

ESCUELA POLITECNICA NACIONAL

```
%load_ext autoreload
```

Materia: Métodos Numéricos

Nombre: Stiv Quishpe

link repositorio

https://github.com/stiv001/CorreccionB2/blob/b91c06cac097be9b7262307622c8317a59019ac3/Correccion/MN24B-prueba02/Ejercicio-minimos_cuadrados.ipynb

Ejercicio Determinante

```
%load_ext autoreload
%autoreload 2
from src import (
    eliminacion_gaussiana,
    descomposicion_LU,
    resolver_LU,
    matriz_aumentada,
    separar_m_aumentada,
)

# #####
def calc_determinante(A: list[list[float]]) -> float:
    """Función que calcula el determinante usando el método
    [Descomposición LU, eliminación gaussiana, Gauss-Jordan, Gauss-Jacobi o Gauss-Seidel]
```

```

## Parameters
``A``: Matriz cuadrada de tamaño n x n

## Return
``detA``: Determinante de la matriz A

"""
# completar
from src import descomposicion_LU

det = 1
L, U = descomposicion_LU(A)

for i in range(0, len(U)):
    det *= U[i][i]

return det

```

Ejercicio 1

```

A1 = [
    [-4, 2, -4, -4, 1, 2, 5, 3, 5, 1],
    [1, 0, 4, 3, 0, -2, 3, 0, 1, 5],
    [5, 5, -4, 5, -4, 2, 2, 2, 4, 4],
    [-1, 3, 4, -1, -4, 0, 5, 0, 0, 5],
    [4, 1, 4, 2, 0, 0, 3, -1, 0, 2],
    [2, -2, 1, -1, -2, -3, 2, -2, 4, -1],
    [3, -2, -3, -2, -1, -3, 5, -1, 5, 0],
    [3, 4, -3, 3, -2, 2, -4, -4, 1, 5],
    [-4, 0, 3, 3, -3, -2, -2, 0, 5, -4],
    [-2, 4, 4, -2, -1, 1, 5, -1, 3, -3],
]
print(
    calc_determinante(A1))

```

[01-11 12:06:22] [INFO]

```

[[-4.    2.   -4.   -4.    1.    2.    5.    3.    5.    1.  ]
 [ 0.    0.5   3.    2.    0.25 -1.5   4.25  0.75  2.25  5.25]
 [ 0.    7.5  -9.    0.   -2.75  4.5   8.25  5.75 10.25  5.25]
 [ 0.    2.5   5.    0.   -4.25 -0.5   3.75 -0.75 -1.25  4.75]
 [ 0.    3.    0.   -2.    1.    2.    8.    2.    5.    3.  ]
 [ 0.   -1.   -1.   -3.   -1.5  -2.    4.5  -0.5   6.5  -0.5 ]
 [ 0.   -0.5  -6.   -5.   -0.25 -1.5   8.75  1.25  8.75  0.75]
 [ 0.    5.5  -6.    0.   -1.25  3.5  -0.25 -1.75  4.75  5.75]
 [ 0.   -2.    7.    7.   -4.   -4.   -7.   -3.    0.   -5.  ]
 [ 0.    3.    6.    0.   -1.5   0.    2.5  -2.5   0.5  -3.5 ]]

[01-11 12:06:22] [INFO]
[[ -4.    2.   -4.   -4.    1.    2.    5.    3.    5.    1.  ]
 [ 0.    0.5   3.    2.    0.25 -1.5   4.25  0.75  2.25  5.25]
 [ 0.    0.  -54.  -30.   -6.5  27.  -55.5  -5.5  -23.5  -73.5 ]
 [ 0.    0.  -10.  -10.   -5.5  7.  -17.5  -4.5  -12.5  -21.5 ]
 [ 0.    0.  -18.  -14.   -0.5  11.  -17.5  -2.5  -8.5  -28.5 ]
 [ 0.    0.    5.    1.   -1.   -5.   13.    1.   11.   10.  ]
 [ 0.    0.   -3.   -3.    0.   -3.   13.    2.   11.    6.  ]
 [ 0.    0.  -39.  -22.   -4.   20.  -47.  -10.  -20.  -52.  ]
 [ 0.    0.   19.   15.   -3.  -10.   10.    0.    9.   16.  ]
 [ 0.    0.  -12.  -12.   -3.    9.  -23.   -7.  -13.  -35.  ]]

[01-11 12:06:22] [INFO]
[[ -4.    2.   -4.   -4.    1.
    2.    5.    3.    5.    1.    ]
 [ 0.    0.5   3.    2.    0.25
 -1.5   4.25   0.75   2.25   5.25 ]
 [ 0.    0.  -54.  -30.   -6.5
 27.  -55.5  -5.5  -23.5  -73.5 ]
 [ 0.    0.    0.   -4.444444444
 2.  -7.222222222 -3.481481481 -8.14814815 -7.888888889]
 [ 0.    0.    0.   -4.    1.666666667
 2.    1.  -0.666666667 -0.666666667 -4.    ]
 [ 0.    0.    0.  -1.777777778 -1.60185185
 -2.5   7.861111111  0.49074074  8.82407407  3.194444444]
 [ 0.    0.    0.  -1.333333333  0.361111111
 -4.5  16.083333333  2.305555556 12.305555556 10.083333333]
 [ 0.    0.    0.  -0.333333333  0.694444444
 0.5  -6.916666667 -6.027777778 -3.027777778 1.083333333]
 [ 0.    0.    0.    4.444444444 -5.28703704
 -0.5  -9.527777778 -1.93518519  0.73148148 -9.861111111]
 [ 0.    0.    0.  -5.333333333 -1.555555556
 3.  -10.666666667 -5.777777778 -7.777777778 -18.666666667]]

[01-11 12:06:22] [INFO]

