

Introducció al Matlab

Operacions amb vectors

```
% Creació de vectors  
x = [1 2 3 4 5] % vector fila
```

```
x = 1×5  
    1     2     3     4     5
```

```
y = [5; 6; 7; 8; 9] % vector columna
```

```
y = 5×1  
     5  
     6  
     7  
     8  
     9
```

```
x = x' % trasposada
```

```
x = 5×1  
     1  
     2  
     3  
     4  
     5
```

```
z = 1:1:10 % progressió inici:pas:fi
```

```
z = 1×10  
     1     2     3     4     5     6     7     8     9    10
```

```
x(1) %primer element de l'array !Els vectors, matrius, etc. comencen amb índex 1
```

```
ans = 1
```

```
q = zeros([1 5]) %omplir vectors amb zeros
```

```
q = 1×5  
     0     0     0     0     0
```

```
k = ones([5 1]) %omplir vectors amb uns
```

```
k = 5×1  
     1  
     1  
     1  
     1  
     1
```

```
x = x'
```

```
x = 1×5  
     1     2     3     4     5
```

```
x*y % producte escalar
```

```
ans = 115
```

```
norm(x) % longitud del vector (mòdul del vector)
```

```
ans = 7.4162
```

```
sqrt(x*x') % mòdul del vector (mètode 2)
```

```
ans = 7.4162
```

```
q = rand([1 1000000]); % creació columna de un milió de valors aleatoris entre 0 i 1  
tic %inici cronòmetre  
q*q' % mòdul vector
```

```
ans = 3.3347e+05
```

```
toc % fi cronòmetre
```

```
Elapsed time is 0.003409 seconds.
```

