Code to import file :

In [1]:
```
from google.colab import files
uploaded = files.upload()
```

Choose Files No file chosen

Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving titanic.csv to titanic.csv
```

Importing libraries :

In [2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.tree import DecisionTreeClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.metrics import classification_report
from sklearn import tree
import warnings
warnings.filterwarnings('ignore')
```

```
/usr/local/lib/python3.6/dist-packages/statsmodels/tools/_testing.py:19: FutureWarning: pandas.util.testing is deprecat
ed. Use the functions in the public API at pandas.testing instead.
  import pandas.util.testing as tm
```

In [3]:
```
df = pd.read_csv("titanic.csv")
```

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

Out[4]:

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

In [6]:
```
df.tail()
```

Out[6]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.00	NaN	S
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.00	B42	S
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.45	NaN	S
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.00	C148	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.75	NaN	Q

Removing unwanted column :

In [7]:
```
df.drop(["Name","Ticket","Cabin"], axis=1,inplace = True)
```

Missing Values :

In [8]:
```
df.isnull().sum()
```

Out[8]:
```
PassengerId      0
Survived         0
Pclass           0
Sex              0
Age            177
SibSp            0
Parch            0
Fare             0
Embarked         2
dtype: int64
```

In [9]:
```
df["Embarked"].value_counts()
```

Out[9]:
```
S    644
C    168
Q     77
Name: Embarked, dtype: int64
```

In [10]:
```
df["Embarked"].fillna("S",inplace=True)
```

In [11]:
```
df["Age"].value_counts()
```

Out[11]:
```
24.00    30
22.00    27
18.00    26
19.00    25
30.00    25
         ..
55.50     1
70.50     1
66.00     1
23.50     1
0.42      1
Name: Age, Length: 88, dtype: int64
```

In [12]:
```
df["Age"].fillna(df["Age"].mean(), inplace=True)
```

In [13]:
```
df.isnull().sum()
```

Out[13]:
```
PassengerId    0
Survived       0
Pclass         0
Sex            0
Age            0
SibSp          0
Parch          0
Fare           0
Embarked       0
dtype: int64
```

Data Type :

