

# Métodos de aprendizaje no supervisado





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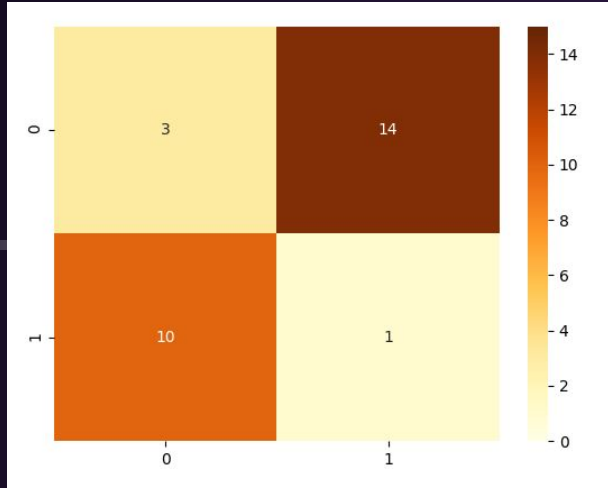
## OBJETIVOS

- Implementar algoritmos de redes neuronales de aprendizaje no supervisado vistos en clase.
- Utilizar dataset provisto por la cátedra para asociar valores y luego sacar conclusiones.
- Identificar la primera componente principal (PCA1) del conjunto dado.
- A partir de letras (matrices) que ya se encuentran en nuestra red, asociar nuevas matrices desconocidas con ruido.

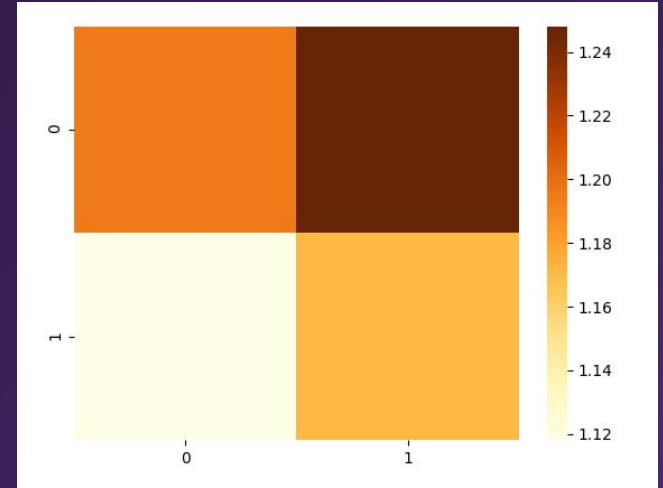
## ***EJERCICIO 1 - A***

## Red de 2x2 Neuronas; 1000 épocas; R = 1

Concentración de países



Matriz U

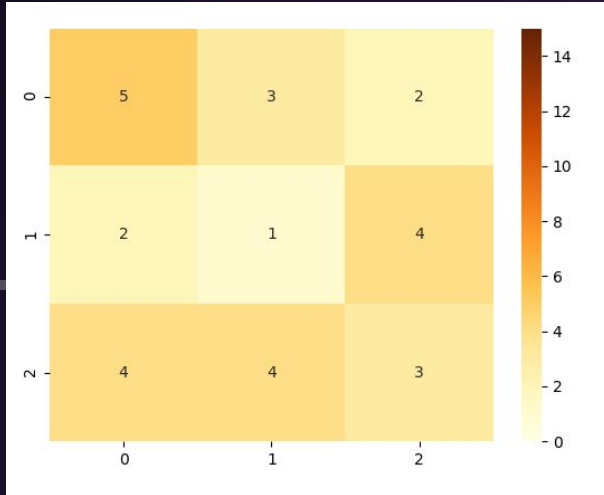


```
[[['Czech Republic', 'Greece', 'Slovenia'], ['Austria', 'Belgium', 'Denmark', 'Germany', 'Iceland', 'Ireland', 'Italy', 'Luxembourg', 'Netherlands', 'Norway', 'Spain', 'Sweden', 'Switzerland', 'United Kingdom']], [['Bulgaria', 'Croatia', 'Estonia', 'Hungary', 'Latvia', 'Lithuania', 'Poland', 'Portugal', 'Slovakia', 'Ukraine'], ['Finland']]]
```