```

```

[[ -4.          2.          -4.          -4.          1.
   2.          5.          3.          5.          1.      ]
 [  0.          0.5         3.          2.          0.25
 -1.5         4.25         0.75         2.25         5.25      ]
 [  0.          0.         -54.         -30.         -6.5
 27.         -55.5        -5.5         -23.5        -73.5      ]
 [  0.          0.          0.          -4.44444444 -4.2962963
 2.          -7.22222222 -3.48148148 -8.14814815 -7.88888889]
 [  0.          0.          0.          0.          5.53333333
 0.2         7.5         2.46666667  6.66666667  3.1          ]
 [  0.          0.          0.          0.          0.11666667
 -3.3        10.75        1.88333333 12.08333333  6.35          ]
 [  0.          0.          0.          0.          1.65
 -5.1        18.25        3.35         14.75        12.45        ]
 [  0.          0.          0.          0.          1.01666667
 0.35        -6.375       -5.76666667 -2.41666667  1.675          ]
 [  0.          0.          0.          0.          -9.58333333
 1.5         -16.75       -5.41666667 -7.41666667 -17.75          ]
 [  0.          0.          0.          0.          3.6
 0.6         -2.         -1.6         2.          -9.2          ]]

```

[01-11 12:06:22] [INFO]

```

[[-4.00000000e+00  2.00000000e+00 -4.00000000e+00 -4.00000000e+00
 1.00000000e+00  2.00000000e+00  5.00000000e+00  3.00000000e+00
 5.00000000e+00  1.00000000e+00]
 [ 0.00000000e+00  5.00000000e-01  3.00000000e+00  2.00000000e+00
 2.50000000e-01 -1.50000000e+00  4.25000000e+00  7.50000000e-01
 2.25000000e+00  5.25000000e+00]
 [ 0.00000000e+00  0.00000000e+00 -5.40000000e+01 -3.00000000e+01
 -6.50000000e+00  2.70000000e+01 -5.55000000e+01 -5.50000000e+00
 -2.35000000e+01 -7.35000000e+01]
 [ 0.00000000e+00  0.00000000e+00  0.00000000e+00 -4.44444444e+00
 -4.29629630e+00  2.00000000e+00 -7.22222222e+00 -3.48148148e+00
 -8.14814815e+00 -7.88888889e+00]
 [ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 5.53333333e+00  2.00000000e-01  7.50000000e+00  2.46666667e+00
 6.66666667e+00  3.10000000e+00]
 [ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00 -3.30421687e+00  1.05918675e+01  1.83132530e+00
 1.19427711e+01  6.28463855e+00]
 [ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 -2.22044605e-16 -5.15963855e+00  1.60135542e+01  2.61445783e+00
 1.27620482e+01  1.15256024e+01]
 [ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00