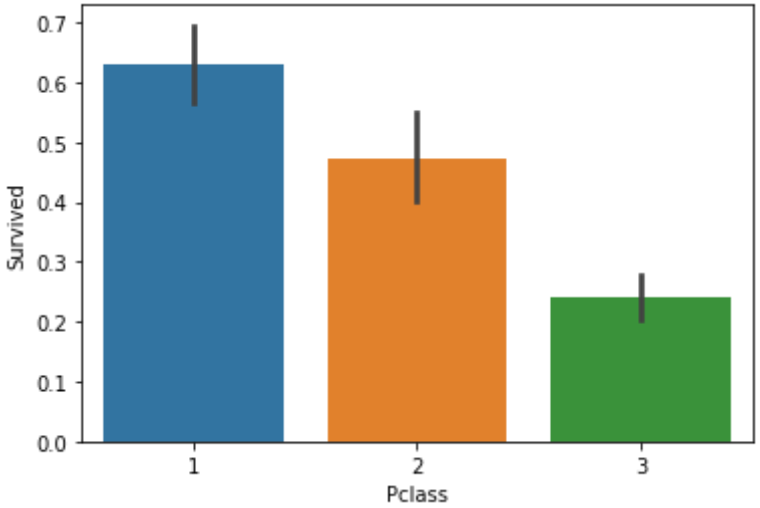
In [14]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 9 columns):
 #   Column       Non-Null Count  Dtype  
---  ------       --------------  -----  
 0   PassengerId  891 non-null    int64  
 1   Survived     891 non-null    int64  
 2   Pclass       891 non-null    int64  
 3   Sex          891 non-null    object 
 4   Age          891 non-null    float64
 5   SibSp        891 non-null    int64  
 6   Parch        891 non-null    int64  
 7   Fare         891 non-null    float64
 8   Embarked     891 non-null    object 
dtypes: float64(2), int64(5), object(2)
memory usage: 62.8+ KB
```

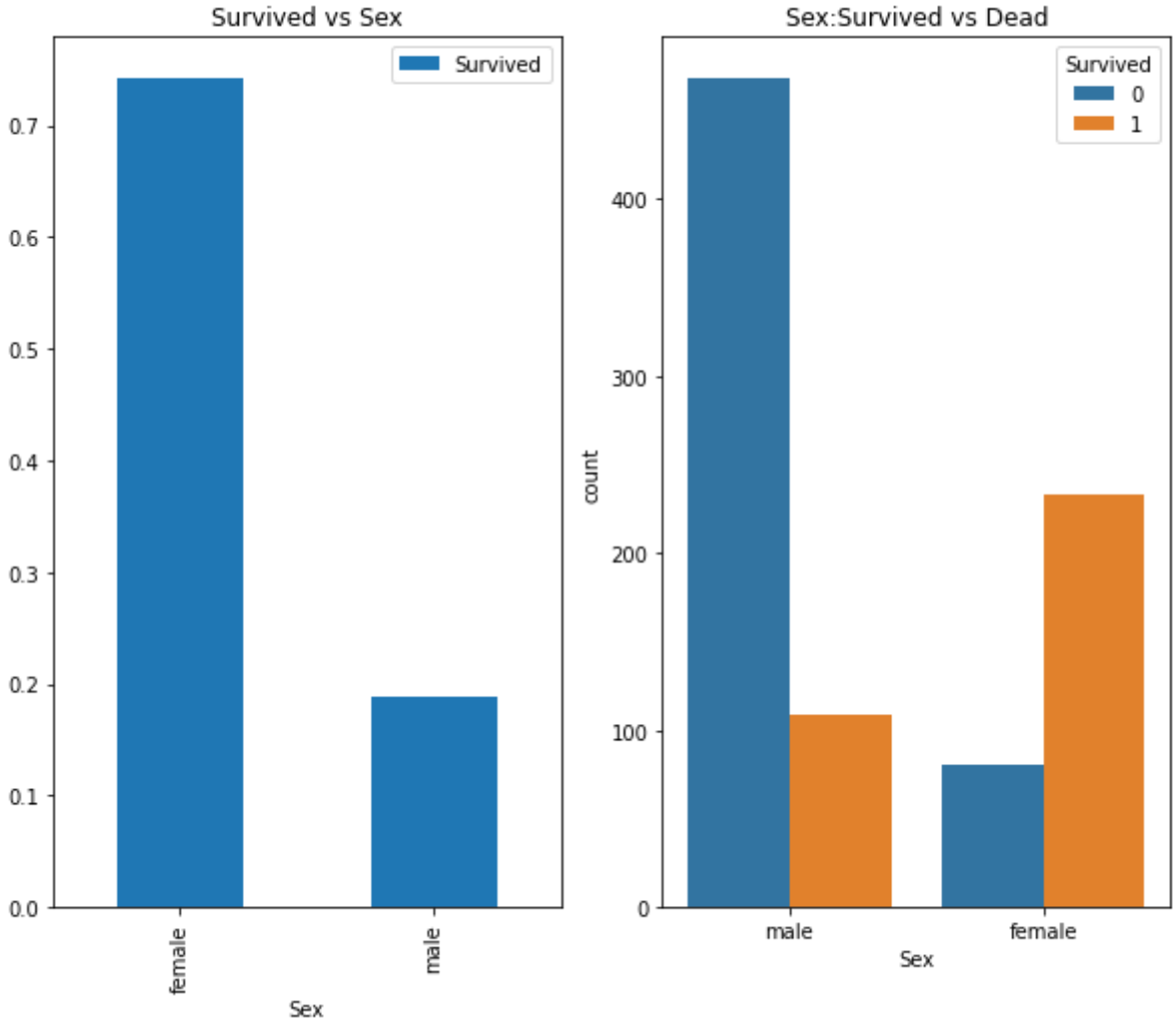
Visualization of columns with surivived (Target) :

In [15]:
```
sns.barplot(x="Pclass", y="Survived", data=df)
#print percentage of people by Pclass that survived
print("Percentage of Pclass = 1 who survived:", df["Survived"][df["Pclass"] == 1].value_counts(normalize = True)[1]*100)
print("Percentage of Pclass = 2 who survived:", df["Survived"][df["Pclass"] == 2].value_counts(normalize = True)[1]*100)
