nihal-21bcb7146-assg-3

September 20, 2023

ASSIGNMENT 3 NIHAL SHAIK 21BCB7146

1 DATA PREPROCESSING

[1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

IMPORTING THE DATASET

[2]:
```
df= pd.read_csv("Titanic-Dataset.csv")
```

[3]:
```
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]
```

```
[4]: df.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]: df.shape
```

```
[5]: (891, 12)
```

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

[6]:

```
       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
```

[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]:

```
df.corr()
```

```
C:\Users\lenovo\AppData\Local\Temp\ipykernel_11992\1134722465.py: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.
```

```
  df.corr()
```

```
[8]:              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
```

```
[9]: df.corr().Fare.sort_values(ascending=False)
```

```
C:\Users\lenovo\AppData\Local\Temp\ipykernel_11992\60082530.py: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.
  df.corr().Fare.sort_values(ascending=False)
```

```
[9]: Fare           1.000000
     Survived       0.257307
     Parch          0.216225
     SibSp          0.159651
     Age            0.096067
     PassengerId    0.012658
     Pclass        -0.549500
     Name: Fare, dtype: float64
```

CHECKING FOR NULL VALUES

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

[11]:
```
     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 Embarked
0        0         A/5 21171   7.2500        S
1        0          PC 17599  71.2833        C
2        0  STON/O2. 3101282   7.9250        S
3        0            113803  53.1000        S
4        0            373450   8.0500        S
..     …               …      …      …
886      0            211536  13.0000        S
887      0            112053  30.0000        S
888      2        W./C. 6607  23.4500        S
889      0            111369  30.0000        C
```

```
890      0            370376   7.7500        Q

[891 rows x 11 columns]
```

We dropped cabin beacuse it has highest number of null values.

