ENTREGA 3 DE SISTEMAS INTELIGENTES

Alejandro Inglés e Israel Brea

DEFINICIÓN DEL PROBLEMA

Se presenta un problema donde en un futuro lejano, una nave espacial Titanic, con casi 13.000 pasajeros a bordo, emprende su viaje inaugural hacia tres exoplanetas habitables. Mientras rodeaba Alpha Centauri en ruta hacia su primer destino, la nave espacial Titanic chocó con una anomalía del espacio-tiempo escondida dentro de una nube de polvo. La nave permaneció intacta, sin embargo, casi la mitad de los pasajeros fueron transportados a una dimensión alternativa. El objetivo del algoritmo será predecir dado un individuo (si hubiera estado en esa situación) si sería transportado o no.

VISUALIZACION y Selección de variables

En la visualización/exploración de nuestro conjunto de datos podemos extraer la siguiente información:

```
• El conjunto de datos es información sobre los pasajeros a bordo
de la nave espacial
Titanic.

• Se obtuvo la información personal de aproximadamente 8700
pasajeros.

• La variable de estudio es representada por si el pasajero fue
transportado a otra
dimensión o no.

• Los datos recogen 8693 individuos de los cuales 4315 no fueron
transportados a otra
dimensión y 4378 que sí que lo fueron.

• Que cada individuo tiene 14 atributos/variables, 7 nominales, 6
numéricos y la variable
respuesta:

    ✓ @attribute 'PassengerId': Una identificación única para cada
pasajero. Cada Id
    toma la forma gggg_pp donde gggg indica un grupo con el que
viaja el pasajero y
    pp es su número dentro del grupo. Las personas en un grupo a
menudo son
    miembros de la familia, pero no siempre.

    ✓ @attribute 'HomePlanet': Planeta del que parte el pasajero.

    ✓ @attribute 'CryoSleep': Indica si el pasajero eligió ser
puesto en animación
    suspendida durante la duración del viaje. Los pasajeros en
```

```
crio sueño están
    confinados en sus cabinas.

    ✓ @attribute 'Cabin': El número de cabina donde se hospeda el
pasajero. Toma la
    forma cubierta/número/lado, donde lado puede ser P para babor
o S para estribor.

    ✓ @attribute 'Destination': El planeta en el que desembarcará
el pasajero.

    ✓ @attribute 'Age': Edad del pasajero.

    ✓ @attribute 'VIP' : Si el pasajero es VIP o no.

    ✓ @attribute 'RoomService', 'FoodCourt', 'ShoppingMall',
'Spa', 'VRDeck': Dinero
    facturado en cada uno de los servicios de lujo

    ✓ @attribute 'Name': Los nombres y apellidos del pasajero/a.

    ✓ @attribute 'Transported': Si el pasajero fue transportado a
otra dimensión o no.

• Las variables que borraremos serán Destination, RoomService,
FoodCourt,
ShoppingMall, Spa y VRDeck y Name (dinero gastado, el nombre y el
destino de un
pasajero) debido a que son variables que estamos seguros de que no
van a influenciar
en nada a que un pasajero se transporte o no.

• El resto de variables hemos decidido tratarlas para su posterior
análisis. Como
desconocemos totalmente los motivos por lo que un individuo se
transporta o no, no
queremos descartar las diferentes teorías por muy extrañas que
sean. Por lo que
trabajaremos con ellas, y finalmente, en la poda podremos
concretar y descartar estas
opciones. Principalmente barajamos dos teorías que podrían influir
en el destino de un
pasajero:

    ✓ Más probable: La localización en el momento del impacto
    ✓ Menos probable: Las condiciones físicas y la tendencia
genética a la
       transportación.
```

Sospechamos que el motivo más probable de que un individuo se transporte o no será su localizacion en la nave en el momento del impacto. Por eso hemos decidido dejar las variables que pueden tener relación con esta; PassengerId, CryoSleep, Cabin y VIP. Sin embargo, también pensamos que el destino de un individuo también puede depender de alguna forma de su genética/rasgos físicos, por lo que hemos creído oportuno dejar las variables: PassengerId, HomePlanet y Age. Características físicas como por ejemplo son la altura o el peso, capacidades físicas como la velocidad para escapar, la fuerza para agarrase a las cosas... O simplemente la tendencia genética a ser transportado a otra dimensión. (que no tenemos ni idea si podría influir).

Es destacable el motivo por el que creemos que la variable PassengerId es muy importante, ya que extrayendo unicamente la informacion de la familia a la que permanece un individuo, esta nos puede arrojar información sobre su localización (entendemos que una persona tiene más probabilidades de moverse por la nave acompañado de sus allegados, que en solitarioo con gente sin ninguna relación), y también sobre sus carcterísticas genéticas. Parecido (con respecto a la ubicación)con los que pensamos de la variable VIP, que creemos que un individuo de una determinada clase social tiene más probabilidades de estar con sus iguales en zonas reservadas para estos.

In [1]:
```
#IMPORTACION DE LIBRERIAS

import pandas as pd
from sklearn.impute import SimpleImputer
from sklearn.compose import ColumnTransformer
import numpy as np
```

In [2]:
```
##Compruebo que la lectura de los datos se hace correspondente (viendo si detecta 
```

In [3]:
```
df= pd.read_csv('./conjDatosE3.csv', na_values= '?')
```

In [4]:
```
df.head()
```

Out[4]:

	PassengerId	HomePlanet	CryoSleep	Cabin	Destination	Age	VIP	RoomService	FoodCourt
0	0001_01	Europa	False	B/0/P	TRAPPIST-1e	39.0	False	0.0	0.0
1	0002_01	Earth	False	F/0/S	TRAPPIST-1e	24.0	False	109.0	9.0
2	0003_01	Europa	False	A/0/S	TRAPPIST-1e	58.0	True	43.0	3576.0
3	0003_02	Europa	False	A/0/S	TRAPPIST-1e	33.0	False	0.0	1283.0
4	0004_01	Earth	False	F/1/S	TRAPPIST-1e	16.0	False	303.0	70.0

In [5]:
```
df.isnull().sum()
```

Out[5]:
```
PassengerId       0
HomePlanet      201
CryoSleep       217
Cabin           199
Destination     182
Age             179
VIP             203
RoomService     181
FoodCourt       183
ShoppingMall    208
Spa             183
VRDeck          188
Name            200
Transported       0
dtype: int64
```

PREPROCESADO DE LOS DATOS

1) Quitamos las variables inútiles

2) Tratamos los valores perdidos --> imputacion

3) Ingeniería de características

Obtener informacion a partir de variables existentes para crear nuevas con más sentido

4) Tratamiento de variables categóricas y continuas

Discretizamos en 4 intervalos de igual dimensión la variable edad

5) Normalización de variables

In [6]:
```
#QUITAMOS LAS VARIABLES/ATRIBUTOS QUE EN LA EXPLORACION/VISUALIZACION DE LOS DATOS
#INFLUYEN EN LA VARIABLE RESPUESTA
```

In [7]:
```
datos = df[['PassengerId','HomePlanet','CryoSleep', 'Cabin', 'Age', 'VIP', 'Transp
```

In [8]:
```
datos
```

Out[8]:

	PassengerId	HomePlanet	CryoSleep	Cabin	Age	VIP	Transported
0	0001_01	Europa	False	B/0/P	39.0	False	False
1	0002_01	Earth	False	F/0/S	24.0	False	True
2	0003_01	Europa	False	A/0/S	58.0	True	False
3	0003_02	Europa	False	A/0/S	33.0	False	False
4	0004_01	Earth	False	F/1/S	16.0	False	True
...	...	...	...	...	...	...	...
8688	9276_01	Europa	False	A/98/P	41.0	True	False
8689	9278_01	Earth	True	G/1499/S	18.0	False	False
8690	9279_01	Earth	False	G/1500/S	26.0	False	True
8691	9280_01	Europa	False	E/608/S	32.0	False	False
8692	9280_02	Europa	False	E/608/S	44.0	False	True

