

Matlab Tutorial

- Read Tutorial.
- Run "demo"
- Running Matlab
 - setting the path
 - by `cd`
 - by `path(path, 'dir_path');`
 - by `startup.m`
- Assistance
 - `help <instruction>`
 - `lookfor <word>`
- Matrix/vector definitions
 - `a=2;` or `a=2`
 - `b=[1 2 ; 3 4];`
 - `c=[b b];` or `c=[b ; b ; a a];`
 - `v=1:5;`
 - `v=1:2:10;`
 - `v=10:-2:1;`

- Matrix Operations
 - `c=b+b;` `c=b-b;`
 - `c=b*b;` `c=b.*b;`
 - `c=b*2;` `c=b.*2;`
 - `c=b./2;`
 - `c=b.^2;` `b^2;`
 - `c=b.^-1;` `c=b^-1;`
 - `c=b'` ;
- Assignments using functions
 - `a=zeros(2,2);` `a=ones(2,3);`
 - `a=ones(3,3);`
- Scalar functions (element by element)
 - `abs(b);`
 - `round(b);`
 - `sin(b);` `cos(b);` ...
 - `floor(b);` `ceil(b);`
- Vector functions (column by column)
 - `max(b);` `min(b);`
 - `sum(b);` `mean(b);`
- Matrix functions
 - `size(b);`

- Relations
 - `c=(b==2) ;`
 - `c=(b>2 & b<=4) ;`
 - `c=(b~=a);`
- Sub-Matrices
 - `a=[1:12];`
 - `b=reshape(a,3,4);`
 - `c=b(:);` `max(b(:));`
 - `b(2,1);`
 - `b(:,2);`
 - `b(2,:);`
 - `b(2:3,1:2:4);` `b([2 3],[1 3]);`
 - `c=(b>2 & b<4);` `sum(c(:))`
 - `c = find(b>2);` `b(find(b>2))=2;`
- Control Flow: If
 - `if expression`
 - statements
 - `elseif expression`
 - statements
 - `else statements`
 - `end`

- Control Flow: for/while
 - `for var=expression,`
 - statements
 - `end;`
- I/O:
 - `fprintf`
 - `disp`
 - `input`
- Graphics
 - `plot`
 - `bar`
 - `mesh`
- Images:
 - `image(mat)`
 - `imagesc(mat)`
 - `colormap(gray(256))`
 - `axis image`
- m-files: scripts and functions
 - Running script
 - Functions

Supplied functions:

- readImage.m** - reads a grayscale image from a file.
- writeImage.m** - writes a grayscale image into a file.
- showImage.m** - opens a window and displays a grayscale image in its true size.
- putImage.m** - opens a window and displays a grayscale image in a resizable mode.

Matlab Tips:

- **To run a selected code in m-file:**

Select → Tools → Run

- **Matrix to Vector :**

```
>> A = [1 2 3; 4 5 6];
>> A
A = 1 2 3
    4 5 6
>> b=A(:)
b = 1
    4
    2
    5
    3
    6
```

- **Vector to matrix:**

```
>> reshape(b,2,3)
ans = 1 2 3
      4 5 6
```

- **Count how many pixels with value 17 in image A:**

```
>> A
A = 10 17 55
    11 72 17
>> B=(A==17)
B = 0 1 0
    0 0 1
>> pixn=sum(B(:))
pixn = 2
```

- **Coordinates:**

```
>> [X,Y]=meshgrid(1:3,1:2)
X = 1 2 3
    1 2 3
Y = 1 1 1
    2 2 2
```

```
>> dist=sqrt(X.^2+Y.^2)
dist =
1.4142 2.2361 3.1623
2.2361 2.8284 3.6056
```

- **Indirect Indices:**

```
>> A = [1 2 3 4 5 ; 6 7 8 9 10; 11 12 13 14 15]
A = 1 2 3 4 5
    6 7 8 9 10
    11 12 13 14 15
>> Yup=[1 1 2]; Xleft=[1:5];
>> A(Yup,Xleft)
ans =
1 2 3 4 5
1 2 3 4 5
6 7 8 9 10
>> B=[ 1 2 3; 4 5 6];
>> A(B)
ans =
1 6 11
2 7 12
```