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

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

[14]:
```
df.isnull().any()
```

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

Finally,we can observe there are no null values in any attribute

[15]:
```
df.Embarked.nunique()
```

[15]:
```
3
```

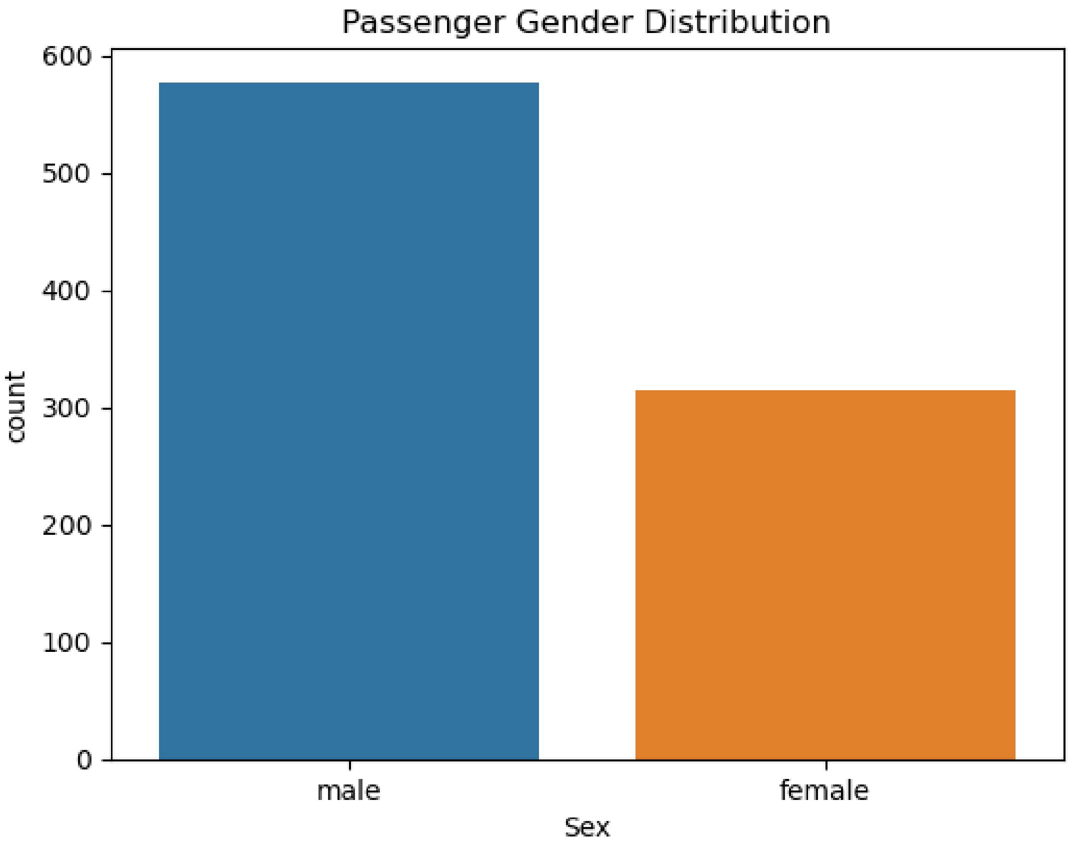
[16]:
```
df.Embarked.unique()
```

[16]:
```
array(['S', 'C', 'Q'], dtype=object)
```

[17]:
```
df.Embarked.value_counts()
```

[17]:
```
S    646
C    168
Q     77
Name: Embarked, dtype: int64
```

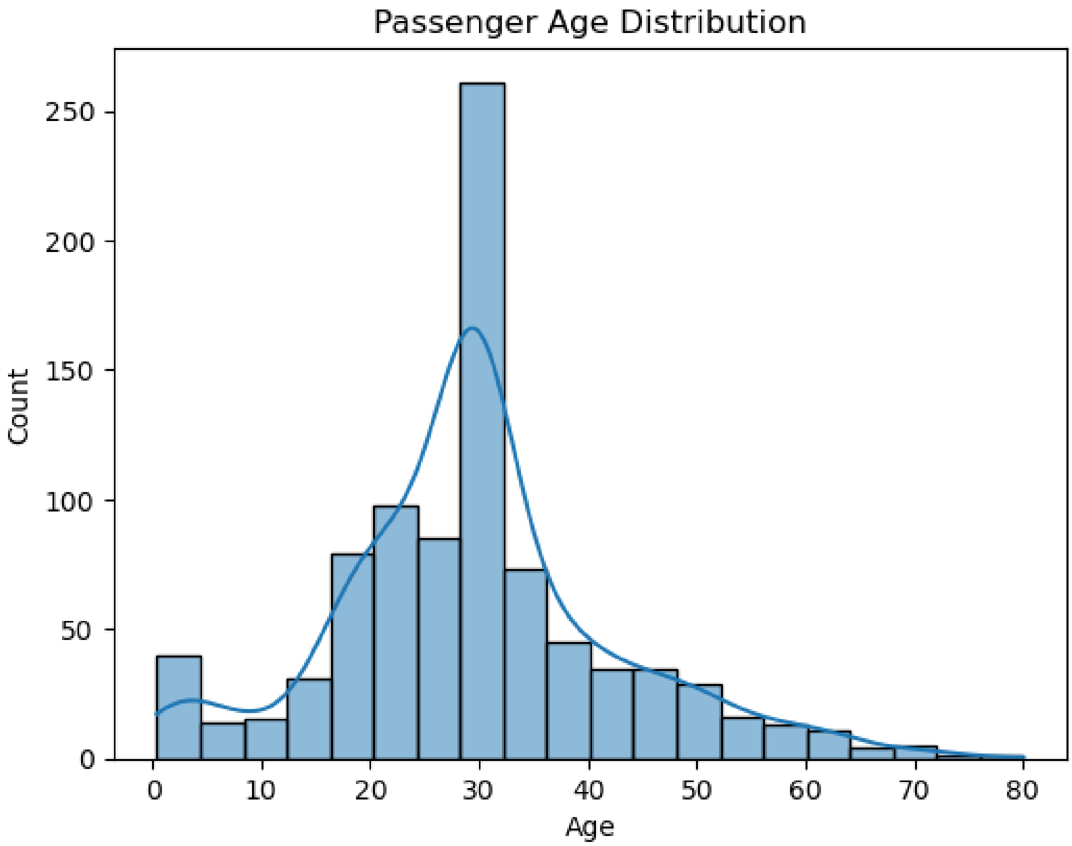
[18]:
```
sns.countplot(data=df, x='Sex')
plt.title('Passenger Gender Distribution')
plt.show()
```



INFERENCE: We can observe that there are more number of male passengers than female passengers

[19]:

```
sns.histplot(data=df, x='Age', bins=20, kde=True)
plt.title('Passenger Age Distribution')
plt.xlabel('Age')
plt.ylabel('Count')
plt.show()
```