Operacions amb matrius

```
X = rand([10 10]) %generar matriu 10x10 amb valors aleatòris entre 0 i 1
```

```
X = 10x10  
    0.5225    0.7050    0.7573    0.0444    0.8796    0.0832    0.9706    0.8879 ...  
    0.9798    0.1704    0.2909    0.0429    0.3654    0.1056    0.6497    0.4292  
    0.1265    0.9831    0.6644    0.3009    0.3317    0.0078    0.2011    0.8968  
    0.4956    0.0877    0.7921    0.1860    0.4749    0.5098    0.0153    0.3499  
    0.3198    0.5964    0.6100    0.1056    0.0804    0.3397    0.0808    0.1900  
    0.0777    0.6758    0.6983    0.9616    0.8942    0.2328    0.3758    0.8412  
    0.2149    0.1511    0.5916    0.6808    0.3805    0.2559    0.3372    0.9680  
    0.8099    0.6374    0.2069    0.2595    0.5242    0.6971    0.1301    0.5056  
    0.2319    0.6190    0.1755    0.2289    0.7591    0.1790    0.3989    0.5474  
    0.8598    0.2733    0.8702    0.2932    0.8579    0.9757    0.0863    0.0366
```

```
X(2, 3) % valor de fila 2 columna 3 !Al revés que a mates
```

```
ans = 0.2909
```

```
s = size(X) % mida de matriu - vector on et diu la mida de cada dimensió
```

```
s = 1x2  
    10    10
```

```
files = s(1) % número de files
```

```
files = 10
```

```
columnes = s(2) % número de columnes
```

```
columnes = 10
```

```
ndims(X) % dimensió de la matriu
```

```
ans = 2
```

```
Z = [X X] % Concatenació de matrius, en aquest cas 10 x 20
```

```
Z = 10x20
0.5225    0.7050    0.7573    0.0444    0.8796    0.0832    0.9706    0.8879 ...
0.9798    0.1704    0.2909    0.0429    0.3654    0.1056    0.6497    0.4292
0.1265    0.9831    0.6644    0.3009    0.3317    0.0078    0.2011    0.8968
0.4956    0.0877    0.7921    0.1860    0.4749    0.5098    0.0153    0.3499
0.3198    0.5964    0.6100    0.1056    0.0804    0.3397    0.0808    0.1900
0.0777    0.6758    0.6983    0.9616    0.8942    0.2328    0.3758    0.8412
0.2149    0.1511    0.5916    0.6808    0.3805    0.2559    0.3372    0.9680
0.8099    0.6374    0.2069    0.2595    0.5242    0.6971    0.1301    0.5056
0.2319    0.6190    0.1755    0.2289    0.7591    0.1790    0.3989    0.5474
0.8598    0.2733    0.8702    0.2932    0.8579    0.9757    0.0863    0.0366
```

```
Z = [X; X] % Concatenació en columna
```

```
Z = 20x10
0.5225    0.7050    0.7573    0.0444    0.8796    0.0832    0.9706    0.8879 ...
0.9798    0.1704    0.2909    0.0429    0.3654    0.1056    0.6497    0.4292
0.1265    0.9831    0.6644    0.3009    0.3317    0.0078    0.2011    0.8968
0.4956    0.0877    0.7921    0.1860    0.4749    0.5098    0.0153    0.3499
0.3198    0.5964    0.6100    0.1056    0.0804    0.3397    0.0808    0.1900
0.0777    0.6758    0.6983    0.9616    0.8942    0.2328    0.3758    0.8412
0.2149    0.1511    0.5916    0.6808    0.3805    0.2559    0.3372    0.9680
0.8099    0.6374    0.2069    0.2595    0.5242    0.6971    0.1301    0.5056
0.2319    0.6190    0.1755    0.2289    0.7591    0.1790    0.3989    0.5474
0.8598    0.2733    0.8702    0.2932    0.8579    0.9757    0.0863    0.0366
⋮
```

```
Z = [X X; X X] % Concatenació en quadrat, 20x20
```

```
Z = 20x20
0.5225    0.7050    0.7573    0.0444    0.8796    0.0832    0.9706    0.8879 ...
0.9798    0.1704    0.2909    0.0429    0.3654    0.1056    0.6497    0.4292
0.1265    0.9831    0.6644    0.3009    0.3317    0.0078    0.2011    0.8968
0.4956    0.0877    0.7921    0.1860    0.4749    0.5098    0.0153    0.3499
0.3198    0.5964    0.6100    0.1056    0.0804    0.3397    0.0808    0.1900
0.0777    0.6758    0.6983    0.9616    0.8942    0.2328    0.3758    0.8412
0.2149    0.1511    0.5916    0.6808    0.3805    0.2559    0.3372    0.9680
0.8099    0.6374    0.2069    0.2595    0.5242    0.6971    0.1301    0.5056
0.2319    0.6190    0.1755    0.2289    0.7591    0.1790    0.3989    0.5474
0.8598    0.2733    0.8702    0.2932    0.8579    0.9757    0.0863    0.0366
⋮
```

```
Z(1, 1) = 0 % Assignació d'un valor de la matriu
```

```
Z = 20x20
0    0.7050    0.7573    0.0444    0.8796    0.0832    0.9706    0.8879 ...
0.9798    0.1704    0.2909    0.0429    0.3654    0.1056    0.6497    0.4292
0.1265    0.9831    0.6644    0.3009    0.3317    0.0078    0.2011    0.8968
0.4956    0.0877    0.7921    0.1860    0.4749    0.5098    0.0153    0.3499
0.3198    0.5964    0.6100    0.1056    0.0804    0.3397    0.0808    0.1900
0.0777    0.6758    0.6983    0.9616    0.8942    0.2328    0.3758    0.8412
0.2149    0.1511    0.5916    0.6808    0.3805    0.2559    0.3372    0.9680
0.8099    0.6374    0.2069    0.2595    0.5242    0.6971    0.1301    0.5056
0.2319    0.6190    0.1755    0.2289    0.7591    0.1790    0.3989    0.5474
0.8598    0.2733    0.8702    0.2932    0.8579    0.9757    0.0863    0.0366
⋮
```

```
v = Z(:) % Transformar matriu a vector
```

```
v = 400x1
0
0.9798
0.1265
0.4956
0.3198
0.0777
0.2149
0.8099
0.2319
0.8598
⋮
```