```

```

0.00000000e+00 3.13253012e-01 -7.75301205e+00 -6.21987952e+00
-3.64156627e+00 1.10542169e+00]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
0.00000000e+00 1.84638554e+00 -3.76054217e+00 -1.14457831e+00
4.12951807e+00 -1.23810241e+01]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
0.00000000e+00 4.69879518e-01 -6.87951807e+00 -3.20481928e+00
-2.33734940e+00 -1.12168675e+01]]
[01-11 12:06:22] [INFO]
[[-4.00000000e+00 2.00000000e+00 -4.00000000e+00 -4.00000000e+00
1.00000000e+00 2.00000000e+00 5.00000000e+00 3.00000000e+00
5.00000000e+00 1.00000000e+00]
[ 0.00000000e+00 5.00000000e-01 3.00000000e+00 2.00000000e+00
2.50000000e-01 -1.50000000e+00 4.25000000e+00 7.50000000e-01
2.25000000e+00 5.25000000e+00]
[ 0.00000000e+00 0.00000000e+00 -5.40000000e+01 -3.00000000e+01
-6.50000000e+00 2.70000000e+01 -5.55000000e+01 -5.50000000e+00
-2.35000000e+01 -7.35000000e+01]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 -4.44444444e+00
-4.29629630e+00 2.00000000e+00 -7.22222222e+00 -3.48148148e+00
-8.14814815e+00 -7.88888889e+00]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
5.53333333e+00 2.00000000e-01 7.50000000e+00 2.46666667e+00
6.66666667e+00 3.10000000e+00]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
0.00000000e+00 -3.30421687e+00 1.05918675e+01 1.83132530e+00
1.19427711e+01 6.28463855e+00]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
-2.22044605e-16 0.00000000e+00 -5.25979945e-01 -2.45214221e-01
-5.88696445e+00 1.71194166e+00]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
0.00000000e+00 0.00000000e+00 -6.74886053e+00 -6.04626253e+00
-2.50934366e+00 1.70123063e+00]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
0.00000000e+00 0.00000000e+00 2.15815861e+00 -1.21239745e-01
1.08030994e+01 -8.86918870e+00]
[ 0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00
0.00000000e+00 0.00000000e+00 -5.37329079e+00 -2.94439380e+00
-6.39015497e-01 -1.03231541e+01]]
[01-11 12:06:22] [INFO]
[[-4.00000000e+00 2.00000000e+00 -4.00000000e+00 -4.00000000e+00
1.00000000e+00 2.00000000e+00 5.00000000e+00 3.00000000e+00
5.00000000e+00 1.00000000e+00]

```

```

[ 0.00000000e+00  5.00000000e-01  3.00000000e+00  2.00000000e+00
  2.50000000e-01 -1.50000000e+00  4.25000000e+00  7.50000000e-01
  2.25000000e+00  5.25000000e+00]
[ 0.00000000e+00  0.00000000e+00 -5.40000000e+01 -3.00000000e+01
 -6.50000000e+00  2.70000000e+01 -5.55000000e+01 -5.50000000e+00
 -2.35000000e+01 -7.35000000e+01]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00 -4.44444444e+00
 -4.29629630e+00  2.00000000e+00 -7.22222222e+00 -3.48148148e+00
 -8.14814815e+00 -7.88888889e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
  5.53333333e+00  2.00000000e-01  7.50000000e+00  2.46666667e+00
  6.66666667e+00  3.10000000e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
  0.00000000e+00 -3.30421687e+00  1.05918675e+01  1.83132530e+00
  1.19427711e+01  6.28463855e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 -2.22044605e-16  0.00000000e+00 -5.25979945e-01 -2.45214221e-01
 -5.88696445e+00  1.71194166e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
  0.00000000e+00  0.00000000e+00  0.00000000e+00 -2.89991334e+00
  7.30264298e+01 -2.02647314e+01]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
  0.00000000e+00  0.00000000e+00  0.00000000e+00 -1.12738302e+00
 -1.33518198e+01 -1.84488735e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
  0.00000000e+00  0.00000000e+00  0.00000000e+00 -4.39341421e-01
  5.95008666e+01 -2.78119584e+01]]
[01-11 12:06:22] [INFO]
[[-4.00000000e+00  2.00000000e+00 -4.00000000e+00 -4.00000000e+00
  1.00000000e+00  2.00000000e+00  5.00000000e+00  3.00000000e+00
  5.00000000e+00  1.00000000e+00]
[ 0.00000000e+00  5.00000000e-01  3.00000000e+00  2.00000000e+00
  2.50000000e-01 -1.50000000e+00  4.25000000e+00  7.50000000e-01
  2.25000000e+00  5.25000000e+00]
[ 0.00000000e+00  0.00000000e+00 -5.40000000e+01 -3.00000000e+01
 -6.50000000e+00  2.70000000e+01 -5.55000000e+01 -5.50000000e+00
 -2.35000000e+01 -7.35000000e+01]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00 -4.44444444e+00
 -4.29629630e+00  2.00000000e+00 -7.22222222e+00 -3.48148148e+00
 -8.14814815e+00 -7.88888889e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
  5.53333333e+00  2.00000000e-01  7.50000000e+00  2.46666667e+00
  6.66666667e+00  3.10000000e+00]

