Reporte Solución Reto Titanic

Librerías y modulos utilizados

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.impute import KNNImputer
from sklearn import preprocessing
from sklearn.preprocessing import OneHotEncoder
from sklearn.preprocessing import LabelEncoder
from sklearn.tree import DecisionTreeClassifier
from sklearn import metrics
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
from sklearn.ensemble import RandomForestClassifier
from sklearn.datasets import make_classification
from sklearn import svm
from sklearn.linear_model import LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
sns.set_theme(style="darkgrid", palette="bright")
from sklearn.neural_network import MLPClassifier
from sklearn.model_selection import RandomizedSearchCV
from sklearn.model_selection import GridSearchCV
from sklearn.model_selection import KFold
import multiprocessing
import xgboost as xgb
from sklearn.ensemble import GradientBoostingClassifier
```

DATOS

Lectura de datos

In [2]:

```
# Carga de la base de datos
titanic = pd.read_csv("train.csv")
titanic.head()
```

Out[2]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN

Análisis de Variables

```
In [4]: titanic.corr()
```

Out[4]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	1.000000	-0.005007	-0.035144	0.036847	-0.057527	-0.001652	0.012658
Survived	-0.005007	1.000000	-0.338481	-0.077221	-0.035322	0.081629	0.257307
Pclass	-0.035144	-0.338481	1.000000	-0.369226	0.083081	0.018443	-0.549500
Age	0.036847	-0.077221	-0.369226	1.000000	-0.308247	-0.189119	0.096067
SibSp	-0.057527	-0.035322	0.083081	-0.308247	1.000000	0.414838	0.159651
Parch	-0.001652	0.081629	0.018443	-0.189119	0.414838	1.000000	0.216225
Fare	0.012658	0.257307	-0.549500	0.096067	0.159651	0.216225	1.000000

La variable objetivo al parecer no tiene una alta correlacion con las variables numericas del dataset, descartamos algunas de estas variables.

```
In [5]: titanic=titanic.drop('PassengerId',axis=1)
        titanic
```

Out[5]:

	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarkec
0	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S
...	...	...	...	...	...	...	...	...	...	...	..
886	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	NaN	S
887	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	B42	S
888	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.4500	NaN	S
889	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C148	C
890	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	NaN	C

891 rows × 11 columns

Valores Faltantes

In [6]:

```
# Número de datos nulos por feature
titanic.isnull().sum()
```

```
Out[6]: Survived      0
        Pclass        0
        Name          0
        Sex           0
        Age         177
        SibSp         0
        Parch         0
        Ticket        0
        Fare          0
        Cabin       687
        Embarked      2
        dtype: int64
```

Embarked

```
In [7]: titanic['Embarked'].value_counts()
```

```
Out[7]: S    644
        C    168
        Q     77
        Name: Embarked, dtype: int64
```

```
In [8]: titanic[titanic['Embarked'].isnull()==True]
```

Out[8]:

	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
61	1	1	Icard, Miss. Amelie	female	38.0	0	0	113572	80.0	B28	NaN
829	1	1	Stone, Mrs. George Nelson (Martha Evelyn)	female	62.0	0	0	113572	80.0	B28	NaN

```
In [9]: titanic['Embarked'].fillna(value='S',inplace=True)
```

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

```
Out[10]: Survived      0
         Pclass        0
         Name          0
         Sex           0
         Age         177
         SibSp         0
         Parch         0
         Ticket        0
         Fare          0
         Cabin       687
         Embarked      0
         dtype: int64
```

Debido al gran numero de valores faltantes en Age y en Cabin se hace un analisis un poco mas profundo sobre estas variables

Variables Dummy (Transformación de Datos)

In [11]:

```
#Encoder para variables categoricas
one_hot_encoder = OneHotEncoder(handle_unknown='ignore')

#Variable Female/Male
encoder_titanic = pd.DataFrame(one_hot_encoder.fit_transform(titanic[['Sex']]).toar
titanic =titanic.join(encoder_titanic)
titanic.rename(columns={0:'Female',
                        1:'Male'},
               inplace=True)

#Variable Embarked
label_encoder=LabelEncoder()
titanic['Embarked']=label_encoder.fit_transform(titanic['Embarked'])
```

In [12]:

```
titanic=titanic.drop('Sex',axis=1)
titanic
```

Out[12]:

	Survived	Pclass	Name	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Femal
0	0	3	Braund, Mr. Owen Harris	22.0	1	0	A/5 21171	7.2500	NaN	2	0.
1	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	38.0	1	0	PC 17599	71.2833	C85	0	1.
2	1	3	Heikkinen, Miss. Laina	26.0	0	0	STON/O2. 3101282	7.9250	NaN	2	1.
3	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	35.0	1	0	113803	53.1000	C123	2	1.
4	0	3	Allen, Mr. William Henry	35.0	0	0	373450	8.0500	NaN	2	0.
...	...	...	...	...	...	...	...	...	...	...	
886	0	2	Montvila, Rev. Juozas	27.0	0	0	211536	13.0000	NaN	2	0.
887	1	1	Graham, Miss. Margaret Edith	19.0	0	0	112053	30.0000	B42	2	1.
888	0	3	Johnston, Miss. Catherine Helen "Carrie"	NaN	1	2	W./C. 6607	23.4500	NaN	2	1.
889	1	1	Behr, Mr. Karl Howell	26.0	0	0	111369	30.0000	C148	0	0.
890	0	3	Dooley, Mr. Patrick	32.0	0	0	370376	7.7500	NaN	1	0.

891 rows × 12 columns

Variable Name (Transformación)

In [13]:
```
#Creando nueva columna para la variable nombre
titanic['Name_Pref']=np.nan

#LLenado de la variable
lista_pref=['Mr.','Miss.','Mrs.','Master.','Dr.','Capt.','Mlle.','Col.','Rev.','Maj
for i in range(len(titanic)):
    for j in lista_pref:
        if j in titanic['Name'][i]:
            titanic['Name_Pref'][i]=j
```