8693 rows × 7 columns

In [9]:
```
##TRATAMIENTO DE VALORES PERDIDOS --> IMPUTACION a través del column transformer
```

In [10]:
```
datos.isnull().sum()
```

Out[10]:
```
PassengerId      0
HomePlanet     201
CryoSleep      217
Cabin          199
Age            179
VIP            203
Transported      0
dtype: int64
```

In [11]:
```
#para comprobar que hemos solucionado bien la imputación, vemos por ejemplo los va
#comprobar posteriormente que se han imputado correctamente

missing = datos['CryoSleep'].isnull()
datos[missing][0:5]
```

Out[11]:

	PassengerId	HomePlanet	CryoSleep	Cabin	Age	VIP	Transported
92	0099_02	Earth	NaN	G/12/P	2.0	False	True
98	0105_01	Earth	NaN	F/21/P	27.0	False	False
104	0110_02	Europa	NaN	B/5/P	40.0	False	False
111	0115_01	Mars	NaN	F/24/P	26.0	False	True
152	0173_01	Earth	NaN	E/11/S	58.0	False	True

In [12]:
```
#Realizamos LA IMPUTACION a través de transformaciones sobre las columnas

ct = ColumnTransformer([
    ("nada",'passthrough',['PassengerId']), #no tiene valores perdidos y no aplica
    ("modaHP",SimpleImputer(strategy='most_frequent'),['HomePlanet']),
    ("modaCS",SimpleImputer(strategy='most_frequent'),['CryoSleep']), #se imputa p
    ("modaC",SimpleImputer(strategy='most_frequent'),['Cabin']),
    ("media",SimpleImputer(strategy='mean'),['Age']), # por la media
```

```
    ("modaV",SimpleImputer(strategy='most_frequent'),['VIP'])
    ], remainder='passthrough') #para la ultima variable lo hacemos así, pero podr

datos2 = ct.fit_transform(datos)

#Comprobamos que los valores se han imputado correctamente

datos2[missing][0:5]
```

Out[12]:

```
array([['0099_02', 'Earth', False, 'G/12/P', 2.0, False, True],
       ['0105_01', 'Earth', False, 'F/21/P', 27.0, False, False],
       ['0110_02', 'Europa', False, 'B/5/P', 40.0, False, False],
       ['0115_01', 'Mars', False, 'F/24/P', 26.0, False, True],
       ['0173_01', 'Earth', False, 'E/11/S', 58.0, False, True]],
      dtype=object)
```

In [13]:

```
# Al aplicar el column transformer de sklearn nuestros datos pasan a formato numpy
# para que sea más agradable lo pasamos a tabla de datos pamda

datos21 = pd.DataFrame(datos2, columns=datos.columns)
datos21
```

Out[13]:

	PassengerId	HomePlanet	CryoSleep	Cabin	Age	VIP	Transported
0	0001_01	Europa	False	B/0/P	39.0	False	False
1	0002_01	Earth	False	F/0/S	24.0	False	True
2	0003_01	Europa	False	A/0/S	58.0	True	False
3	0003_02	Europa	False	A/0/S	33.0	False	False
4	0004_01	Earth	False	F/1/S	16.0	False	True
...	...	...	...	...	...	...	...
8688	9276_01	Europa	False	A/98/P	41.0	True	False
8689	9278_01	Earth	True	G/1499/S	18.0	False	False
8690	9279_01	Earth	False	G/1500/S	26.0	False	True
8691	9280_01	Europa	False	E/608/S	32.0	False	False
8692	9280_02	Europa	False	E/608/S	44.0	False	True

8693 rows × 7 columns

In [14]:

```
# INGENIERIA DE CARACTERISTICAS:
#A partir de la variable cabin, obtenemos los atributos CUBIERTA/PLANTA y LADO.
#La variable CUBIERTA/PLANTA corresponde a la altura en la que estan situadas las c
#La variable LADO corresponde a si la cabina se sitúa a estribor o a babor
#que describen la ubicacion de los camarotes de los pasajeros
```

In [15]:

```
#VARIABLE CATEGORICA ORDINAL (cuyo orden es el alfabético)

datos21['CUBIERTA/PLANTA'] = datos21['Cabin'].apply(lambda cabin: cabin[0] ) #no h
datos21[0:5]
```

Out[15]:

	PassengerId	HomePlanet	CryoSleep	Cabin	Age	VIP	Transported	CUBIERTA/PLANTA
0	0001_01	Europa	False	B/0/P	39.0	False	False	B
1	0002_01	Earth	False	F/0/S	24.0	False	True	F
2	0003_01	Europa	False	A/0/S	58.0	True	False	A
3	0003_02	Europa	False	A/0/S	33.0	False	False	A
4	0004_01	Earth	False	F/1/S	16.0	False	True	F

In [16]:
```
#VARIABLE CATEGORICA NOMINAL

datos21['LADO'] = datos21['Cabin'].apply(lambda cabin: cabin.split('/')[2] ) #no h
datos21[0:5]
```

Out[16]:

	PassengerId	HomePlanet	CryoSleep	Cabin	Age	VIP	Transported	CUBIERTA/PLANTA	LAD
0	0001_01	Europa	False	B/0/P	39.0	False	False	B	
1	0002_01	Earth	False	F/0/S	24.0	False	True	F	
2	0003_01	Europa	False	A/0/S	58.0	True	False	A	
3	0003_02	Europa	False	A/0/S	33.0	False	False	A	
4	0004_01	Earth	False	F/1/S	16.0	False	True	F	

In [17]:
```
# INGENIERIA DE CARACTERISTICAS:
#A partir de la variable passengerId, obtenemos el atributo FAMILIA, que se corres
# a la que pertenece un individuo (que nos interesa como comentamos anteriormente e
```

In [18]:
```
#VARIABLE CATEGORICA NOMINAL

datos21['FAMILIA'] = datos21['PassengerId'].apply(lambda id: id[0:4] ) #no hay dat
datos21[0:5]
```

Out[18]:

	PassengerId	HomePlanet	CryoSleep	Cabin	Age	VIP	Transported	CUBIERTA/PLANTA	LAD
0	0001_01	Europa	False	B/0/P	39.0	False	False	B	
1	0002_01	Earth	False	F/0/S	24.0	False	True	F	
2	0003_01	Europa	False	A/0/S	58.0	True	False	A	
3	0003_02	Europa	False	A/0/S	33.0	False	False	A	
4	0004_01	Earth	False	F/1/S	16.0	False	True	F	

In [19]:
```
datos4 = datos21[['FAMILIA','HomePlanet','CryoSleep', 'CUBIERTA/PLANTA',  'LADO' ,
datos4
```

Out[19]:

	FAMILIA	HomePlanet	CryoSleep	CUBIERTA/PLANTA	LADO	Age	VIP	Transported
0	0001	Europa	False	B	P	39.0	False	False
1	0002	Earth	False	F	S	24.0	False	True
2	0003	Europa	False	A	S	58.0	True	False
3	0003	Europa	False	A	S	33.0	False	False
4	0004	Earth	False	F	S	16.0	False	True
...	...	...	...	...	...	...	...	...
8688	9276	Europa	False	A	P	41.0	True	False
8689	9278	Earth	True	G	S	18.0	False	False
8690	9279	Earth	False	G	S	26.0	False	True
8691	9280	Europa	False	E	S	32.0	False	False
8692	9280	Europa	False	E	S	44.0	False	True

8693 rows × 8 columns

In [20]:
```
# TRATAMIENTO DE VARIABLES CATEGÓRICAS

from sklearn.pipeline import Pipeline
from sklearn.preprocessing import OneHotEncoder
from sklearn.preprocessing import KBinsDiscretizer
from sklearn.preprocessing import OrdinalEncoder
```

