Introduction to MATLAB

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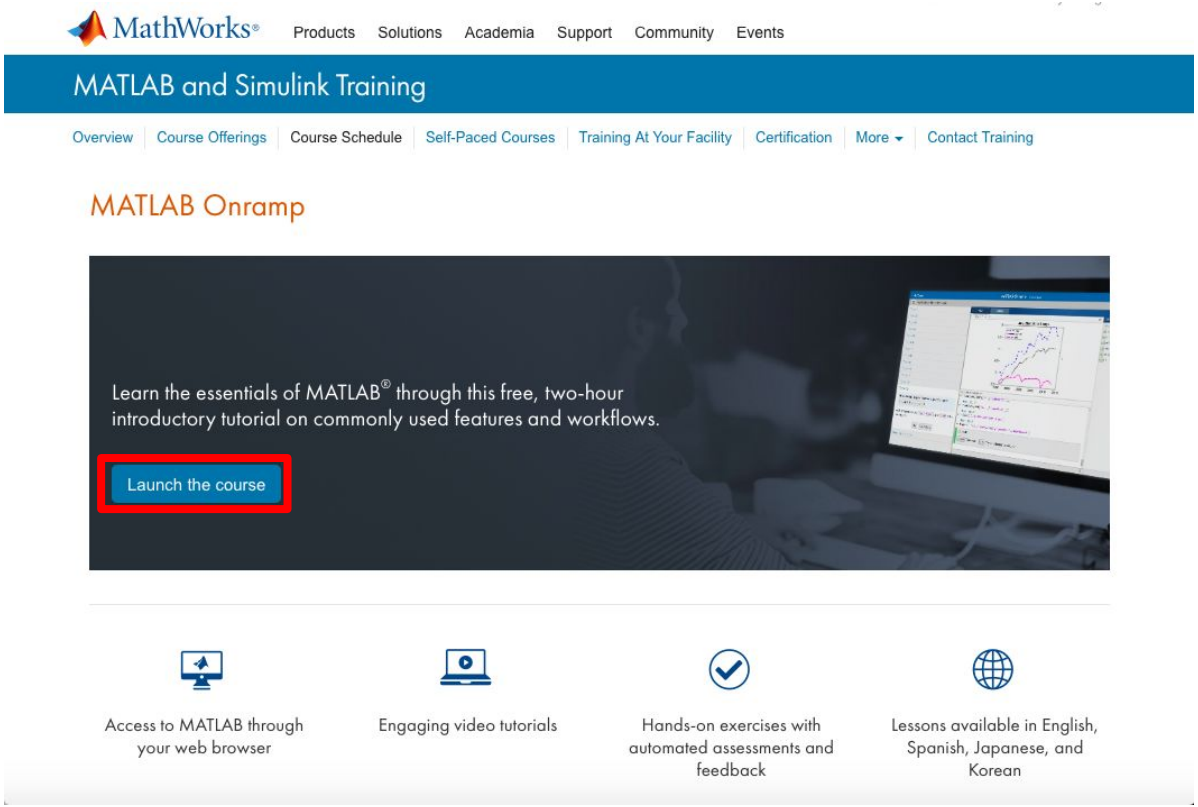
MATLAB Onramp



2. Commands

- Basic MATLAB operation.
- Pressing the “Enter”, the commands will be executed.
- Notice:

  Invalid: `>> 3a = 3`

  Valid: `>> a3 = 3`

-

  π: `>> pi`

  sin function: `>> sin(x)`

  cos function: `>> cos(x)`

3. Vectors and Matrices

- How to create the array.

- Example:

```
>> x = [1 2 3 4; 5 6 7 8]
x =
    1   2   3   4
    5   6   7   8
```

```
>> x = [1:4; 5:8]
x =
    1   2   3   4
    5   6   7   8
```

- linspace function:

```
>> linspace(0,2,5)
ans =
         0   0.500   1.000   1.500   2.000
```

- Transpose of the vector v:

```
>> transpose(v)      or      >> v'
```

- rand function:

```
>> rand(2)                  >> rand(2, 1)
ans =                    ans =
    0~1    0~1               0~1
    0~1    0~1               0~1
```

- zeros function:

```
>> zeros(2, 3)
ans =
    0   0   0
    0   0   0
```

4. Importing Data

- Save the array “v” to the file “data.mat”:

```
>> save data v
```

- Load the file “data.mat”:

```
>> load data
```

- 5 mins.