print("Percentage of Pclass = 3 who survived:", df["Survived"][df["Pclass"] == 3].value_counts(normalize = True)[1]*100)
```

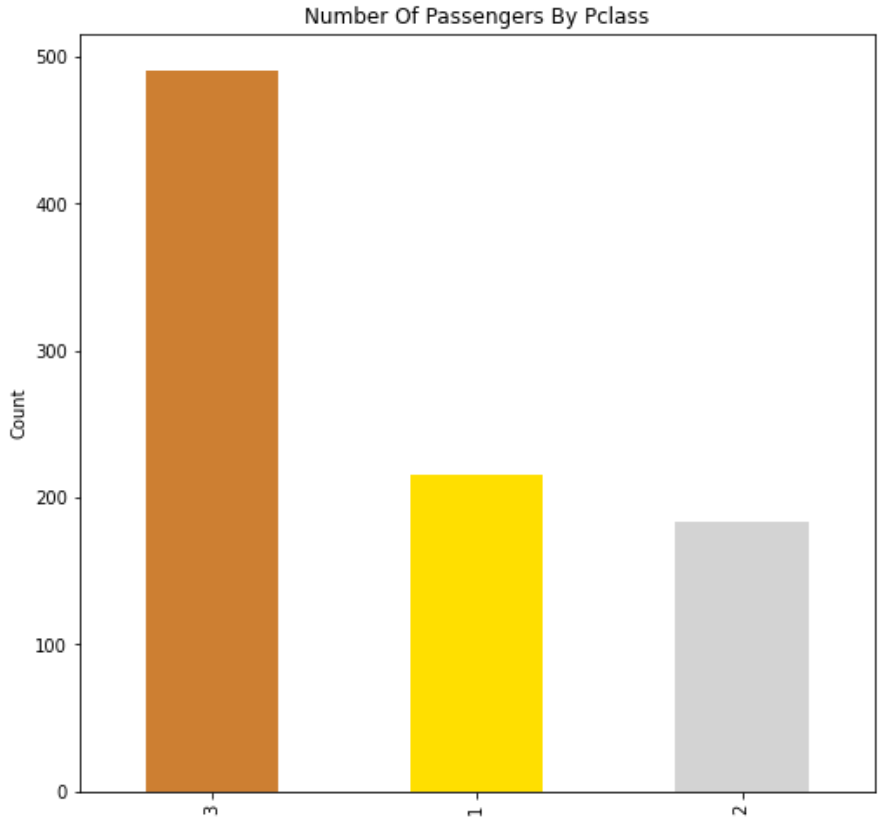
```
Percentage of Pclass = 1 who survived: 62.96296296296296
Percentage of Pclass = 2 who survived: 47.28260869565217
Percentage of Pclass = 3 who survived: 24.236252545824847
```

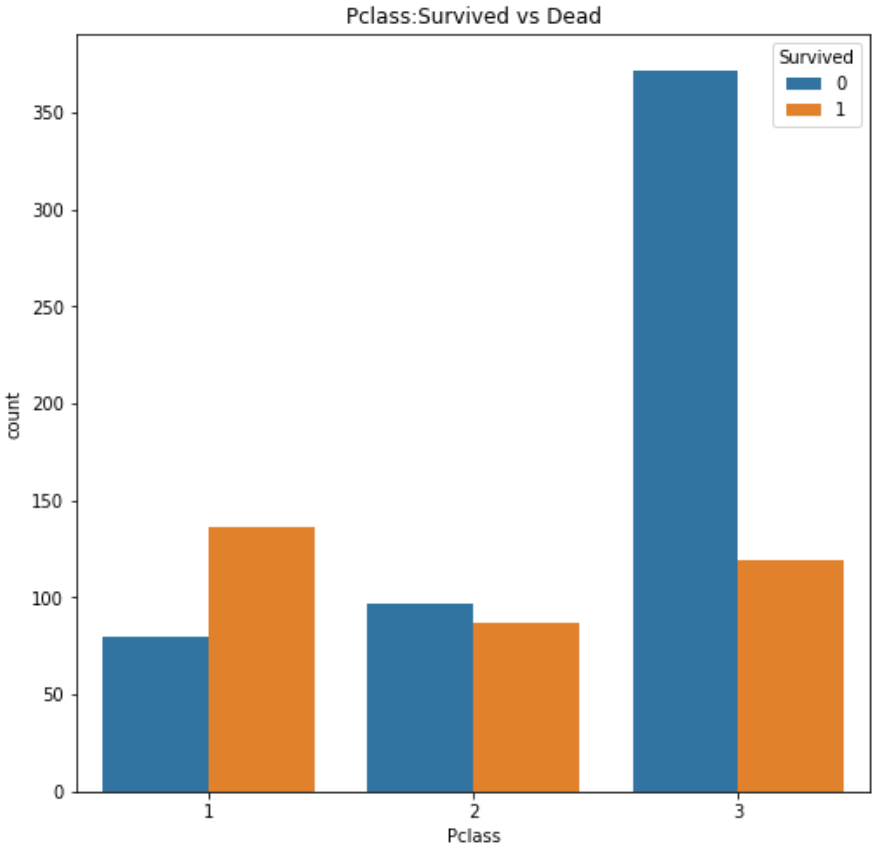


In [17]:
```
f,ax=plt.subplots(1,2,figsize=(10,8))
df[['Sex','Survived']].groupby(['Sex']).mean().plot.bar(ax=ax[0])
ax[0].set_title('Survived vs Sex')
sns.countplot('Sex',hue='Survived',data=df,ax=ax[1])
ax[1].set_title('Sex:Survived vs Dead')
plt.show()
```

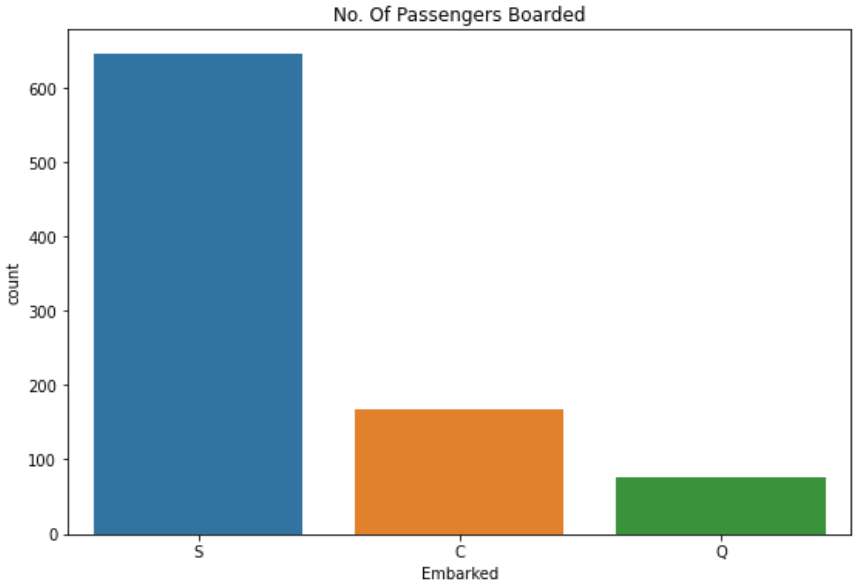


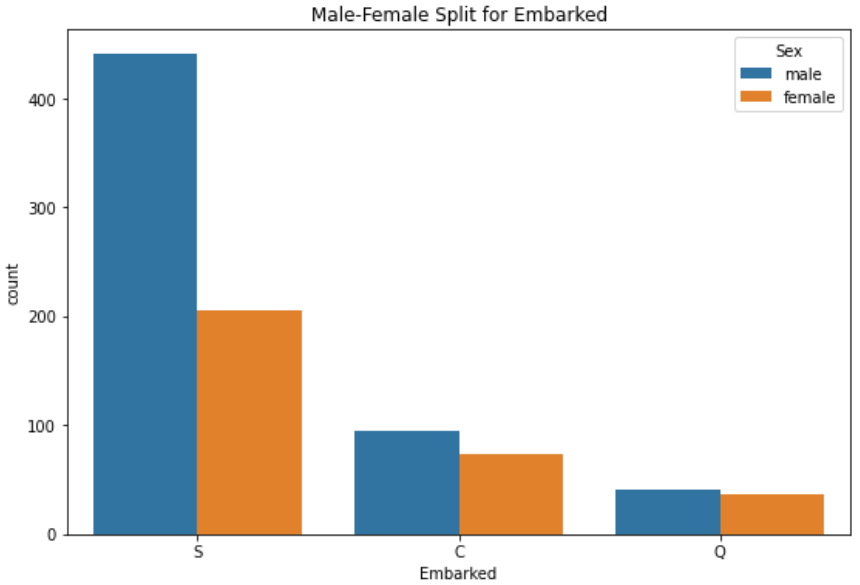
In [18]:
```
f,ax=plt.subplots(1,2,figsize=(18,8))
df['Pclass'].value_counts().plot.bar(color=['#CD7F32','#FFDF00','#D3D3D3'],ax=ax[0])
ax[0].set_title('Number Of Passengers By Pclass')
ax[0].set_ylabel('Count')
sns.countplot('Pclass',hue='Survived',data=df,ax=ax[1])
ax[1].set_title('Pclass:Survived vs Dead')
plt.show()
```

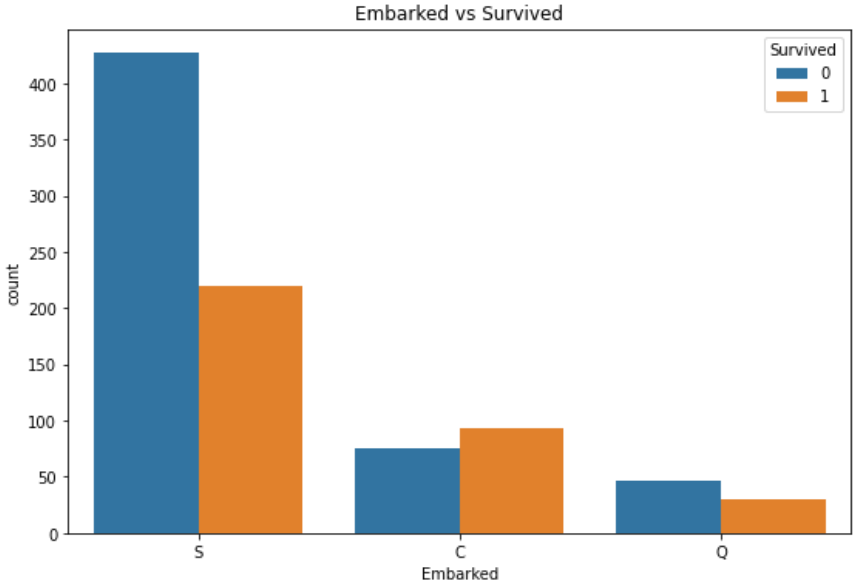


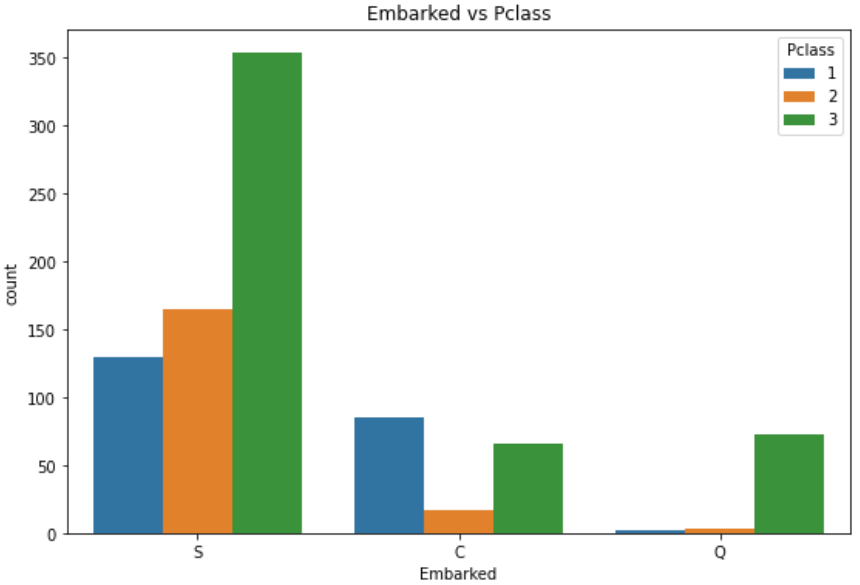


In [19]:
```
f,ax=plt.subplots(2,2,figsize=(20,15))