In [21]:
```
datos4['CUBIERTA/PLANTA'].unique()
```

Out[21]:
```
array(['B', 'F', 'A', 'G', 'E', 'D', 'C', 'T'], dtype=object)
```

In [22]:
```
#No usamos pipeline ya que no nos interesa hacer todas las trasnformaciones en un 
#ya creado nuevas caracteristicas a partir de las ya existentes y para eso tenían 

#Discretizamos age porque vemos más funcional/descriptivo saber si dependiendo de 


ct2 = ColumnTransformer([
    ("HP", OneHotEncoder() ,['HomePlanet']),
    ("CS",OneHotEncoder() ,['CryoSleep']),
    ("A",   KBinsDiscretizer(4, strategy='uniform', encode='ordinal') , ['Age']), 
    ("VIP",OneHotEncoder(),['VIP']),                                               
    ("LD",OneHotEncoder(),['LADO']),
    ("ordCP",  OrdinalEncoder(categories=[['A', 'B', 'C', 'D', 'E', 'F', 'G', 'T']
    #("fam", OneHotEncoder()  ,['FAMILIA'])
    ("nada", OneHotEncoder() ,['Transported'])
    ])


datos5 = ct2.fit_transform(datos4)

datos5
#Como al hacer OneHotEncoding en la variable familia nos saldrían miles de columna
# con una tabla que ni siquiera somos capaces de visualizar, hemos decidido elimin
```

Out[22]:
```
array([[0., 1., 0., ..., 1., 1., 0.],
       [1., 0., 0., ..., 5., 0., 1.],
       [0., 1., 0., ..., 0., 1., 0.],
       ...,
       [1., 0., 0., ..., 6., 0., 1.],
       [0., 1., 0., ..., 4., 1., 0.],
       [0., 1., 0., ..., 4., 0., 1.]])
```

In [23]:
```
datos4.head()
```

Out[23]:

	FAMILIA	HomePlanet	CryoSleep	CUBIERTA/PLANTA	LADO	Age	VIP	Transported
0	0001	Europa	False	B	P	39.0	False	False
1	0002	Earth	False	F	S	24.0	False	True
2	0003	Europa	False	A	S	58.0	True	False
3	0003	Europa	False	A	S	33.0	False	False
4	0004	Earth	False	F	S	16.0	False	True

In [24]:
```
#datos5[:200,:31 ]
print(datos5[:5, : ])
```

```
[[0. 1. 0. 1. 0. 1. 1. 0. 1. 0. 1. 1. 0.]
 [1. 0. 0. 1. 0. 1. 1. 0. 0. 1. 5. 0. 1.]
 [0. 1. 0. 1. 0. 2. 0. 1. 0. 1. 0. 1. 0.]
 [0. 1. 0. 1. 0. 1. 1. 0. 0. 1. 0. 1. 0.]
 [1. 0. 0. 1. 0. 0. 1. 0. 0. 1. 5. 0. 1.]]
```

In [25]:
```
datos4.columns
```

Out[25]:
```
Index(['FAMILIA', 'HomePlanet', 'CryoSleep', 'CUBIERTA/PLANTA', 'LADO', 'Age',
       'VIP', 'Transported'],
      dtype='object')
```

In [26]:
```
#Al aplicar onehotencoding con dos posibles categorias, nos crea dos columnas, mien
#una binarizada.
#Para conseguirlo realizamos ahora estos pasos, y finalmente eliminamos una de las


colnames = ['HomePlanet=Tierra', 'HomePlanet=Europa', 'HomePlanet= Mars', 'CryoSle
       'VIP=False', '2',  'LADO= P', 'LADO= S',  'CUBIERTA/PLANTA', 'Transported=F

datos51 = pd.DataFrame(datos5, columns=colnames)
datos51
```

Out[26]:

	HomePlanet=Tierra	HomePlanet=Europa	HomePlanet= Mars	CryoSleep=False	2	Age	VIP=Fa
0	0.0	1.0	0.0	1.0	0.0	1.0	
1	1.0	0.0	0.0	1.0	0.0	1.0	
2	0.0	1.0	0.0	1.0	0.0	2.0	
3	0.0	1.0	0.0	1.0	0.0	1.0	
4	1.0	0.0	0.0	1.0	0.0	0.0	
...	...	...	...	...	...	...	
8688	0.0	1.0	0.0	1.0	0.0	2.0	
8689	1.0	0.0	0.0	0.0	1.0	0.0	
8690	1.0	0.0	0.0	1.0	0.0	1.0	
8691	0.0	1.0	0.0	1.0	0.0	1.0	
8692	0.0	1.0	0.0	1.0	0.0	2.0	

8693 rows × 13 columns

In [27]:

```
datos6pd=datos51[['HomePlanet=Tierra', 'HomePlanet=Europa', 'HomePlanet= Mars', 'Cı
       'VIP=False',  'LADO= P', 'LADO= S',  'CUBIERTA/PLANTA', 'Transported=False'
datos6pd
```

Out[27]:

	HomePlanet=Tierra	HomePlanet=Europa	HomePlanet= Mars	CryoSleep=False	Age	VIP=False
0	0.0	1.0	0.0	1.0	1.0	1.0
1	1.0	0.0	0.0	1.0	1.0	1.0
2	0.0	1.0	0.0	1.0	2.0	0.0
3	0.0	1.0	0.0	1.0	1.0	1.0
4	1.0	0.0	0.0	1.0	0.0	1.0
...	...	...	...	...	...	...
8688	0.0	1.0	0.0	1.0	2.0	0.0
8689	1.0	0.0	0.0	0.0	0.0	1.0
8690	1.0	0.0	0.0	1.0	1.0	1.0
8691	0.0	1.0	0.0	1.0	1.0	1.0
8692	0.0	1.0	0.0	1.0	2.0	1.0

8693 rows × 10 columns

In [28]:

```
#NORMALIZACION//ESCALADO DE DATOS
from sklearn.preprocessing import MinMaxScaler
```

In [29]:

```
#paso la tabla de datos de pamda DATOS6 a matriz de numpy
# para aplicar la normalizacion
```

```
datos6np=datos6pd.to_numpy()
datos6np
```

Out[29]:
```
array([[0., 1., 0., ..., 0., 1., 1.],
       [1., 0., 0., ..., 1., 5., 0.],
       [0., 1., 0., ..., 1., 0., 1.],
       ...,
       [1., 0., 0., ..., 1., 6., 0.],
       [0., 1., 0., ..., 1., 4., 1.],
       [0., 1., 0., ..., 1., 4., 0.]])
```

In [30]:
```
#Voy a normalizar todos los datos (independientemente del clasificador que aplique

scaler = MinMaxScaler(feature_range=(0, 1))
scaler.fit(datos6np)
datos6np_escalado = scaler.transform(datos6np)
print(datos6np_escalado[:6,])
```

```
[[0.         1.         0.         1.         0.33333333 1.
  1.         0.         0.14285714 1.        ]
 [1.         0.         0.         1.         0.33333333 1.
  0.         1.         0.71428571 0.        ]
 [0.         1.         0.         1.         0.66666667 0.
  0.         1.         0.         1.        ]
 [0.         1.         0.         1.         0.33333333 1.
  0.         1.         0.         1.        ]
 [1.         0.         0.         1.         0.         1.
  0.         1.         0.71428571 0.        ]
 [1.         0.         0.         1.         0.66666667 1.
  1.         0.         0.71428571 0.        ]]
```

In [31]:
```
datosEpd = pd.DataFrame(datos6np_escalado, columns= datos6pd.columns)
datosEpd
```

Out[31]:

	HomePlanet=Tierra	HomePlanet=Europa	HomePlanet=Mars	CryoSleep=False	Age	VIP=Fal
0	0.0	1.0	0.0	1.0	0.333333	
1	1.0	0.0	0.0	1.0	0.333333	
2	0.0	1.0	0.0	1.0	0.666667	
3	0.0	1.0	0.0	1.0	0.333333	
4	1.0	0.0	0.0	1.0	0.000000	
...	...	...	...	...	...	
8688	0.0	1.0	0.0	1.0	0.666667	
8689	1.0	0.0	0.0	0.0	0.000000	
8690	1.0	0.0	0.0	1.0	0.333333	
8691	0.0	1.0	0.0	1.0	0.333333	
8692	0.0	1.0	0.0	1.0	0.666667	

8693 rows × 10 columns

SELECCION DE CARACTERÍSTICAS

1)Matriz de correlación

2)Método de envoltura

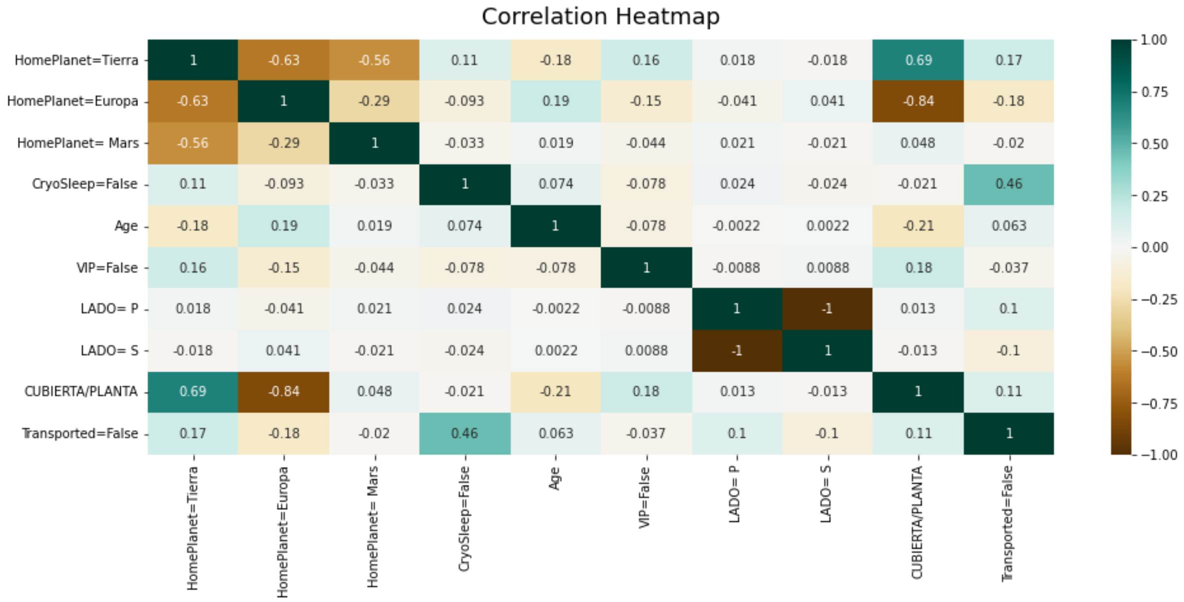
In [32]:
```
#SELECCION DE CARACTERISTICAS ---> Matriz de confusion

#Nustro objetivo aplicando la matriz de correlacion de las vraibles, es tratar de e
#y hacernos una idea de que variables tienen una mayor influencia lineal con la var



import seaborn as sns
import matplotlib.pyplot as plt


plt.figure(figsize=(16, 6))
heatmap = sns.heatmap(datosEpd.corr(),
                      vmin=-1, vmax=1, annot=True, cmap='BrBG') # method='spearman
heatmap.set_title('Correlation Heatmap', fontdict={'fontsize':18}, pad=12);
```



In [33]:
```
#OBSERVACIONES

# En la matriz de confusion podemos apreciar que la variables "LADO=X" son totalmen
# para ya que no nos proporciona ningún tipo de información (y hacemos más compacto

#Por otro lado, parece ser que la variable predictora que más influye es si el paso
# mientras que lo que menos influye es si proviene de marte o no. Aunque incluso si
# ya que podría existir una más comleja y NO lineal.

#A partir de esto, podemos declinarnos respecto a la sospecha inicial del visualiza
# mientras que la teoría genética dista más y parece ser que no interviene demasiad


datosEpd= datosEpd.drop(columns= 'LADO= S')
datosEpd
```

Out[33]:

	HomePlanet=Tierra	HomePlanet=Europa	HomePlanet=Mars	CryoSleep=False	Age	VIP=Fal
0	0.0	1.0	0.0	1.0	0.333333	
1	1.0	0.0	0.0	1.0	0.333333	
2	0.0	1.0	0.0	1.0	0.666667	(
3	0.0	1.0	0.0	1.0	0.333333	
4	1.0	0.0	0.0	1.0	0.000000	
...	...	...	...	...	...	
8688	0.0	1.0	0.0	1.0	0.666667	(
8689	1.0	0.0	0.0	0.0	0.000000	
8690	1.0	0.0	0.0	1.0	0.333333	
8691	0.0	1.0	0.0	1.0	0.333333	
8692	0.0	1.0	0.0	1.0	0.666667	

8693 rows × 9 columns

In [34]:

```
#METODO DE ENVOLTURA
```

In [35]:

```
#Lo que necesitamos para hacerlo

X_datosEpd= datosEpd.drop(columns='Transported=False')

X_datosEnp=X_datosEpd.to_numpy()

Y_datosEpd= datosEpd[['Transported=False']]

Y_datosEnp=Y_datosEpd.to_numpy()

from sklearn.model_selection import StratifiedKFold
from sklearn.model_selection import cross_val_score
from sklearn.tree import DecisionTreeClassifier

strat_cv = StratifiedKFold(5, shuffle=True, random_state=2345)

dt = DecisionTreeClassifier(random_state=2345)

cross_val_score(dt, X_datosEnp, Y_datosEnp, cv=strat_cv, scoring='balanced_accurac
```

Out[35]:

```
array([0.72346717, 0.7330156 , 0.71822701, 0.72431584, 0.73115709])
```

In [36]:

```
#!pip install mlxtend

from mlxtend.feature_selection import SequentialFeatureSelector as SFS

dt = DecisionTreeClassifier(random_state=2354)

sbs = SFS(dt, k_features=1, forward=False, floating=False,
          scoring='balanced_accuracy',cv=strat_cv) #verbose=2

sbs = sbs.fit(X_datosEpd, Y_datosEpd)
```