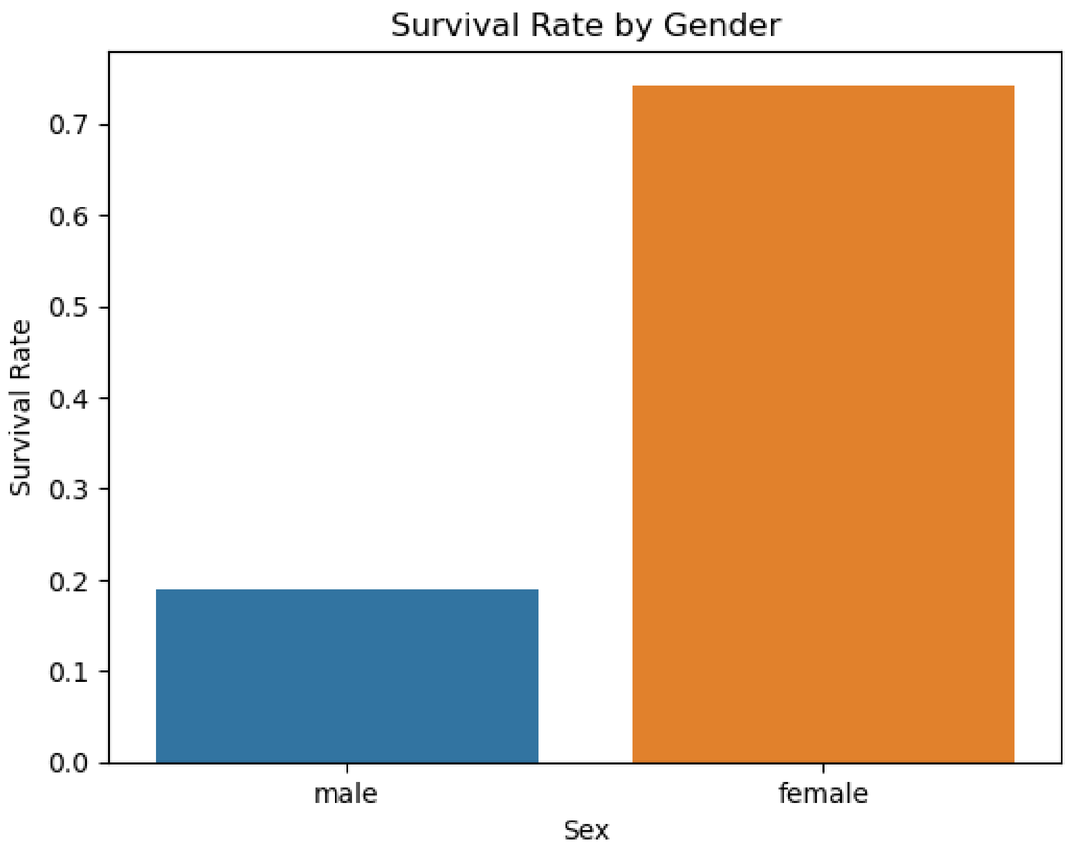


INFERENCE: The histogram of the 'Age' distribution provides insights into the age of Titanic passengers, showing that the majority were 30 to 40 aged adults, but there were also significant numbers of younger and older passengers.

[20]:

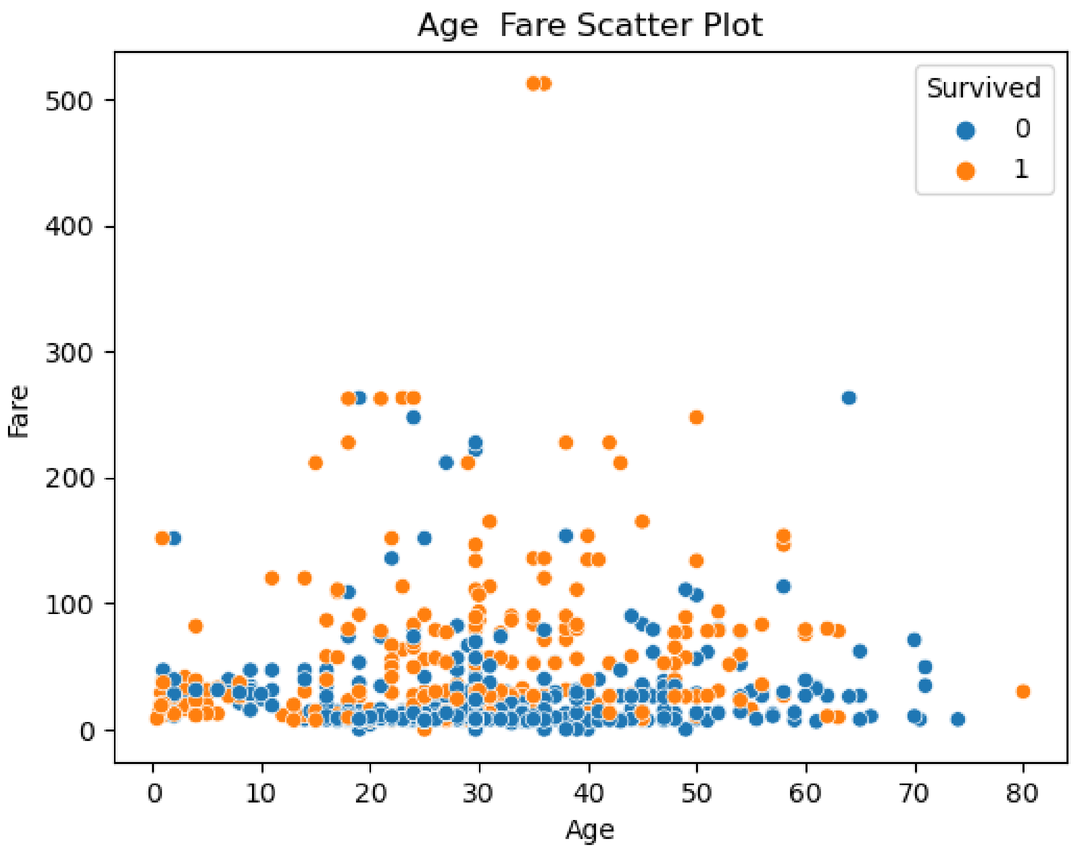
```
sns.barplot(data=df, x='Sex', y='Survived', ci=None)
plt.title('Survival Rate by Gender')
plt.ylabel('Survival Rate')
plt.show()
```

```
C:\Users\lenovo\AppData\Local\Temp\ipykernel_11992\3687825708.py:1:
FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(data=df, x='Sex', y='Survived', ci=None)
```



INFERENCE: we can observe that female passengers have high survival rate than male passengers

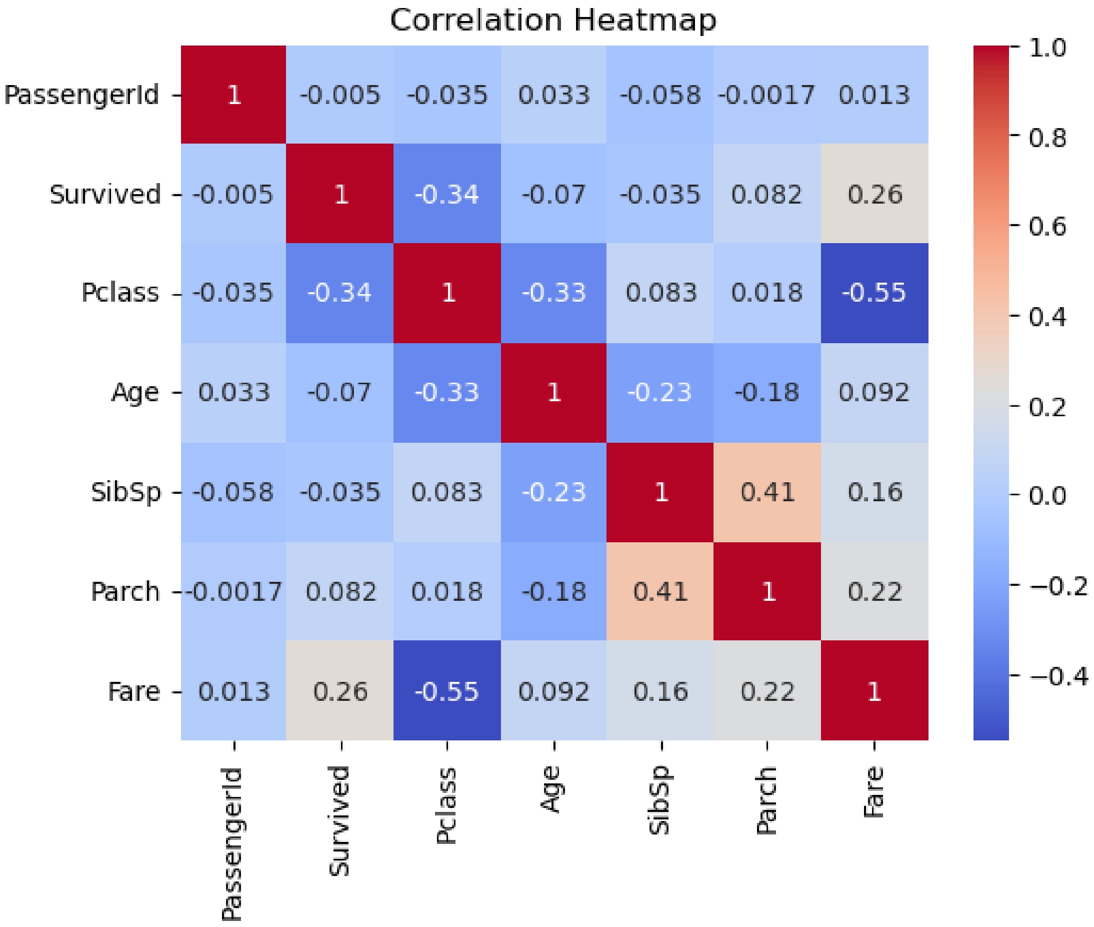
[21]:
```
sns.scatterplot(data=df, x='Age', y='Fare', hue='Survived')
plt.title('Age  Fare Scatter Plot')
plt.xlabel('Age')
plt.ylabel('Fare')
plt.show()
```



