21BCE7286_Assignment-3

September 20, 2023

1 Importing Libraries

[1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, LabelEncoder
from sklearn.preprocessing import MinMaxScaler
```

2 Importing the dataset

[2]:

```
dataset=pd.read_csv("Titanic-Dataset.csv")
```

[3]:

```
dataset
```

[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]
```

[4]:
```
dataset.head()
```

[4]:
```
   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
```

[5]:
```
dataset.tail()
```

[5]:
```
     PassengerId  Survived  Pclass                                      Name  \
886          887         0       2                     Montvila, Rev. Juozas
```

```
887          888         1       1             Graham, Miss. Margaret Edith
888          889         0       3  Johnston, Miss. Catherine Helen "Carrie"
889          890         1       1                     Behr, Mr. Karl Howell
890          891         0       3                       Dooley, Mr. Patrick

        Sex   Age  SibSp  Parch      Ticket   Fare Cabin Embarked
886    male  27.0      0      0      211536  13.00   NaN        S
887  female  19.0      0      0      112053  30.00   B42        S
888  female   NaN      1      2  W./C. 6607  23.45   NaN        S
889    male  26.0      0      0      111369  30.00  C148        C
890    male  32.0      0      0      370376   7.75   NaN        Q
```

[6]:

```
dataset.shape
```

[6]:

```
(891, 12)
```

[7]:

```
dataset.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]:

```
dataset.describe()
```

[8]:

```
       PassengerId    Survived      Pclass         Age       SibSp  \
count   891.000000  891.000000  891.000000  714.000000  891.000000
mean    446.000000    0.383838    2.308642   29.699118    0.523008
std     257.353842    0.486592    0.836071   14.526497    1.102743
min       1.000000    0.000000    1.000000    0.420000    0.000000
25%     223.500000    0.000000    2.000000   20.125000    0.000000
50%     446.000000    0.000000    3.000000   28.000000    0.000000
75%     668.500000    1.000000    3.000000   38.000000    1.000000
```

```
max     891.000000    1.000000    3.000000   80.000000    8.000000

            Parch        Fare
count  891.000000  891.000000
mean     0.381594   32.204208
std      0.806057   49.693429
min      0.000000    0.000000
25%      0.000000    7.910400
50%      0.000000   14.454200
75%      0.000000   31.000000
max      6.000000  512.329200
```

3 Checking for Null Values

[9]:

```
dataset.isnull().any()
```

[9]:

```
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
```

[10]:

```
dataset.isnull().sum()
```

[10]:

```
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
```

4 Handling the null values

[11]:
```
dataset['Age'].fillna(dataset['Age'].median(), inplace=True)
```

[12]:
```
dataset.drop(['Cabin'], axis=1, inplace=True)
```

[13]:
```
mode_embarked = dataset['Embarked'].mode()[0]
dataset['Embarked'].fillna(mode_embarked, inplace=True)
```

[14]:
```
dataset.isnull().sum()
```

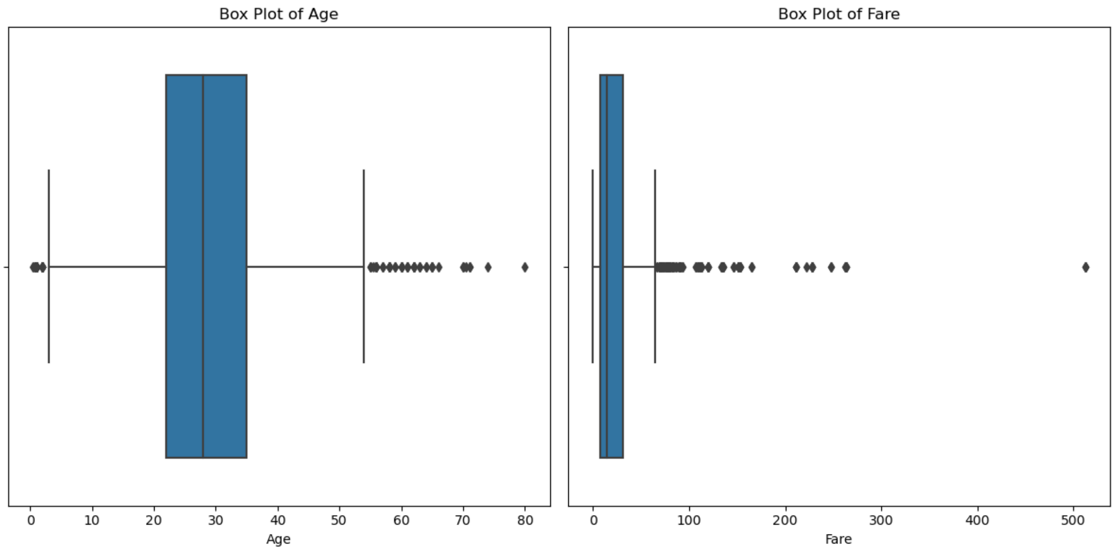
[14]:
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked       0
dtype: int64
```