```

```

[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00 -3.30421687e+00  1.05918675e+01  1.83132530e+00
 1.19427711e+01  6.28463855e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
-2.22044605e-16  0.00000000e+00 -5.25979945e-01 -2.45214221e-01
-5.88696445e+00  1.71194166e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00 -2.89991334e+00
 7.30264298e+01 -2.02647314e+01]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
-4.17418945e+01  6.03331839e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 4.84372479e+01 -2.47418198e+01]]
[01-11 12:06:22] [INFO]
[[-4.00000000e+00  2.00000000e+00 -4.00000000e+00 -4.00000000e+00
 1.00000000e+00  2.00000000e+00  5.00000000e+00  3.00000000e+00
 5.00000000e+00  1.00000000e+00]
[ 0.00000000e+00  5.00000000e-01  3.00000000e+00  2.00000000e+00
 2.50000000e-01 -1.50000000e+00  4.25000000e+00  7.50000000e-01
 2.25000000e+00  5.25000000e+00]
[ 0.00000000e+00  0.00000000e+00 -5.40000000e+01 -3.00000000e+01
-6.50000000e+00  2.70000000e+01 -5.55000000e+01 -5.50000000e+00
-2.35000000e+01 -7.35000000e+01]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00 -4.44444444e+00
-4.29629630e+00  2.00000000e+00 -7.22222222e+00 -3.48148148e+00
-8.14814815e+00 -7.88888889e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 5.53333333e+00  2.00000000e-01  7.50000000e+00  2.46666667e+00
 6.66666667e+00  3.10000000e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00 -3.30421687e+00  1.05918675e+01  1.83132530e+00
 1.19427711e+01  6.28463855e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
-2.22044605e-16  0.00000000e+00 -5.25979945e-01 -2.45214221e-01
-5.88696445e+00  1.71194166e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00 -2.89991334e+00
 7.30264298e+01 -2.02647314e+01]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
-4.17418945e+01  6.03331839e+00]

```

```

[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00 -1.77407639e+01]]
[01-11 12:06:22] [INFO]
[[-4.00000000e+00  2.00000000e+00 -4.00000000e+00 -4.00000000e+00
 1.00000000e+00  2.00000000e+00  5.00000000e+00  3.00000000e+00
 5.00000000e+00  1.00000000e+00]
[ 0.00000000e+00  5.00000000e-01  3.00000000e+00  2.00000000e+00
 2.50000000e-01 -1.50000000e+00  4.25000000e+00  7.50000000e-01
 2.25000000e+00  5.25000000e+00]
[ 0.00000000e+00  0.00000000e+00 -5.40000000e+01 -3.00000000e+01
-6.50000000e+00  2.70000000e+01 -5.55000000e+01 -5.50000000e+00
-2.35000000e+01 -7.35000000e+01]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00 -4.44444444e+00
-4.29629630e+00  2.00000000e+00 -7.22222222e+00 -3.48148148e+00
-8.14814815e+00 -7.88888889e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 5.53333333e+00  2.00000000e-01  7.50000000e+00  2.46666667e+00
 6.66666667e+00  3.10000000e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00 -3.30421687e+00  1.05918675e+01  1.83132530e+00
 1.19427711e+01  6.28463855e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
-2.22044605e-16  0.00000000e+00 -5.25979945e-01 -2.45214221e-01
-5.88696445e+00  1.71194166e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00 -2.89991334e+00
 7.30264298e+01 -2.02647314e+01]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
-4.17418945e+01  6.03331839e+00]
[ 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
 0.00000000e+00 -1.77407639e+01]]
9912776.000000015

```

Ejercicio 2

```

A2 = [
      [2, 2, 4, 5, -2, -3, 2, -2],

```



```

    [-1, -1, 3, 2, 1, 1, -4, 4],
    [2, 5, -3, -3, -2, 2, 5, 3],
    [-2, -4, 0, 1, -1, 5, -4, -1],
    [1, -2, -1, 5, 5, 2, 1, -2],
    [5, 4, 0, 3, 4, -1, -3, -2],
    [4, -4, 1, 2, 3, 3, -1, 3],
    [-2, 1, -3, 0, 5, 4, 4, -4],
]
try:
    print(calc_determinante(A2))
except ValueError as e:
    print(e)

```

[01-11 12:14:51] [INFO]

```

[[ 2.    2.    4.    5.   -2.   -3.    2.   -2. ]
 [ 0.    0.    5.   4.5    0.  -0.5   -3.    3. ]
 [ 0.    3.   -7.   -8.    0.    5.    3.    5. ]
 [ 0.   -2.    4.    6.   -3.    2.   -2.   -3. ]
 [ 0.   -3.   -3.    2.5    6.    3.5    0.   -1. ]
 [ 0.   -1.  -10.   -9.5    9.    6.5   -8.    3. ]
 [ 0.   -8.   -7.   -8.    7.    9.   -5.    7. ]
 [ 0.    3.    1.    5.    3.    1.    6.   -6. ]]

```

No existe solución única.