5. Indexing into and Modifying Arrays

- How to extract elements from any array.
- Example:

```
A =
     1     2     3
     4     5     6
```

```
>> A(2, 3) or
ans =
     6
```

```
>> A(end, end)
ans =
     6
```

- Example:

```
A =
     1     2     3     4
     5     6     7     8
     9    10    11    12
    13    14    15    16
```

```
>> A(1:3, 2:3)
ans =
     2     3
     6     7
    10    11
```

- If we want to extract whole row or column elements.
- Example:

```
A =
    1   2   3
    4   5   6

A' =
    1   4
    2   5
    3   6
```

```
>> A(1, :)
ans =
    1   2   3

    >> A'(:, end)
ans =
    4
    5
    6
```

- If you want to pick a single element in any vector.
- Example:

```
v1 =
    1   2   3   4

v2 =
    1
    2
    3
    4
```

```
>> v1(2)
ans =
    2

>> v2(3)
ans =
    3
```

6. Array calculation

- The sum of two vectors or arrays.
- Example:

```
v1 =                        >> v1 + v2
    1   2   3   4       ans =
v2 =                            6   8   10  12
    5   6   7   8
```

- Example:

```
>> 2*v1
ans =
    2   4   6   8
```

- If you want to get the maximum element in any array.
- Example:

```
A =                 >> max(A)
    1   4   6       ans =
    10  20  3           20
    11  3   5
```

- Rounding (四捨五入)
- Example:

```
A =                     >> round(A)
    1.236  3.571        ans =
    2.889  4.108            1   4
                            3   4
```

- Element-wise multiplication
- Example:

```
A =
    1     3
    5     7
    9    11
B =
   10    20
    5    10
   30    15
```

```
>> A .*B
ans =
   10    60
   25    70
  270   165
```

7. Calling Functions

- The size of the array.
- Example:

```
A =                     >> size(A)
    1   2   3           ans =
    4   5   6               2       3
```

- The maximum value and its index.
- Example:

```
B =                     >> [vMax, idx] = max(B)
    1   5   9           vMax =
    3   2   7               3       5       9
                        Idx =
                            2       1       1
```

8. Obtaining Help

- How to use the function “plot”.
- Example:

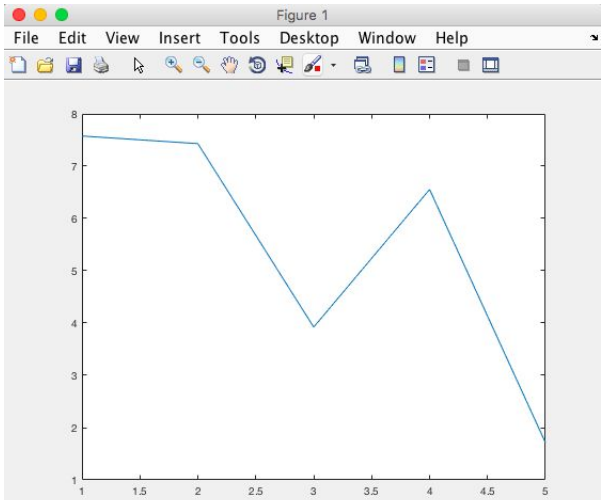
```
>> doc plot

>> help plot
```

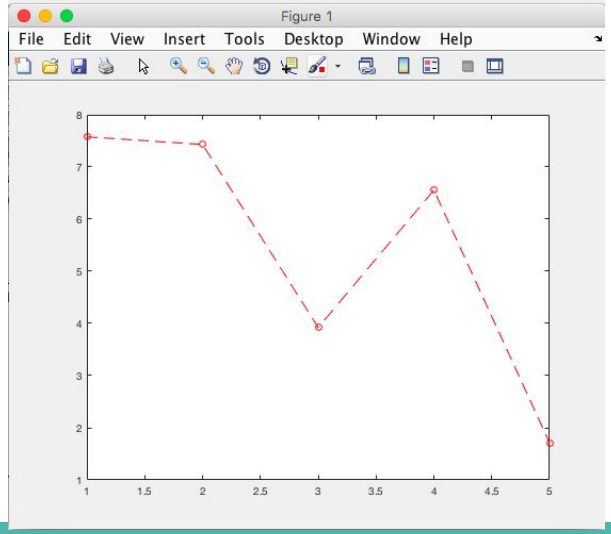
Google

9. Plotting Data

- How to plot the data?
- Example:

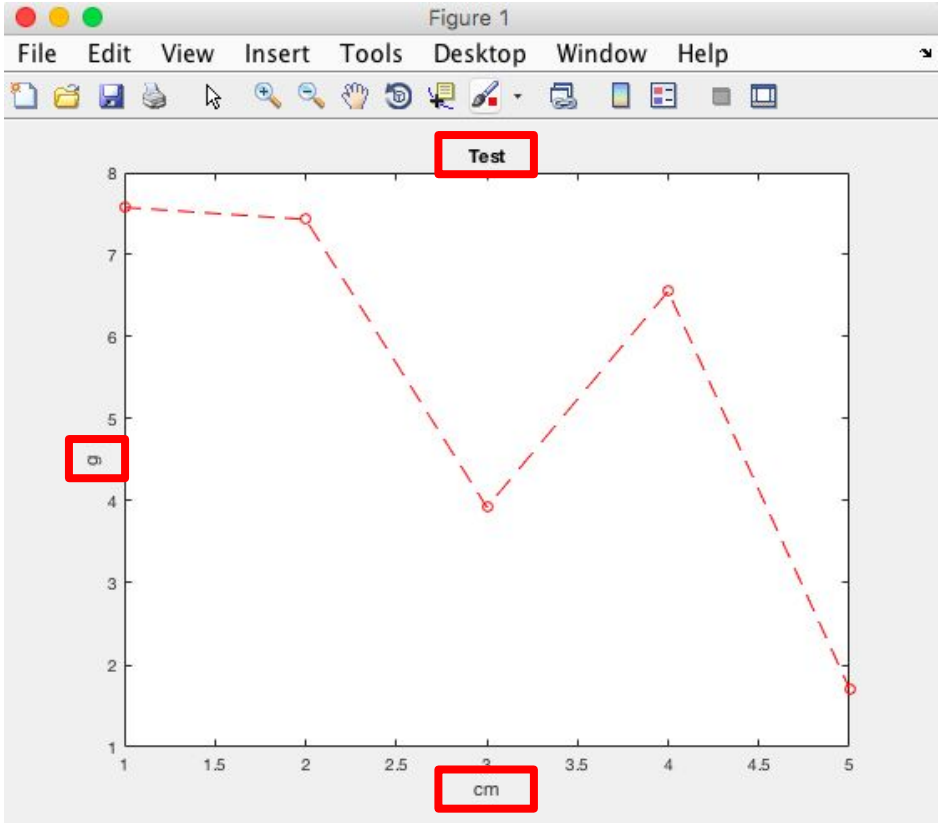
```
>> x = 1:5;
>> y = rand(1,5)*10;
>> plot(x,y)

>> plot(x,y,'r--o')
```





- Add some information in the figure.
- Example:

```
>> plot(x,y,'r--o');
>> title('Test');
>> xlabel('cm');
>> ylabel('g')
```