sns.countplot('Embarked',data=df,ax=ax[0,0])
ax[0,0].set_title('No. Of Passengers Boarded')
sns.countplot('Embarked',hue='Sex',data=df,ax=ax[0,1])
ax[0,1].set_title('Male-Female Split for Embarked')
sns.countplot('Embarked',hue='Survived',data=df,ax=ax[1,0])
ax[1,0].set_title('Embarked vs Survived')
sns.countplot('Embarked',hue='Pclass',data=df,ax=ax[1,1])
ax[1,1].set_title('Embarked vs Pclass')
plt.subplots_adjust(wspace=0.2,hspace=0.5)
plt.show()
```


No. Of Passengers Boarded
count
Embarked
S
C
Q
0
100
200
300
400
500
600


Male-Female Split for Embarked
Sex
male
female
count
Embarked
S
C
Q
0
100
200
300
400


Embarked vs Survived
Survived
0
1
count
Embarked
S
C
Q
0
50
100
150
200
250
300
350
400


Embarked vs Pclass
Pclass
1
2
3
count
Embarked
S
C
Q
0
50
100
150
200
250
300
350

Numaric Data :

In [20]:
```
df_num = df.select_dtypes(["float64","int64"])
```

In [21]:
```
df_num
```

Out[21]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
0	1	0	3	22.000000	1	0	7.2500
1	2	1	1	38.000000	1	0	71.2833
2	3	1	3	26.000000	0	0	7.9250
3	4	1	1	35.000000	1	0	53.1000
4	5	0	3	35.000000	0	0	8.0500
...	...	...	...	...	...	...	...
886	887	0	2	27.000000	0	0	13.0000
