Titanic - Machine Learning from Disaster

Predicting survival on the Titanic

Data Dictionary

Variable	Definition	Key
survival	Survival	0 = No, 1 = Yes
pclass	Ticket class	1 = 1st, 2 = 2nd, 3 = 3rd
sex	Sex	
Age	Age in years	
sibsp	# of siblings / spouses aboard the Titanic	
parch	# of parents / children aboard the Titanic	
ticket	Ticket number	
fare	Passenger fare	
cabin	Cabin number	
embarked	Port of Embarkation	C = Cherbourg, Q = Queenstown, S = Southampton

```
#importing the libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# importing the tarin data set
df = pd.read_csv('titanic_train.csv')
df.head()
```

```
   PassengerId  Survived  Pclass                                      Name
Sex  \
0          631         1       1  Barkworth, Mr. Algernon Henry Wilson
male
1          852         0       3                     Svensson, Mr. Johan
male
2           97         0       1              Goldschmidt, Mr. George B
```

```
male
3          494          0       1                Artagaveytia, Mr. Ramon
male
4          117          0       3                   Connors, Mr. Patrick
male

    Age  SibSp  Parch    Ticket     Fare Cabin Embarked
0  80.0      0      0     27042  30.0000   A23        S
1  74.0      0      0    347060   7.7750   NaN        S
2  71.0      0      0  PC 17754  34.6542    A5        C
3  71.0      0      0  PC 17609  49.5042   NaN        C
4  70.5      0      0    370369   7.7500   NaN        Q

df.shape

(891, 12)
```

Data Preprocessing

```
# removing the unnecessary columns
df = df.drop(columns=['PassengerId','Name','Cabin','Ticket'], axis= 1)

df.describe()

         Survived      Pclass         Age       SibSp       Parch
Fare
count  891.000000  891.000000  891.000000  891.000000  891.000000
891.000000
mean     0.383838    2.308642   29.361582    0.523008    0.381594
32.204208
std      0.486592    0.836071   13.019697    1.102743    0.806057
49.693429
min      0.000000    1.000000    0.420000    0.000000    0.000000
0.000000
25%      0.000000    2.000000   22.000000    0.000000    0.000000
7.910400
50%      0.000000    3.000000   28.000000    0.000000    0.000000
14.454200
75%      1.000000    3.000000   35.000000    1.000000    0.000000
31.000000
max      1.000000    3.000000   80.000000    8.000000    6.000000
512.329200

#checking data types
df.dtypes

Survived      int64
Pclass        int64
Sex          object
Age         float64
```

```
SibSp         int64
Parch         int64
Fare        float64
Embarked     object
dtype: object
```

```
#checking for unique value count
df.nunique()
```

```
Survived      2
Pclass        3
Sex           2
Age          88
SibSp         7
Parch         7
Fare        248
Embarked      3
dtype: int64
```

```
#checking for missing value count
df.isnull().sum()
```

```
Survived    0
Pclass      0
Sex         0
Age         0
SibSp       0
Parch       0
Fare        0
Embarked    2
dtype: int64
```

Refining the data

```
# replacing the missing values
df['Age'] =  df['Age'].replace(np.nan,df['Age'].median(axis=0))
df['Embarked'] = df['Embarked'].replace(np.nan, 'S')

#type casting Age to integer
df['Age'] = df['Age'].astype(int)

#replacing with 1 and female with 0
df['Sex'] = df['Sex'].apply(lambda x : 1 if x == 'male' else 0)
```

Categorising in groups i.e. Infant(0-5), Teen (6-20), 20s(21-30), 30s(31-40), 40s(41-50), 50s(51-60), Elder(61-100)

```
# creating age groups - young (0-18), adult(18-30), middle aged(30-50), old (50-100)
```