5 Data Visualization

[15]:
```
plt.figure(figsize=(12, 6))
plt.subplot(1, 2, 1)
sns.boxplot(data=dataset, x="Age")
plt.title('Box Plot of Age')

plt.subplot(1, 2, 2)
sns.boxplot(data=dataset, x="Fare")
plt.title('Box Plot of Fare')

plt.tight_layout()
plt.show()
```



6 Outlier Detection:-

[16]:
```
Q1_age = dataset['Age'].quantile(0.25)
Q3_age = dataset['Age'].quantile(0.75)
IQR_age = Q3_age - Q1_age
lower_bound_age = Q1_age - 1.5 * IQR_age
upper_bound_age = Q3_age + 1.5 * IQR_age

outliers_age = dataset[(dataset['Age'] < lower_bound_age) | (dataset['Age'] >␣
 ↪upper_bound_age)]
```

[17]:
```
outliers_age
```

[17]:
```
     PassengerId  Survived  Pclass  \
7              8         0       3
11            12         1       1
15            16         1       2
16            17         0       3
33            34         0       2
..           ...       ...     ...
827          828         1       2
829          830         1       1
831          832         1       2
851          852         0       3
879          880         1       1

                                   Name   Sex   Age  SibSp  \
7          Palsson, Master. Gosta Leonard  male  2.00      3
```

```
11                        Bonnell, Miss. Elizabeth  female  58.00      0
15                Hewlett, Mrs. (Mary D Kingcome)   female  55.00      0
16                            Rice, Master. Eugene    male   2.00      4
33                           Wheadon, Mr. Edward H    male  66.00      0
..                                             …     …    …    …
827                          Mallet, Master. Andre    male   1.00      0
829      Stone, Mrs. George Nelson (Martha Evelyn)  female  62.00      0
831                Richards, Master. George Sibley    male   0.83      1
851                            Svensson, Mr. Johan    male  74.00      0
879  Potter, Mrs. Thomas Jr (Lily Alexenia Wilson)  female  56.00      0

     Parch           Ticket     Fare Embarked
7        1           349909  21.0750        S
11       0           113783  26.5500        S
15       0           248706  16.0000        S
16       1           382652  29.1250        Q
33       0       C.A. 24579  10.5000        S
..     …              …      …      …
827      2  S.C./PARIS 2079  37.0042        C
829      0           113572  80.0000        S
831      1            29106  18.7500        S
851      0           347060   7.7750        S
879      1            11767  83.1583        C

[66 rows x 11 columns]
```

[18]:
```
Q1_fare = dataset['Fare'].quantile(0.25)
Q3_fare = dataset['Fare'].quantile(0.75)
IQR_fare = Q3_fare - Q1_fare
lower_bound_fare = Q1_fare - 1.5 * IQR_fare
upper_bound_fare = Q3_fare + 1.5 * IQR_fare

outliers_fare = dataset[(dataset['Fare'] < lower_bound_fare) | (dataset['Fare']␣
 ↪> upper_bound_fare)]
```