```
c:\users\mariana\appdata\local\programs\python\python37\lib\site-packages\ipykernel
_launcher.py:9: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/
user_guide/indexing.html#returning-a-view-versus-a-copy
  if __name__ == '__main__':
c:\users\mariana\appdata\local\programs\python\python37\lib\site-packages\pandas\co
re\indexing.py:1732: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/
user_guide/indexing.html#returning-a-view-versus-a-copy
  self._setitem_single_block(indexer, value, name)
```

Limpieza de Datos y Selección de Variables

In [14]:
```
titanic['Name_Pref']=label_encoder.fit_transform(titanic['Name_Pref'])
titanic=titanic.drop(['Name','Ticket'],axis=1)
titanic
```

Out[14]:

	Survived	Pclass	Age	SibSp	Parch	Fare	Cabin	Embarked	Female	Male	Name_Pref
0	0	3	22.0	1	0	7.2500	NaN	2	0.0	1.0	12
1	1	1	38.0	1	0	71.2833	C85	0	1.0	0.0	13
2	1	3	26.0	0	0	7.9250	NaN	2	1.0	0.0	9
3	1	1	35.0	1	0	53.1000	C123	2	1.0	0.0	13
4	0	3	35.0	0	0	8.0500	NaN	2	0.0	1.0	12
...	...	...	...	...	...	...	...	...	...	...	...
886	0	2	27.0	0	0	13.0000	NaN	2	0.0	1.0	15
887	1	1	19.0	0	0	30.0000	B42	2	1.0	0.0	9
888	0	3	NaN	1	2	23.4500	NaN	2	1.0	0.0	9
889	1	1	26.0	0	0	30.0000	C148	0	0.0	1.0	12
890	0	3	32.0	0	0	7.7500	NaN	1	0.0	1.0	12

891 rows × 11 columns

In [15]:
```
titanic.corr()
```

Out[15]:

	Survived	Pclass	Age	SibSp	Parch	Fare	Embarked	Female
Survived	1.000000	-0.338481	-0.077221	-0.035322	0.081629	0.257307	-0.167675	0.543351
Pclass	-0.338481	1.000000	-0.369226	0.083081	0.018443	-0.549500	0.162098	-0.131900
Age	-0.077221	-0.369226	1.000000	-0.308247	-0.189119	0.096067	-0.030394	-0.093254
SibSp	-0.035322	0.083081	-0.308247	1.000000	0.414838	0.159651	0.068230	0.114631
Parch	0.081629	0.018443	-0.189119	0.414838	1.000000	0.216225	0.039798	0.245489
Fare	0.257307	-0.549500	0.096067	0.159651	0.216225	1.000000	-0.224719	0.182333
Embarked	-0.167675	0.162098	-0.030394	0.068230	0.039798	-0.224719	1.000000	-0.108262
Female	0.543351	-0.131900	-0.093254	0.114631	0.245489	0.182333	-0.108262	1.000000
Male	-0.543351	0.131900	0.093254	-0.114631	-0.245489	-0.182333	0.108262	-1.000000
Name_Pref	-0.201345	0.045541	0.294111	-0.191786	-0.119721	-0.086359	0.066462	-0.256407

In [16]:

```
#Mantener Mayores Correlaciones (Pclass,Fare,Embarked,Female,Male,Name_Pref)
titanic=titanic.drop(['Age','SibSp','Parch'],axis=1)
titanic
```

Out[16]:

	Survived	Pclass	Fare	Cabin	Embarked	Female	Male	Name_Pref
0	0	3	7.2500	NaN	2	0.0	1.0	12
1	1	1	71.2833	C85	0	1.0	0.0	13
2	1	3	7.9250	NaN	2	1.0	0.0	9
3	1	1	53.1000	C123	2	1.0	0.0	13
4	0	3	8.0500	NaN	2	0.0	1.0	12
...	...	...	...	...	...	...	...	...
886	0	2	13.0000	NaN	2	0.0	1.0	15
887	1	1	30.0000	B42	2	1.0	0.0	9
888	0	3	23.4500	NaN	2	1.0	0.0	9
889	1	1	30.0000	C148	0	0.0	1.0	12
890	0	3	7.7500	NaN	1	0.0	1.0	12

891 rows × 8 columns

La variable edad puede ser llenada por medio de diversos metodos, como KKN, Regresion Lineal, Media, etc

Valores Faltantes P2

Edad

In [16]:
```
## Se elimina Edad
```

Cabin

Por el momento la variable Cabin sera eliminada

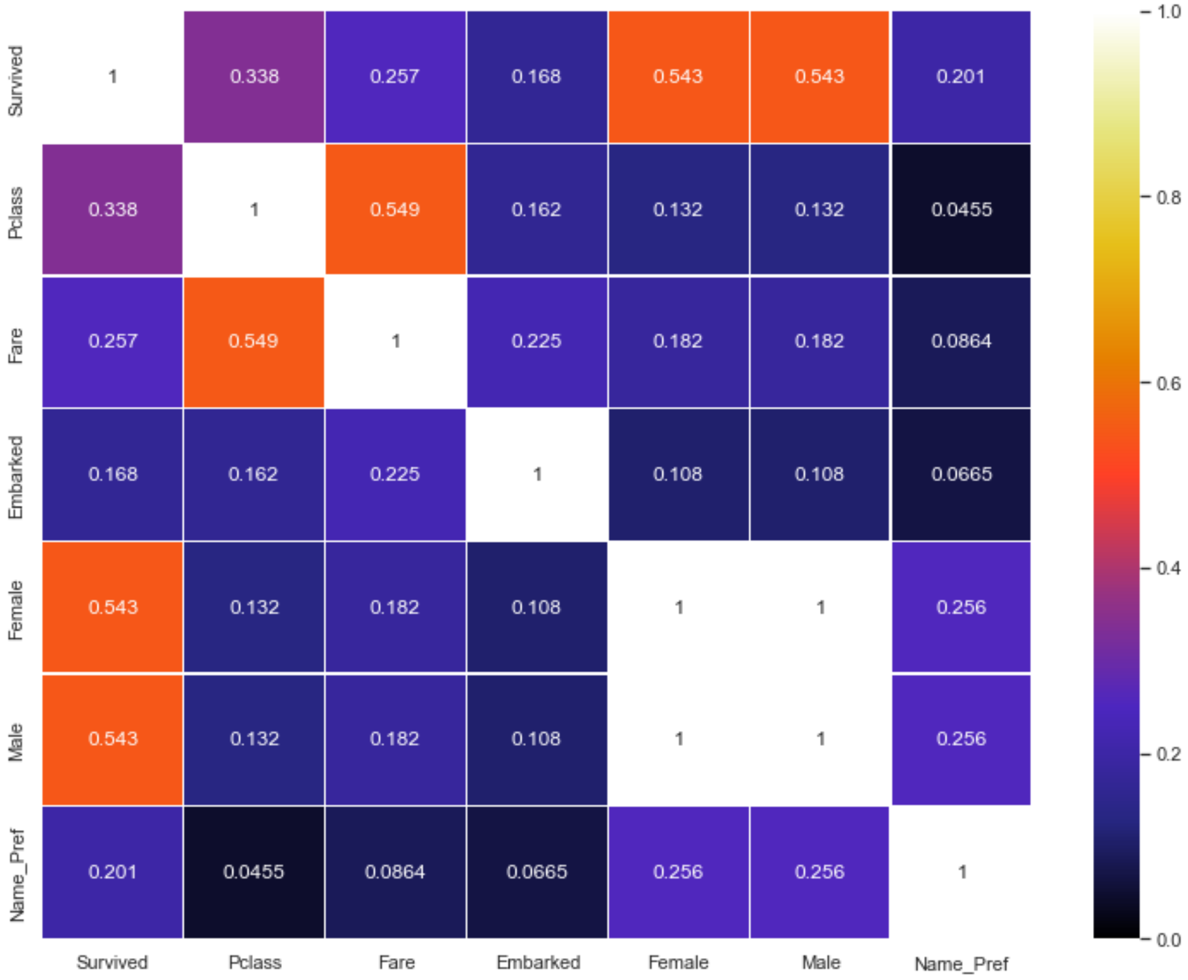
In [17]:
```
titanic=titanic.drop(['Cabin'],axis=1)
titanic
```

Out[17]:

	Survived	Pclass	Fare	Embarked	Female	Male	Name_Pref
0	0	3	7.2500	2	0.0	1.0	12
1	1	1	71.2833	0	1.0	0.0	13
2	1	3	7.9250	2	1.0	0.0	9
3	1	1	53.1000	2	1.0	0.0	13
4	0	3	8.0500	2	0.0	1.0	12
...	...	...	...	...	...	...	...
886	0	2	13.0000	2	0.0	1.0	15
887	1	1	30.0000	2	1.0	0.0	9
888	0	3	23.4500	2	1.0	0.0	9
889	1	1	30.0000	0	0.0	1.0	12
890	0	3	7.7500	1	0.0	1.0	12

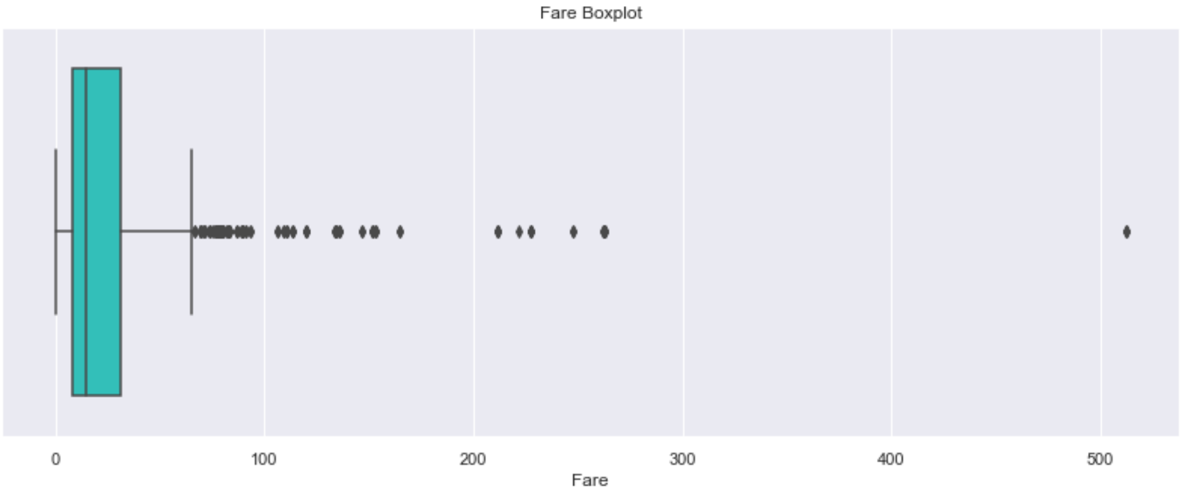
891 rows × 7 columns

In [39]:
```
sns.set(rc = {'figure.figsize':(13,10)})
ax = sns.heatmap(abs(titanic.corr()), vmin=0, vmax=1,annot=True,linewidths=.3,cmap=
plt.savefig('corr_matriz.png',dpi=96)
```



Outliers

