21bit0481-asst-3

September 20, 2023

[ ]:

```
'''Assignment 15 sep
Perform Data preprocessing on Titanic dataset
1.Data Collection.
   Please download the dataset from
   https://www.kaggle.com/datasets/yasserh/titanic-datase
2.Data Preprocessing
    o   Import the Libraries.
    o   Importing the dataset.
    o   Checking for Null Values.
    o   Data Visualization.
    o   Outlier Detection
    o   Splitting Dependent and Independent variables
    o   Perform Encoding
    o   Feature Scaling.
    o   Splitting Data into Train and Test'''
```

##Import the Libraries

[2]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

##Import the dataset

[3]:

```
df=pd.read_csv('Titanic-Dataset.csv')
df
```

[3]:

```
     PassengerId  Survived  Pclass  \
0              1         0       3
1              2         1       1
2              3         1       3
3              4         1       1
4              5         0       3
..           …         …     …
886          887         0       2
887          888         1       1
888          889         0       3
```

```
889          890         1       1
890          891         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
..                                                 …     …   …    …
886                              Montvila, Rev. Juozas    male  27.0      0
887                       Graham, Miss. Margaret Edith  female  19.0      0
888           Johnston, Miss. Catherine Helen "Carrie"  female   NaN      1
889                              Behr, Mr. Karl Howell    male  26.0      0
890                                Dooley, Mr. Patrick    male  32.0      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
..     …                 …      …   …      …
886      0            211536  13.0000   NaN        S
887      0            112053  30.0000   B42        S
888      2        W./C. 6607  23.4500   NaN        S
889      0            111369  30.0000  C148        C
890      0            370376   7.7500   NaN        Q

[891 rows x 12 columns]
```

##Checking for Null Values

[4]:
```
df.isnull().sum()
```

[4]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
```

```
dtype: int64
```

[5]:
```
#inference: There are 3 columns which have null values-Age,Cabin,Embarked
```

##Data Visualisation

[6]:
```
df.head()
```

[6]:
```
   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
```

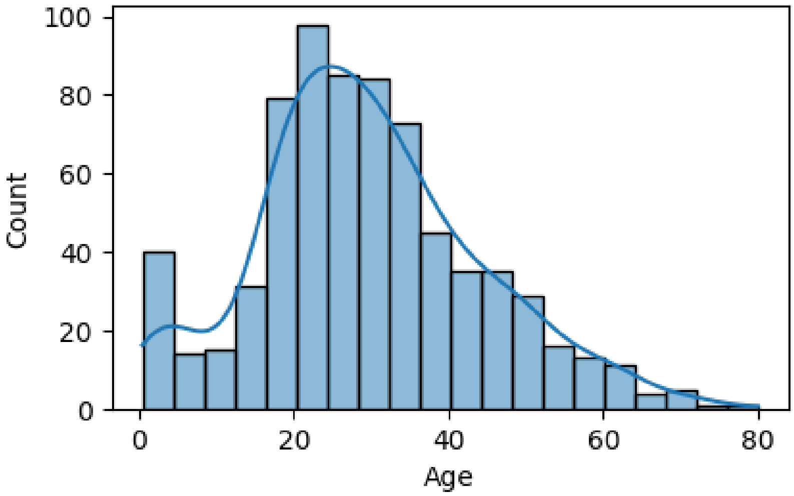
[7]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 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   Name         891 non-null    object
 4   Sex          891 non-null    object
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64
 7   Parch        891 non-null    int64
 8   Ticket       891 non-null    object
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object
 11  Embarked     889 non-null    object
```

```
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

[8]:
```
plt.figure(figsize=(10, 6))
plt.subplot(2, 2, 1)
sns.histplot(df['Age'], bins=20, kde=True)
plt.xlabel('Age')
plt.ylabel('Count')
```

[8]:
```
Text(0, 0.5, 'Count')
```



[9]:
```
corr=df.corr()
corr
```