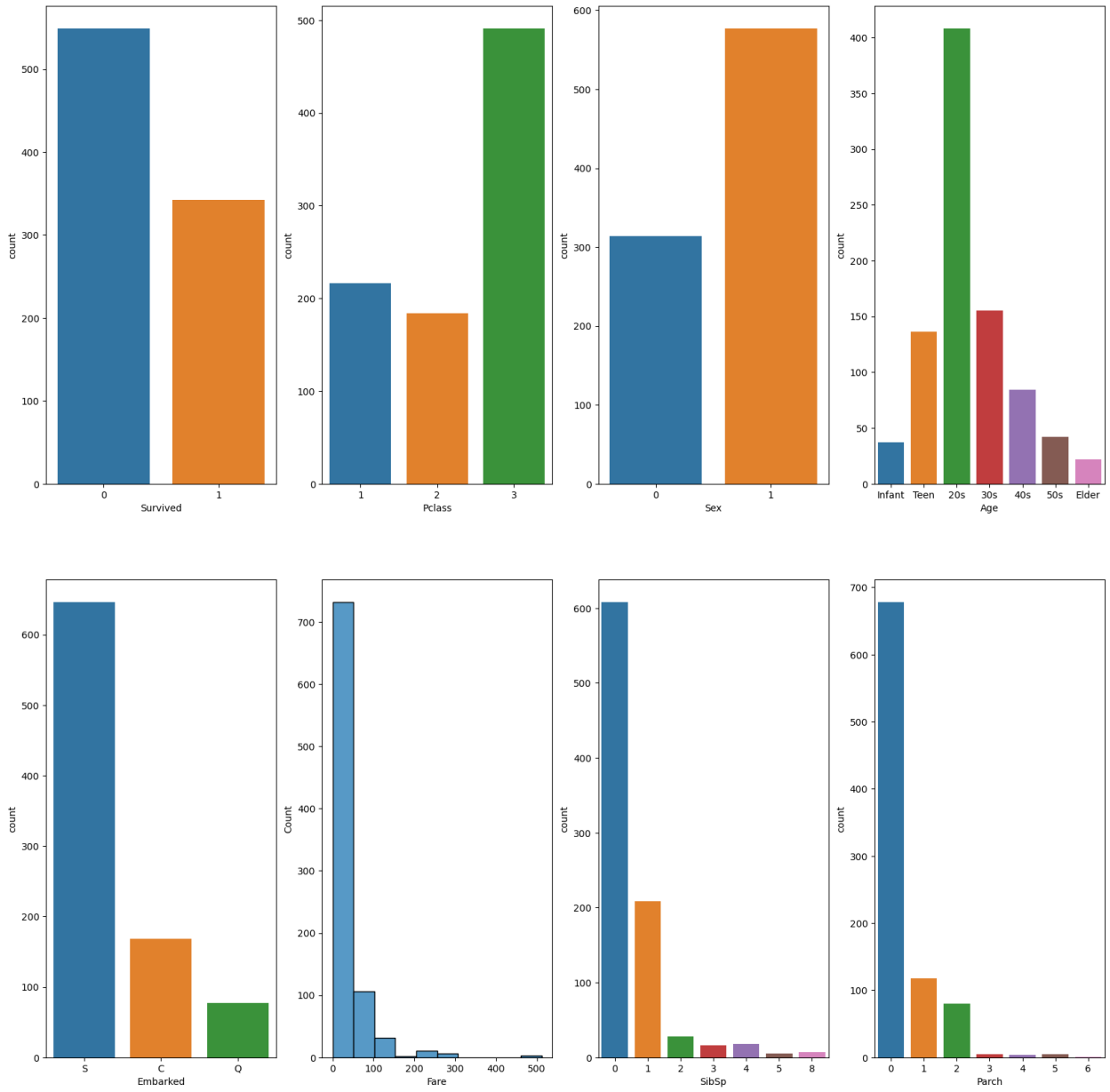
```
df['Age'] = pd.cut(x=df['Age'], bins=[0, 5, 20, 30, 40, 50, 60, 100],
labels = ['Infant', 'Teen', '20s', '30s', '40s', '50s', 'Elder'])
```

Exploratory Data Analysis

Plotting the Countplot to visualize the numbers

```
# visulizing the count of the features
fig, ax = plt.subplots(2,4,figsize=(20,20))
sns.countplot(x = 'Survived', data = df, ax= ax[0,0])
sns.countplot(x = 'Pclass', data = df, ax=ax[0,1])
sns.countplot(x = 'Sex', data = df, ax=ax[0,2])
sns.countplot(x = 'Age', data = df, ax=ax[0,3])
sns.countplot(x = 'Embarked', data = df, ax=ax[1,0])
sns.histplot(x = 'Fare', data= df, bins=10, ax=ax[1,1])
sns.countplot(x = 'SibSp', data = df, ax=ax[1,2])
sns.countplot(x = 'Parch', data = df, ax=ax[1,3])
```