887	888	1	1	19.000000	0	0	30.0000
888	889	0	3	29.699118	1	2	23.4500
889	890	1	1	26.000000	0	0	30.0000
890	891	0	3	32.000000	0	0	7.7500

891 rows × 7 columns

Categorical Data :

In [22]:
```
df_cat = df.select_dtypes(object)
```

In [23]:
```
df_cat
```

Out[23]:

	Sex	Embarked
0	male	S
1	female	C
2	female	S
3	female	S
4	male	S
...	...	...
886	male	S
887	female	S
888	female	S
889	male	C
890	male	Q

891 rows × 2 columns

Fixing categorical data :

In [24]:
```
le = LabelEncoder()
```

In [26]:
```
for col in df_cat:
  le = LabelEncoder()
  df_cat[col] = le.fit_transform(df_cat[col])
```

In [27]:
```
df_cat
```

Out[27]:

	Sex	Embarked
0	1	2
1	0	0
2	0	2
3	0	2
4	1	2
...	...	...
886	1	2
887	0	2
888	0	2
889	1	0
890	1	1

891 rows × 2 columns

Final data for model :

In [28]:
```
df = pd.concat([df_cat,df_num],axis=1)
```

In [29]:
```
df
```

Out[29]:

	Sex	Embarked	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
0	1	2	1	0	3	22.000000	1	0	7.2500
1	0	0	2	1	1	38.000000	1	0	71.2833
2	0	2	3	1	3	26.000000	0	0	7.9250
3	0	2	4	1	1	35.000000	1	0	53.1000
4	1	2	5	0	3	35.000000	0	0	8.0500
...	...	...	...	...	...	...	...	...	...
