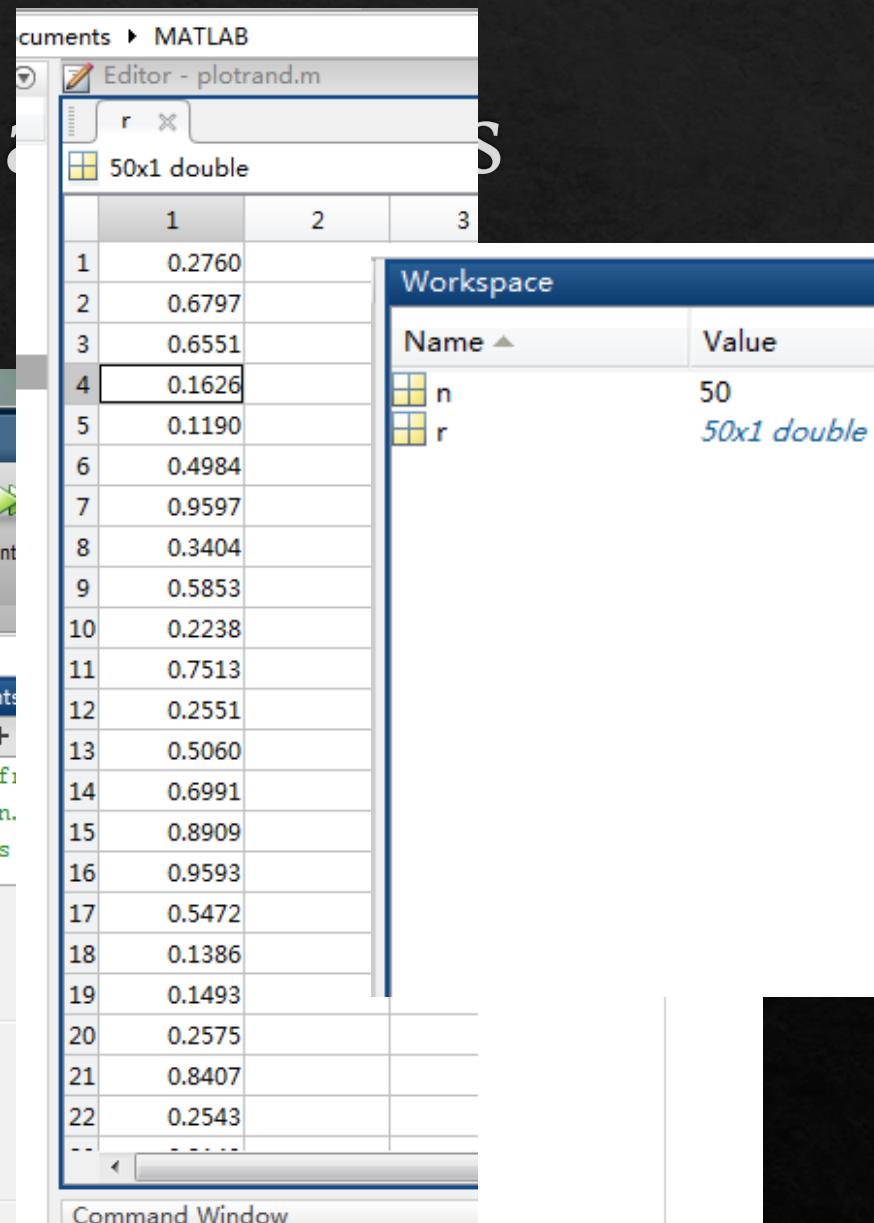
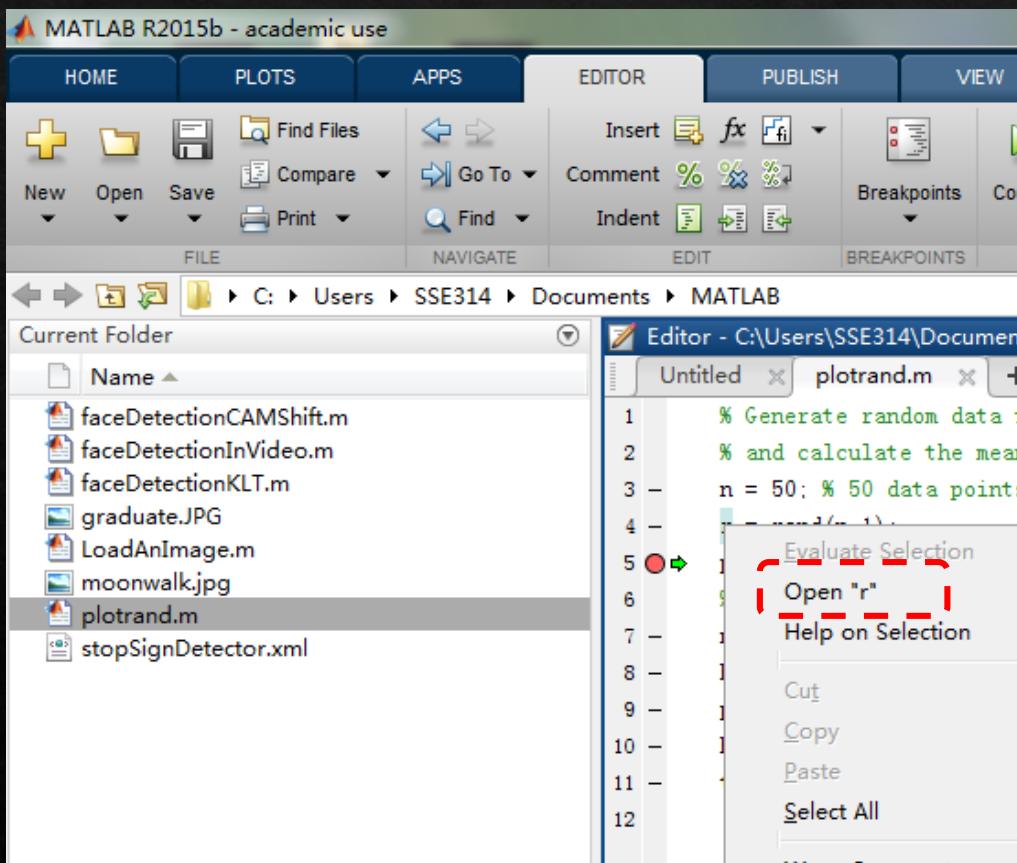
Programming and Scripts

❖ Set a breakpoint



Programming in MATLAB

◆ Set a breakpoint



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')`