assignment-3-smartinternz

September 20, 2023

1 1. IMPORT THE LIBRARIES

[5]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
```

2 2. IMPORT THE DATASET

[6]:
```
df=pd.read_csv("Titanic-Dataset.csv")
```

[7]:
```
df
```

[7]:
```
     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]
```

[8]:

```
df.head()
```

[8]:

```
   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
```

[9]:

```
df.tail()
```

[9]:

```
     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
```

[10]:

```
df.shape
```

[10]:

```
(891, 12)
```

[11]:

```
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
```

[12]:

```
df.describe()
```

[12]:

```
       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
```

[13]:

```
corr=df.corr()
corr
```

```
<ipython-input-13-7d5195e2bf4d>: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()
```

[13]:

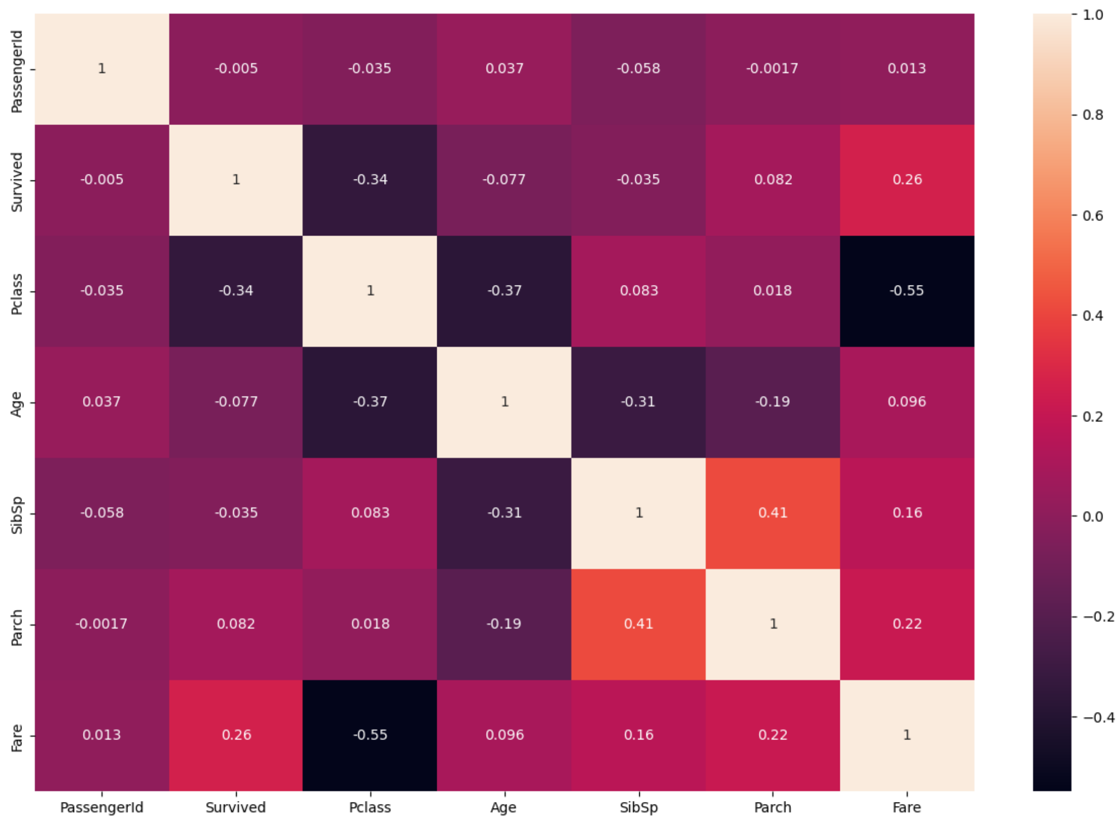
```
             PassengerId  Survived    Pclass       Age     SibSp     Parch  \
PassengerId     1.000000 -0.005007 -0.035144  0.036847 -0.057527 -0.001652
Survived       -0.005007  1.000000 -0.338481 -0.077221 -0.035322  0.081629
Pclass         -0.035144 -0.338481  1.000000 -0.369226  0.083081  0.018443
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
```

[14]:

```
plt.subplots(figsize=(15,10))
sns.heatmap(corr,annot=True)
```

[14]:

```
<Axes: >
```



```
[15]: df.Survived.value_counts()
```

```
[15]: 0    549
      1    342
      Name: Survived, dtype: int64
```

```
[16]: df.Sex.value_counts()
```

```
[16]: male      577
      female    314
      Name: Sex, dtype: int64
```

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

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

#3. CHECK FOR NULL VALUES

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

```
[18]: 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
```

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

```
[19]: 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
```

Fill null values in the ‘Age’ column with the mean age

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

Fill null values in the ‘Embarked’ column with the most common value

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

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

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

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

[25]:

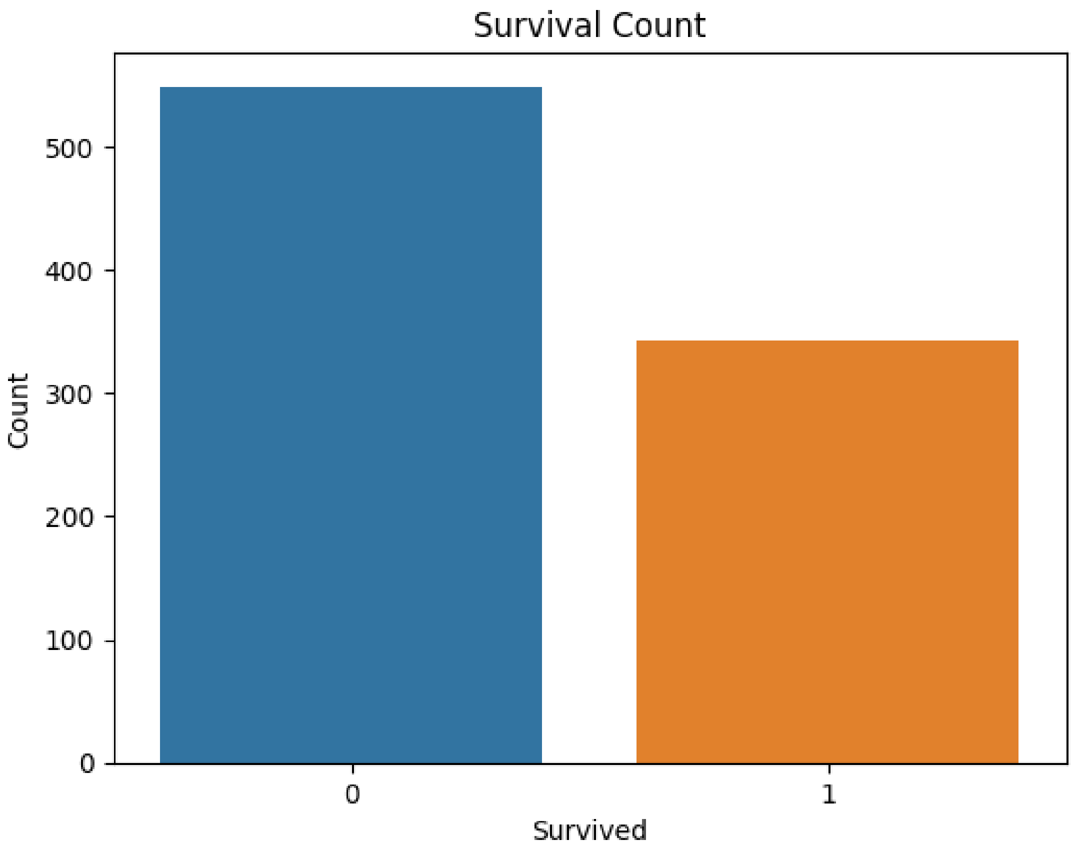
```
print(df.isnull().sum())
```

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

#4. Data Visualization

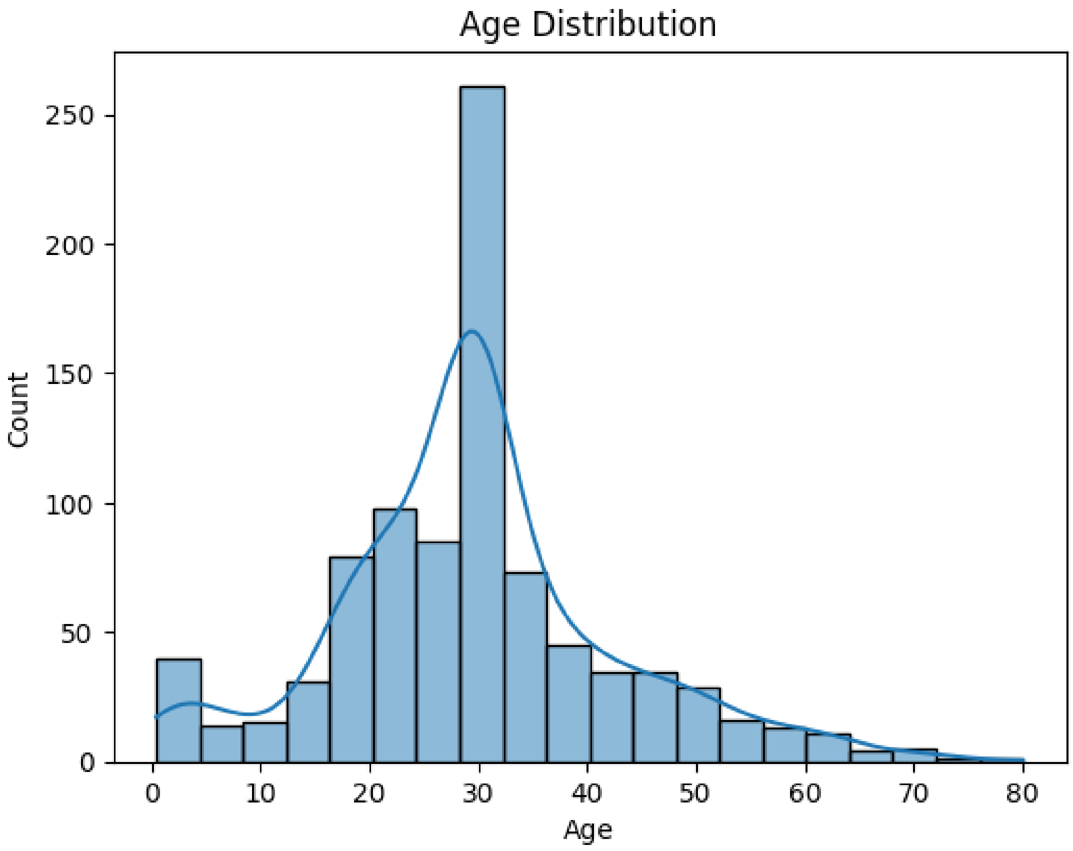
[26]:

```
# Visualize the distribution of the 'Survived' column (0 = Not Survived, 1 = Survived)
sns.countplot(data=df, x='Survived')
plt.title('Survival Count')
plt.xlabel('Survived')
plt.ylabel('Count')
plt.show()
```



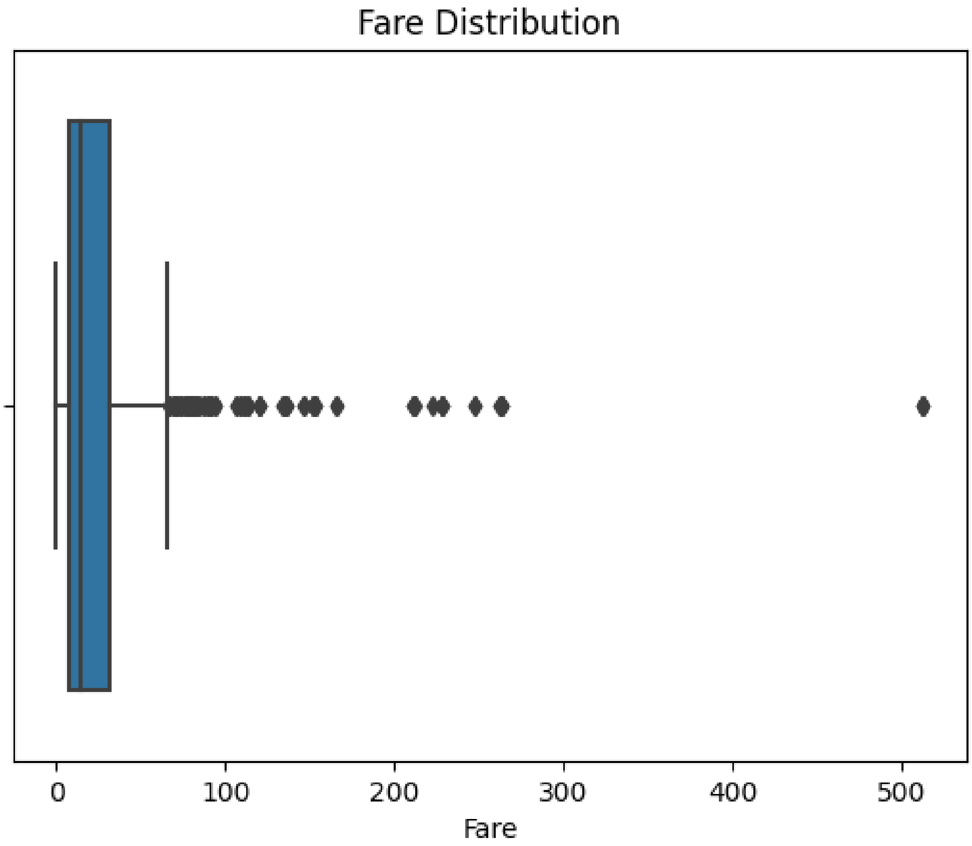
[27]:

```python
#Visualize the distribution of the 'Age' column
sns.histplot(data=df, x='Age', bins=20, kde=True)
plt.title('Age Distribution')
plt.xlabel('Age')
plt.ylabel('Count')
plt.show()
```

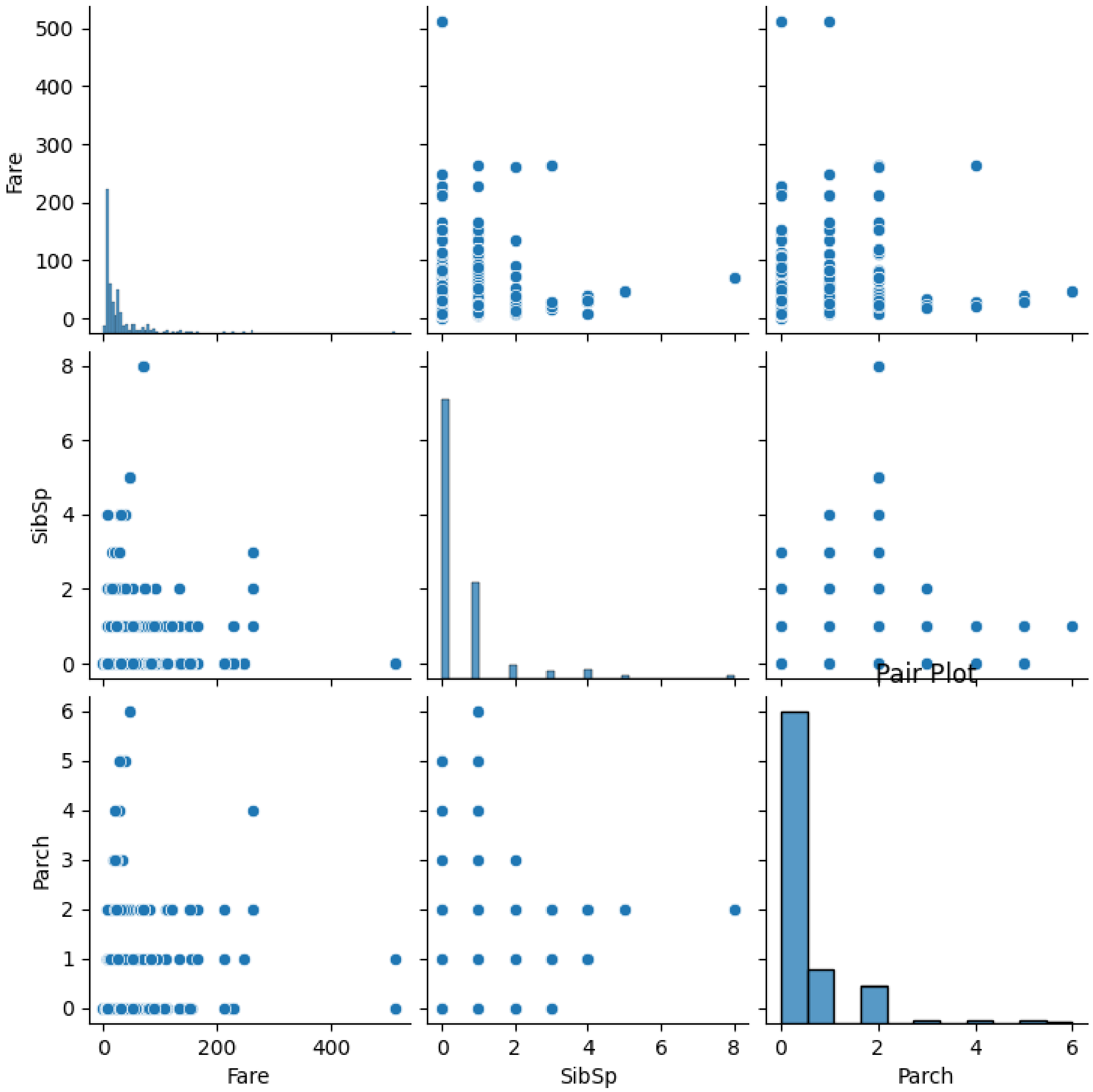


[28]:

```python
#Visualize the distribution of the 'Fare' column and detect outliers we will handle outliers in the next step
sns.boxplot(data=df, x='Fare')
plt.title('Fare Distribution')
plt.xlabel('Fare')
plt.show()
```



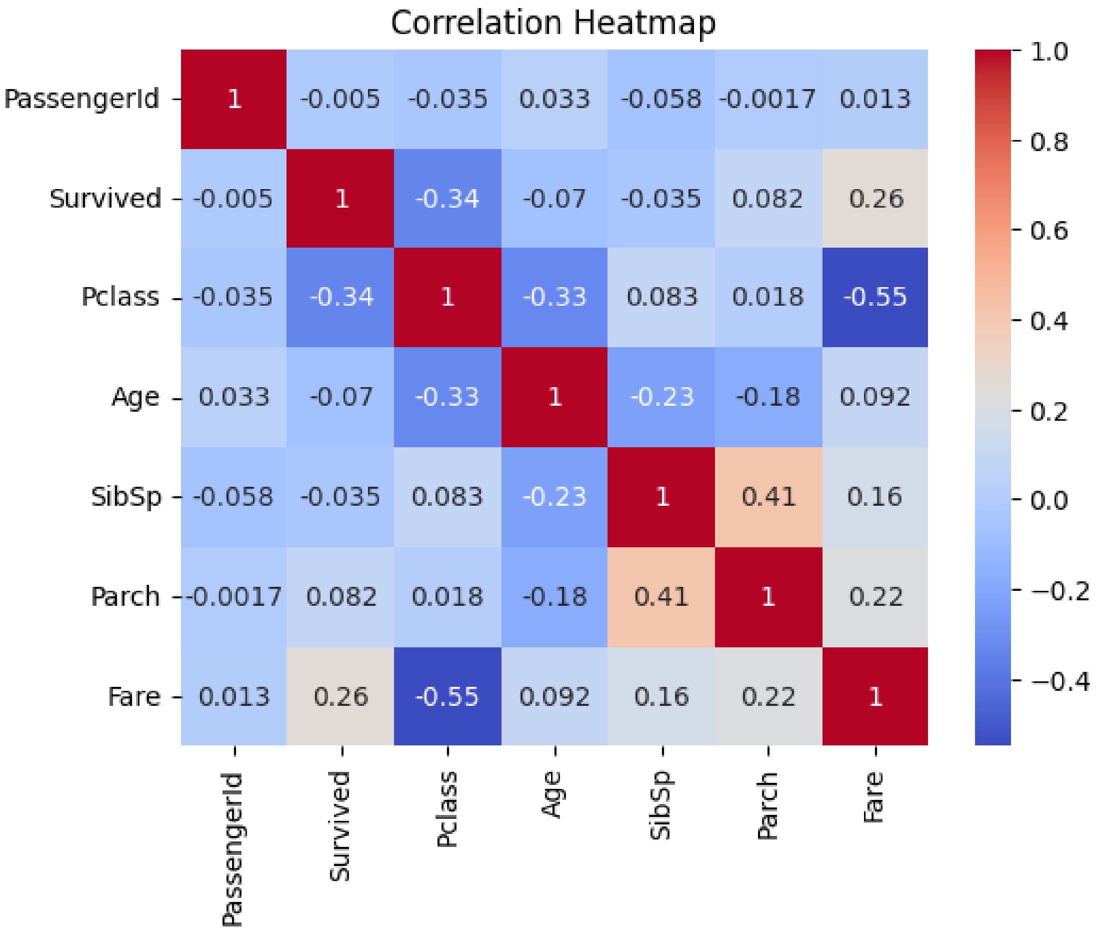
[29]:
```
#Pair plot for selected numerical columns
sns.pairplot(data=df[['Fare', 'SibSp', 'Parch']])
plt.title('Pair Plot')
plt.show()
```



[30]:

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