```
In [54]: #Pensar Implementar Despues
         sns.set(rc = {'figure.figsize':(14,5)})
         sns.boxplot(x=titanic["Fare"],color='#1CD6CE').set(title='Fare Boxplot')
         plt.savefig('fareboxplot.png',dpi=120)
```



MODELADO Y EVALUACIÓN

Variable Predictora y Predictores

In [86]:

```
X = titanic.drop(['Survived'],axis=1)
y = titanic['Survived']
```

Datos de entrenamiento, validacion y testeo

In [56]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.10, random_st
```

Decision Tree

In [57]:

```
# Se guarda el modelo en una variable
decision_tree = DecisionTreeClassifier(criterion="entropy", max_depth=3)

# Se entrena el modelo de árbol de decisión
decision_tree = decision_tree.fit(X_train,y_train)
```

In [58]:

```
y_pred = decision_tree.predict(X_test)
```

In [59]:

```
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.8222222222222222
```

In [60]:

```
confusion_matrix(y_test, y_pred)
```

Out[60]:

```
array([[45,  9],
       [ 7, 29]], dtype=int64)
```

In [61]:

```
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.87      0.83      0.85        54
           1       0.76      0.81      0.78        36

    accuracy                           0.82        90
   macro avg       0.81      0.82      0.82        90
weighted avg       0.82      0.82      0.82        90
```

Random Forest

In [75]:

```
random_forest= RandomForestClassifier(max_depth=10, random_state=42,n_estimators=20
random_forest=random_forest.fit(X_train, y_train)
```

In [76]:

```
y_pred = random_forest.predict(X_test)
```

In [77]:

```
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.8222222222222222
```

In [78]:

```
confusion_matrix(y_test, y_pred)
```

Out[78]:

```
array([[44, 10],
       [ 6, 30]], dtype=int64)
```

In [79]:

```python
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.88      0.81      0.85        54
           1       0.75      0.83      0.79        36

    accuracy                           0.82        90
   macro avg       0.81      0.82      0.82        90
weighted avg       0.83      0.82      0.82        90
```

SVM

In [80]:

```python
s_vm= svm.SVC(kernel='linear')
s_vm=s_vm.fit(X_train, y_train)
```

In [81]:

```python
y_pred = s_vm.predict(X_test)
```

In [82]:

```python
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.8111111111111111
```

KNN

In [83]:

```python
neigh = KNeighborsClassifier(n_neighbors=7)
neigh = neigh.fit(X_train, y_train)
```

In [84]:

```python
y_pred = neigh.predict(X_test)
```

In [85]:

```python
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.7444444444444445
```

Datos Test (Limpieza y Modelado)

In [87]:

```python
titanic_test = pd.read_csv("test.csv")
titanic_test.head()
```