$Z(Z < 0.5) = 0$ % tots els valors menors a 0.5 posar-los a 0

```
Z = 20x20
0      0.7050    0.7573      0      0.8796      0      0.9706    0.8879 ...
0.9798      0      0      0      0      0      0.6497      0
0      0.9831    0.6644      0      0      0      0      0.8968
0      0      0.7921      0      0      0.5098      0      0
0      0.5964    0.6100      0      0      0      0      0
0      0.6758    0.6983    0.9616    0.8942      0      0      0.8412
0      0      0.5916    0.6808      0      0      0      0.9680
0.8099    0.6374      0      0      0.5242    0.6971      0      0.5056
0      0.6190      0      0      0.7591      0      0      0.5474
0.8598      0      0.8702      0      0.8579    0.9757      0      0
⋮
```

$Z(Z \neq 0) = 1$ % tots els valors diferents a 0, posar-los a 1

```
Z = 20x20
0      1      1      0      1      0      1      1      1      0      1      1      1 ...
1      0      0      0      0      0      1      0      1      0      1      0      0
0      1      1      0      0      0      0      1      1      0      0      0      1
0      0      1      0      0      1      0      0      1      0      0      0      1
0      1      1      0      0      0      0      0      1      0      0      1      1
0      1      1      1      1      0      0      1      1      1      0      1      1
0      0      1      1      0      0      0      1      0      1      0      0      1
1      1      0      0      1      1      0      1      0      0      1      1      0
0      1      0      0      1      0      0      1      0      1      0      1      0
1      0      1      0      1      1      0      0      1      1      1      0      1
⋮
```

%eliminar files/columnes

$Z(1, :) = []$ % eliminar primera fila - primera fila, tots els elements de la columna

```
Z = 19x20
1      0      0      0      0      0      1      0      1      0      1      0      0 ...
0      1      1      0      0      0      0      1      1      0      0      1      1
0      0      1      0      0      1      0      0      1      0      0      0      1
0      1      1      0      0      0      0      0      1      0      0      1      1
0      1      1      1      1      0      0      1      1      1      0      1      1
0      0      1      1      0      0      0      1      0      1      0      0      1
1      1      0      0      1      1      0      1      0      0      1      1      0
0      1      0      0      1      0      0      1      0      1      0      1      0
1      0      1      0      1      1      0      0      1      1      1      0      1
1      1      1      0      1      0      1      1      1      0      1      1      1
⋮
```

```
Z(:, 1) = [] % eliminar primera columna
```

```
Z = 19x19
    0     0     0     0     0     1     0     1     0     1     0     0     0 ...
    1     1     0     0     0     0     1     1     0     0     1     1     0
    0     1     0     0     1     0     0     1     0     0     0     1     0
    1     1     0     0     0     0     0     1     0     0     1     1     0
    1     1     1     1     0     0     1     1     1     0     1     1     1
    0     1     1     0     0     0     1     0     1     0     0     1     1
    1     0     0     1     1     0     1     0     0     1     1     0     0
    1     0     0     1     0     0     1     0     1     0     1     0     0
    0     1     0     1     1     0     0     1     1     1     0     1     0
    1     1     0     1     0     1     1     1     0     1     1     1     0
    ⋮
```

```
B = Z(10:end, 11:end) %Agafem la submatriu de la fila 10 al final, i de la columna 11 al final
```

```
B = 10x9
    1     1     0     1     0     1     1     1     0
    0     0     0     0     0     1     0     1     0
    1     1     0     0     0     0     1     1     0
    0     1     0     0     1     0     0     1     0
    1     1     0     0     0     0     0     1     0
    1     1     1     1     0     0     1     1     1
    0     1     1     0     0     0     1     0     1
    1     0     0     1     1     0     1     0     0
    1     0     0     1     0     0     1     0     1
    0     1     0     1     1     0     0     1     1
```

Plots

```
x = 1:1:100
```

```
x = 1x100
    1     2     3     4     5     6     7     8     9    10    11    12    13 ...
```