In [37]:
```
sbs.subsets_
```

Out[37]:
```
{8: {'feature_idx': (0, 1, 2, 3, 4, 5, 6, 7),
  'cv_scores': array([0.72346717, 0.7330156 , 0.71822701, 0.72431584, 0.7311570
9]),
  'avg_score': 0.7260365437395454,
  'feature_names': ('HomePlanet=Tierra',
   'HomePlanet=Europa',
   'HomePlanet= Mars',
   'CryoSleep=False',
   'Age',
   'VIP=False',
   'LADO= P',
   'CUBIERTA/PLANTA')},
 7: {'feature_idx': (0, 1, 2, 3, 4, 6, 7),
  'cv_scores': array([0.72463452, 0.73419155, 0.7205703 , 0.72380003, 0.7317285
2]),
  'avg_score': 0.726984984190981,
  'feature_names': ('HomePlanet=Tierra',
   'HomePlanet=Europa',
   'HomePlanet= Mars',
   'CryoSleep=False',
   'Age',
   'LADO= P',
   'CUBIERTA/PLANTA')},
 6: {'feature_idx': (0, 1, 2, 3, 4, 7),
  'cv_scores': array([0.72374231, 0.73755271, 0.72228792, 0.72076875, 0.7355623
2]),
  'avg_score': 0.7279828022969375,
  'feature_names': ('HomePlanet=Tierra',
   'HomePlanet=Europa',
   'HomePlanet= Mars',
   'CryoSleep=False',
   'Age',
   'CUBIERTA/PLANTA')},
 5: {'feature_idx': (0, 1, 3, 4, 7),
  'cv_scores': array([0.72374231, 0.73755271, 0.72228792, 0.72076875, 0.7355623
2]),
  'avg_score': 0.7279828022969375,
  'feature_names': ('HomePlanet=Tierra',
   'HomePlanet=Europa',
   'CryoSleep=False',
   'Age',
   'CUBIERTA/PLANTA')},
 4: {'feature_idx': (0, 3, 4, 7),
  'cv_scores': array([0.72368212, 0.7334713 , 0.72279851, 0.7270783 , 0.7314828
7]),
  'avg_score': 0.727702619164779,
  'feature_names': ('HomePlanet=Tierra',
   'CryoSleep=False',
   'Age',
   'CUBIERTA/PLANTA')},
 3: {'feature_idx': (0, 3, 4),
  'cv_scores': array([0.71728321, 0.72996926, 0.71981566, 0.72761794, 0.7216017
2]),
  'avg_score': 0.72325755873676,
  'feature_names': ('HomePlanet=Tierra', 'CryoSleep=False', 'Age')},
 2: {'feature_idx': (0, 3),
  'cv_scores': array([0.71812053, 0.72741631, 0.71258472, 0.72551498, 0.7132766
1]),
  'avg_score': 0.7193826296562531,
  'feature_names': ('HomePlanet=Tierra', 'CryoSleep=False')},
 1: {'feature_idx': (3,),
  'cv_scores': array([0.71812053, 0.72741631, 0.71258472, 0.72551498, 0.7132766
1]),
```

```
 'avg_score': 0.7193826296562531,
 'feature_names': ('CryoSleep=False',)}}
```

In [38]:

```
#Observacion

# # A través de los rendimientos de los árboles de decision (parecido a lo que hab
# mejor rendimiento lo consigue sin las variables preditoras VIP y LADO

# Estas dos variables en la matriz de correlación también tienen una muy baja punt
# con las que son más bajas como por ejemplo MARS, esto parece significar que MARS
# la variable respuesta, ya que de alguna forma si la quitamos no mejora el rendim
# evidenetmente si tuvieramos 800000 pasajeros en vez de 8000 este tipo de afirmac

#Aunque hemos decidio no quitarlas para seguir confirmando nuestras sospechas apli
# del siguiente árbol que usaremos (knn)
```

In [39]:

```
from sklearn.neighbors import KNeighborsClassifier

knn_Viaje = KNeighborsClassifier(n_neighbors=5, metric='euclidean')

sbs2 = SFS(knn_Viaje, k_features=1, forward=False, floating=False,
          scoring='balanced_accuracy',cv=strat_cv) #verbose=2

sbs2 = sbs2.fit(X_datosEpd, Y_datosEpd)
sbs2.subsets_
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

Out[39]:

```
{8: {'feature_idx': (0, 1, 2, 3, 4, 5, 6, 7),
  'cv_scores': array([0.65166444, 0.68606909, 0.67452989, 0.65410892, 0.6899341
2]),
  'avg_score': 0.6712612922805274,
  'feature_names': ('HomePlanet=Tierra',
   'HomePlanet=Europa',
   'HomePlanet= Mars',
   'CryoSleep=False',
   'Age',
   'VIP=False',
   'LADO= P',
   'CUBIERTA/PLANTA')},
 7: {'feature_idx': (0, 1, 2, 3, 4, 6, 7),
  'cv_scores': array([0.65165585, 0.68376879, 0.68741369, 0.65817249, 0.6895374
9]),
  'avg_score': 0.674109661453432,
  'feature_names': ('HomePlanet=Tierra',
   'HomePlanet=Europa',
   'HomePlanet= Mars',
   'CryoSleep=False',
   'Age',
   'LADO= P',
   'CUBIERTA/PLANTA')},
 6: {'feature_idx': (1, 2, 3, 4, 6, 7),
  'cv_scores': array([0.66154291, 0.6994238 , 0.68664516, 0.66371991, 0.6812991
2]),
  'avg_score': 0.6785261806876753,
  'feature_names': ('HomePlanet=Europa',
   'HomePlanet= Mars',
   'CryoSleep=False',
   'Age',
   'LADO= P',
   'CUBIERTA/PLANTA')},
 5: {'feature_idx': (1, 2, 3, 6, 7),
  'cv_scores': array([0.64501619, 0.66240932, 0.70232266, 0.68691806, 0.6821400
4]),
  'avg_score': 0.6757612547137937,
  'feature_names': ('HomePlanet=Europa',
   'HomePlanet= Mars',
   'CryoSleep=False',
   'LADO= P',
   'CUBIERTA/PLANTA')},
 4: {'feature_idx': (2, 3, 6, 7),
  'cv_scores': array([0.60639058, 0.64257832, 0.69952036, 0.66768019, 0.6506883
]),
  'avg_score': 0.6533715487547422,
  'feature_names': ('HomePlanet= Mars',
   'CryoSleep=False',
   'LADO= P',
   'CUBIERTA/PLANTA')},
 3: {'feature_idx': (2, 3, 7),
  'cv_scores': array([0.60857381, 0.69176495, 0.60099896, 0.61940142, 0.6091786
1]),
  'avg_score': 0.6259835512128311,
  'feature_names': ('HomePlanet= Mars', 'CryoSleep=False', 'CUBIERTA/PLANTA')},
 2: {'feature_idx': (2, 3),
  'cv_scores': array([0.71812053, 0.67873498, 0.56538001, 0.72551498, 0.6560053
]),
  'avg_score': 0.6687511579548883,
  'feature_names': ('HomePlanet= Mars', 'CryoSleep=False')},
 1: {'feature_idx': (3,),
  'cv_scores': array([0.71812053, 0.5       , 0.5       , 0.72551498, 0.7132766
1]),
```

```
 'avg_score': 0.6313824233037713,
 'feature_names': ('CryoSleep=False',)}}
```

In [40]:
```
#OBSERVACION

# El mejor rendimiento obtenido se encuentre en la sexta iteración, que nos indica
# Coinciden en que quitando VIP mejora el rendimiento, mientras que distan en la o

#Por lo que hemos decidido quitar la variable VIP de nuestro conjunto de dato

datosEpd= datosEpd.drop(columns= 'VIP=False')
datosEpd
```

Out[40]:

	HomePlanet=Tierra	HomePlanet=Europa	HomePlanet=Mars	CryoSleep=False	Age	LADO=P
0	0.0	1.0	0.0	1.0	0.333333	1.0
1	1.0	0.0	0.0	1.0	0.333333	0.0
2	0.0	1.0	0.0	1.0	0.666667	0.0
3	0.0	1.0	0.0	1.0	0.333333	0.0
4	1.0	0.0	0.0	1.0	0.000000	0.0
...	...	...	...	...	...	...
8688	0.0	1.0	0.0	1.0	0.666667	1.0
8689	1.0	0.0	0.0	0.0	0.000000	0.0
8690	1.0	0.0	0.0	1.0	0.333333	0.0
8691	0.0	1.0	0.0	1.0	0.333333	0.0
8692	0.0	1.0	0.0	1.0	0.666667	0.0

8693 rows × 8 columns

ENTRENAMIENTO DE MODELOS//OPTIMIZACION DE HIPERPARÁMETROS

--> APRENDIZAJE SUPERVISADO

0) Separacion de datos

1) ARBOLES DE DECISIÓN

1.1) Visualización gráfica del árbol

2) KNN (vecino más cercano)

3) PERCEPTRON MULTICAPA

4) RESUMEN FINAL

--> APRENDIZAJE NO SUPERVISADO

KMEANS

In [41]:
```
from sklearn.model_selection import train_test_split, cross_val_score, GridSearchC\
from sklearn.dummy import DummyClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score, balanced_accuracy_score, confusion_mat
```

In [42]:
```
#SEPARACION DE VARIABLES:
# como vamos a calcular los rendimientos (precisiones) de los clasificadores median
#Solo sepraráremos nuestro conjunto de datos en dos (uno para las variables predict
# eso no aplico train_test_split
# lo voy a separar a mano y despues lo voy a pasar a np