```
<ipython-input-9-7d5195e2bf4d>:1: FutureWarning: The default value of
numeric_only in DataFrame.corr is deprecated. In a future version, it will
default to False. Select only valid columns or specify the value of numeric_only
to silence this warning.
  corr=df.corr()
```

[9]:
```
             PassengerId  Survived    Pclass       Age     SibSp     Parch  \
PassengerId     1.000000 -0.005007 -0.035144  0.036847 -0.057527 -0.001652
Survived       -0.005007  1.000000 -0.338481 -0.077221 -0.035322  0.081629
Pclass         -0.035144 -0.338481  1.000000 -0.369226  0.083081  0.018443
Age             0.036847 -0.077221 -0.369226  1.000000 -0.308247 -0.189119
SibSp          -0.057527 -0.035322  0.083081 -0.308247  1.000000  0.414838
Parch          -0.001652  0.081629  0.018443 -0.189119  0.414838  1.000000
Fare            0.012658  0.257307 -0.549500  0.096067  0.159651  0.216225

                 Fare
```

```
PassengerId  0.012658
Survived     0.257307
Pclass      -0.549500
Age          0.096067
SibSp        0.159651
Parch        0.216225
Fare         1.000000
```

```
[10]: df.isnull().any()
```

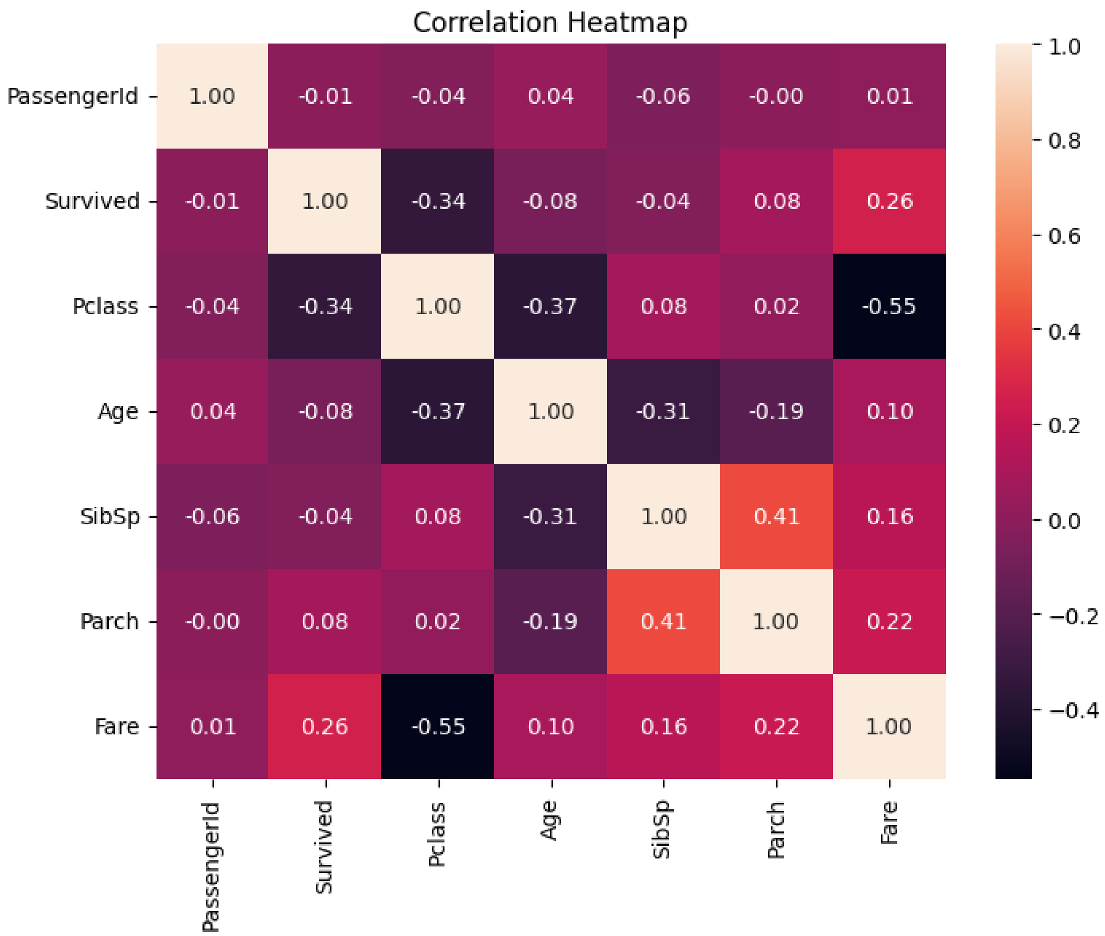
```
[10]: PassengerId    False
      Survived       False
      Pclass         False
      Name           False
      Sex            False
      Age             True
      SibSp          False
      Parch          False
      Ticket         False
      Fare           False
      Cabin           True
      Embarked        True
      dtype: bool
```