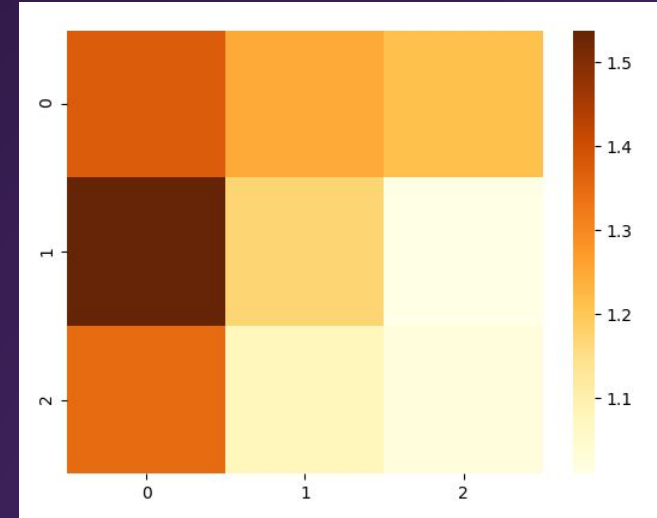


## Red de 3x3 Neuronas; 1000 épocas; R = 1

Concentración de países



Matriz U



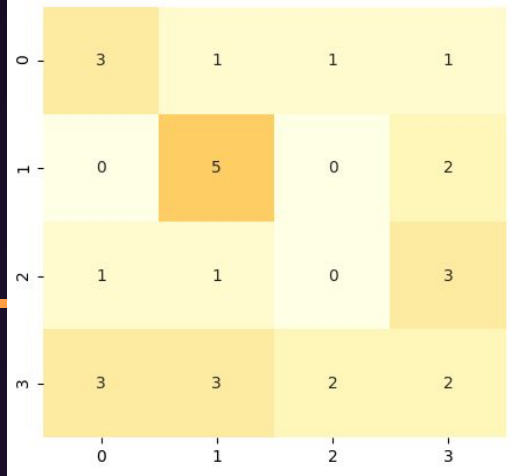
```
[[['Bulgaria', 'Estonia', 'Latvia', 'Lithuania', 'Ukraine'], ['Croatia', 'Hungary', 'Poland'], ['Greece', 'Portugal']], [['Czech Republic', 'Slovakia'], ['Slovenia'], ['Finland', 'Italy', 'Spain', 'United Kingdom']], [['Iceland', 'Ireland', 'Luxembourg', 'Switzerland'], ['Austria', 'Belgium', 'Denmark', 'Netherlands'], ['Germany', 'Norway', 'Sweden']]]
```



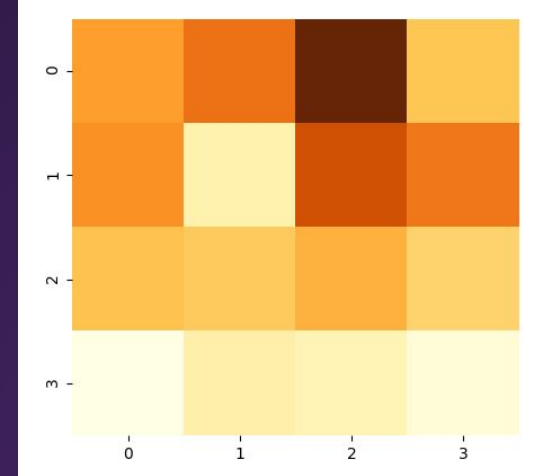


## Red de 4x4 Neuronas; 1000 épocas; R = 1

Concentración de países



Matriz U



```
[[['Greece', 'Portugal', 'United Kingdom'], ['Spain'], ['Poland'], ['Ukraine']], [[], ['Finland', 'Germany', 'Italy', 'Norway', 'Sweden'], [], ['Bulgaria', 'Estonia']], [['Switzerland'], ['Netherlands'], [], ['Hungary', 'Latvia', 'Lithuania']], [['Iceland', 'Ireland', 'Luxembourg'], ['Austria', 'Belgium', 'Denmark'], ['Czech Republic', 'Slovenia'], ['Croatia', 'Slovakia']]]
```



