

# SEMANA 3 : MATRIZ, MATRICES ELEMENTALES, OPERACIONES CON MATRICES, MATRIZ ESCALONADA, INVERSA DE UNA MATRIZ, DETERMINANTE

## Integrantes:

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```
In [1]: # Importando Librerias
import pandas as pd
import numpy as np
```

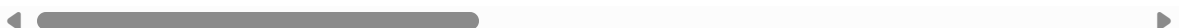
## PARTE A

```
In [2]: # Leyendo el documento y creando el dataframe
data = pd.read_csv("banca.csv", sep=";")
data
```

```
Out[2]:
```

	age	job	marital	education	default	housing	loan	contact	m
0	56	housemaid	married	basic.4y	no	no	no	telephone	
1	57	services	married	high.school	unknown	no	no	telephone	
2	37	services	married	high.school	no	yes	no	telephone	
3	40	admin.	married	basic.6y	no	no	no	telephone	
4	56	services	married	high.school	no	no	yes	telephone	
...	...	...	...	...	...	...	...	...	
41183	73	retired	married	professional.course	no	yes	no	cellular	
41184	46	blue-collar	married	professional.course	no	no	no	cellular	
41185	56	retired	married	university.degree	no	yes	no	cellular	
41186	44	technician	married	professional.course	no	no	no	cellular	
41187	74	retired	married	professional.course	no	yes	no	cellular	

41188 rows × 21 columns



```
In [3]: # Tomando los valores nmericos
v_numericas = data.select_dtypes(["float64","int64"]) # tomando los valores enteros
v_numericas = list(v_numericas.columns.values) # creando una lista con los nombres
dnumericos = data[v_numericas] # creando dataframe con los valores numericos
numdata = dnumericos.to_numpy()# convirtiendo el dataframe en una matriz
numdata
```

```
Out[3]: array([[ 5.6000e+01,  2.6100e+02,  1.0000e+00, ..., -3.6400e+01,
                4.8570e+00,  5.1910e+03],
               [ 5.7000e+01,  1.4900e+02,  1.0000e+00, ..., -3.6400e+01,
                4.8570e+00,  5.1910e+03],
               [ 3.7000e+01,  2.2600e+02,  1.0000e+00, ..., -3.6400e+01,
                4.8570e+00,  5.1910e+03],
               ...,
               [ 5.6000e+01,  1.8900e+02,  2.0000e+00, ..., -5.0800e+01,
                1.0280e+00,  4.9636e+03],
               [ 4.4000e+01,  4.4200e+02,  1.0000e+00, ..., -5.0800e+01,
                1.0280e+00,  4.9636e+03],
               [ 7.4000e+01,  2.3900e+02,  3.0000e+00, ..., -5.0800e+01,
                1.0280e+00,  4.9636e+03]])
```

## PARTE B

```
In [4]: # Vector de medias para cada variable
Medias = np.mean(numdata,axis=0)
Medias
```

```
Out[4]: array([ 4.00240604e+01,  2.58285010e+02,  2.56759250e+00,  9.62475454e+02,
                1.72962999e-01,  8.18855006e-02,  9.35756644e+01, -4.05026003e+01,
                3.62129081e+00,  5.16703591e+03])
```

```
In [5]: # Resta de la matriz de datos y el vector de medias
Resta = numdata - Medias
Resta
```

```
Out[5]: array([[ 15.97593959,   2.7149898 , -1.5675925 , ...,   4.10260027,
                1.23570919,  23.96408906],
               [ 16.97593959, -109.2850102 , -1.5675925 , ...,   4.10260027,
                1.23570919,  23.96408906],
               [ -3.02406041, -32.2850102 , -1.5675925 , ...,   4.10260027,
                1.23570919,  23.96408906],
               ...,
               [ 15.97593959, -69.2850102 , -0.5675925 , ..., -10.29739973,
                -2.59329081, -203.43591094],
               [  3.97593959, 183.7149898 , -1.5675925 , ..., -10.29739973,
                -2.59329081, -203.43591094],
               [ 33.97593959, -19.2850102 ,  0.4324075 , ..., -10.29739973,
                -2.59329081, -203.43591094]])
```

```
In [6]: # Matriz de covarianza de las variables
Covarianza = np.cov(numdata,rowvar=False)
Covarianza
```