[22]:

```
correlation_matrix = df.corr()
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```

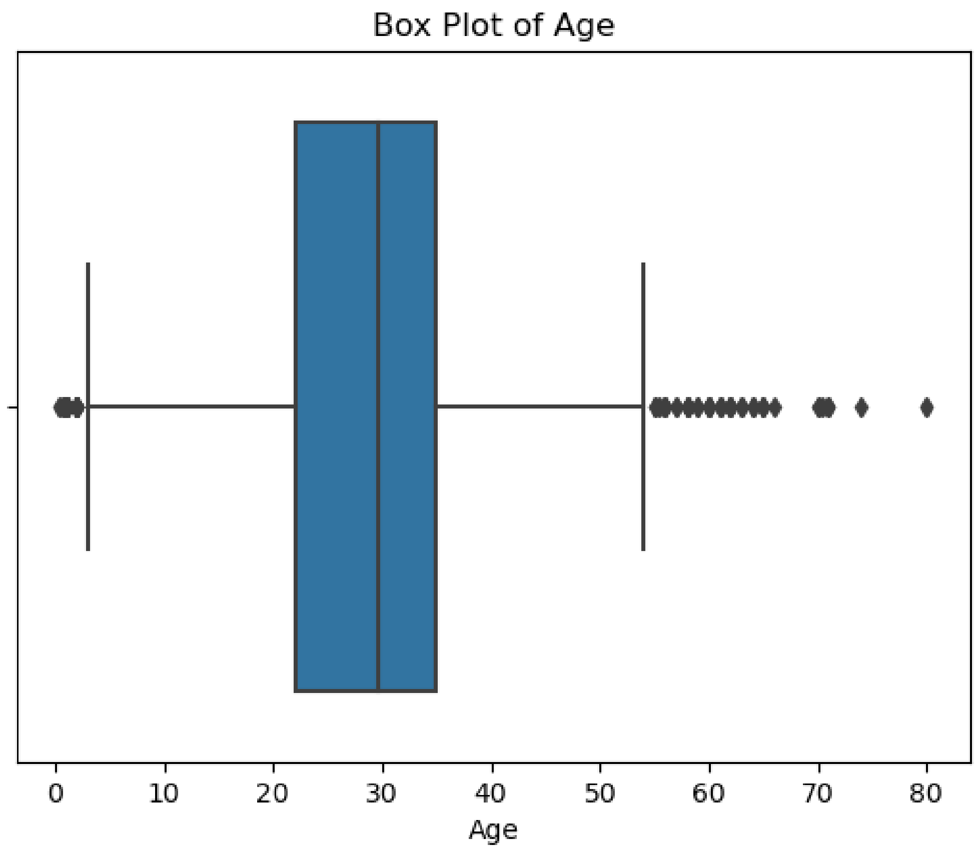
```
C:\Users\lenovo\AppData\Local\Temp\ipykernel_11992\2298098936.py:1:
FutureWarning: The default value of numeric_only in DataFrame.corr is
deprecated. In a future version, it will default to False. Select only valid
columns or specify the value of numeric_only to silence this warning.
  correlation_matrix = df.corr()
```



OUTLIER DETECTION

[23]:

```
sns.boxplot(data=df, x='Age')
plt.title('Box Plot of Age')
plt.show()
```



```
[24]: df.shape
```

```
[24]: (891, 11)
```

```
[25]: q1=df.Age.quantile(0.25)
      q3=df.Age.quantile(0.75)
      print(q1)
      print(q3)
```

```
22.0
35.0
```

```
[26]: IQR=q3-q1
      IQR
```

```
[26]: 13.0
```

```
[27]: upper_limit=q3+1.5*IQR
      upper_limit
```

[27]:
```
54.5
```

[28]:
```
lower_limit=q3-1.5*IQR
lower_limit
```

[28]:
```
15.5
```

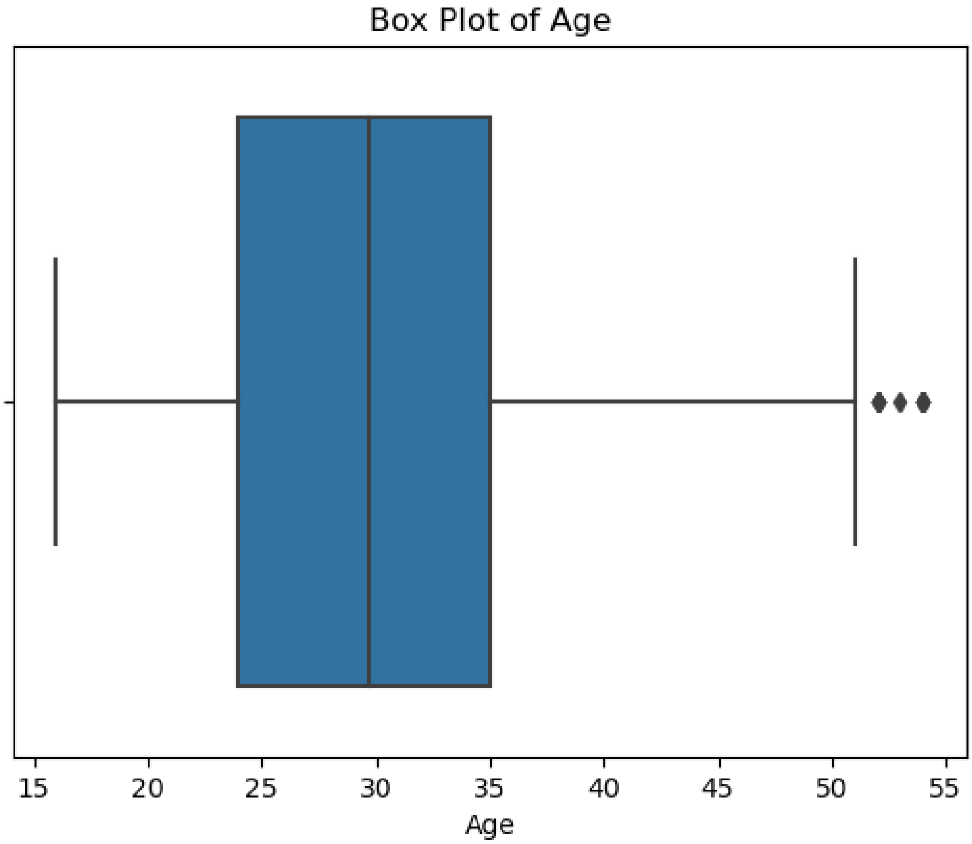
[29]:
```
from scipy import stats

z_scores = np.abs(stats.zscore(df['Age']))
outliers = (z_scores > 3)
z_scores
```

[29]:
```
0      0.592481
1      0.638789
2      0.284663
3      0.407926
4      0.407926
         …
886    0.207709
887    0.823344
888    0.000000
889    0.284663
890    0.177063
Name: Age, Length: 891, dtype: float64
```

[30]:
```
df_no_outliers = df[(df['Age'] >= lower_limit) & (df['Age'] <= upper_limit)]
print("Original dataset shape:", df.shape)
print("Dataset shape after removing outliers:", df_no_outliers.shape)
```

