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# Pemrograman Komputer

## Matriks

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## Matriks

- Terdapat tiga jenis format data di MATLAB, yaitu skalar, vektor, dan matriks.
  - **Skalar**, ialah suatu bilangan tunggal
  - **Vektor**, ialah sekelompok bilangan yang tersusun 1-dimensi.
  - **Matriks**, sekelompok bilangan yang tersusun dalam segi-empat 2-dimensi.

## Introduction of Matrix

- $s = [1\ 3\ 5\ 2];$
- $s = [1, 3, 5, 2];$
- $s = [1\ 2\ 3\ 4; 5\ 6\ 7\ 8; 9\ 10\ 11\ 12]$

1	2	3	4
5	6	7	8
9	10	11	12

## Introduction of Matrix

- $s = [1\ 3\ 5\ 2];$
- $t = 2*s+1$

Command Window

```
>> s = [1 3 5 2];
```

```
t = 2*s+1
```

```
t =
```

```
3     7    11     5
```

## Introduction of Matrix

■  $s = [1\ 2\ 3\ 4 ; 5\ 6\ 7\ 8 ; 9\ 10\ 11\ 12]$

```
Command Window
>> s = [1 2 3 4 ; 5 6 7 8 ; 9 10 11 12]

s =

     1     2     3     4
     5     6     7     8
     9    10    11    12
```

S(1,1)	S(1,2)	S(1,3)	S(1,4) or S(1,end)
S(2,1)	S(2,2)	S(2,3)	S(2,4) or S(2,end)
S(3,1) or S(end,1)	S(3,2) or S(end,2)	S(3,3) or S(end,3)	S(3,4) or S(end,end)

## Introduction of Matrix

```
Command Window
>> s = [1 2 3 4 ; 5 6 7 8 ; 9 10 11 12]

s =

     1     2     3     4
     5     6     7     8
     9    10    11    12
```

```
>> s(1,2)
```

```
ans =
```

```
2
```

```
>> s(3,4)
```

```
ans =
```

```
12
```

```
>> s(2,3)
```

```
ans =
```

```
7
```

## Introduction of Matrix

- $A=[1\ 2\ 3\ 4]$
- $B=[5\ 6\ 7\ 8]$
- $C=B'$

```
Command Window
>> A=[1 2 3 4]

A =

     1     2     3     4

>> B=[5 6 7 8]

B =

     5     6     7     8

>> C=B'

C =

     5
     6
     7
     8
```

## Introduction of Matrix

- $A*B$ .....error

```
Command Window
>> A*B
??? Error using ==> mtimes
Inner matrix dimensions must agree.
```

- $A.*B$

```
Command Window
>> A.*B

ans =

     5    12    21    32
```

## Introduction of Matrix

### ■ $A * C$

$$\begin{bmatrix} 1 & 2 & 3 & 4 \end{bmatrix} * \begin{bmatrix} 5 \\ 6 \\ 7 \\ 8 \end{bmatrix}$$

### ■ $C * A$

$$\begin{bmatrix} 5 \\ 6 \\ 7 \\ 8 \end{bmatrix} * \begin{bmatrix} 1 & 2 & 3 & 4 \end{bmatrix}$$

Command Window

```
>> A*C
```

```
ans =
```

```
70
```

```
>> C*A
```

```
ans =
```

```
5  10  15  20
6  12  18  24
7  14  21  28
8  16  24  32
```

## Matriks Khusus

- **ones(n)** membuat matriks satuan (semua elemennya berisi angka 1) berukuran  $n \times n$ .
- **ones(m,n)** membuat matriks satuan berukuran  $m \times n$ .
- **zeros(n)** membuat matriks nol (semua elemennya berisi angka 0) berukuran  $n \times n$ .
- **zeros(m,n)** membuat matriks nol berukuran  $m \times n$ .
- **eye(n)** membuat matriks identitas berukuran  $n \times n$  (semua elemen diagonal bernilai 1, sementara lainnya bernilai 0)

## Matriks Khusus

- **rand(n), rand(m,n)** membuat matriks  $n \times n$ , atau  $m \times n$ , berisi bilangan random terdistribusi uniform pada selang 0 s.d. 1.
- **randn(n), randn(m,n)** membuat matriks  $n \times n$ , atau  $m \times n$ , berisi bilangan random terdistribusi normal dengan mean = 0 dan varians = 1. *Command ini kerap kita gunakan untuk membangkitkan derau putih gaussian.*
- **[]** matriks kosong, atau dengan kata lain matriks  $0 \times 0$ ; biasa digunakan untuk mendefinisikan variabel yang belum diketahui ukurannya.

## Introduction of Matrix

- **A=[1 2 3 4;5 6 7 8;9 10 11 12]**
- **B=[A;13 14 15 16]**
- **C=A(:,2)**  
 ":" means All

```
Command Window
>> A=[1 2 3 4;5 6 7 8;9 10 11 12]

A =

     1     2     3     4
     5     6     7     8
     9    10    11    12

>> B=[A;13 14 15 16]

B =

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

>> C=A(:,2)

C =

     2
     6
    10
```

## Introduction of Matrix

- $D=A([1\ 3],:)$   
Select the row 1 & 3
- $E=A(:,[2\ 4])$   
Select the column 2 & 4

```
Command Window
>> A=[1 2 3 4;5 6 7 8;9 10 11 12]

A =

     1     2     3     4
     5     6     7     8
     9    10    11    12

>> D=A([1 3],:)

D =

     1     2     3     4
     9    10    11    12

>> E=A(:,[2 4])

E =

     2     4
     6     8
    10    12
```

## Introduction of Matrix

- “[]” means  $\emptyset$
- $A(:,3)=[]$

```
Command Window
>> A

A =

     1     2     3     4
     5     6     7     8
     9    10    11    12

>> A(:,3)=[]

A =

     1     2     4
     5     6     8
     9    10    12
```

## Introduction of Matrix

- `A=magic(5)`
- `B=A(:,1:3)`
- `C=A(2:4,[1 4 5])`

```
>> B=A(:,1:3)
```

```
B =
```

```
    17    24     1
    23     5     7
     4     6    13
    10    12    19
    11    18    25
```

```
Command Window
```

```
>> A=magic(5)
```

```
A =
```

```
    17    24     1     8    15
    23     5     7    14    16
     4     6    13    20    22
    10    12    19    21     3
    11    18    25     2     9
```

```
>> C=A(2:4,[1 4 5])
```

```
C =
```

```
    23    14    16
     4    20    22
    10    21     3
```

## Introduction of Matrix

- `a=zeros(4,4,3)`
- `a(:,:,1)=1`
- `a(:,:,2)=5`
- `a(:,:,3)=7`

```
Command Window
```

```
>> a=zeros(4,4,3)
```

```
a(:,:,1) =
```

```
    0    0    0    0
    0    0    0    0
    0    0    0    0
    0    0    0    0
```

```
a(:,:,2) =
```

```
    0    0    0    0
    0    0    0    0
    0    0    0    0
    0    0    0    0
```

```
a(:,:,3) =
```

```
    0    0    0    0
    0    0    0    0
    0    0    0    0
    0    0    0    0
```

```
a(:,:,1) =
```

```
    1     1     1     1
    1     1     1     1
    1     1     1     1
    1     1     1     1
```

```
a(:,:,2) =
```

```
    5     5     5     5
    5     5     5     5
    5     5     5     5
    5     5     5     5
```

```
a(:,:,3) =
```

```
    7     7     7     7
    7     7     7     7
    7     7     7     7
    7     7     7     7
```