886	1	2	887	0	2	27.000000	0	0	13.0000
887	0	2	888	1	1	19.000000	0	0	30.0000
888	0	2	889	0	3	29.699118	1	2	23.4500
889	1	0	890	1	1	26.000000	0	0	30.0000
890	1	1	891	0	3	32.000000	0	0	7.7500

891 rows × 9 columns

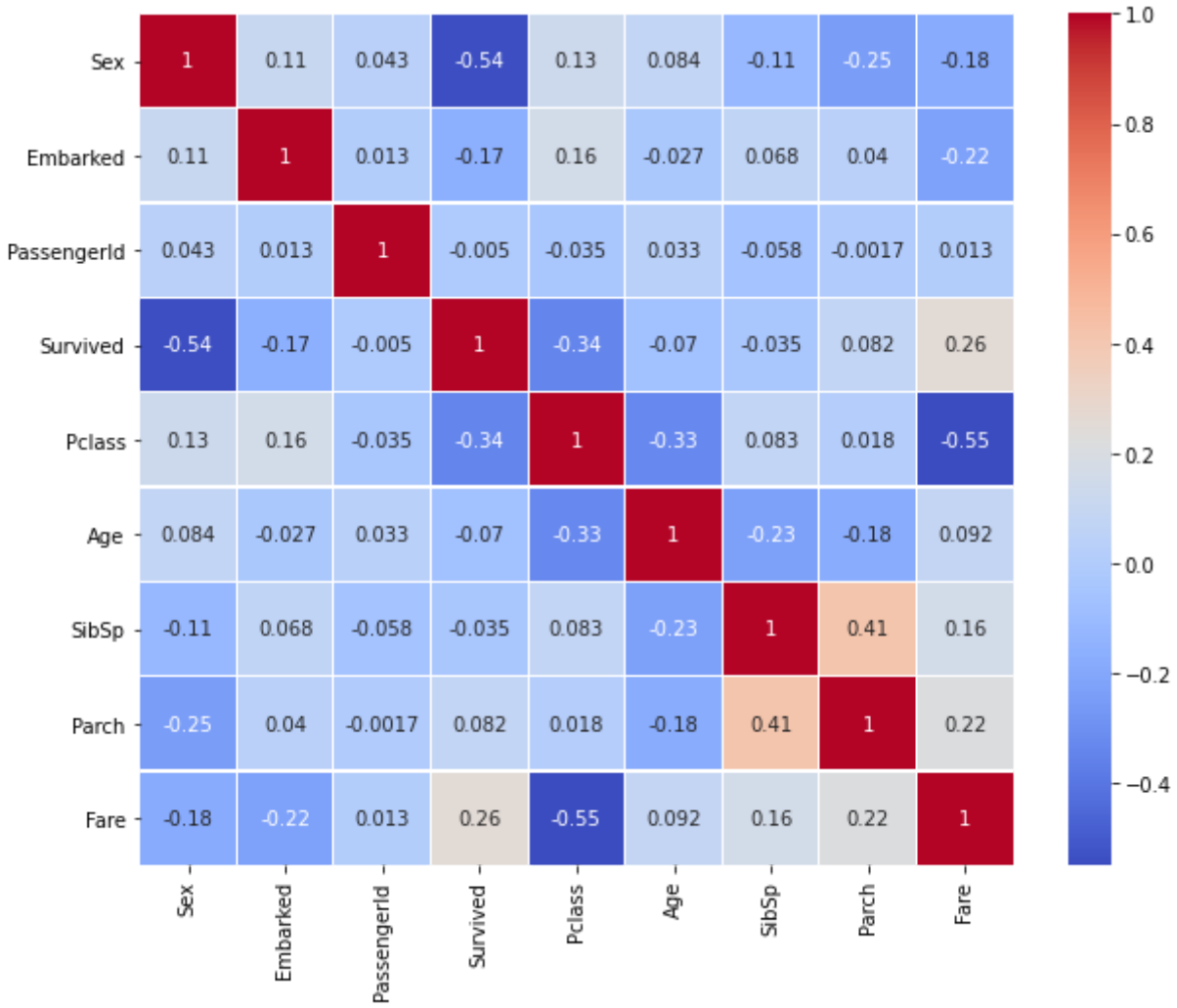
In [30]:
```
df.describe(include="all")
```

Out[30]:

	Sex	Embarked	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	891.000000	891.000000	891.000000	891.000000	891.000000	891.000000
mean	0.647587	1.536476	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	0.477990	0.791503	257.353842	0.486592	0.836071	13.002015	1.102743	0.806057	49.693429
min	0.000000	0.000000	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	0.000000	1.000000	223.500000	0.000000	2.000000	22.000000	0.000000	0.000000	7.910400
50%	1.000000	2.000000	446.000000	0.000000	3.000000	29.699118	0.000000	0.000000	14.454200
75%	1.000000	2.000000	668.500000	1.000000	3.000000	35.000000	1.000000	0.000000	31.000000
max	1.000000	2.000000	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

Correlation using heatmap :

In [31]:
```
df.corr()
sns.heatmap(df.corr(),annot=True,cmap='coolwarm',linewidths=0.2)
fig=plt.gcf()