X_datosEpd= datosEpd.drop(columns='Transported=False')

X_datosEnp=X_datosEpd.to_numpy()

Y_datosEpd= datosEpd[['Transported=False']]

Y_datosEnp=Y_datosEpd.to_numpy()
```

ARBOLES DE DECISION

In [43]:
```
# Vamos a entrenar el modelo mediante validación cruzada directamente, por eso no 
# la separación de datos entre entrenamiento y prueba
```

In [44]:
```
# Creo una instancia de objeto de árbol de decisión con el que trabajaré.
# Primero aplicaré dos ejemplos: uno con los valores por defecto, y otro en el que
# de dos parámetros del clasificador (el minimo de hojas por nodo y la máxima profu
# Posterirmente, a través de gridsearch optimizaré los valores de estos para mejora
#Obteniendo el más óptimo posible



AD_dt = DecisionTreeClassifier(random_state=99)
```

In [45]:
```
AD_acc = cross_val_score(AD_dt, X_datosEnp, Y_datosEnp, cv=5)
AD_acc
```

Out[45]:
```
array([0.71075331, 0.73030477, 0.72742956, 0.72151899, 0.72957422])
```

In [46]:
```
# El rendimiento va a ser la media de los 5 conjuntos de entrenamiento
```

In [47]:
```
AD_acc.mean()
```

Out[47]:
```
0.7239161694319248
```

In [48]:
```
# Arbol de decisión con número mínimo de muestras requeridas para dividir un nodo 
#numero minimo de objetos igual a 2
```

In [49]:
```
AD_dt = DecisionTreeClassifier(random_state=99, max_depth = 4, min_samples_leaf = 
```

In [50]:
```
AD_acc = cross_val_score(AD_dt, X_datosEnp, Y_datosEnp, cv=5)
AD_acc
```
Out[50]:
```
array([0.71535365, 0.7239793 , 0.71650374, 0.72497123, 0.72497123])
```

In [51]:
```
AD_acc.mean()
```
Out[51]:
```
0.7211558300704544
```

In [52]:
```
# Optimización de hiperparámetros para algoritmo de árboles de decisión

# Optimizamos los mismos parámetros que probamos anteriormente al azar, y obtenemos
# la validación cruzada con precisión balanceada (ya que nos parece más justa que 
```

In [53]:
```
parameters = {'criterion':['gini', 'entropy'], 'max_depth':range(1,10), 'min_sampl

gcv_AD = GridSearchCV(AD_dt, parameters, cv=5, scoring='balanced_accuracy')
```

Se ha conseguido un rendimiento mejor

In [54]:
```
gcv_AD.fit(X_datosEpd, Y_datosEpd)
```
Out[54]:
```
GridSearchCV(cv=5,
             estimator=DecisionTreeClassifier(max_depth=4, min_samples_leaf=2,
                                              random_state=99),
             param_grid={'criterion': ['gini', 'entropy'],
                         'max_depth': range(1, 10),
                         'min_samples_leaf': [1, 5, 10, 20, 30]},
             scoring='balanced_accuracy')
```

In [55]:
```
gcv_AD.best_params_
```
Out[55]:
```
{'criterion': 'entropy', 'max_depth': 7, 'min_samples_leaf': 1}
```

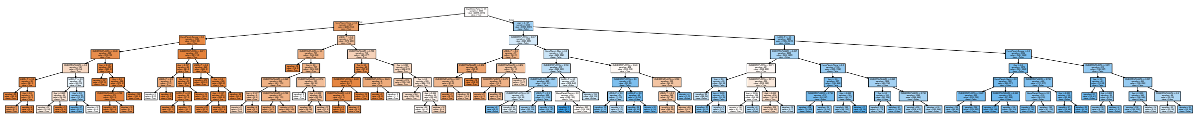
In [56]:
```
gcv_AD.best_score_
```
Out[56]:
```
0.7282601530334193
```

In [57]:
```
# Visualización del árbol de decision obtenido anteriormente.

from sklearn.tree import export_graphviz
export_graphviz(gcv_AD.best_estimator_, out_file="tree.dot", class_names=["True", 
                feature_names=['HomePlanet=Tierra', 'HomePlanet=Europa', 'HomePlan
                               'Age', 'LADO= P', 'CUBIERTA/PLANTA'], impurity=Fals
```

In [58]:
```
import graphviz

with open("tree.dot") as f:
    dot_graph = f.read()
display(graphviz.Source(dot_graph))
```



In [59]:
```
# RESUMEN de rendimientos

# Como curiosidad hemos usado la ayuda de chatgpt para hacer esta tabla

from tabulate import tabulate
```

```python
# Crea una lista de listas con los datos de la tabla
datos = [
    ["Por defecto", "72,391%"],
    ["MinHojas=2 y MaxProfundidad=4", "72,115%"],
    [ "MinHojas=1 y MaxProfundidad=7" , '72,826%' ]
]

# Imprime la tabla usando el formato "simple"
print(tabulate(datos, headers=["Parámetros", "Rendimiento"], tablefmt="simple"))
```

```
Parámetros                     Rendimiento
-----------------------------  -------------
Por defecto                    72,391%
MinHojas=2 y MaxProfundidad=4  72,115%
MinHojas=1 y MaxProfundidad=7  72,826%
```

KNN

In [60]:
```python
#Podemos aplicar satisfactoriamente este algoritmo porque en el preprocesado de los

#Creamos una instancia del clasificador usando distancia manhattam y con 5 vecinos


knn = KNeighborsClassifier(n_neighbors=5, metric='manhattan')
```

In [61]:
```python
CV_knn = cross_val_score(knn, X_datosEnp, Y_datosEnp, cv=5, scoring='balanced_accu
CV_knn
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

Out[61]:
```
array([0.69180132, 0.66598875, 0.68777282, 0.651561  , 0.67524383])
```

In [62]:
```python
CV_knn.mean()
```

Out[62]:
```
0.6744735452339
```

In [63]:
```python
# Optimización de hiperparámetros para algoritmo de Knn

# Optmizamos la forma de medir la distancias entre los individuos y el número de ve
# para observar sus variables respuesta)

#Usamos k impares ya que no existe el caso de empate, mientras que si cogiesemos un
```

In [64]:
```
# COMENTARIO DESTACABLE
# al principio optimizamos entre estos valores de k 'n_neighbors':[1, 3, 5, 7, 9, 1
#pero observamos al aumentarlos que mejoraba el rendimiento por lo que para no tard
# hemos decidido quitar los primeros valores k hasta encontrar el valor máximo de k


parameters_knn = {'n_neighbors':[17, 19, 21, 23, 25, 27, 29, 31, 33, 35], 'metric'

gcv_knn = GridSearchCV(knn, parameters_knn, cv=5, scoring='balanced_accuracy')
```

In [65]:
```
gcv_knn.fit(X_datosEnp, Y_datosEnp)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neighbors\_classification.py:19
8: DataConversionWarning: A column-vector y was passed when a 1d array was expecte
d. Please change the shape of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
```

Out[65]:
```
GridSearchCV(cv=5, estimator=KNeighborsClassifier(metric='manhattan'),
             param_grid={'metric': ['euclidean', 'manhattan'],
                         'n_neighbors': [17, 19, 21, 23, 25, 27, 29, 31, 33,
                                         35]},
             scoring='balanced_accuracy')
```

In [66]:
```
gcv_knn.best_params_
```

Out[66]:
```
{'metric': 'euclidean', 'n_neighbors': 33}
```

In [67]:
```
gcv_knn.best_score_
```

Out[67]:
```
0.7236462832743378
```

In [68]:
```
#RESUMEN de rendimientos obtenidos

datos = [
    ["Manhattan y k=5", "67,447%"],
    ["Euclidean y k=33", "72,364%"]
]

# Imprime la tabla usando el formato "simple"
print(tabulate(datos, headers=["Parámetros", "Rendimiento"], tablefmt="simple"))
```

```
Parámetros        Rendimiento
----------------  -------------
Manhattan y k=5   67,447%
Euclidean y k=33  72,364%
```