```
[11]: df.isnull().sum()
```

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

```
[12]: plt.figure(figsize=(8, 6))
      sns.heatmap(corr, annot=True, fmt=".2f")
      plt.title('Correlation Heatmap')
```

```
[12]: Text(0.5, 1.0, 'Correlation Heatmap')
```



##Handling Null Values

Imputing null values of age and emabarked

[13]:
```
median_age=df['Age'].median()
df['Age'].fillna(median_age,inplace=True)
```

[14]:
```
mode_embarked=df['Embarked'].mode()[0]
df['Embarked'].fillna(mode_embarked,inplace=True)
```

Dropping the column Cabin having large Null Values

[15]:
```
df.drop('Cabin',axis=1,inplace=True)
```

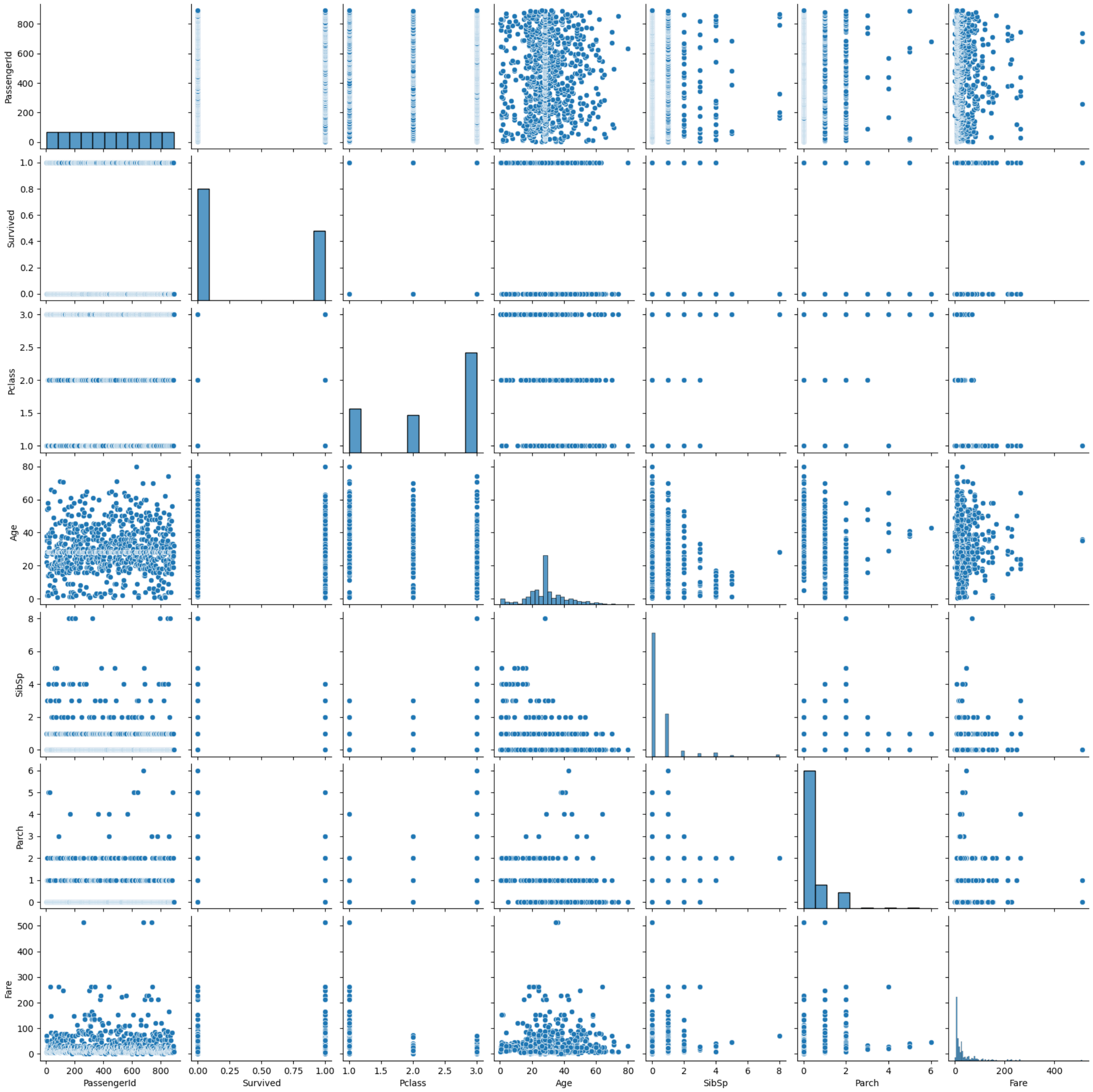
[16]:
```
df.isnull().sum()
```

[16]:
```
PassengerId    0
Survived       0
Pclass         0
```