fig.set_size_inches(10,8)
plt.show()
```



Seprating X and y :

In [32]:
```
y = df["Survived"]
X = df.drop("Survived",axis=1)
```

In [33]:
```
y
```

Out[33]:
```
0      0
1      1
2      1
3      1
4      0
      ..
886    0
887    1
888    0
889    1
890    0
Name: Survived, Length: 891, dtype: int64
```

In [34]:
```
X
```

Out[34]:

	Sex	Embarked	PassengerId	Pclass	Age	SibSp	Parch	Fare
0	1	2	1	3	22.000000	1	0	7.2500
1	0	0	2	1	38.000000	1	0	71.2833
2	0	2	3	3	26.000000	0	0	7.9250
3	0	2	4	1	35.000000	1	0	53.1000
4	1	2	5	3	35.000000	0	0	8.0500
...	...	...	...	...	...	...	...	...
886	1	2	887	2	27.000000	0	0	13.0000
887	0	2	888	1	19.000000	0	0	30.0000
888	0	2	889	3	29.699118	1	2	23.4500
889	1	0	890	1	26.000000	0	0	30.0000
890	1	1	891	3	32.000000	0	0	7.7500

891 rows × 8 columns

In [35]:
```
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.3,random_state=1)
```

In [36]:
```
def train_model(model):
  model.fit(X_train,y_train)
  y_pred = model.predict(X_test)
  print(classification_report(y_test,y_pred))
  return model
```

Logistic Regression :

In [37]:
```
log = LogisticRegression()
```

In [38]:
```
train_model(log)
```