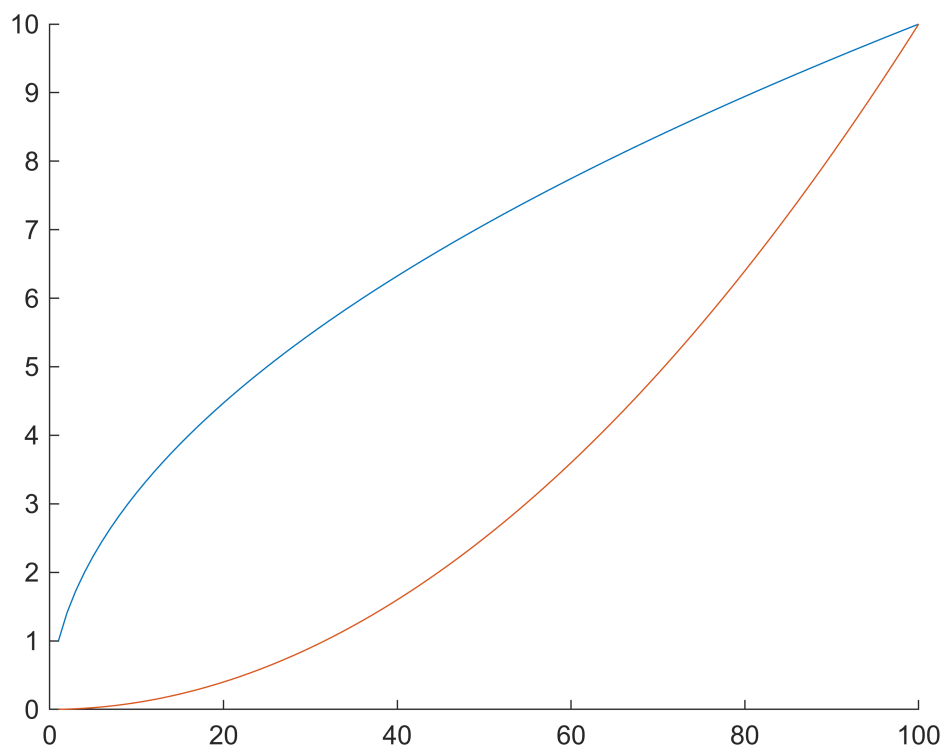
```
y = sqrt(x) % arrel quadrada component a component
```

```
y = 1x100
    1.0000    1.4142    1.7321    2.0000    2.2361    2.4495    2.6458    2.8284 ...
```

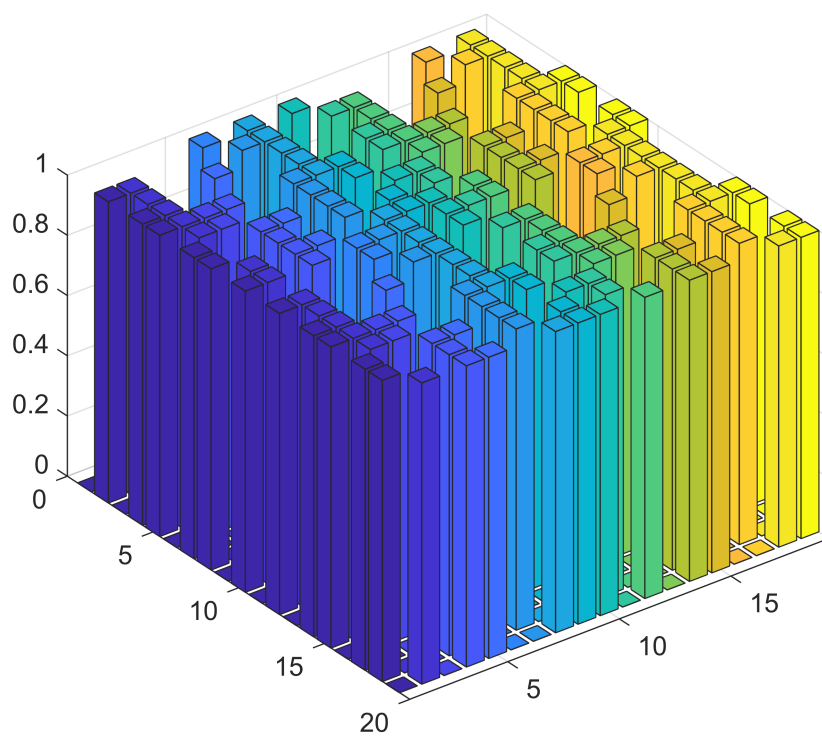
```
hold on % tots els gràfics es mostraran overlaped
plot(x, y) % mostrar gràfic
z = x.*x/1000 % multiplicació component a component
```

```
z = 1x100
    0.0010    0.0040    0.0090    0.0160    0.0250    0.0360    0.0490    0.0640 ...
```