# Conclusiones





## ***EJERCICIO 1 - B***

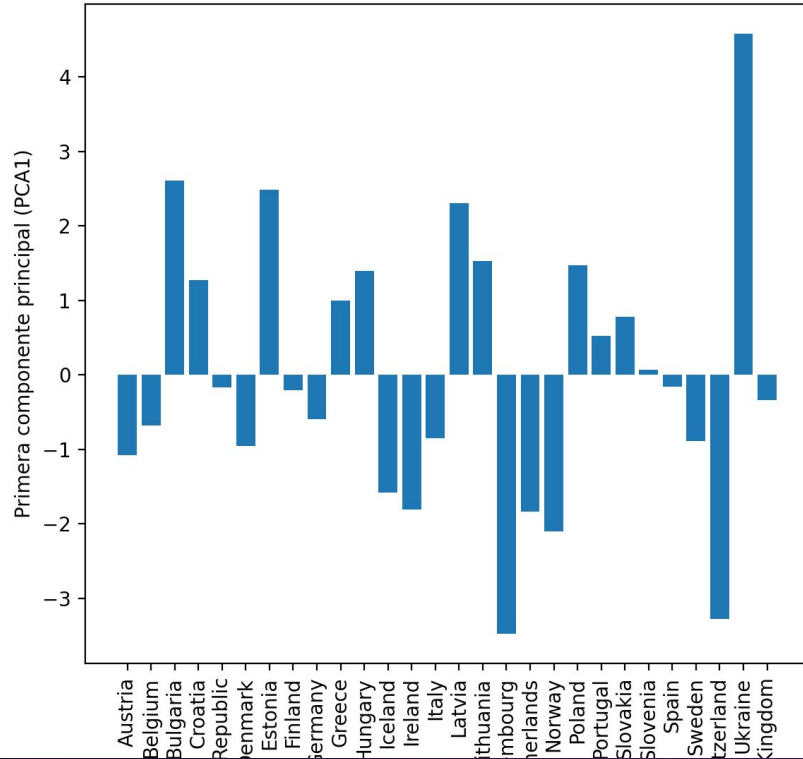
# 1era Componente principal

	AREA	GDP	INFLACION	EXPECTATIVA DE VIDA	MILITARIZACION	CRECIMIENTO	DESEMPLEO
LIB PCA	0.1248739	-0.50050586	0.40651815	-0.48287333	0.18811162	-0.47570355	0.27165582
OJA	0.12557215	-0.50037441	0.40716648	-0.48295445	0.18748873	-0.47548698	0.27127044

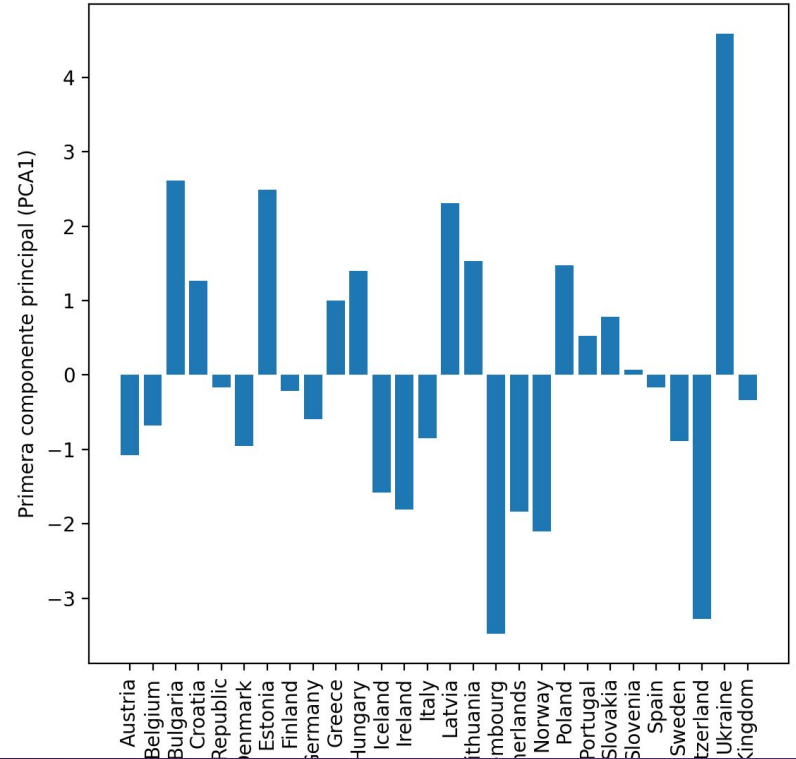
Valores obtenidos para 10000 épocas y  $\text{Eta} = 0.0001$