```

Out[6]: array([[ 1.08602451e+02, -2.33914694e+00,  1.32602905e-01,
                -6.69453996e+01,  1.25660856e-01, -6.06862678e-03,
                 5.16790762e-03,  6.23980083e+00,  1.94622473e-01,
                -1.33461599e+01],
               [-2.33914694e+00,  6.72257289e+04, -5.14948884e+01,
                -2.30568302e+03,  2.64851986e+00, -1.13918021e+01,
                 7.97271590e-01, -9.80741194e+00, -1.47938307e+01,
                -8.37439866e+02],
               [ 1.32602905e-01, -5.14948884e+01,  7.67297503e+00,
                 2.72249214e+01, -1.08493675e-01,  6.56017208e-01,
                 2.04971433e-01, -1.76060671e-01,  6.49236419e-01,
                 2.88388223e+01],
               [-6.69453996e+01, -2.30568302e+03,  2.72249214e+01,
                 3.49356873e+04, -5.43464475e+01,  7.95748230e+01,
                 8.53513249e+00, -7.90166771e+01,  9.62508736e+01,
                 5.03187748e+03],
               [ 1.25660856e-01,  2.64851986e+00, -1.08493675e-01,
                -5.43464475e+01,  2.44927079e-01, -3.26917530e-01,
                -5.81903503e-02, -1.16669718e-01, -3.90128214e-01,
                -1.79263416e+01],
               [-6.06862678e-03, -1.13918021e+01,  6.56017208e-01,
                 7.95748230e+01, -3.26917530e-01,  2.46791451e+00,
                 7.05038043e-01,  1.42535970e+00,  2.64912079e+00,
                 1.02944953e+02],
               [ 5.16790762e-03,  7.97271590e-01,  2.04971433e-01,
                 8.53513249e+00, -5.81903503e-02,  7.05038043e-01,
                 3.35055802e-01,  1.58023171e-01,  6.90960743e-01,
                 2.18325456e+01],
               [ 6.23980083e+00, -9.80741194e+00, -1.76060671e-01,
                -7.90166771e+01, -1.16669718e-01,  1.42535970e+00,
                 1.58023171e-01,  2.14202154e+01,  2.22908885e+00,
                 3.36111253e+01],
               [ 1.94622473e-01, -1.47938307e+01,  6.49236419e-01,
                 9.62508736e+01, -3.90128214e-01,  2.64912079e+00,
                 6.90960743e-01,  2.22908885e+00,  3.00830780e+00,
                 1.18443421e+02],
               [-1.33461599e+01, -8.37439866e+02,  2.88388223e+01,
                 5.03187748e+03, -1.79263416e+01,  1.02944953e+02,
                 2.18325456e+01,  3.36111253e+01,  1.18443421e+02,
                 5.22028325e+03]])

```

```

In [7]: # Inversa de la matriz de covarianza de las variables
Inversa = np.linalg.inv(Covarianza)
Inversa

```

```
Out[7]: array([[ 9.38173198e-03,  3.34861347e-07, -4.19763601e-04,
 1.36121285e-06, -3.83502917e-03,  5.91771204e-03,
-3.34866075e-03, -2.57771661e-03, -6.23700615e-03,
 6.72917534e-05],
 [ 3.34861347e-07,  1.50158934e-05,  9.62870679e-05,
 9.83273819e-07,  2.49779398e-04,  6.70782611e-06,
-1.19291115e-04,  2.30610883e-05, -1.93072125e-04,
 6.38651062e-06],
 [-4.19763601e-04,  9.62870679e-05,  1.35335551e-01,
 1.09911594e-05,  1.42838208e-02, -6.63710866e-02,
-8.70631753e-02, -4.79336291e-03,  1.41186158e-01,
-2.19436697e-03],
 [ 1.36121285e-06,  9.83273819e-07,  1.09911594e-05,
 4.62235336e-05,  9.18864731e-03,  2.31031936e-04,
 1.76824294e-03,  2.62003352e-04, -4.10047095e-04,
-1.72357243e-05],
 [-3.83502917e-03,  2.49779398e-04,  1.42838208e-02,
 9.18864731e-03,  7.33548730e+00, -3.74523111e-01,
 4.38774276e-01,  6.87595024e-02, -7.94986119e-02,
 2.31958821e-02],
 [ 5.91771204e-03,  6.70782611e-06, -6.63710866e-02,
 2.31031936e-04, -3.74523111e-01,  1.34000538e+01,
-7.97345492e+00,  1.32073108e-01, -8.80714981e+00,
-3.30547118e-02],
 [-3.34866075e-03, -1.19291115e-04, -8.70631753e-02,
 1.76824294e-03,  4.38774276e-01, -7.97345492e+00,
 1.89169993e+01,  7.79616933e-01, -7.22421545e+00,
 2.37269104e-01],
 [-2.57771661e-03,  2.30610883e-05, -4.79336291e-03,
 2.62003352e-04,  6.87595024e-02,  1.32073108e-01,
 7.79616933e-01,  1.23701795e-01, -1.15467811e+00,
 1.95442209e-02],
 [-6.23700615e-03, -1.93072125e-04,  1.41186158e-01,
-4.10047095e-04, -7.94986119e-02, -8.80714981e+00,
-7.22421545e+00, -1.15467811e+00,  2.13908792e+01,
-2.74717397e-01],
 [ 6.72917534e-05,  6.38651062e-06, -2.19436697e-03,
-1.72357243e-05,  2.31958821e-02, -3.30547118e-02,
 2.37269104e-01,  1.95442209e-02, -2.74717397e-01,
 6.06792114e-03]])
```

## PARTE C