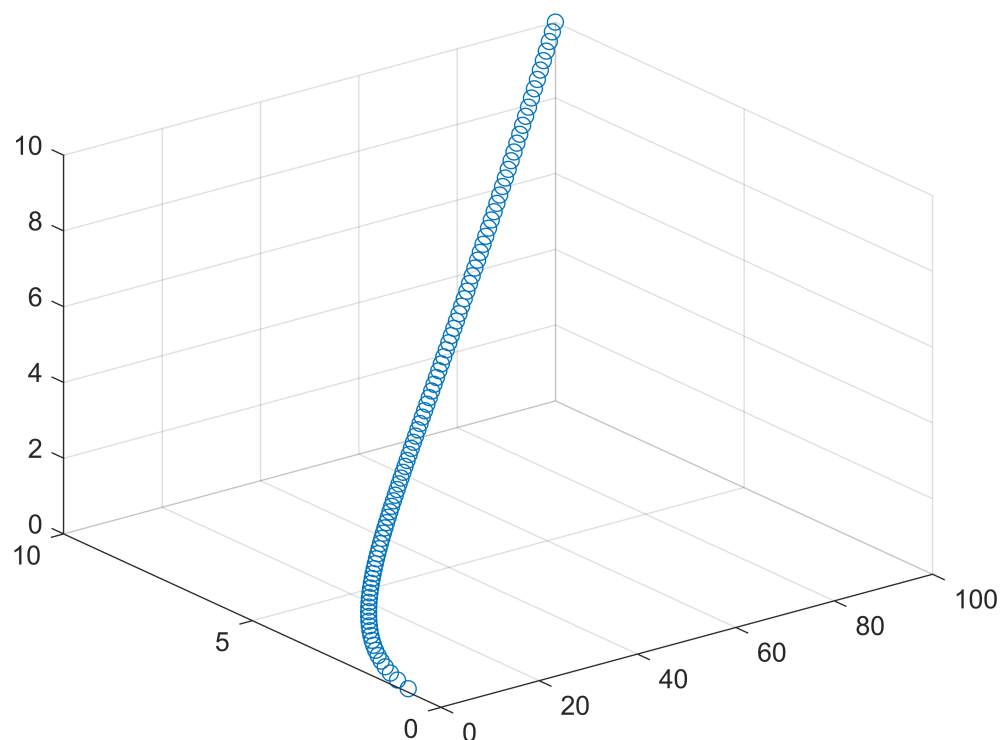
```
plot (x, z)
hold off % ja no es mostraran les gràfiques overlapped
```



bar3(Z) % diagrama de barras en 3D



```
scatter3(x, y, z, 'o') % scatterplot en 3D on cada punt es representa amb 'o'
```



Funcions bàsiques

```
m = max(Z) % retorna el valor màxim de cada columna
```

```
m = 1×19  
    1     1     1     1     1     1     1     1     1     1     1     1     1 ...
```

```
m = max(max(Z)) % retorna el valor màxim de la matriu
```

```
m = 1
```

```
m = min(min(Z)) % retorna el valor mínim
```

```
m = 0
```

```
s = sum(Z) % suma totes les columnes
```

```
s = 1×19  
    11    13     4     9     6     3    11    13     8     7    11    13     4 ...
```

```
s = sum(sum(Z)) % suma tots els valors
```

```
s = 163
```

Funcions pròpies

```
c = myFunction(x)
```

```
c = 100x100
```

1	2	3	4	5	6	7	8	9	10	11	12	13	...
2	4	6	8	10	12	14	16	18	20	22	24	26	
3	6	9	12	15	18	21	24	27	30	33	36	39	
4	8	12	16	20	24	28	32	36	40	44	48	52	
5	10	15	20	25	30	35	40	45	50	55	60	65	
6	12	18	24	30	36	42	48	54	60	66	72	78	
7	14	21	28	35	42	49	56	63	70	77	84	91	
8	16	24	32	40	48	56	64	72	80	88	96	104	
9	18	27	36	45	54	63	72	81	90	99	108	117	
10	20	30	40	50	60	70	80	90	100	110	120	130	
:													
:													