# Vs

PCA1 por país usando la librería Sklearn



PCA1 por país usando OJA





# Conclusiones







## ***EJERCICIO 2***

# EXPERIMENTO 1

## Letras almacenadas



```
####  
...#.  
...#.  
#..#.  
###..,
```

J

```
# . . . #  
# # . . #  
# . # . #  
# . . # #  
# . . . #,
```

N

```
# . . . #  
# . . . #  
# # # # #  
# . . . #  
# . . . #,
```

H

```
# . . . #  
# # . # #  
# . # . #  
# . . . #  
# . . . #,  
|
```

M

# LETRA → J

Ruido: 0.4

```
Época 0  
H = -4.32  
#####  
.#.#.  
...##  
#.#.  
###.#  
Época 1  
H = -12.000  
#####  
...#.  
...#.  
#..#.  
###..  
Época 2  
H = -12.000  
#####  
...#.  
...#.  
#..#.  
###..
```



Ruido: 0.6

```
Época 0  
H = -2.8800  
#####  
...#.  
..##  
####.  
#####  
Época 1  
H = -16.000  
.###.  
..##.  
...#.  
...#.  
.#..  
Época 2  
H = -27.359  
.###.  
..##.  
.#.#.  
.###.  
.###.  
Época 3  
H = -27.359  
.###.  
..##.  
.#.#.  
.###.  
.###.
```



# LETRA $\rightarrow$ N

Ruido: 0.2

```
Época 0  
H = -23.9  
#...#  
##..#  
###.#  
#..##  
#...#  
Época 1  
H = -27.3  
#...#  
##..#  
#.#.#  
#...#  
#...#  
Época 2  
H = -27.3  
#...#  
##..#  
#.#.#  
#...#  
#...#
```

X

# LETRA $\rightarrow$ H

Ruido: 0.2

```
Época  0  
H = -22.55  
#...#  
#...#  
#####  
#...#  
#...#  
Época  1  
H = -27.35  
#...#  
##...#  
#.#.#  
#...#  
#...#  
Época  2  
H = -27.35  
#...#  
##...#  
#.#.#  
#...#  
#...#
```

X

# LETRA → M

Ruido: 0.2

```
Época 0  
H = -25.5  
#...#  
##.##  
#.#.#  
#...#  
#...#  
Época 1  
H = -27.3  
#...#  
##..#  
#.#.#  
#...#  
#...#  
Época 2  
H = -27.3  
#...#  
##..#  
#.#.#  
#...#  
#...#
```

X

# EXPERIMENTO 2

## Letras almacenadas



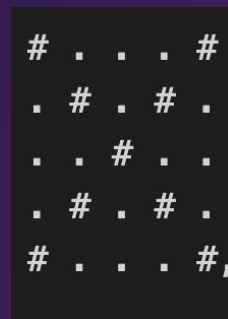
#####  
...#.   
...#.   
#...#.   
###...

J



. . # . .   
. # . # .   
# # # # #   
# . . . #   
# . . . #,

A



# . . . #   
. # . # .   
. . # . .   
. # . # .   
# . . . #,

X



# . . . .   
# . . . .   
# . . . .   
# . . . .   
# # # # #,

L

# LETRA $\rightarrow$ J

Ruido: 0.4

```
Época 0  
H = -5.760  
#####  
..##.  
..##.  
#..#.  
###.#  
Época 1  
H = -11.04  
#####  
...#.  
...#.  
#..#.  
###..  
Época 2  
H = -11.04  
#####  
...#.  
...#.  
#..#.  
###..
```