```
              precision    recall  f1-score   support

           0       0.75      0.86      0.80       153
           1       0.77      0.62      0.69       115

    accuracy                           0.76       268
   macro avg       0.76      0.74      0.74       268
weighted avg       0.76      0.76      0.75       268
```

Out[38]:
```
LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
                   intercept_scaling=1, l1_ratio=None, max_iter=100,
                   multi_class='auto', n_jobs=None, penalty='l2',
                   random_state=None, solver='lbfgs', tol=0.0001, verbose=0,
                   warm_start=False)
```

Decision Tree :

In [39]:
```
dt1 = DecisionTreeClassifier()
```

In [40]:
```
dt1 = train_model(dt1)
```

```
              precision    recall  f1-score   support

           0       0.76      0.82      0.79       153
           1       0.74      0.66      0.70       115

    accuracy                           0.75       268
   macro avg       0.75      0.74      0.74       268
weighted avg       0.75      0.75      0.75       268
```

In [41]:
```
dt1.feature_importances_
```

Out[41]:
```
array([0.32100818, 0.03894385, 0.20193345, 0.10560546, 0.15586209,
       0.04939164, 0.01270037, 0.11455496])
```

In [42]:
```
print(df.columns.tolist())
```

```
['Sex', 'Embarked', 'PassengerId', 'Survived', 'Pclass', 'Age', 'SibSp', 'Parch', 'Fare']
```

In [43]:
```
from sklearn import tree
```

PLotting DecsionTree :

In [44]:
```
tree.plot_tree(dt1)
```

Out[44]:
```
[Text(114.5390625, 211.4, 'X[0] <= 0.5\ngini = 0.463\nsamples = 623\nvalue = [396, 227]'),
 Text(54.225, 199.32, 'X[3] <= 2.5\ngini = 0.387\nsamples = 217\nvalue = [57, 160]'),
 Text(28.8, 187.24, 'X[4] <= 2.5\ngini = 0.097\nsamples = 117\nvalue = [6, 111]'),
 Text(21.6, 175.16, 'X[7] <= 88.775\ngini = 0.5\nsamples = 2\nvalue = [1, 1]'),
 Text(18.0, 163.07999999999998, 'gini = 0.0\nsamples = 1\nvalue = [0, 1]'),
 Text(25.2, 163.07999999999998, 'gini = 0.0\nsamples = 1\nvalue = [1, 0]'),
 Text(36.0, 175.16, 'X[7] <= 28.856\ngini = 0.083\nsamples = 115\nvalue = [5, 110]'),
 Text(32.4, 163.07999999999998, 'X[7] <= 28.231\ngini = 0.206\nsamples = 43\nvalue = [5, 38]'),
 Text(28.8, 151.0, 'X[2] <= 828.5\ngini = 0.172\nsamples = 42\nvalue = [4, 38]'),
 Text(21.6, 138.92000000000002, 'X[2] <= 373.0\ngini = 0.142\nsamples = 39\nvalue = [3, 36]'),
 Text(18.0, 126.84, 'X[2] <= 352.5\ngini = 0.245\nsamples = 21\nvalue = [3, 18]'),
 Text(14.4, 114.75999999999999, 'X[4] <= 27.5\ngini = 0.18\nsamples = 20\nvalue = [2, 18]'),
 Text(10.8, 102.67999999999999, 'X[6] <= 1.5\ngini = 0.444\nsamples = 6\nvalue = [2, 4]'),
 Text(7.2, 90.6, 'X[2] <= 315.0\ngini = 0.444\nsamples = 3\nvalue = [2, 1]'),
 Text(3.6, 78.52000000000001, 'gini = 0.0\nsamples = 2\nvalue = [2, 0]'),
 Text(10.8, 78.52000000000001, 'gini = 0.0\nsamples = 1\nvalue = [0, 1]'),
 Text(14.4, 90.6, 'gini = 0.0\nsamples = 3\nvalue = [0, 3]'),
 Text(18.0, 102.67999999999999, 'gini = 0.0\nsamples = 14\nvalue = [0, 14]'),
 Text(21.6, 114.75999999999999, 'gini = 0.0\nsamples = 1\nvalue = [1, 0]'),
```

Depth in tree :

In [45]:
```
dt1.get_depth()
```

Out[45]:
```
17
```

Using Custom Depth :

In [46]:
```
dt2 = DecisionTreeClassifier(max_depth=10)
```

In [47]:
```
train_model(dt2)
```

```
              precision    recall  f1-score   support

           0       0.75      0.88      0.81       153
           1       0.79      0.61      0.69       115

    accuracy                           0.76       268
   macro avg       0.77      0.74      0.75       268
weighted avg       0.76      0.76      0.76       268
```

Out[47]:
```
DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini',
                       max_depth=10, max_features=None, max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, presort='deprecated',
                       random_state=None, splitter='best')
```

Using random sample leaf :

In [48]:
```
dt3 = DecisionTreeClassifier(min_samples_leaf=16)
```

In [49]:
```
train_model(dt3)
```

```
              precision    recall  f1-score   support

           0       0.75      0.80      0.77       153
           1       0.71      0.65      0.68       115

    accuracy                           0.74       268
   macro avg       0.73      0.72      0.73       268
weighted avg       0.73      0.74      0.73       268
```

Out[49]:
```
DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='gini',
                       max_depth=None, max_features=None, max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=16, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, presort='deprecated',
                       random_state=None, splitter='best')
```

Entropy Criterion :

In [50]:
```
dt4 = DecisionTreeClassifier(criterion='entropy')
```

In [51]:
```
train_model(dt4)
```

```
              precision    recall  f1-score   support

           0       0.74      0.81      0.78       153
           1       0.71      0.63      0.67       115

    accuracy                           0.73       268
   macro avg       0.73      0.72      0.72       268
weighted avg       0.73      0.73      0.73       268
```

Out[51]:
```
DecisionTreeClassifier(ccp_alpha=0.0, class_weight=None, criterion='entropy',
                       max_depth=None, max_features=None, max_leaf_nodes=None,
                       min_impurity_decrease=0.0, min_impurity_split=None,
                       min_samples_leaf=1, min_samples_split=2,
                       min_weight_fraction_leaf=0.0, presort='deprecated',
                       random_state=None, splitter='best')
```

In [ ]:
```

```