Perceptrón multicapa

In [69]:
```
from sklearn.neural_network import MLPClassifier

# Creamos  una instancia de red neuronal formada por una sola capa intermedia compu
# computación de 200 épocas
# Que vamos a entrenar y validar de nuevo con la técnica de validación cruzada (par

perceptronMC = MLPClassifier(random_state=99, hidden_layer_sizes=(100,), max_iter=
#mlp_perceptron.fit(X_datosEnp, Y_datosEnp)
```

In [70]:
```
perceptronCV=cross_val_score(perceptronMC, X_datosEnp, Y_datosEnp, cv=5, scoring='
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
```

In [71]:
```
#RENDIMIENTO
perceptronCV.mean()
```

Out[71]:
```
0.7245424852548681
```

In [72]:
```
# Optimización de hiperparámetros
```

In [73]:
```
# Optimizamos la topologíaRed, la funcion de activacion, y el algoritmo de nrtenam
# Probamos dos topologías de red, una de una capa con 100 neuronas (intermedia) y d
# por jugar un poco y ver como varían los rendimientos

parametersMC = {'hidden_layer_sizes':[(100,), (50,50)],'activation':['identity', 'l
                'solver':['lbfgs', 'sgd', 'adam']}

gcvMC = GridSearchCV(perceptronMC, parametersMC, cv=5, scoring='balanced_accuracy'
```

In [74]:
```
gcvMC.fit(X_datosEnp, Y_datosEnp)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
```

```
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
```

```
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
```

```
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
```

```
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
```

```
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
```

```
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
```

```
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
```

```
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
```

```
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
```

```
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.
```

```
Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
```

```
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

Out[74]:
```
GridSearchCV(cv=5, estimator=MLPClassifier(random_state=99),
             param_grid={'activation': ['identity', 'logistic', 'tanh', 'relu'],
                         'hidden_layer_sizes': [(100,), (50, 50)],
                         'solver': ['lbfgs', 'sgd', 'adam']},
             scoring='balanced_accuracy')
```

In [75]:
```
#El mejor rendimiento se consigue con estos parámetros, y en efecto con la segunda

gcvMC.best_params_
```

Out[75]:
```
{'activation': 'tanh', 'hidden_layer_sizes': (50, 50), 'solver': 'lbfgs'}
```

In [76]:
```
#RENDIMIENTO
gcvMC.best_score_
```

Out[76]:
```
0.7272561779136327
```

In [77]:
```
#Por seguir jugando con las topologías, comparamos la de mejor rendimiento de antes
# y 25 por capa. Y quitamos la optimización de los algoritmos de entrenamiento para
# (ya que anteriormente fue muy largo)

parametersMC2 = {'hidden_layer_sizes':[(50,50), (25,25,25)],'activation':['identity

gcvMC2 = GridSearchCV(perceptronMC, parametersMC, cv=5, scoring='balanced_accuracy
```

In [78]:
```
gcvMC2.fit(X_datosEnp, Y_datosEnp)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
```

```
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
```

```
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
```

```
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
```

```
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
```

```
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
```

```
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
```

```
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

```
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
```

```
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
```

```
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
```

```
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.
```

```
Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:692: ConvergenceWarning: Stochastic Optimizer: Maximum iterations (200)
reached and the optimization hasn't converged yet.
  warnings.warn(
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
```

```
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:1109: DataConversionWarning: A column-vector y was passed when a 1d arra
y was expected. Please change the shape of y to (n_samples, ), for example using r
avel().
  y = column_or_1d(y, warn=True)
C:\Users\farme\anaconda3\lib\site-packages\sklearn\neural_network\_multilayer_perc
eptron.py:549: ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
  self.n_iter_ = _check_optimize_result("lbfgs", opt_res, self.max_iter)
```

Out[78]:

```
GridSearchCV(cv=5, estimator=MLPClassifier(random_state=99),
             param_grid={'activation': ['identity', 'logistic', 'tanh', 'relu'],
                         'hidden_layer_sizes': [(100,), (50, 50)],
                         'solver': ['lbfgs', 'sgd', 'adam']},
             scoring='balanced_accuracy')
```

In [79]:

```
# Efectivamente encontramos mejor rendimiento en la tercera topología probada

gcvMC2.best_params_
```

Out[79]:

```
{'activation': 'tanh', 'hidden_layer_sizes': (50, 50), 'solver': 'lbfgs'}
```

In [80]:

```
gcvMC2.best_score_
```

Out[80]:

```
0.7272561779136327
```

In [113…

```
#RESUMEN de rendimientos obtenidos

datos = [
    ["fActivacion=relu, TopologíaRed=(100,), N_epocas=200, A_Entrenamiento=lbfgs" 
    ["fActivacion=tanh, TopologíaRed=(50, 50), N_epocas= 200 , A_Entrenamiento=lbf
    ["fActivacion=relu, TopologíaRed=(25, 25, 25), N_epocas= 200, A_Entrenamiento=
]

# Imprime la tabla usando el formato "simple"
print(tabulate(datos, headers=["Parámetros", "Rendimiento"], tablefmt="simple"))
```

```
Parámetros
Rendimiento
--------------------------------------------------------------------------------
-------------
fActivacion=relu, TopologíaRed=(100,), N_epocas=200, A_Entrenamiento=lbfgs
72,454%
fActivacion=tanh, TopologíaRed=(50, 50), N_epocas= 200 , A_Entrenamiento=lbfgs
72,725%
fActivacion=relu, TopologíaRed=(25, 25, 25), N_epocas= 200, A_Entrenamiento=lbfgs
72,884%
```

Resumen final

In [119…

```python
# Resumen de todos los MEJORES rendimientos obtenidos de los clasificadores

datos = [
    ["Arboles de Decisión" , "MinHojas=1 y MaxProfundidad=7" , '72,826%'],
    ["KNN", "Euclidean y k=33", "72,364%"],
    ["Perceptrón Multicapa (25,25,25)", "fActivacion=relu,  N_epocas= 200, A_Entre
]

# Imprime la tabla usando el formato "simple"
print(tabulate(datos, headers=["Clasificador", "Parámetros", "Rendimiento"], table
```

```
Clasificador                     Parámetros
Rendimiento
-------------------------------  -------------------------------------------------
------  -------------
Arboles de Decisión              MinHojas=1 y MaxProfundidad=7
72,826%
KNN                              Euclidean y k=33
72,364%
Perceptrón Multicapa (25,25,25)  fActivacion=relu,  N_epocas= 200, A_Entrenamiento
=lbfgs  72,884%
```

APRENDIZAJE NO SUPERVISADO

K MEANS

1) Historia

2) Preprocesado de datos

3) Aplicación del clasificador

In [130…

```python
# HISTORIA

# La empresa organizadora del viaje espacial, pidió antes de saber el triste desti
# que analisaramos a los tripulantes de la nave para  poder decidir que tipo de ofe
# a la llegada a su destino final.
# Para ello, decidimos aplicar kmeans, un algoritmo de aprendizaje no supervisado,
# distintos grupos según sus consumo en la nave y según su edad.
# Personificando posteriormente a estos grupos en un individuo "medio" con el que s
# ofrecer para hacer un mejor negocio. (como por ejemplo puede ser los hoteles para
# por que tiendas pasar en las rutas turísticas...)
```

In [115…

```python
datosKMeans = df[['Age', 'VIP', 'RoomService', 'FoodCourt', 'ShoppingMall', 'Spa',
```

In [116…

```python
datosKMeans
```

Out[116]:

	Age	VIP	RoomService	FoodCourt	ShoppingMall	Spa	VRDeck
0	39.0	False	0.0	0.0	0.0	0.0	0.0
1	24.0	False	109.0	9.0	25.0	549.0	44.0
2	58.0	True	43.0	3576.0	0.0	6715.0	49.0
3	33.0	False	0.0	1283.0	371.0	3329.0	193.0
4	16.0	False	303.0	70.0	151.0	565.0	2.0
...	...	...	...	...	...	...	...
8688	41.0	True	0.0	6819.0	0.0	1643.0	74.0
8689	18.0	False	0.0	0.0	0.0	0.0	0.0
8690	26.0	False	0.0	0.0	1872.0	1.0	0.0
8691	32.0	False	0.0	1049.0	0.0	353.0	3235.0
8692	44.0	False	126.0	4688.0	0.0	0.0	12.0

8693 rows × 7 columns

In [120…

```
#Realizamos LA IMPUTACION a través de transformaciones sobre las columnas
from sklearn.pipeline import Pipeline

edad = Pipeline([("media",SimpleImputer(strategy='mean')),
                   ("A",KBinsDiscretizer(4, strategy='uniform', encode='ordinal'))
VIP = Pipeline([("modaV",SimpleImputer(strategy='most_frequent')),
                   ("VIP",OneHotEncoder())])
PLDineroGastado = Pipeline([("media2",SimpleImputer(strategy='mean'))])

ct = ColumnTransformer([
    ("media",edad,['Age']),
    ("modaV",VIP,['VIP']),
    ("me1",PLDineroGastado,['RoomService']),
    ("me2",PLDineroGastado,['FoodCourt']),
    ("me3",PLDineroGastado,['ShoppingMall']),
    ("me4",PLDineroGastado,['Spa']),
    ("me5",PLDineroGastado,['VRDeck'])
    ]) #para la ultima variable lo hacemos así, pero podriamos hacerlo igual que en

datosKMeans2 = ct.fit_transform(datosKMeans)
```

In [121…

```
datosKMeans2
```

Out[121]:

```
array([[1.000e+00, 1.000e+00, 0.000e+00, ..., 0.000e+00, 0.000e+00,
        0.000e+00],
       [1.000e+00, 1.000e+00, 0.000e+00, ..., 2.500e+01, 5.490e+02,
        4.400e+01],
       [2.000e+00, 0.000e+00, 1.000e+00, ..., 0.000e+00, 6.715e+03,
        4.900e+01],
       ...,
       [1.000e+00, 1.000e+00, 0.000e+00, ..., 1.872e+03, 1.000e+00,
        0.000e+00],
       [1.000e+00, 1.000e+00, 0.000e+00, ..., 0.000e+00, 3.530e+02,
        3.235e+03],
       [2.000e+00, 1.000e+00, 0.000e+00, ..., 0.000e+00, 0.000e+00,
        1.200e+01]])
```

In [122…

```
scaler = MinMaxScaler(feature_range=(0, 1))
scaler.fit(datosKMeans2)
```

```
datosKMeans2_escalado = scaler.transform(datosKMeans2)
print(datosKMeans2_escalado[:6,])
```

```
[[3.33333333e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00
  0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00]
 [3.33333333e-01 1.00000000e+00 0.00000000e+00 7.60801284e-03
  3.01881729e-04 1.06419207e-03 2.45001785e-02 1.82322960e-03]
 [6.66666667e-01 0.00000000e+00 1.00000000e+00 3.00132617e-03
  1.19947674e-01 0.00000000e+00 2.99669761e-01 2.03041478e-03]
 [3.33333333e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00
  4.30349177e-02 1.57926103e-02 1.48563013e-01 7.99734803e-03]
 [0.00000000e+00 1.00000000e+00 0.00000000e+00 2.11488797e-02
  2.34796901e-03 6.42772007e-03 2.52142092e-02 8.28740728e-05]
 [6.66666667e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00
  1.62009861e-02 0.00000000e+00 1.29864334e-02 0.00000000e+00]]
```

In [126…

```
datosKMeans2_escalado = pd.DataFrame(datosKMeans2_escalado, columns=['Age', 'VIP=F
datosKMeans2_escalado
```

Out[126]:

	Age	VIP=FALSE	VIP=TRUE	RoomService	FoodCourt	ShoppingMall	Spa	VRDe
0	0.333333	1.0	0.0	0.000000	0.000000	0.000000	0.000000	0.0000
1	0.333333	1.0	0.0	0.007608	0.000302	0.001064	0.024500	0.0018
2	0.666667	0.0	1.0	0.003001	0.119948	0.000000	0.299670	0.0020
3	0.333333	1.0	0.0	0.000000	0.043035	0.015793	0.148563	0.0079
4	0.000000	1.0	0.0	0.021149	0.002348	0.006428	0.025214	0.0000
...	...	...	...	...	...	...	...	
8688	0.666667	0.0	1.0	0.000000	0.228726	0.000000	0.073322	0.0030
8689	0.000000	1.0	0.0	0.000000	0.000000	0.000000	0.000000	0.0000
8690	0.333333	1.0	0.0	0.000000	0.000000	0.079687	0.000045	0.0000
8691	0.333333	1.0	0.0	0.000000	0.035186	0.000000	0.015753	0.1340
8692	0.666667	1.0	0.0	0.008795	0.157247	0.000000	0.000000	0.0004

8693 rows × 8 columns

In [133…

```
datosKMeans3=datosKMeans2_escalado.drop(columns='VIP=TRUE')
datosKMeans3
```

Out[133]:

	Age	VIP=FALSE	RoomService	FoodCourt	ShoppingMall	Spa	VRDeck
0	0.333333	1.0	0.000000	0.000000	0.000000	0.000000	0.000000
1	0.333333	1.0	0.007608	0.000302	0.001064	0.024500	0.001823
2	0.666667	0.0	0.003001	0.119948	0.000000	0.299670	0.002030
3	0.333333	1.0	0.000000	0.043035	0.015793	0.148563	0.007997
4	0.000000	1.0	0.021149	0.002348	0.006428	0.025214	0.000083
...	...	...	...	...	...	...	...
8688	0.666667	0.0	0.000000	0.228726	0.000000	0.073322	0.003066
8689	0.000000	1.0	0.000000	0.000000	0.000000	0.000000	0.000000
8690	0.333333	1.0	0.000000	0.000000	0.079687	0.000045	0.000000
8691	0.333333	1.0	0.000000	0.035186	0.000000	0.015753	0.134049
8692	0.666667	1.0	0.008795	0.157247	0.000000	0.000000	0.000497

8693 rows × 7 columns

In [131…

```
# Creo una instancia del clasificador KMedias(Aprendizaje NO supervisado) con el qu

from sklearn.cluster import KMeans

Kmeans = KMeans(random_state=99, n_clusters=3)
#mlp_perceptron.fit(X_datosEnp, Y_datosEnp)
```

In [134…

```
# Ajustar los datos

Kmeans.fit(datosKMeans3)
```

Out[134]:

```
KMeans(n_clusters=3, random_state=99)
```

In [135…

```
# Obtener las etiquetas de los grupos asignados

Kmeans.labels_
```

Out[135]:

```
array([0, 0, 2, ..., 0, 0, 1])
```

In [139…

```
# Estos serían los individuos representativos de cada grupo y en los que se va a bo

Kmeans.cluster_centers_
```

Out[139]:

```
array([[ 2.26069652e-01,  1.00000000e+00,  1.48343399e-02,
         1.26860440e-02,  7.21033381e-03,  1.17529841e-02,
         1.11656536e-02],
       [ 7.11817168e-01,  1.00000000e+00,  1.69630085e-02,
         2.04866216e-02,  7.74521684e-03,  1.96450310e-02,
         1.39208917e-02],
       [ 4.57286432e-01, -3.33066907e-16,  3.27082998e-02,
         5.93898725e-02,  1.04660126e-02,  3.37465347e-02,
         5.03941868e-02]])
```