Ruido: 0.6

```
Época 0  
H = 0.4800  
#####  
#..##  
#####  
#####  
###.#  
Época 1  
H = -6.560  
.####  
..###  
.#.##  
#.###  
.##..  
Época 2  
H = -6.560  
.####  
..###  
.#.##  
#.###  
.##..
```





# LETRA → A

Ruido: 0.4



```
Época 0
H = -3.200
###..
.#.#.
.###.
#####
#...#
Época 1
H = -7.840
..#.#
.#.#.
.####
...##
#...#
Época 2
H = -7.840
..#..
.#.#.
.####
##.##
#...#
```

```
Época 3
H = -8.480
..#.#
.#.#.
#####
....#
#...#
Época 4
H = -10.800
..#..
.#.#.
#####
#...#
#...#
Época 5
H = -10.800
..#..
.#.#.
#####
#...#
#...#
```

Ruido: 0.6



```
Época 0
H = 0.95990
###..
##.##
.####
#####
###.#
Época 1
H = -4.96000
..###
.###.
#####
....#
....#
Época 2
H = -6.40000
..#..
.####
.####
.####
#####
....#
Época 3
H = -8.00000
.###
.####
#####
.##.#
.....
```

```
Época 4
H = -9.44000
.###.
.####
.####
.####
.....
Época 5
H = -10.72000
.####
.####
.####
.....
Época 6
H = -10.72000
.####
.####
.####
.####
.....
```

# LETRA → X

Ruido: 0.4

```
Época 0
H = -3.8400
#...#
####.
..#..
.###.
#.#..#
Época 1
H = -8.8000
#...#
.#...
..#..
.#.#.
#...#
Época 2
H = -10.8800
#...#
.#.#.
..#..
.#.#.
#...#
Época 3
H = -10.8800
#...#
.#.#.
..#..
.#.#.
#...#
```



Ruido: 0.6

```
Época 0
H = 0.96000
#...#
####.
#.#.#
.#.#.
#####
Época 1
H = -3.36000
#...#
.....
.....
.###.
.....
Época 2
H = -6.88000
#...#
.#.#.
..#..
.#.#.
#...#
Época 3
H = -7.52000
#...#
.....
.....
.#.#.
#...#
Época 4
H = -8.80000
#...#
.....
.....
.#.#.
#...#
```



```
Época 5
H = -9.76000
#...#
...#.
.....
#...#
###..
Época 6
H = -11.04000
#####
...#.
...#.
#...#
###..
Época 7
H = -11.04000
#####
...#.
...#.
#...#
###..
```

False Hit!

# LETRA → L

Ruido: 0.4



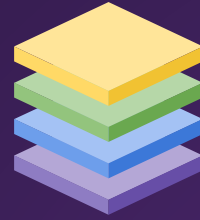
```
Época 0
H = -4.00000
###.#
#....
#....
####.
####
Época 1
H = -7.84000
#..##
#....
....
#....
####.
Época 2
H = -8.32000
#...
#....
#....
#..#.
####
Época 3
H = -10.72000
#....
#....
#....
####
Época 4
H = -10.72000
#....
#....
#....
####
```

Ruido: 0.6



```
Época 0
H = -0.31999
####.
#..#.
##.##
##.##
####
Época 1
H = -6.24000
.###.
#...#
#..#.
#..#.
.###.
Época 2
H = -9.12000
####.
#.#.#
##.##
#.#.#
.###.
Época 3
H = -10.88000
.###.
#.#.#
##.##
#.#.#
.###.
Época 4
H = -10.88000
.###.
#.#.#
##.##
#.#.#
.###.
```

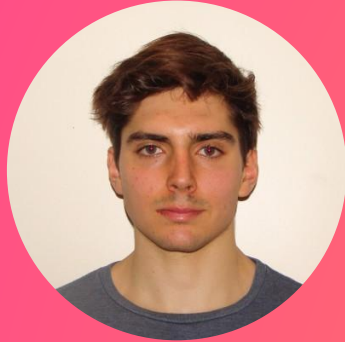
# Conclusiones





**iGracias! :)**

**iBuenos Días!**



**Martin  
Ciccioli**



**Ignacio  
Sampedro**



**Geronimo  
Maspero**