```
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked       0
dtype: int64
```

[17]:
```
sns.pairplot(df)
```

[17]:
```
<seaborn.axisgrid.PairGrid at 0x7d24298e68f0>
```



[18]:

```python
Q1 = df['Age'].quantile(0.25)
Q3 = df['Age'].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR
outliers = (df['Age'] < lower_bound) | (df['Age'] > upper_bound)
print("Indices of potential outliers:")
print(df[outliers].index)
```

```
Indices of potential outliers:
Int64Index([  7,  11,  15,  16,  33,  54,  78,  94,  96, 116, 119, 152, 164,
            170, 172, 174, 183, 195, 205, 232, 252, 268, 275, 280, 297, 305,
            326, 340, 366, 381, 386, 438, 456, 467, 469, 479, 483, 487, 492,
            493, 530, 545, 555, 570, 587, 625, 626, 630, 642, 644, 647, 659,
            672, 684, 694, 745, 755, 772, 788, 803, 824, 827, 829, 831, 851,
            879],
           dtype='int64')
```

[19]:

```python
Q1 = df['Fare'].quantile(0.25)
Q3 = df['Fare'].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR
outliers = (df['Fare'] < lower_bound) | (df['Fare'] > upper_bound)
print(df[outliers].index)
```

```
Int64Index([  1,  27,  31,  34,  52,  61,  62,  72,  88, 102,
            …
            792, 802, 820, 829, 835, 846, 849, 856, 863, 879],
           dtype='int64', length=116)
```

[20]:

```python
from scipy import stats
mean_fare=np.mean(df['Fare'])
median_fare=np.median(df['Fare'])
mode_fare=stats.mode(df['Fare'])
print('Mean',mean_fare)
print('Median',median_fare)
print('Mode',mode_fare)
```

```
Mean 32.204207968574636
Median 14.4542
Mode ModeResult(mode=8.05, count=43)
```

[21]:

```python
Q1 = df['Fare'].quantile(0.25)
Q3 = df['Fare'].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR
```

```
df = df[(df['Fare'] >= lower_bound) & (df['Fare'] <= upper_bound)]
```

[22]:

```
mean_fare=np.mean(df['Fare'])
median_fare=np.median(df['Fare'])
mode_fare=stats.mode(df['Fare'])
print('Mean',mean_fare)
print('Median',median_fare)
print('Mode',mode_fare)
```

```
Mean 17.82209070967742
Median 13.0
Mode ModeResult(mode=8.05, count=43)
```

[23]:

```
mean_age=np.mean(df['Age'])
median_age=np.median(df['Age'])
mode_age=stats.mode(df['Age'])
print('Mean',mean_age)
print('Median',median_age)
print('Mode',mode_age)
```

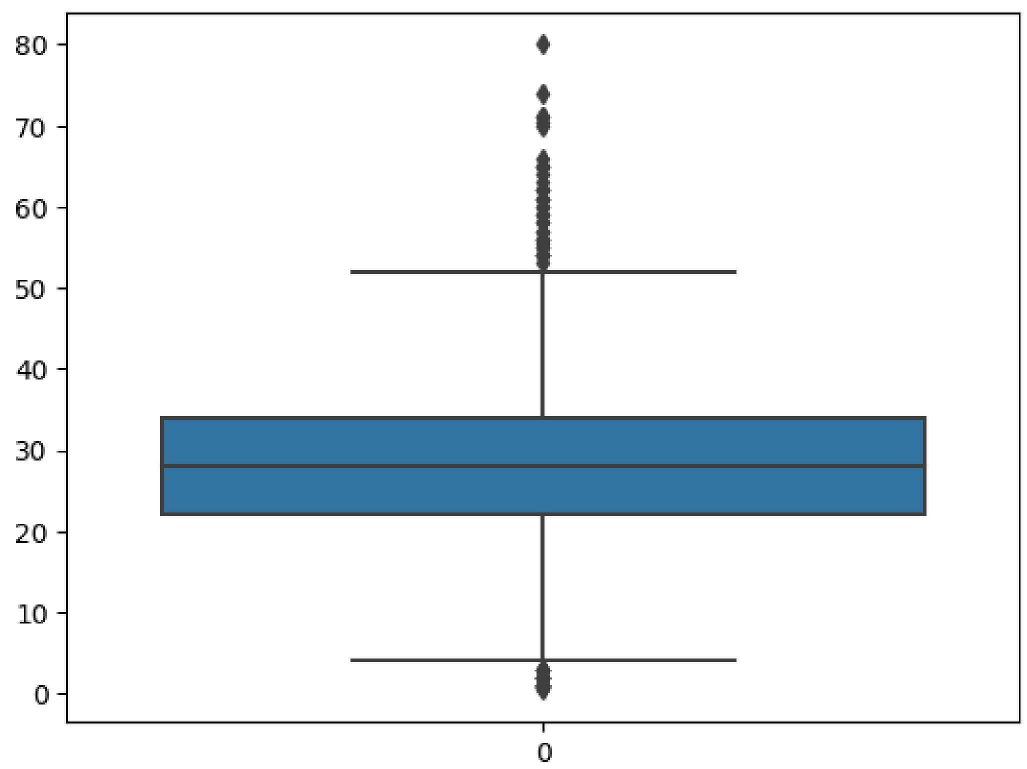
```
Mean 28.748709677419356
Median 28.0
Mode ModeResult(mode=28.0, count=186)
```

[24]:

```
sns.boxplot(df.Age)
```

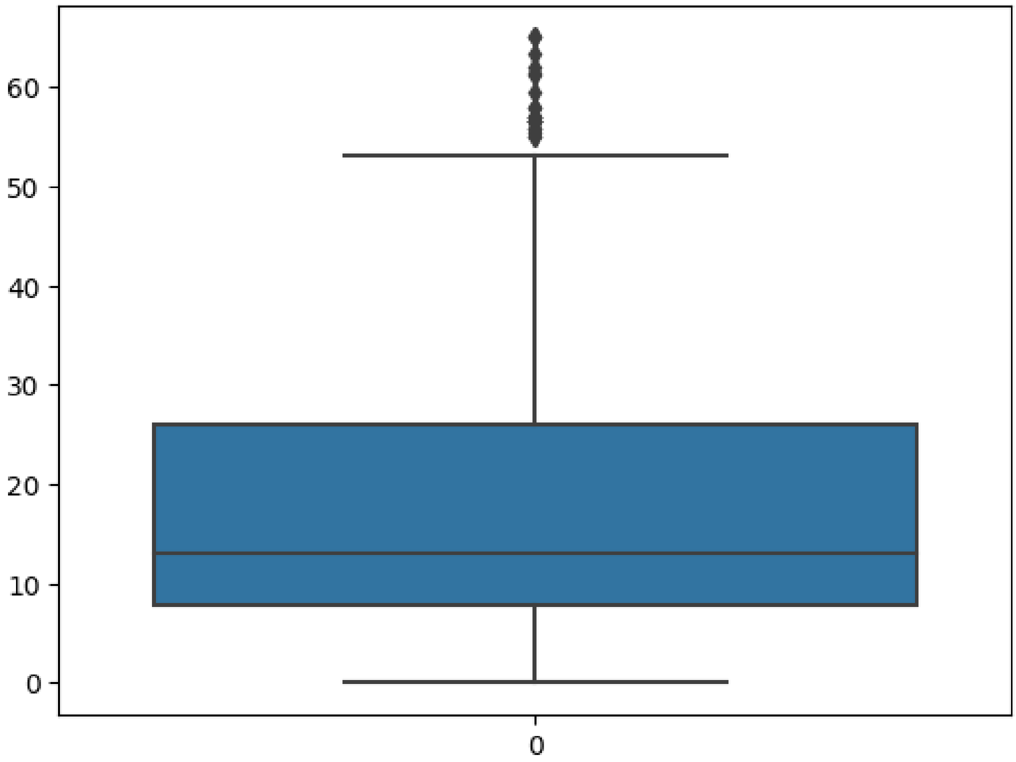
[24]:

```
<Axes: >
```



```
[25]: sns.boxplot(df.Fare)
```

```
[25]: <Axes: >
```



[34]:
```
df
```

[34]:
```
     PassengerId  Survived  Pclass  \
0              1         0       3
2              3         1       3
3              4         1       1
4              5         0       3
5              6         0       3
..           …         …     …
886          887         0       2
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3

                                            Name     Sex   Age  SibSp  Parch  \
0                        Braund, Mr. Owen Harris    male  22.0      1      0
2                         Heikkinen, Miss. Laina  female  26.0      0      0
3   Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0      1      0
4                       Allen, Mr. William Henry    male  35.0      0      0
5                               Moran, Mr. James    male  28.0      0      0
..                                           …     …   …    …    …
```

```
886                         Montvila, Rev. Juozas    male  27.0      0      0
887                  Graham, Miss. Margaret Edith  female  19.0      0      0
888      Johnston, Miss. Catherine Helen "Carrie"  female  28.0      1      2
889                         Behr, Mr. Karl Howell    male  26.0      0      0
890                           Dooley, Mr. Patrick    male  32.0      0      0

               Ticket     Fare Embarked
0           A/5 21171   7.2500        S
2    STON/O2. 3101282   7.9250        S
3              113803  53.1000        S
4              373450   8.0500        S
5              330877   8.4583        Q
..                …        …       …
886            211536  13.0000        S
887            112053  30.0000        S
888        W./C. 6607  23.4500        S
889            111369  30.0000        C
890            370376   7.7500        Q

[775 rows x 11 columns]
```

##Seperate dependent and independent variables

[26]:

```
Y=df['Survived']
X=df.drop('Survived', axis=1)
```

##Perform Encoding

[27]:

```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
X["Sex"]=le.fit_transform(X["Sex"])
X["Sex"].value_counts()
```

[27]:

```
1    531
0    244
Name: Sex, dtype: int64
```

[28]:

```
df
```

[28]:

```
     PassengerId  Survived  Pclass  \
0              1         0       3
2              3         1       3
3              4         1       1
4              5         0       3
5              6         0       3
..           …       …     …
886          887         0       2
887          888         1       1
```

```
888          889         0       3
889          890         1       1
890          891         0       3

                                             Name     Sex   Age  SibSp  Parch  \
0                         Braund, Mr. Owen Harris    male  22.0      1      0
2                          Heikkinen, Miss. Laina  female  26.0      0      0
3    Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0      1      0
4                        Allen, Mr. William Henry    male  35.0      0      0
5                                Moran, Mr. James    male  28.0      0      0
..                                            …     …   …    …    …
886                         Montvila, Rev. Juozas    male  27.0      0      0
887                  Graham, Miss. Margaret Edith  female  19.0      0      0
888      Johnston, Miss. Catherine Helen "Carrie"  female  28.0      1      2
889                         Behr, Mr. Karl Howell    male  26.0      0      0
890                           Dooley, Mr. Patrick    male  32.0      0      0

               Ticket     Fare Embarked
0           A/5 21171   7.2500        S
2    STON/O2. 3101282   7.9250        S
3              113803  53.1000        S
4              373450   8.0500        S
5              330877   8.4583        Q
..                …      …      …
886            211536  13.0000        S
887            112053  30.0000        S
888        W./C. 6607  23.4500        S
889            111369  30.0000        C
890            370376   7.7500        Q

[775 rows x 11 columns]
```

[29]:

```python
X.Embarked.value_counts()
```

[29]:

```
S    584
C    116
Q     75
Name: Embarked, dtype: int64
```

[30]:

```python
Embarked=pd.get_dummies(X["Embarked"],drop_first=True)
Embarked
```

[30]:

```
     Q  S
0    0  1
2    0  1
3    0  1
4    0  1
```

```
5    1  0
..  .. ..
886  0  1
887  0  1
888  0  1
889  0  0
890  1  0

[775 rows x 2 columns]
```

##Splitting into training and testing set

```
[31]: from sklearn.model_selection import train_test_split
      X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2,␣
       ↪random_state=0)

      X_train.shape,X_test.shape,Y_train.shape,Y_test.shape
```

```
[31]: ((620, 10), (155, 10), (620,), (155,))
```

##Feature Scaling.

```
[36]: from sklearn.preprocessing import MinMaxScaler
      numeric_columns = ['Age', 'Fare', 'Pclass', 'SibSp', 'Parch']
      X_train_numeric = X_train[numeric_columns]
      X_test_numeric = X_test[numeric_columns]
      sc=MinMaxScaler()
      X_train_scaled=sc.fit_transform(X_train_numeric)
      X_test_scaled=sc.transform(X_test_numeric)
      X_train_scaled
      X_test_scaled
```