Out[87]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	892	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	Q
1	893	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	S
2	894	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	Q
3	895	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	S
4	896	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	S

In [88]:

```
titanic_test=titanic_test.drop('PassengerId',axis=1)
titanic_test
```

Out[88]:

	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	3	Kelly, Mr. James	male	34.5	0	0	330911	7.8292	NaN	Q
1	3	Wilkes, Mrs. James (Ellen Needs)	female	47.0	1	0	363272	7.0000	NaN	S
2	2	Myles, Mr. Thomas Francis	male	62.0	0	0	240276	9.6875	NaN	Q
3	3	Wirz, Mr. Albert	male	27.0	0	0	315154	8.6625	NaN	S
4	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	female	22.0	1	1	3101298	12.2875	NaN	S
...	...	...	...	...	...	...	...	...	...	...
413	3	Spector, Mr. Woolf	male	NaN	0	0	A.5. 3236	8.0500	NaN	S
414	1	Oliva y Ocana, Dona. Fermina	female	39.0	0	0	PC 17758	108.9000	C105	C
415	3	Saether, Mr. Simon Sivertsen	male	38.5	0	0	SOTON/O.Q. 3101262	7.2500	NaN	S
416	3	Ware, Mr. Frederick	male	NaN	0	0	359309	8.0500	NaN	S
417	3	Peter, Master. Michael J	male	NaN	1	1	2668	22.3583	NaN	C

418 rows × 10 columns

In [89]:

```
# Número de datos nulos por feature
titanic_test.isnull().sum()
```

Out[89]:

```
Pclass        0
Name          0
Sex           0
Age          86
SibSp         0
Parch         0
Ticket        0
Fare          1
Cabin       327
Embarked      0
dtype: int64
```

In [90]:
```
titanic_test[titanic_test['Fare'].isnull()==True]
```

Out[90]:

	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
152	3	Storey, Mr. Thomas	male	60.5	0	0	3701	NaN	NaN	S

In [91]:
```
titanic_test.groupby("Pclass")["Fare"].mean()
```

Out[91]:
```
Pclass
1    94.280297
2    22.202104
3    12.459678
Name: Fare, dtype: float64
```

In [92]:
```
titanic_test['Fare'].fillna(value=12.45,inplace=True)
```

In [93]:
```
titanic_test.isnull().sum()
```

Out[93]:
```
Pclass        0
Name          0
Sex           0
Age          86
SibSp         0
Parch         0
Ticket        0
Fare          0
Cabin       327
Embarked      0
dtype: int64
```

In [94]:
```
#Encoder para variables categoricas
one_hot_encoder = OneHotEncoder(handle_unknown='ignore')

#Variable Female/Male
encoder_titanic = pd.DataFrame(one_hot_encoder.fit_transform(titanic_test[['Sex']])
titanic_test =titanic_test.join(encoder_titanic)
titanic_test.rename(columns={0:'Female',
                        1:'Male'},
               inplace=True)

#Variable Embarked
label_encoder=LabelEncoder()
titanic_test['Embarked']=label_encoder.fit_transform(titanic_test['Embarked'])
```

In [95]:
```
titanic_test=titanic_test.drop('Sex',axis=1)
titanic_test
```

Out[95]:

	Pclass	Name	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Female	Mal
0	3	Kelly, Mr. James	34.5	0	0	330911	7.8292	NaN	1	0.0	1.(
1	3	Wilkes, Mrs. James (Ellen Needs)	47.0	1	0	363272	7.0000	NaN	2	1.0	0.(
2	2	Myles, Mr. Thomas Francis	62.0	0	0	240276	9.6875	NaN	1	0.0	1.(
3	3	Wirz, Mr. Albert	27.0	0	0	315154	8.6625	NaN	2	0.0	1.(
4	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	22.0	1	1	3101298	12.2875	NaN	2	1.0	0.(
...	...	...	...	...	...	...	...	...	...	...	..
413	3	Spector, Mr. Woolf	NaN	0	0	A.5. 3236	8.0500	NaN	2	0.0	1.(
414	1	Oliva y Ocana, Dona. Fermina	39.0	0	0	PC 17758	108.9000	C105	0	1.0	0.(
415	3	Saether, Mr. Simon Sivertsen	38.5	0	0	SOTON/O.Q. 3101262	7.2500	NaN	2	0.0	1.(
416	3	Ware, Mr. Frederick	NaN	0	0	359309	8.0500	NaN	2	0.0	1.(
417	3	Peter, Master. Michael J	NaN	1	1	2668	22.3583	NaN	0	0.0	1.(

418 rows × 11 columns

In [96]:

```
#Creando nueva columna para la variable nombre
titanic_test['Name_Pref']=np.nan

#LLenado de la variable
lista_pref=['Mr.','Miss.','Mrs.','Master.','Dr.','Capt.','Mlle.','Col.','Rev.','Maj
for i in range(len(titanic_test)):
    for j in lista_pref:
        if j in titanic_test['Name'][i]:
            titanic_test['Name_Pref'][i]=j
```

```
c:\users\mariana\appdata\local\programs\python\python37\lib\site-packages\ipykernel
_launcher.py:9: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/
user_guide/indexing.html#returning-a-view-versus-a-copy
  if __name__ == '__main__':
c:\users\mariana\appdata\local\programs\python\python37\lib\site-packages\pandas\co
re\indexing.py:1732: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/
user_guide/indexing.html#returning-a-view-versus-a-copy
  self._setitem_single_block(indexer, value, name)
```

In [97]:

```
titanic_test[titanic_test['Name_Pref'].isnull()==True]
```

Out[97]:

	Pclass	Name	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Female	Male	Name_Pr
414	1	Oliva y Ocana, Dona. Fermina	39.0	0	0	PC 17758	108.9	C105	0	1.0	0.0	Na

In [98]:

```
titanic_test['Name_Pref'].fillna(value='Dona.',inplace=True)
```

In [99]:

```
titanic_test
```

Out[99]:

	Pclass	Name	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Female	Mal
0	3	Kelly, Mr. James	34.5	0	0	330911	7.8292	NaN	1	0.0	1.(
1	3	Wilkes, Mrs. James (Ellen Needs)	47.0	1	0	363272	7.0000	NaN	2	1.0	0.(
2	2	Myles, Mr. Thomas Francis	62.0	0	0	240276	9.6875	NaN	1	0.0	1.(
3	3	Wirz, Mr. Albert	27.0	0	0	315154	8.6625	NaN	2	0.0	1.(
4	3	Hirvonen, Mrs. Alexander (Helga E Lindqvist)	22.0	1	1	3101298	12.2875	NaN	2	1.0	0.(
...	...	...	...	...	...	...	...	...	...	...	..
413	3	Spector, Mr. Woolf	NaN	0	0	A.5. 3236	8.0500	NaN	2	0.0	1.(
414	1	Oliva y Ocana, Dona. Fermina	39.0	0	0	PC 17758	108.9000	C105	0	1.0	0.(
415	3	Saether, Mr. Simon Sivertsen	38.5	0	0	SOTON/O.Q. 3101262	7.2500	NaN	2	0.0	1.(
416	3	Ware, Mr. Frederick	NaN	0	0	359309	8.0500	NaN	2	0.0	1.(
417	3	Peter, Master. Michael J	NaN	1	1	2668	22.3583	NaN	0	0.0	1.(

418 rows × 12 columns

In [100…

```
name_pref_dict={'Capt.':0,'Col.':1,'Countess.':2,'Don.':3,'Dr.':4,'Jonkheer.':5,'La
titanic_test['Name_Pref']=titanic_test.Name_Pref.map(name_pref_dict)
titanic_test=titanic_test.drop(['Name','Ticket'],axis=1)
titanic_test
```

Out[100]:

	Pclass	Age	SibSp	Parch	Fare	Cabin	Embarked	Female	Male	Name_Pref
0	3	34.5	0	0	7.8292	NaN	1	0.0	1.0	12
1	3	47.0	1	0	7.0000	NaN	2	1.0	0.0	13
2	2	62.0	0	0	9.6875	NaN	1	0.0	1.0	12
3	3	27.0	0	0	8.6625	NaN	2	0.0	1.0	12
4	3	22.0	1	1	12.2875	NaN	2	1.0	0.0	13
...	...	...	...	...	...	...	...	...	...	...
413	3	NaN	0	0	8.0500	NaN	2	0.0	1.0	12
414	1	39.0	0	0	108.9000	C105	0	1.0	0.0	17
415	3	38.5	0	0	7.2500	NaN	2	0.0	1.0	12
416	3	NaN	0	0	8.0500	NaN	2	0.0	1.0	12
417	3	NaN	1	1	22.3583	NaN	0	0.0	1.0	8

418 rows × 10 columns

In [101…

```
#Mantener Mayores Correlaciones (Pclass,Fare,Embarked,Female,Male,Name_Pref)
titanic_test=titanic_test.drop(['Age','SibSp','Parch'],axis=1)
titanic_test
```

Out[101]:

	Pclass	Fare	Cabin	Embarked	Female	Male	Name_Pref
0	3	7.8292	NaN	1	0.0	1.0	12
1	3	7.0000	NaN	2	1.0	0.0	13
2	2	9.6875	NaN	1	0.0	1.0	12
3	3	8.6625	NaN	2	0.0	1.0	12
4	3	12.2875	NaN	2	1.0	0.0	13
...	...	...	...	...	...	...	...
413	3	8.0500	NaN	2	0.0	1.0	12
414	1	108.9000	C105	0	1.0	0.0	17
415	3	7.2500	NaN	2	0.0	1.0	12
416	3	8.0500	NaN	2	0.0	1.0	12
417	3	22.3583	NaN	0	0.0	1.0	8

418 rows × 7 columns

In [102…

```
titanic_test=titanic_test.drop(['Cabin'],axis=1)
titanic_test
```

Out[102]:

	Pclass	Fare	Embarked	Female	Male	Name_Pref
0	3	7.8292	1	0.0	1.0	12
1	3	7.0000	2	1.0	0.0	13
2	2	9.6875	1	0.0	1.0	12
3	3	8.6625	2	0.0	1.0	12
4	3	12.2875	2	1.0	0.0	13
...	...	...	...	...	...	...
413	3	8.0500	2	0.0	1.0	12
414	1	108.9000	0	1.0	0.0	17
415	3	7.2500	2	0.0	1.0	12
416	3	8.0500	2	0.0	1.0	12
417	3	22.3583	0	0.0	1.0	8

418 rows × 6 columns

In [103…

```
x_test=titanic_test
x_test
```

Out[103]:

	Pclass	Fare	Embarked	Female	Male	Name_Pref
0	3	7.8292	1	0.0	1.0	12
1	3	7.0000	2	1.0	0.0	13
2	2	9.6875	1	0.0	1.0	12
3	3	8.6625	2	0.0	1.0	12
4	3	12.2875	2	1.0	0.0	13
...	...	...	...	...	...	...
413	3	8.0500	2	0.0	1.0	12
414	1	108.9000	0	1.0	0.0	17
415	3	7.2500	2	0.0	1.0	12
416	3	8.0500	2	0.0	1.0	12
417	3	22.3583	0	0.0	1.0	8

418 rows × 6 columns

Random Forest

In [104…

```
random_forest= RandomForestClassifier(max_depth=10, random_state=0,n_estimators=200
random_forest=random_forest.fit(X_train, y_train)
```

In [105…

```
y_pred = decision_tree.predict(x_test)
```

In [107…

```
test = pd.read_csv('test.csv')
resultados = pd.DataFrame(test['PassengerId'])
resultados
```

Out[107]:

```
     PassengerId
  0          892
  1          893
  2          894
  3          895
  4          896
...          ...
413         1305
414         1306
415         1307
416         1308
417         1309

418 rows × 1 columns
```

In [108…

```
resultados['Survived'] = y_pred
resultados=resultados.set_index("PassengerId")
resultados
```

Out[108]:

	Survived
PassengerId	
892	0
893	1
894	0
895	0
896	1
...	...
1305	0
1306	1
1307	0
1308	0
1309	0

418 rows × 1 columns

In [109…

```
resultados.to_csv('PruebaUnoXtYt.csv')
```

Decision Tree

In [110…

```
# Se guarda el modelo en una variable
decision_tree = DecisionTreeClassifier(criterion="entropy", max_depth=6)

# Se entrena el modelo de árbol de decisión
decision_tree = decision_tree.fit(X,y)
```

In [111…

```
y_pred = decision_tree.predict(x_test)
```

In [112…

```
np.count_nonzero((y_pred == 1))
```

Out[112]:

```
144
```

In [113…

```
np.count_nonzero((y_pred == 0))
```

Out[113]:

```
274
```

In [114…

```
test = pd.read_csv('test.csv')
resultados = pd.DataFrame(test['PassengerId'])
resultados
```

Out[114]:

	PassengerId
0	892
1	893
2	894
3	895
4	896
...	...
413	1305
414	1306
415	1307
416	1308
417	1309

418 rows × 1 columns

In [115…

```
resultados['Survived'] = y_pred
resultados=resultados.set_index("PassengerId")
resultados
```