[19]:
```
outliers_fare
```

[19]:
```
     PassengerId  Survived  Pclass  \
1              2         1       1
27            28         0       1
31            32         1       1
34            35         0       1
52            53         1       1
..           …        …      …
846          847         0       3
849          850         1       1
856          857         1       1
```

```
863          864         0       3
879          880         1       1

                                                  Name     Sex   Age  SibSp  \
1    Cumings, Mrs. John Bradley (Florence Briggs Th…  female  38.0      1
27                      Fortune, Mr. Charles Alexander    male  19.0      3
31      Spencer, Mrs. William Augustus (Marie Eugenie)  female  28.0      1
34                             Meyer, Mr. Edgar Joseph    male  28.0      1
52            Harper, Mrs. Henry Sleeper (Myna Haxtun)  female  49.0      1
..                                                 …     …   …    …
846                           Sage, Mr. Douglas Bullen    male  28.0      8
849       Goldenberg, Mrs. Samuel L (Edwiga Grabowska)  female  28.0      1
856         Wick, Mrs. George Dennick (Mary Hitchcock)  female  45.0      1
863                  Sage, Miss. Dorothy Edith "Dolly"  female  28.0      8
879      Potter, Mrs. Thomas Jr (Lily Alexenia Wilson)  female  56.0      0

     Parch    Ticket      Fare Embarked
1        0  PC 17599   71.2833        C
27       2     19950  263.0000        S
31       0  PC 17569  146.5208        C
34       0  PC 17604   82.1708        C
52       0  PC 17572   76.7292        C
..     …       …       …      …
846      2  CA. 2343   69.5500        S
849      0     17453   89.1042        C
856      1     36928  164.8667        S
863      2  CA. 2343   69.5500        S
879      1     11767   83.1583        C

[116 rows x 11 columns]
```

7 Splitting Dependent and Independent variables

[20]:

```
x = dataset.drop('Survived', axis=1)
y = dataset['Survived']
```

[21]:

```
x
```

[21]:

```
     PassengerId  Pclass                                               Name  \
0              1       3                            Braund, Mr. Owen Harris
1              2       1  Cumings, Mrs. John Bradley (Florence Briggs Th…
2              3       3                             Heikkinen, Miss. Laina
3              4       1       Futrelle, Mrs. Jacques Heath (Lily May Peel)
4              5       3                           Allen, Mr. William Henry
..           …     …                                                …
886          887       2                              Montvila, Rev. Juozas
```

```
887          888       1                       Graham, Miss. Margaret Edith
888          889       3           Johnston, Miss. Catherine Helen "Carrie"
889          890       1                              Behr, Mr. Karl Howell
890          891       3                                Dooley, Mr. Patrick

        Sex   Age  SibSp  Parch            Ticket     Fare Embarked
0      male  22.0      1      0         A/5 21171   7.2500        S
1    female  38.0      1      0          PC 17599  71.2833        C
2    female  26.0      0      0  STON/O2. 3101282   7.9250        S
3    female  35.0      1      0            113803  53.1000        S
4      male  35.0      0      0            373450   8.0500        S
..      …   …    …    …               …      …      …
886    male  27.0      0      0            211536  13.0000        S
887  female  19.0      0      0            112053  30.0000        S
888  female  28.0      1      2        W./C. 6607  23.4500        S
889    male  26.0      0      0            111369  30.0000        C
890    male  32.0      0      0            370376   7.7500        Q

[891 rows x 10 columns]
```

[22]:
```
y
```

[22]:
```
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
```

8 Encoding

8.0.1 • Label encoding on Pclass Column :-

[23]:
```
le=LabelEncoder()
```

[24]:
```
x["Pclass"]=le.fit_transform(x["Pclass"])
```

[25]:
```
x["Pclass"]
```

[25]:
```
0      2
1      0
```

```
2      2
3      0
4      2
      ..
886    1
887    0
888    2
889    0
890    2
Name: Pclass, Length: 891, dtype: int64
```

[26]:
```
x["Pclass"].value_counts()
```

[26]:
```
2    491
0    216
1    184
Name: Pclass, dtype: int64
```

[27]:
```
x["Pclass"].nunique()
```

[27]:
```
3
```

[28]:
```
x.head()
```

[28]:
```
   PassengerId  Pclass                                               Name  \
0            1       2                            Braund, Mr. Owen Harris
1            2       0  Cumings, Mrs. John Bradley (Florence Briggs Th…
2            3       2                             Heikkinen, Miss. Laina
3            4       0       Futrelle, Mrs. Jacques Heath (Lily May Peel)
4            5       2                           Allen, Mr. William Henry

      Sex   Age  SibSp  Parch            Ticket     Fare Embarked
0    male  22.0      1      0         A/5 21171   7.2500        S
1  female  38.0      1      0          PC 17599  71.2833        C
2  female  26.0      0      0  STON/O2. 3101282   7.9250        S
3  female  35.0      1      0            113803  53.1000        S
4    male  35.0      0      0            373450   8.0500        S
```