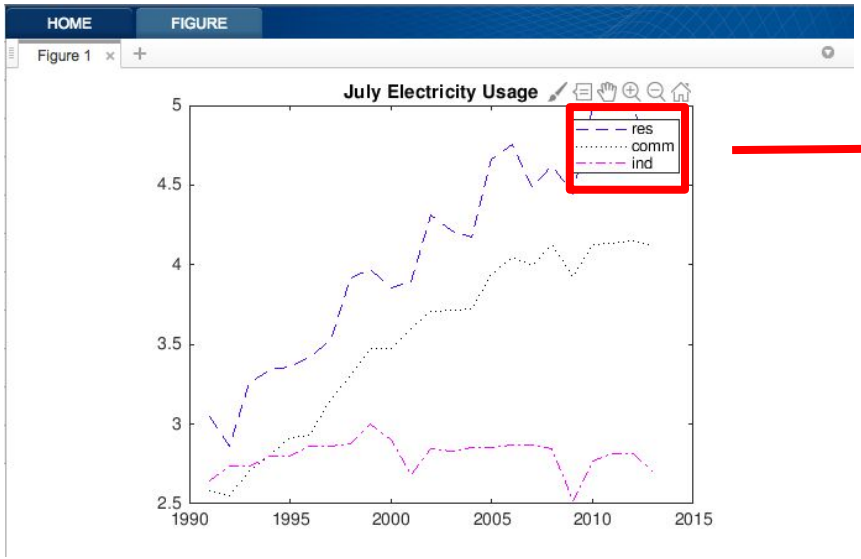
Test

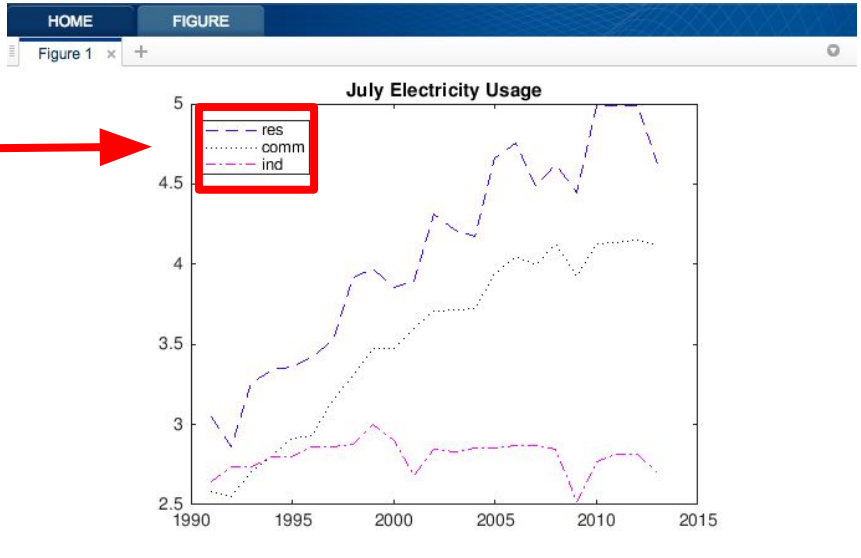
- 10 mins.

10. Review Problems

- Review 2. Commands ~ 9. Plotting Data
- Load `electricity.mat`
- Learn how to present the data or results.
- 10~15 mins.

- `legend('a','b','c')`


HOME
FIGURE
Figure 1
July Electricity Usage
res
comm
ind
5
4.5
4
3.5
3
2.5
1990
1995
2000
2005
2010
2015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11. MATLAB Scripts

- Use MATLAB Scripts to do some tasks.
- Can write some text and code.
- 5 mins.

12. Logical Arrays

- Boolean value: 1(True), 0(False).
- Example:

```
>> 5 > 3
ans =
    1
```

```
>> 1 == 3
ans =
    0
```

- Example:

```
v =
    1   2   3
>> v > 1
ans =
    0   1   1
```

- True & True = True
  False & True = False
  True & False = False
  False & False = False

  True | True = True
  False | True = True
  True | False = True
  False | False = False

- Example:

```
v =
    2   1   4   3
>> v(v > 2)
ans =
    4   3
```

- 15 mins.

13. Programming

- Decision Branching.
- Example:

```
>> if xxxxx
       xxxxxx;
   elseif xxxxx
       xxxxxx;
   else
       xxxxxx;
   end
```

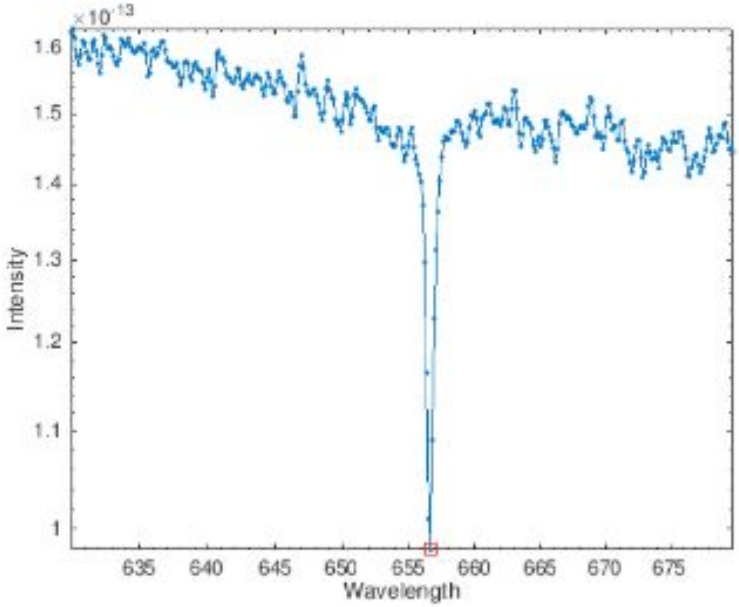
- 15 mins.

- For Loops.
  Example:

```
>> for i = 1:5
       xxxxx;
       xxxxx;
       xxxxx;
   end
```

14. Final Project

- Review 2.Commands~ 13. Programming and try to complete all tasks.
- 20 mins.




```
z = 5.1807e-04
```

```
speed = 155.3139
```

Get the Certification!

- If you still have some problems, you can ask TA.

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Question Or Comments?