Out[115]:

	Survived
PassengerId	
892	0
893	1
894	0
895	0
896	1
...	...
1305	0
1306	1
1307	0
1308	0
1309	0

418 rows × 1 columns

In [116…

```
resultados.to_csv('PruebaUnoXYtree6.csv')
```

SVM

In [117…

```
s_vm= svm.SVC(kernel='linear')
s_vm=s_vm.fit(X, y)
```

In [118…

```
y_pred = s_vm.predict(x_test)
```

In [119…

```
np.count_nonzero((y_pred == 1))
```

Out[119]:

```
152
```

In [120…

```
np.count_nonzero((y_pred == 0))
```

Out[120]:

```
266
```

In [121…

```
test = pd.read_csv('test.csv')
resultados = pd.DataFrame(test['PassengerId'])
resultados
```

Out[121]:

	PassengerId
0	892
1	893
2	894
3	895
4	896
...	...
413	1305
414	1306
415	1307
416	1308
417	1309

418 rows × 1 columns

In [122…

```
resultados['Survived'] = y_pred
resultados=resultados.set_index("PassengerId")
resultados
```

Out[122]:

	Survived
PassengerId	
892	0
893	1
894	0
895	0
896	1
...	...
1305	0
1306	1
1307	0
1308	0
1309	0

418 rows × 1 columns

In [123…

```
resultados.to_csv('PruebaUnoXYsvm.csv')
```

Red Neuronal

In [126…

```
modelo_1 = MLPClassifier(
                hidden_layer_sizes=(5),
                learning_rate_init=0.01,
                solver = 'lbfgs',
                max_iter = 1000,
                random_state = 123)


modelo_1.fit(X=X_train, y=y_train)
```

Out[126]:

```
MLPClassifier(hidden_layer_sizes=5, learning_rate_init=0.01, max_iter=1000,
              random_state=123, solver='lbfgs')
```

In [127…

```
y_pred=modelo_1.predict(x_test)
```

In [129…

```
np.count_nonzero((y_pred == 0))
```

Out[129]:

```
237
```

In [130…

```
np.count_nonzero((y_pred == 1))
```

Out[130]:

```
181
```

In [131…

```
test = pd.read_csv('test.csv')
resultados = pd.DataFrame(test['PassengerId'])
resultados
```

```
Out[131]:
            PassengerId
       0            892
       1            893
       2            894
       3            895
       4            896
     ...            ...
     413           1305
     414           1306
     415           1307
     416           1308
     417           1309

418 rows × 1 columns
```

```
In [132…  resultados['Survived'] = y_pred
          resultados=resultados.set_index("PassengerId")
          resultados
```

```
Out[132]:
                       Survived
            PassengerId
                    892       0
                    893       1
                    894       0
                    895       0
                    896       1
                    ...     ...
                   1305       0
                   1306       1
                   1307       0
                   1308       0
                   1309       0

418 rows × 1 columns
```

```
In [133…  resultados['Survived'].value_counts()
```

Out[133]:
```
0    237
1    181
Name: Survived, dtype: int64
```

In [134…
```
resultados.to_csv('PruebaUnoXtYtrn.csv')
```

In [135…
```
modelo_3 = MLPClassifier(
                hidden_layer_sizes=(20, 20),
                learning_rate_init=0.01,
                solver = 'lbfgs',
                max_iter = 5000,
                random_state = 123
            )
modelo_3.fit(X=X, y=y)
```

Out[135]:
```
MLPClassifier(hidden_layer_sizes=(20, 20), learning_rate_init=0.01,
              max_iter=5000, random_state=123, solver='lbfgs')
```

In [136…
```
y_pred=modelo_3.predict(x_test)
```

In [137…
```
np.count_nonzero((y_pred == 0))
```

Out[137]:
```
291
```

In [138…
```
np.count_nonzero((y_pred == 1))
```

Out[138]:
```
127
```

In [139…
```
test = pd.read_csv('test.csv')
resultados = pd.DataFrame(test['PassengerId'])
resultados
```

Out[139]:

	PassengerId
0	892
1	893
2	894
3	895
4	896
...	...
413	1305
414	1306
415	1307
416	1308
417	1309

418 rows × 1 columns

In [140…

```
resultados['Survived'] = y_pred
resultados=resultados.set_index("PassengerId")
resultados
```

Out[140]:

	Survived
PassengerId	
892	0
893	0
894	0
895	0
896	0
...	...
1305	0
1306	1
1307	0
1308	0
1309	1

418 rows × 1 columns

In [141…

```
resultados['Survived'].value_counts()
```

Out[141]:

```
0    291
1    127
Name: Survived, dtype: int64
```

In [142…

```
resultados.to_csv('PruebaUnoXtYtrn20.csv')
```

In [143…

```
modelo_4 = MLPClassifier(
                hidden_layer_sizes=(50, 50, 50),
                learning_rate_init=0.01,
                solver = 'lbfgs',
                max_iter = 5000,
                random_state = 123
            )
modelo_4.fit(X=X, y=y)
```

Out[143]:

```
MLPClassifier(hidden_layer_sizes=(50, 50, 50), learning_rate_init=0.01,
              max_iter=5000, random_state=123, solver='lbfgs')
```

In [144…

```
y_pred=modelo_4.predict(x_test)
```

In [145…

```
np.count_nonzero((y_pred == 0))
```

Out[145]:

```
277
```

In [146…

```
np.count_nonzero((y_pred == 1))
```

Out[146]:

```
141
```

In [147…

```
test = pd.read_csv('test.csv')
resultados = pd.DataFrame(test['PassengerId'])
resultados
```

Out[147]:

	PassengerId
0	892
1	893
2	894
3	895
4	896
...	...
413	1305
414	1306
415	1307
416	1308
417	1309

418 rows × 1 columns

In [148…

```
resultados['Survived'] = y_pred
resultados=resultados.set_index("PassengerId")
resultados
```

Out[148]:

	Survived
PassengerId	
892	0
893	0
894	0
895	0
896	0
...	...
1305	0
1306	1
1307	0
1308	0
1309	1