```
<ipython-input-30-8dcbd071fff3>: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_matrix = df.corr()
```



3 5. Detect and Handle Outliers

[31]:
```
z_scores = np.abs(stats.zscore(df['Age']))
max_threshold=3
outliers = df['Age'][z_scores > max_threshold]

# Print and visualize the outliers
print("Outliers detected using Z-Score:")
print(outliers)
```

```
Outliers detected using Z-Score:
96     71.0
116    70.5
493    71.0
630    80.0
672    70.0
745    70.0
```

```
851    74.0
Name: Age, dtype: float64
```

[32]:

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

# Print and visualize the outliers
print("Outliers detected using Z-Score:")
print(outliers)
```

```
Outliers detected using Z-Score:
27     263.0000
88     263.0000
118    247.5208
258    512.3292
299    247.5208
311    262.3750
341    263.0000
377    211.5000
380    227.5250
438    263.0000
527    221.7792
557    227.5250
679    512.3292
689    211.3375
700    227.5250
716    227.5250
730    211.3375
737    512.3292
742    262.3750
779    211.3375
Name: Fare, dtype: float64
```

[33]:

```
column_name = 'Fare'

# Calculate the first quartile (Q1) and third quartile (Q3)
Q1 = df[column_name].quantile(0.25)
Q3 = df[column_name].quantile(0.75)

# Calculate the IQR
IQR = Q3 - Q1

# Define the lower and upper bounds for outliers
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR
```

```
# Filter rows with values outside the IQR bounds
df_cleaned = df[(df[column_name] > lower_bound) & (df[column_name]␣
 ↪<upper_bound)]

# Display the original and cleaned DataFrame sizes
print(f"Original DataFrame size: {df.shape}")
print(f"Cleaned DataFrame size: {df_cleaned.shape}")
df_cleaned
```

```
Original DataFrame size: (891, 9)
Cleaned DataFrame size: (775, 9)
```

[33]:

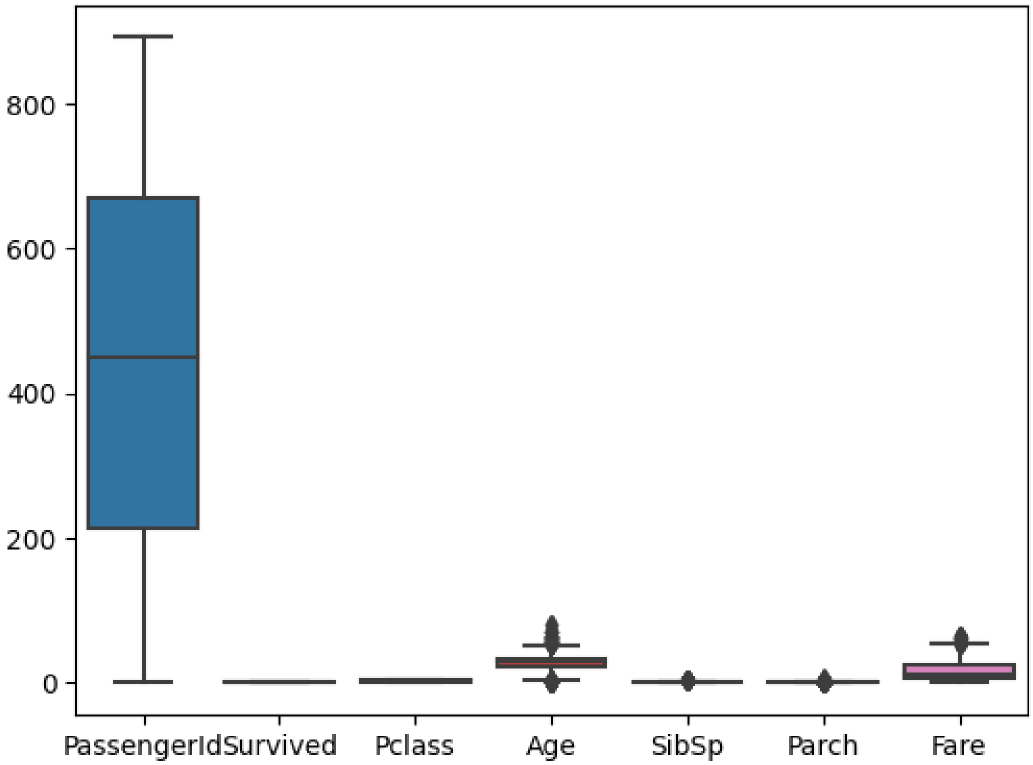
```
     PassengerId  Survived  Pclass     Sex        Age  SibSp  Parch     Fare  \
0              1         0       3    male  22.000000      1      0   7.2500
2              3         1       3  female  26.000000      0      0   7.9250
3              4         1       1  female  35.000000      1      0  53.1000
4              5         0       3    male  35.000000      0      0   8.0500
5              6         0       3    male  29.699118      0      0   8.4583
..           …        …       …      …        …    …      …      …
886          887         0       2    male  27.000000      0      0  13.0000
887          888         1       1  female  19.000000      0      0  30.0000
888          889         0       3  female  29.699118      1      2  23.4500
889          890         1       1    male  26.000000      0      0  30.0000
890          891         0       3    male  32.000000      0      0   7.7500

    Embarked
0          S
2          S
3          S
4          S
5          Q
..       …
886        S
887        S
888        S
889        C
890        Q

[775 rows x 9 columns]
```