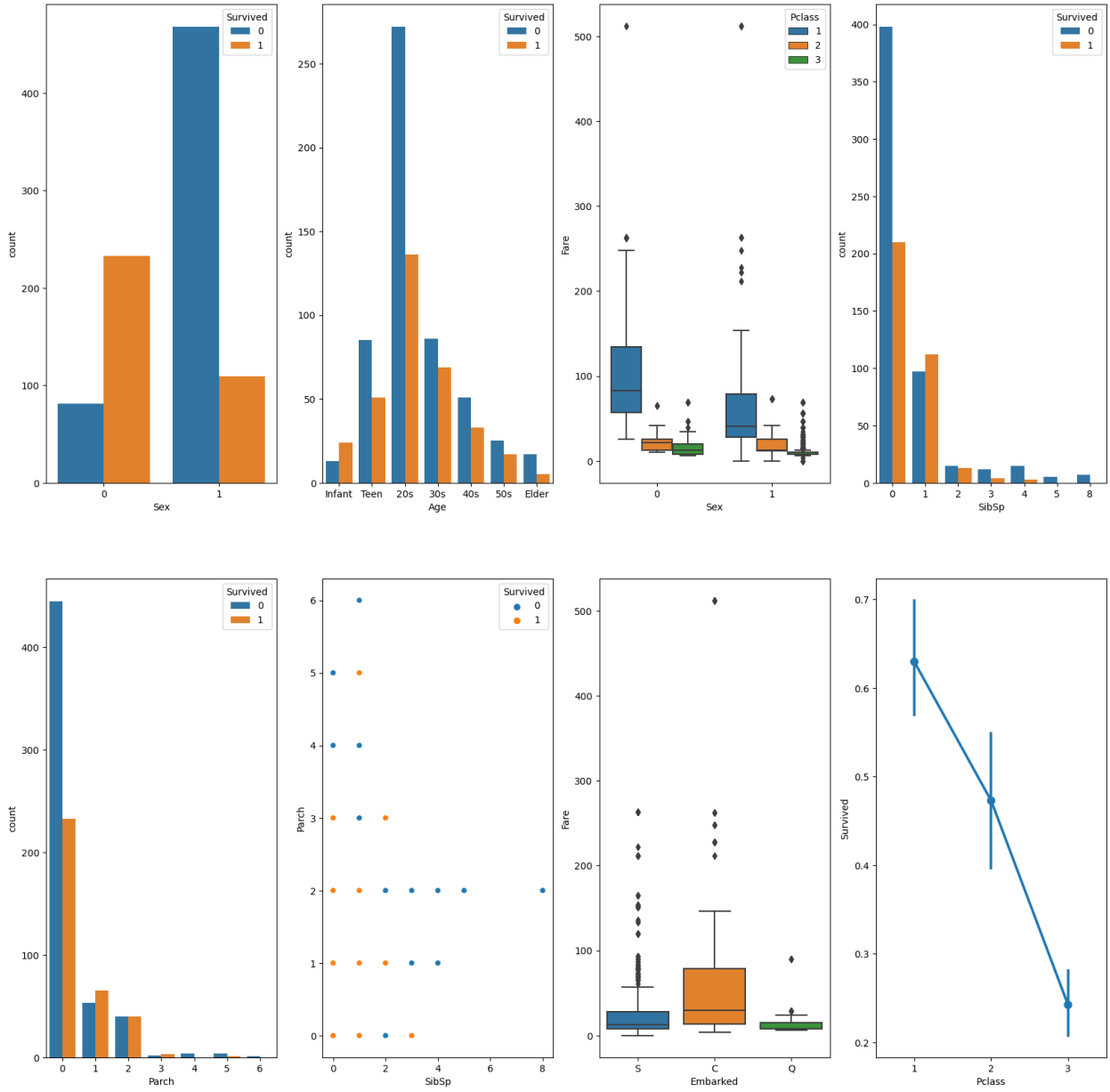
```
<Axes: xlabel='Parch', ylabel='count'>
```