418 rows × 1 columns

In [149…

```
resultados['Survived'].value_counts()
```

Out[149]:

```
0    277
1    141
Name: Survived, dtype: int64
```

In [150…

```
resultados.to_csv('PruebaUnoXYrn50.csv')
```

REFINAMIENTO

In [166…

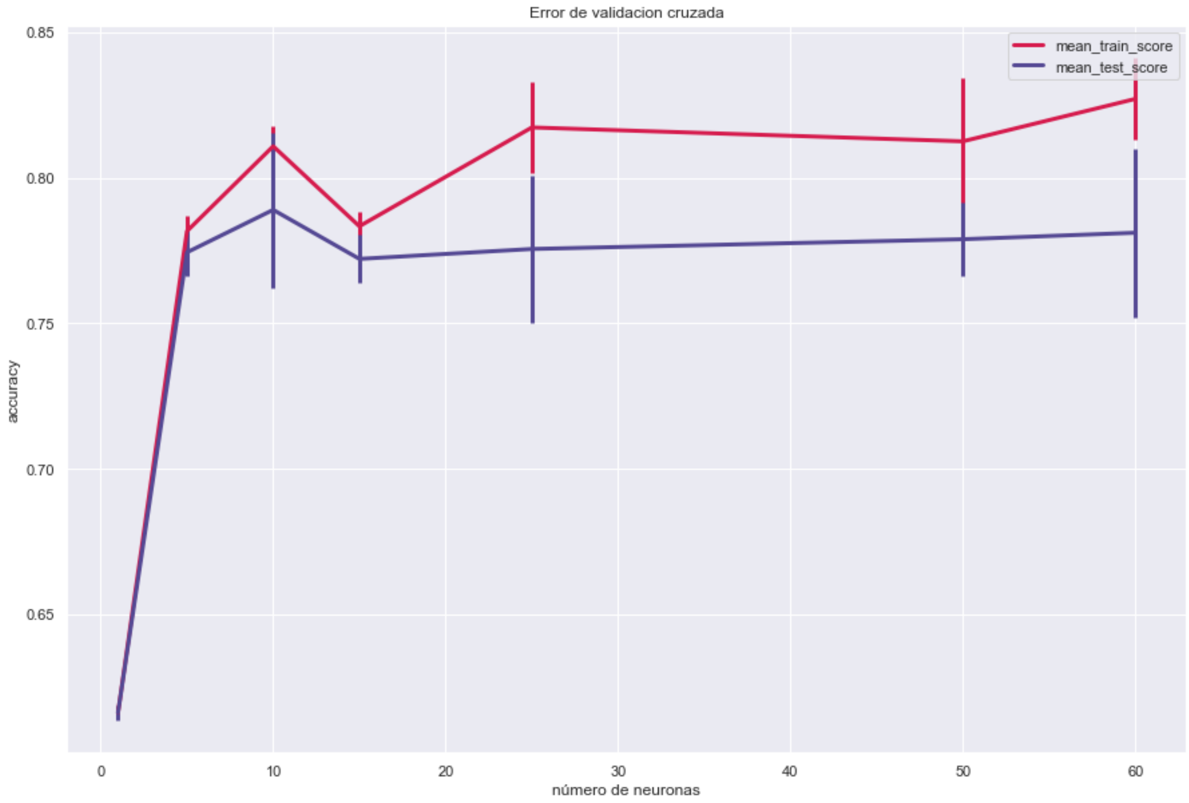
```
param_grid = {'hidden_layer_sizes':[1, 5, 10, 15, 25, 50,60]}

grid = GridSearchCV(
        estimator = MLPClassifier(
                        learning_rate_init=0.01,
                        solver = 'lbfgs',
                        alpha  = 0,
                        max_iter = 5000,
                        random_state = 123
                    ),
        param_grid = param_grid,
        scoring    = 'accuracy',
        cv         = 5,
        refit      = True,
        return_train_score = True
      )

_ = grid.fit(X, y)
```

In [171…

```
fig, ax = plt.subplots(figsize=(15, 10))
scores = pd.DataFrame(grid.cv_results_)
scores.plot(x='param_hidden_layer_sizes', y='mean_train_score', yerr='std_train_sco
scores.plot(x='param_hidden_layer_sizes', y='mean_test_score', yerr='std_test_score
ax.set_ylabel('accuracy')
ax.set_xlabel('número de neuronas')
ax.set_title('Error de validacion cruzada');
plt.savefig('error_capas.png',dpi=180)
```



In [173…

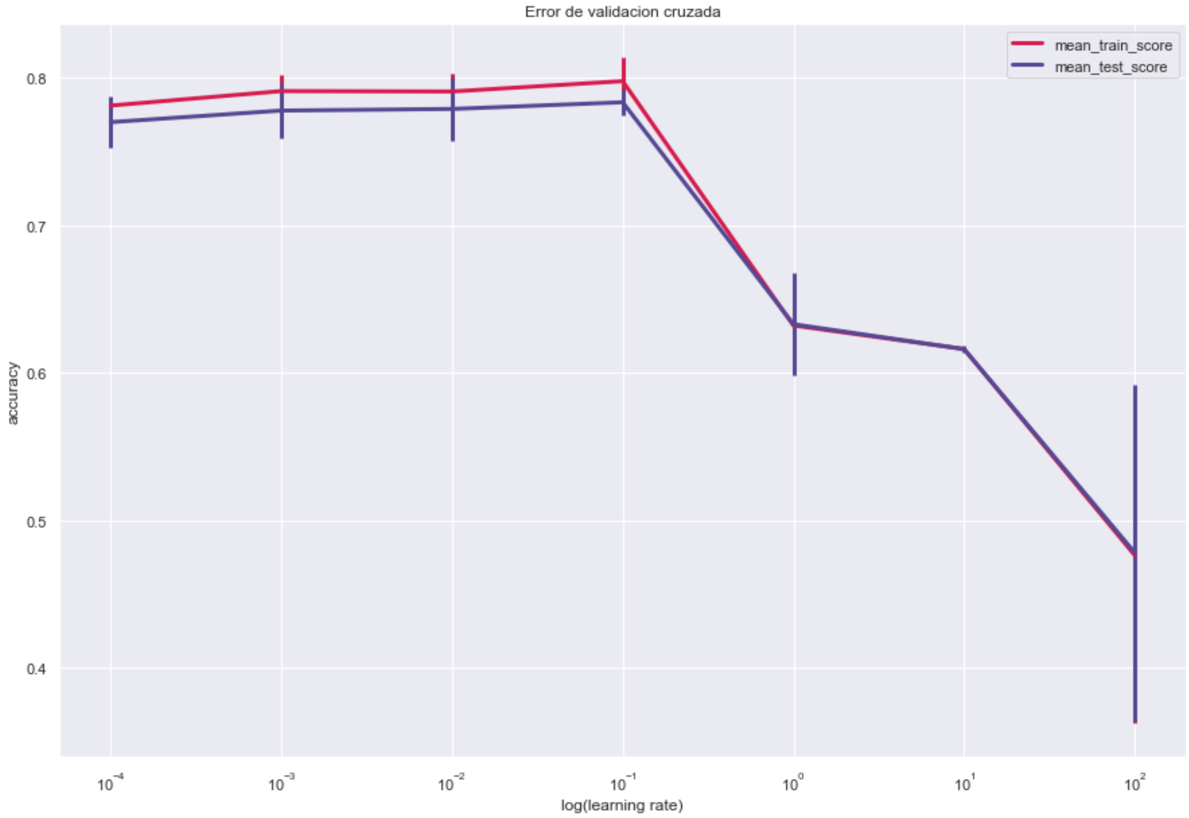
```
# learning rate
# ==============================================================================
param_grid = {'learning_rate_init':[0.0001, 0.001, 0.01, 0.1, 1, 10, 100]}

grid = GridSearchCV(
        estimator = MLPClassifier(
                        hidden_layer_sizes=(25),
                        solver = 'adam',
                        alpha  = 0,
                        max_iter = 5000,
                        random_state = 123
                    ),
        param_grid = param_grid,
        scoring    = 'accuracy',
        cv         = 5,
        refit      = True,
        return_train_score = True
      )

_ = grid.fit(X, y)
```