[34]:

```
sns.boxplot(df_cleaned)
```

[34]:

```
<Axes: >
```



```
[35]: df=df_cleaned
```

```
[36]: x=df.drop('Survived', axis=1)
      y=df['Survived']
```

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

```
[37]:    PassengerId  Pclass     Sex        Age  SibSp  Parch     Fare Embarked
      0            1       3    male  22.000000      1      0   7.2500        S
      2            3       3  female  26.000000      0      0   7.9250        S
      3            4       1  female  35.000000      1      0  53.1000        S
      4            5       3    male  35.000000      0      0   8.0500        S
      5            6       3    male  29.699118      0      0   8.4583        Q
```

```
[38]: y.head()
```

```
[38]: 0    0
      2    1
      3    1
      4    0
      5    0
      Name: Survived, dtype: int64
```

#7. Perform Encoding

```
[39]: en = LabelEncoder()
      x['Sex'] = en.fit_transform(x['Sex'])
```

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

```
[40]:    PassengerId  Pclass  Sex        Age  SibSp  Parch     Fare Embarked
      0            1       3    1  22.000000      1      0   7.2500        S
      2            3       3    0  26.000000      0      0   7.9250        S
      3            4       1    0  35.000000      1      0  53.1000        S
      4            5       3    1  35.000000      0      0   8.0500        S
      5            6       3    1  29.699118      0      0   8.4583        Q
```

```
[41]: x = pd.get_dummies(x,columns=['Embarked'])
```

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

```
[42]:    PassengerId  Pclass  Sex        Age  SibSp  Parch     Fare  Embarked_C  \
      0            1       3    1  22.000000      1      0   7.2500           0
      2            3       3    0  26.000000      0      0   7.9250           0
      3            4       1    0  35.000000      1      0  53.1000           0
      4            5       3    1  35.000000      0      0   8.0500           0
      5            6       3    1  29.699118      0      0   8.4583           0

         Embarked_Q  Embarked_S
      0           0           1
      2           0           1
      3           0           1
      4           0           1
      5           1           0
```

#8. Feature Scaling

```
[43]: scale = StandardScaler()
      x[['Age', 'Fare']] = scale.fit_transform(x[['Age', 'Fare']])
```

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

```
[44]:    PassengerId  Pclass  Sex       Age  SibSp  Parch      Fare  Embarked_C  \
      0            1       3    1 -0.556219      1      0 -0.779117           0
      2            3       3    0 -0.243027      0      0 -0.729373           0
      3            4       1    0  0.461654      1      0  2.599828           0
      4            5       3    1  0.461654      0      0 -0.720161           0
      5            6       3    1  0.046606      0      0 -0.690071           0

         Embarked_Q  Embarked_S
      0           0           1
```

```
2              0              1
3              0              1
4              0              1
5              1              0
```

#9. Splitting the data into Train and Test

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

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

```
(620, 10)
(155, 10)
(620,)
(155,)
```