```
[36]: array([[0.34656949, 0.11923077, 1.        , 0.        , 0.        ],
             [0.22090978, 0.22237231, 1.        , 0.        , 0.16666667],
             [0.34656949, 0.12384615, 1.        , 0.        , 0.        ],
             [0.68585072, 0.24615385, 0.5       , 0.        , 0.        ],
             [0.34656949, 0.11121846, 1.        , 0.        , 0.        ],
             [0.27117366, 0.11153846, 1.        , 0.        , 0.        ],
             [0.28373963, 0.23147385, 0.5       , 0.        , 0.        ],
             [0.63558683, 0.40846154, 0.        , 0.        , 0.        ],
             [0.05755215, 0.29628154, 1.        , 0.4       , 0.16666667],
             [0.33400352, 0.12192308, 1.        , 0.        , 0.        ],
             [0.52249309, 0.8       , 0.        , 0.2       , 0.        ],
             [0.48479517, 0.12192308, 1.        , 0.        , 0.        ],
             [0.24604172, 0.15147385, 1.        , 0.        , 0.        ],
             [0.01985423, 0.42923077, 1.        , 0.6       , 0.33333333],
             [0.34656949, 0.11961538, 1.        , 0.        , 0.        ],
             [0.03242021, 0.24461538, 1.        , 0.2       , 0.16666667],
             [0.34656949, 0.11993538, 1.        , 0.        , 0.        ],
             [0.40939935, 0.07692308, 0.        , 0.        , 0.        ],
             [0.2963056 , 0.29628154, 1.        , 0.        , 0.5       ],
             [0.44709726, 0.12147385, 1.        , 0.        , 0.        ],
             [0.00728826, 0.17128154, 1.        , 0.2       , 0.16666667],
             [0.39683338, 0.86916615, 1.        , 0.        , 0.        ],
             [0.25860769, 0.24769231, 1.        , 0.        , 0.        ],
             [0.37170143, 0.2       , 0.5       , 0.        , 0.        ],
             [0.34656949, 0.12147385, 1.        , 0.        , 0.        ],
             [0.30887158, 0.11115385, 1.        , 0.        , 0.        ],
             [0.27117366, 0.11923077, 1.        , 0.        , 0.        ],
             [0.34656949, 0.11923077, 1.        , 0.        , 0.        ],
             [0.34656949, 0.12384615, 1.        , 0.        , 0.        ],
             [0.30887158, 0.46153846, 0.5       , 0.2       , 0.16666667],
             [0.37170143, 0.12384615, 1.        , 0.        , 0.        ],
             [0.34656949, 0.13403846, 1.        , 0.        , 0.        ],
             [0.04498618, 0.48115385, 1.        , 0.8       , 0.33333333],
             [0.7361146 , 0.11153846, 1.        , 0.        , 0.        ],
             [0.34656949, 0.30718   , 1.        , 0.2       , 0.        ],
             [0.4722292 , 0.13326923, 1.        , 0.        , 0.        ],
             [0.23347575, 0.12083385, 1.        , 0.2       , 0.        ],
             [0.34656949, 0.11121846, 1.        , 0.        , 0.        ],
             [0.54762503, 0.12384615, 1.        , 0.        , 0.        ],
             [0.23347575, 0.12121846, 1.        , 0.        , 0.        ],
             [0.45966323, 0.1475    , 1.        , 0.        , 0.        ],
             [0.23347575, 0.        , 1.        , 0.        , 0.        ],
             [0.34656949, 0.39179538, 1.        , 0.6       , 0.16666667],
             [0.44709726, 0.4       , 0.5       , 0.2       , 0.        ],
             [0.17064589, 0.46262769, 0.5       , 0.2       , 0.        ],
             [0.40939935, 0.11961538, 1.        , 0.        , 0.        ],
             [0.71098266, 0.16153846, 0.5       , 0.        , 0.        ],
             [0.58532295, 0.59230769, 0.        , 0.        , 0.        ],
             [0.34656949, 0.        , 0.5       , 0.        , 0.        ],
             [0.09525006, 0.56538462, 0.5       , 0.2       , 0.16666667],
             [0.3842674 , 0.40384615, 0.5       , 0.2       , 0.16666667],
             [0.3842674 , 0.2       , 0.5       , 0.        , 0.        ],
             [0.44709726, 0.61730769, 0.        , 0.        , 0.        ],
             [0.34656949, 0.        , 0.5       , 0.        , 0.        ],
             [0.27117366, 0.11121846, 1.        , 0.        , 0.        ],
             [0.34656949, 0.72461538, 0.        , 0.        , 0.        ],
             [0.05755215, 0.48288462, 1.        , 0.8       , 0.33333333],
             [0.32143755, 0.12192308, 1.        , 0.        , 0.        ],
             [0.34656949, 0.14615385, 1.        , 0.        , 0.        ],
             [0.24604172, 0.12083385, 1.        , 0.        , 0.        ],
             [0.35913546, 0.11923077, 1.        , 0.        , 0.        ],
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