```
Original dataset shape: (891, 11)
Dataset shape after removing outliers: (766, 11)
```

[31]:
```
sns.boxplot(data=df_no_outliers, x='Age')
plt.title('Box Plot of Age')
plt.show()
```



SPLITTING DEPENDENT AND INDEPENDENT VARIABLES

[32]:
```
df.head()
```

[32]:
```
   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 Embarked
0      0         A/5 21171   7.2500        S
```

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

```
[33]: X=df.drop (columns=["Fare"],axis=1)
      X.head()
```

```
[33]:    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 Embarked
      0      0         A/5 21171        S
      1      0          PC 17599        C
      2      0  STON/O2. 3101282        S
      3      0            113803        S
      4      0            373450        S
```

```
[34]: X.shape
```

```
[34]: (891, 10)
```

```
[35]: type(X)
```

```
[35]: pandas.core.frame.DataFrame
```

```
[36]: y=df["Fare"]
      y.head()
```

```
[36]: 0     7.2500
      1    71.2833
      2     7.9250
      3    53.1000
      4     8.0500
      Name: Fare, dtype: float64
```

ENCODING

[37]:

```
X.head()
```

[37]:

```
   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 Embarked
0      0         A/5 21171        S
1      0          PC 17599        C
2      0  STON/O2. 3101282        S
3      0            113803        S
4      0            373450        S
```

[38]:

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

[38]:

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

             Ticket Embarked
0         A/5 21171        S
1          PC 17599        C
2  STON/O2. 3101282        S
```

```
3           113803        S
4           373450        S
```

[39]:
```
X["Embarked"]=le.fit_transform(X["Embarked"])
X.head()
```

[39]:
```
   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  Parch  \
0                            Braund, Mr. Owen Harris    1  22.0      1      0
1  Cumings, Mrs. John Bradley (Florence Briggs Th…    0  38.0      1      0
2                             Heikkinen, Miss. Laina    0  26.0      0      0
3       Futrelle, Mrs. Jacques Heath (Lily May Peel)    0  35.0      1      0
4                           Allen, Mr. William Henry    1  35.0      0      0

             Ticket  Embarked
0         A/5 21171         2
1          PC 17599         0
2  STON/O2. 3101282         2
3            113803         2
4            373450         2
```

[40]:
```
print(le.classes_)
```

```
['C' 'Q' 'S']
```

[41]:
```
mapping=dict(zip(le.classes_,range(len(le.classes_))))
mapping
```

[41]:
```
{'C': 0, 'Q': 1, 'S': 2}
```

FEATURE SCALING

[49]:
```
from sklearn.preprocessing import MinMaxScaler
ms=MinMaxScaler()
from sklearn.preprocessing import MinMaxScaler
numerical_features = ['Age', 'Fare']
data = df[numerical_features]
ms = MinMaxScaler()
scaled_data = ms.fit_transform(data)
df_scaled = pd.DataFrame(scaled_data, columns=numerical_features)
print(df_scaled.head())
```

```
        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
```

SPLITTING DATA INTO TRAIN AND TEST

```
[50]: 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)
```

```
[51]: print(x_train.shape,x_test.shape,y_train.shape,y_test.shape)
```

```
(712, 10) (179, 10) (712,) (179,)
```

```
[52]: X = df.drop('Survived', axis=1)
      y = df['Survived']
      X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
       ↪random_state=42)
```

```
[53]: print(x_train.shape,x_test.shape,y_train.shape,y_test.shape)
```

```
(712, 10) (179, 10) (712,) (179,)
```

```
[54]: df= df.drop(['PassengerId', 'Name', 'Ticket'], axis=1)
```

```
[55]: df
```

```
[55]:      Survived  Pclass     Sex        Age  SibSp  Parch     Fare Embarked
      0           0       3    male  22.000000      1      0   7.2500        S
      1           1       1  female  38.000000      1      0  71.2833        C
      2           1       3  female  26.000000      0      0   7.9250        S
      3           1       1  female  35.000000      1      0  53.1000        S
      4           0       3    male  35.000000      0      0   8.0500        S
      ..        …     …     …         …     …     …      …      …
      886         0       2    male  27.000000      0      0  13.0000        S
      887         1       1  female  19.000000      0      0  30.0000        S
      888         0       3  female  29.699118      1      2  23.4500        S
      889         1       1    male  26.000000      0      0  30.0000        C
      890         0       3    male  32.000000      0      0   7.7500        Q

      [891 rows x 8 columns]
```

```
[ ]:
```