In [174…

```
fig, ax = plt.subplots(figsize=(15, 10))
scores = pd.DataFrame(grid.cv_results_)
scores.plot(x='param_learning_rate_init', y='mean_train_score', yerr='std_train_sco
scores.plot(x='param_learning_rate_init', y='mean_test_score', yerr='std_test_score
ax.set_xscale('log')
ax.set_xlabel('log(learning rate)')
ax.set_ylabel('accuracy')
ax.set_title('Error de validacion cruzada');
plt.savefig('error_rn_step.png',dpi=180)
```



In [175…

```
modelo_5 = MLPClassifier(
                hidden_layer_sizes=(25, 25, 25),
                learning_rate_init=0.001,
                solver = 'lbfgs',
                max_iter = 5000,
                random_state = 123
            )
modelo_5.fit(X=X, y=y)
```

Out[175]:

```
MLPClassifier(hidden_layer_sizes=(25, 25, 25), max_iter=5000, random_state=123,
              solver='lbfgs')
```

In [176…

```
y_pred=modelo_5.predict(x_test)
```

In [177…

```
np.count_nonzero((y_pred == 0))
```

Out[177]:

```
280
```

In [178…

```
np.count_nonzero((y_pred == 1))
```

Out[178]:

```
138
```

In [179…

```
test = pd.read_csv('test.csv')
resultados = pd.DataFrame(test['PassengerId'])
resultados
```

Out[179]:

```
       PassengerId
   0           892
   1           893
   2           894
   3           895
   4           896
 ...           ...
 413          1305
 414          1306
 415          1307
 416          1308
 417          1309

418 rows × 1 columns
```

In [180…

```
resultados['Survived'] = y_pred
resultados=resultados.set_index("PassengerId")
resultados
```

Out[180]:

```
              Survived
PassengerId
        892          0
        893          0
        894          0
        895          0
        896          1
        ...        ...
       1305          0
       1306          1
       1307          0
       1308          0
       1309          1

418 rows × 1 columns
```

In [181…

```
resultados['Survived'].value_counts()
```

Out[181]:

```
0    280
1    138
Name: Survived, dtype: int64
```

In [183…

```
resultados.to_csv('PruebaUnoXYrn251.csv')
```

Otros modelos

XGboost Modelado

In [186…

```
boosting_classifier= GradientBoostingClassifier(n_estimators=1000, learning_rate=0.
boosting_classifier=boosting_classifier.fit(X_train, y_train)
```

XGboost Evaluación

In [187…

```
boosting_classifier.score(X_test, y_test)
```

Out[187]:

```
0.8333333333333334
```

XGboost Refinamiento

In [202…

```
estimators_scores=[]
for i in range (1000,12000,1000):
    boosting_classifier= GradientBoostingClassifier(n_estimators=i, learning_rate=1
    boosting_classifier=boosting_classifier.fit(X_train, y_train)
    estimators_scores.append(boosting_classifier.score(X_test, y_test))
```

In [189…

```
rate_values=[0.0001,0.001,0.01,0.1,0.5,1,10,100]
rate_scores=[]
for i in rate_values:
    boosting_classifier= GradientBoostingClassifier(n_estimators=1000, learning_rat
    boosting_classifier=boosting_classifier.fit(X_train, y_train)
    rate_scores.append(boosting_classifier.score(X_test, y_test))
```

In [190…

```
depth_values=[1,2,3,4,5,6,7,8,9,10,15,20,50,100]
depth_scores=[]
for i in depth_values:
    boosting_classifier= GradientBoostingClassifier(n_estimators=1000, learning_rat
    boosting_classifier=boosting_classifier.fit(X_train, y_train)
    depth_scores.append(boosting_classifier.score(X_test, y_test))
```

XGboost Modelo Final

In [191…

```
boosting_classifier= GradientBoostingClassifier(n_estimators=1000, learning_rate=0.
boosting_classifier=boosting_classifier.fit(X, y)
```

In [192…

```
y_pred=boosting_classifier.predict(x_test)
y_pred
```

Out[192]:
```
array([0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 1, 0,
       1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1,
       1, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 1,
       1, 0, 0, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0, 1, 1,
       1, 1, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0,
       0, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1,
       0, 0, 1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1,
       1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1,
       0, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 1, 0,
       1, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1,
       0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0,
       0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0,
       0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0,
       1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 1, 1, 0,
       0, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0,
       1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1,
       0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 1, 0, 0, 1],
      dtype=int64)
```

In [193…
```
x_test.shape
```

Out[193]:
```
(418, 6)
```

In [194…
```
np.count_nonzero((y_pred == 0))
```

Out[194]:
```
266
```

In [195…
```
np.count_nonzero((y_pred == 1))
```

Out[195]:
```
152
```

In [196…
```
test = pd.read_csv('test.csv')
resultados = pd.DataFrame(test['PassengerId'])
resultados
```

Out[196]:

	PassengerId
0	892
1	893
2	894
3	895
4	896
...	...
413	1305
414	1306
415	1307
416	1308
417	1309

418 rows × 1 columns

In [197…

```
resultados['Survived'] = y_pred
resultados=resultados.set_index("PassengerId")
resultados
```

Out[197]:

	Survived
PassengerId	
892	0
893	1
894	0
895	0
896	1
...	...
1305	0
1306	1
1307	0
1308	0
1309	1

418 rows × 1 columns

In [198…

```
resultados['Survived'].value_counts()
```

```
Out[198]: 0    266
          1    152
          Name: Survived, dtype: int64
```

```
In [199…  resultados.to_csv('PruebaUnoXYgb.csv')
```

```
In [ ]:
```