Visualizing the replationship between the features

```
fig, ax = plt.subplots(2,4,figsize=(20,20))
sns.countplot(x = 'Sex', data = df, hue = 'Survived', ax= ax[0,0])
sns.countplot(x = 'Age', data = df, hue = 'Survived', ax=ax[0,1])
sns.boxplot(x = 'Sex',y='Fare', data = df, hue = 'Pclass', ax=ax[0,2])
sns.countplot(x = 'SibSp', data = df, hue = 'Survived', ax=ax[0,3])
sns.countplot(x = 'Parch', data = df, hue = 'Survived', ax=ax[1,0])
sns.scatterplot(x = 'SibSp', y = 'Parch', data = df,hue = 'Survived',
ax=ax[1,1])
sns.boxplot(x = 'Embarked', y ='Fare', data = df, ax=ax[1,2])
sns.pointplot(x = 'Pclass', y = 'Survived', data = df, ax=ax[1,3])
```

```
<Axes: xlabel='Pclass', ylabel='Survived'>
```



Data Preprocessing 2

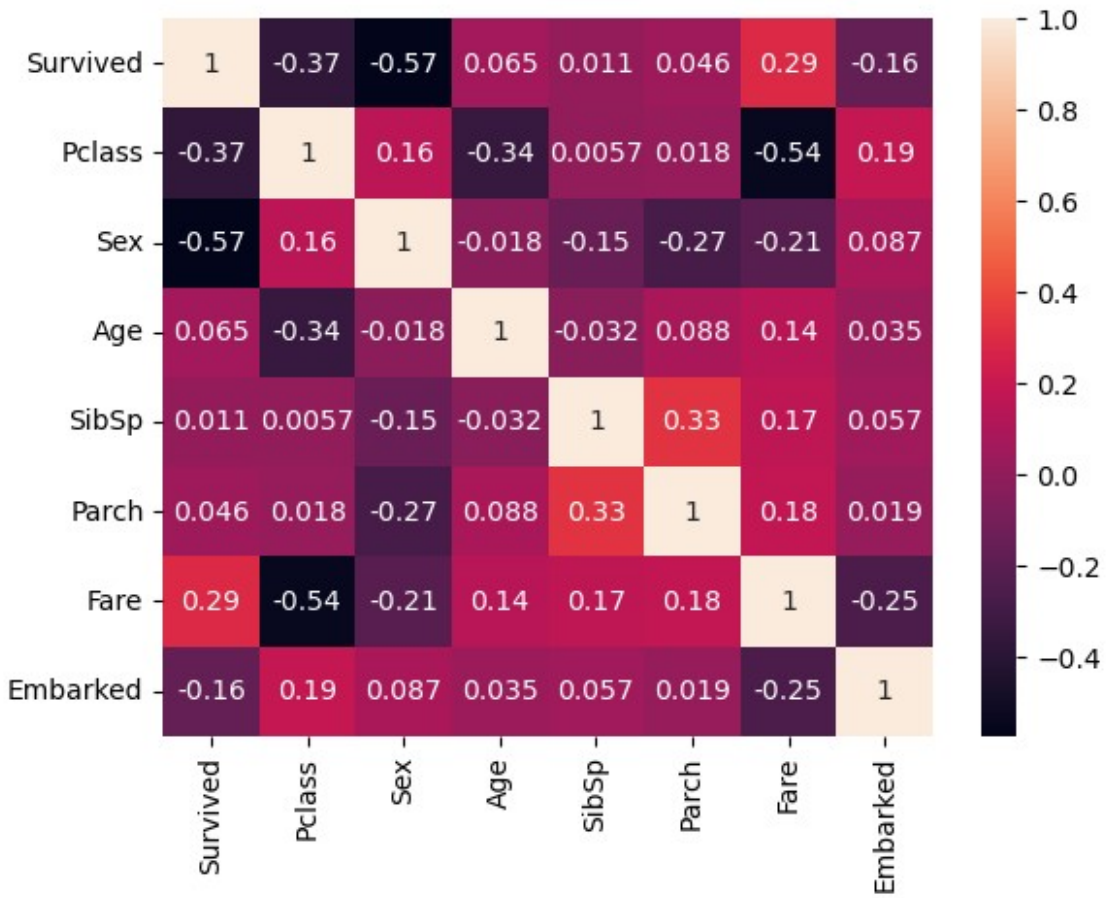
```
from sklearn import preprocessing
le = preprocessing.LabelEncoder()
le.fit(['S','C','Q'])
df['Embarked'] = le.transform(df['Embarked'])

age_mapping = {
    'infant': 0,
    'teen': 1,
```

```
    '20s': 2,
    '30s': 3,
    '40s': 4,
    '50s': 5,
    'elder': 6}
df['Age'] = df['Age'].map(age_mapping)
df.dropna(subset=['Age'], axis= 0, inplace = True)
```