8.0.2 • One hot encoding on Sex and Embarked Column :-

[29]:
```
x.shape
```

[29]:
```
(891, 10)
```

[30]:
```
Sex = pd.get_dummies(x['Sex'], drop_first=False)
```

[31]:
```
Sex
```

[31]:

```
     female  male
0         0     1
1         1     0
2         1     0
3         1     0
4         0     1
..      …   …
886       0     1
887       1     0
888       1     0
889       0     1
890       0     1

[891 rows x 2 columns]
```

[32]:

```
Embarked = pd.get_dummies(x["Embarked"],drop_first=False)
```

[33]:

```
Embarked
```

[33]:

```
     C  Q  S
0    0  0  1
1    1  0  0
2    0  0  1
3    0  0  1
4    0  0  1
..  .. .. ..
886  0  0  1
887  0  0  1
888  0  0  1
889  1  0  0
890  0  1  0

[891 rows x 3 columns]
```

[34]:

```
x=pd.concat([x,Sex,Embarked],axis=1)
```

[35]:

```
x.head()
```

[35]:

```
   PassengerId  Pclass                                               Name  \
0            1       2                            Braund, Mr. Owen Harris
1            2       0  Cumings, Mrs. John Bradley (Florence Briggs Th…
2            3       2                             Heikkinen, Miss. Laina
3            4       0       Futrelle, Mrs. Jacques Heath (Lily May Peel)
4            5       2                           Allen, Mr. William Henry

     Sex   Age  SibSp  Parch            Ticket     Fare Embarked  female  \
0   male  22.0      1      0         A/5 21171   7.2500        S       0
```

```
1  female  38.0      1      0         PC 17599  71.2833        C       1
2  female  26.0      0      0  STON/O2. 3101282   7.9250        S       1
3  female  35.0      1      0           113803  53.1000        S       1
4    male  35.0      0      0           373450   8.0500        S       0

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

[36]:

```python
x.drop(["Sex","Embarked"],axis=1,inplace=True)
```

[37]:

```python
x.head(10)
```

[37]:

```
   PassengerId  Pclass                                               Name  \
0            1       2                            Braund, Mr. Owen Harris
1            2       0  Cumings, Mrs. John Bradley (Florence Briggs Th…
2            3       2                             Heikkinen, Miss. Laina
3            4       0       Futrelle, Mrs. Jacques Heath (Lily May Peel)
4            5       2                           Allen, Mr. William Henry
5            6       2                                   Moran, Mr. James
6            7       0                            McCarthy, Mr. Timothy J
7            8       2                     Palsson, Master. Gosta Leonard
8            9       2  Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)
9           10       1                Nasser, Mrs. Nicholas (Adele Achem)

    Age  SibSp  Parch            Ticket     Fare  female  male  C  Q  S
0  22.0      1      0         A/5 21171   7.2500       0     1  0  0  1
1  38.0      1      0          PC 17599  71.2833       1     0  1  0  0
2  26.0      0      0  STON/O2. 3101282   7.9250       1     0  0  0  1
3  35.0      1      0            113803  53.1000       1     0  0  0  1
4  35.0      0      0            373450   8.0500       0     1  0  0  1
5  28.0      0      0            330877   8.4583       0     1  0  1  0
6  54.0      0      0             17463  51.8625       0     1  0  0  1
7   2.0      3      1            349909  21.0750       0     1  0  0  1
8  27.0      0      2            347742  11.1333       1     0  0  0  1
9  14.0      1      0            237736  30.0708       1     0  1  0  0
```

[38]:

```python
x.shape
```

[38]:

```
(891, 13)
```

9 Feature Scaling

9.0.1 • Normalization:-

[39]:

```
scaler = MinMaxScaler()
x[['Age', 'Fare']] = scaler.fit_transform(x[['Age', 'Fare']])
```

[40]:

```
x[['Age', 'Fare']]
```

[40]:

```
          Age      Fare
0    0.271174  0.014151
1    0.472229  0.139136
2    0.321438  0.015469
3    0.434531  0.103644
4    0.434531  0.015713
..        …         …
886  0.334004  0.025374
887  0.233476  0.058556
888  0.346569  0.045771
889  0.321438  0.058556
890  0.396833  0.015127

[891 rows x 2 columns]
```

9.0.2 • Standardization :-

[41]:

```
scaler = StandardScaler()
x[['Age', 'Fare']] = scaler.fit_transform(x[['Age', 'Fare']])
```

[42]:

```
x[['Age', 'Fare']]
```

[42]:

```
          Age      Fare
0   -0.565736 -0.502445
1    0.663861  0.786845
2   -0.258337 -0.488854
3    0.433312  0.420730
4    0.433312 -0.486337
..        …         …
886 -0.181487 -0.386671
887 -0.796286 -0.044381
888 -0.104637 -0.176263
889 -0.258337 -0.044381
890  0.202762 -0.492378

[891 rows x 2 columns]
```

10 Splitting Data into Train and Test

```
[43]: x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2,␣
       ↪random_state=42)
```

```
[44]: x_train, x_test, y_train, y_test
```

```
[44]: (     PassengerId  Pclass                                Name       Age  SibSp
      \
       331          332       0                 Partner, Mr. Austen  1.240235      0
       733          734       1          Berriman, Mr. William John -0.488887      0
       382          383       2                  Tikkanen, Mr. Juho  0.202762      0
       704          705       2             Hansen, Mr. Henrik Juul -0.258337      1
       813          814       2  Andersson, Miss. Ebba Iris Alfrida -1.795334      4
       ..           …     …                                 …       …    …
       106          107       2    Salkjelsvik, Miss. Anna Kristine -0.642586      0
       270          271       0               Cairns, Mr. Alexander -0.104637      0
       860          861       2             Hansen, Mr. Claus Peter  0.894411      2
       435          436       0           Carter, Miss. Lucile Polk -1.180535      1
       102          103       0           White, Mr. Richard Frasar -0.642586      0

            Parch             Ticket      Fare  female  male  C  Q  S
       331      0             113043 -0.074583       0     1  0  0  1
       733      0              28425 -0.386671       0     1  0  0  1
       382      0  STON/O 2. 3101293 -0.488854       0     1  0  0  1
       704      0             350025 -0.490280       0     1  0  0  1
       813      2             347082 -0.018709       1     0  0  0  1
       ..     …                …       …     …   … .. .. ..
       106      0             343120 -0.494391       1     0  0  0  1
       270      0             113798 -0.024246       0     1  0  0  1
       860      0             350026 -0.364355       0     1  0  0  1
       435      2             113760  1.767741       1     0  0  0  1
       102      1              35281  0.907738       0     1  0  0  1

       [712 rows x 13 columns],
            PassengerId  Pclass                                               Name  \
      709          710       2  Moubarek, Master. Halim Gonios ("William George")
      439          440       1             Kvillner, Mr. Johan Henrik Johannesson
      840          841       2                        Alhomaki, Mr. Ilmari Rudolf
      720          721       1                  Harper, Miss. Annie Jessie "Nina"
      39            40       2                        Nicola-Yarred, Miss. Jamila
      ..           …     …                                                 …
      433          434       2                         Kallio, Mr. Nikolai Erland
      773          774       2                                    Elias, Mr. Dibo
      25            26       2  Asplund, Mrs. Carl Oscar (Selma Augusta Emilia…
      84            85       1                                Ilett, Miss. Bertha
      10            11       2                    Sandstrom, Miss. Marguerite Rut
```

```
          Age  SibSp  Parch             Ticket      Fare  female  male  C  Q  \
709 -0.104637      1      1               2661 -0.341452       0     1  1  0
439  0.125912      0      0          C.A. 18723 -0.437007       0     1  0  0
840 -0.719436      0      0    SOTON/O2 3101287 -0.488854       0     1  0  0
720 -1.795334      0      1             248727  0.016023       1     0  0  0
39  -1.180535      1      0               2651 -0.422074       1     0  1  0
..        …      …      …                  …         …       …     … .. ..
433 -0.949986      0      0  STON/O 2. 3101274 -0.504962       0     1  0  0
773 -0.104637      0      0               2674 -0.502949       0     1  1  0
25   0.663861      1      5             347077 -0.016444       1     0  0  0
84  -0.949986      0      0         SO/C 14885 -0.437007       1     0  0  0
10  -1.949034      1      1            PP 9549 -0.312172       1     0  0  0

     S
709  0
439  1
840  1
720  1
39   0
..  ..
433  1
773  0
25   1
84   1
10   1

[179 rows x 13 columns],
331    0
733    0
382    0
704    0
813    0
      ..
106    1
270    0
860    0
435    1
102    0
Name: Survived, Length: 712, dtype: int64,
709    1
439    0
840    0
720    1
39     1
      ..
433    0
```

```
773    0
25     1
84     1
10     1
Name: Survived, Length: 179, dtype: int64)
```

```
[45]: x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

```
[45]: ((712, 13), (179, 13), (712,), (179,))
```