```
In [8]: n = numdata.shape[0]
valores = []
for i in range (n):
    valor = np.dot(np.dot(Resta[i], Inversa), Resta[i].T)
    valores.append(valor)
valores
```

```
Out[8]: [4.255314704970938,  
4.764125246930451,  
2.3812791810885483,  
2.417393396621806,  
4.273646383090609,  
2.4063976859,  
5.433900787076322,  
2.2323314097155986,  
5.128205236172239,  
5.374817223407318,  
2.889441569521453,  
4.675301631202773,  
3.8467208213593764,  
4.549159439389877,  
2.7797253443471472,  
3.875203845344711,  
2.5693539241057985,  
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2.3190064507084993,  
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3.9860023469346433,  
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2.3102437970679626,  
2.498292422219096,  
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4.261576187164977,
```

3.1023421408602636,  
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2.750291807358175,  
2.8131487161084734,  
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2.3964628707982545,  
2.264273236831451,  
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2.6433295751741763,  
4.595229722034515,  
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2.9373551135786324,  
5.2322350823664046,  
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2.669893618138625,  
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3.2323927973421127,  
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2.6252035767393913,  
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2.7126844093421427,  
6.215076863918963,  
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2.8763986514224213,  
3.248477591324452,  
2.1792685590251226,  
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2.701858287857191,  
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2.9114148991588995,  
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```

```
In [9]: # importando La función mahalanobis  
from scipy.spatial.distance import mahalanobis
```

```
In [10]: # Hallando la distancia de Mahalanobis  
n = numdata.shape[0]  
valoresmaha = []
```

```
for i in range(n):  
    valor = mahalanobis(numdata[i],Medias,Inversa)**2  
    valoresmaha.append(valor)  
valoresmaha
```

```
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...]

```
In [11]: # Guardando valores en el dataframe
data['Mahalanobis'] = valoresmaha
data['Indices'] = data.index
data
```

Out[11]:

	age	job	marital	education	default	housing	loan	contact	m
0	56	housemaid	married	basic.4y	no	no	no	telephone	
1	57	services	married	high.school	unknown	no	no	telephone	
2	37	services	married	high.school	no	yes	no	telephone	
3	40	admin.	married	basic.6y	no	no	no	telephone	
4	56	services	married	high.school	no	no	yes	telephone	
...	...	...	...	...	...	...	...	...	...
41183	73	retired	married	professional.course	no	yes	no	cellular	
41184	46	blue-collar	married	professional.course	no	no	no	cellular	
41185	56	retired	married	university.degree	no	yes	no	cellular	
41186	44	technician	married	professional.course	no	no	no	cellular	
41187	74	retired	married	professional.course	no	yes	no	cellular	

41188 rows × 23 columns



In [12]:

```
# Eliminando los valores mayores que 100
data = data[data["Mahalanobis"] <= 100 ]
data = data.drop(['Mahalanobis', 'Indices'], axis =1)
data
```

Out[12]:

	age	job	marital	education	default	housing	loan	contact	m
0	56	housemaid	married	basic.4y	no	no	no	telephone	
1	57	services	married	high.school	unknown	no	no	telephone	
2	37	services	married	high.school	no	yes	no	telephone	
3	40	admin.	married	basic.6y	no	no	no	telephone	
4	56	services	married	high.school	no	no	yes	telephone	
...	...	...	...	...	...	...	...	...	...
41183	73	retired	married	professional.course	no	yes	no	cellular	
41184	46	blue-collar	married	professional.course	no	no	no	cellular	
41185	56	retired	married	university.degree	no	yes	no	cellular	
41186	44	technician	married	professional.course	no	no	no	cellular	
41187	74	retired	married	professional.course	no	yes	no	cellular	

41094 rows × 21 columns