Coorelation Heatmap

```
sns.heatmap(df.corr(), annot= True)
```

```
<Axes: >
```



Separating the target and independent variable

```
y = df['Survived']
x = df.drop(columns=['Survived'])
```

Model Training

Logistic Regression

```
from sklearn.linear_model import LogisticRegression
lr = LogisticRegression()
lr

LogisticRegression()

lr.fit(x,y)
lr.score(x,y)

C:\Users\admin\anaconda3\Lib\site-packages\sklearn\linear_model\
_logistic.py:460: 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
Please also refer to the documentation for alternative solver options:

https://scikit-learn.org/stable/modules/linear_model.html#logistic-
regression
  n_iter_i = _check_optimize_result(

0.818577648766328
```

Decision Tree Classifier

```
from sklearn.tree import DecisionTreeClassifier
dtree = DecisionTreeClassifier()
dtree

DecisionTreeClassifier()

dtree.fit(x,y)
dtree.score(x,y)

0.9404934687953556
```

Support Vector Machine (SVM)

```
from sklearn.svm import SVC
svm = SVC()
svm

SVC()

svm.fit(x,y)
svm.score(x,y)
```

```
0.7024673439767779
```

K-Nearest Neighbor

```
from sklearn.neighbors import KNeighborsClassifier
knn = KNeighborsClassifier()
knn
```

```
KNeighborsClassifier()
```

```
knn.fit(x,y)
knn.score(x,y)
```

```
0.8127721335268505
```

From the above four model Decision Tree Classifier has the highest Training accuracy, so only Decision Tree Classifier will work on the Test Set.

Importing the test set

```
df2 = pd.read_csv('titanic_test.csv')
df2.head()
```

```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         0       3

                                                Name     Sex   Age
SibSp  \
0                            Braund, Mr. Owen Harris    male  22.0
1
1  Cumings, Mrs. John Bradley (Florence Briggs Th...  female  38.0
1
2                             Heikkinen, Miss. Laina  female  26.0
0
3       Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0
1
4                           Allen, Mr. William Henry    male  35.0
0

   Parch            Ticket     Fare Cabin Embarked
0      0         A/5 21171   7.2500   NaN        S
1      0          PC 17599  71.2833   C85        C
2      0  STON/O2. 3101282   7.9250   NaN        S
3      0            113803  53.1000  C123        S
4      0            373450   8.0500   NaN        S
```

```
df2.shape
```

```
(891, 12)
```

```
#removing the columns
df2 = df2.drop(columns=['PassengerId','Name','Cabin','Ticket'], axis=
1)
```

Data Preprocessing the Test set

```
df2['Age'] =  df2['Age'].replace(np.nan,df2['Age'].median(axis=0))
df2['Embarked'] = df2['Embarked'].replace(np.nan, 'S')

#type casting Age to integer
df2['Age'] = df2['Age'].astype(int)

#replacing with 1 and female with 0
df2['Sex'] = df2['Sex'].apply(lambda x : 1 if x == 'male' else 0)

df2['Age'] = pd.cut(x=df2['Age'], bins=[0, 5, 20, 30, 40, 50, 60,
100], labels = [0,1,2,3,4,5,6])

le.fit(['S','C','Q'])
df2['Embarked'] = le.transform(df2['Embarked'])

df2.dropna(subset=['Age'], axis= 0, inplace = True)

df2.head()
```

	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Embarked
0	0	3	1	2	1	0	7.2500	2
1	1	1	0	3	1	0	71.2833	0
2	1	3	0	2	0	0	7.9250	2
3	1	1	0	3	1	0	53.1000	2
4	0	3	1	3	0	0	8.0500	2

Separating the traget and independent variable

```
x = df2.drop(columns=['Survived'])
y = df2['Survived']
```

Predicting using Decision Tree Classifier

```
tree_pred = dtree.predict(x)

from sklearn.metrics import accuracy_score
accuracy_score(y, tree_pred)
```

```
0.8981900452488688
```

Confusion Matrix

```
from sklearn.metrics import confusion_matrix
sns.heatmap(confusion_matrix(y,tree_pred),annot= True, cmap = 'Blues')
plt.ylabel('Predicted Values')
plt.xlabel('Actual Values')
plt.title('confusion matrix')
plt.show()
```