

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
```