assignment-3-smartinternz-2

September 20, 2023

Name: Challa Uday Kiran
Regd no: 21BCE7780

1 1. IMPORT THE LIBRARIES

[ ]:
```
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

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

[ ]:
```
df
```

[ ]:

	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]
```

[ ]:
```
df.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
```

[ ]:
```
df.tail()
```

[ ]:

	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

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

[ ]: (891, 12)

[ ]:
```
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
```

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

[ ]:

	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

[ ]:
```
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()

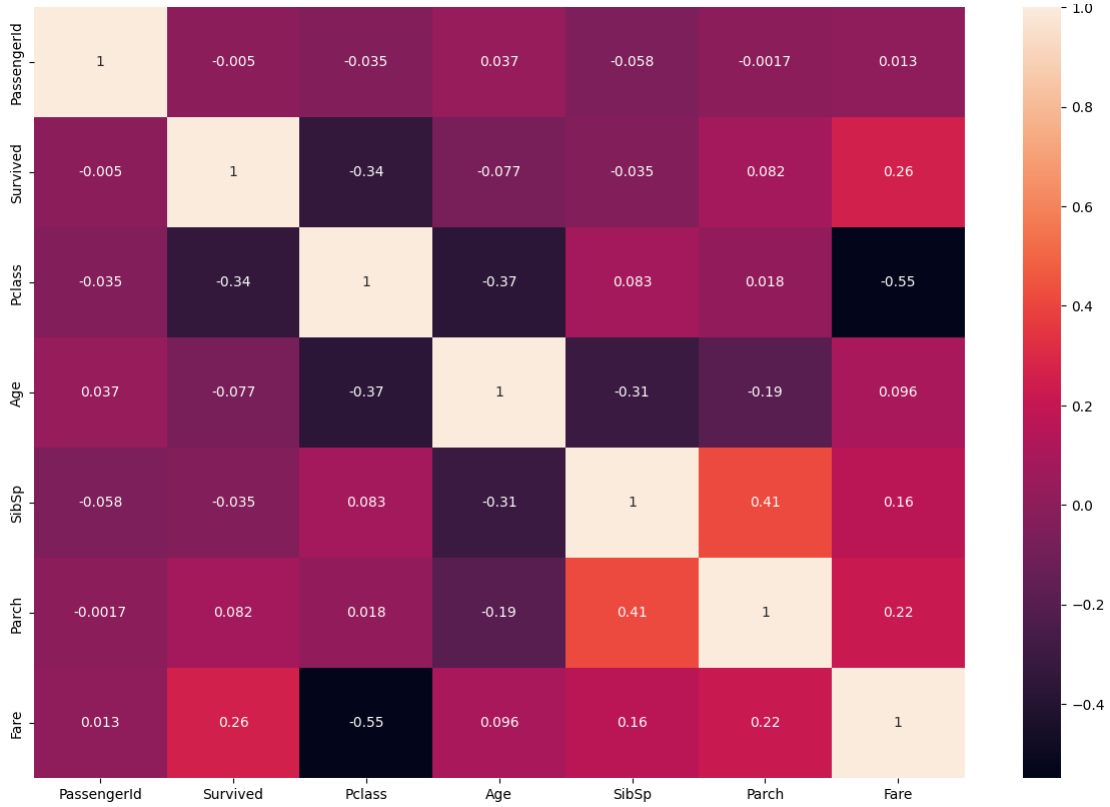
[ ]:

	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

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

[ ]: <Axes: >



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

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

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

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

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

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

#3. CHECK FOR NULL VALUES

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

[ ]:
```
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
```

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

[ ]:
```
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

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

Fill null values in the 'Embarked' column with the most common value

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

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

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

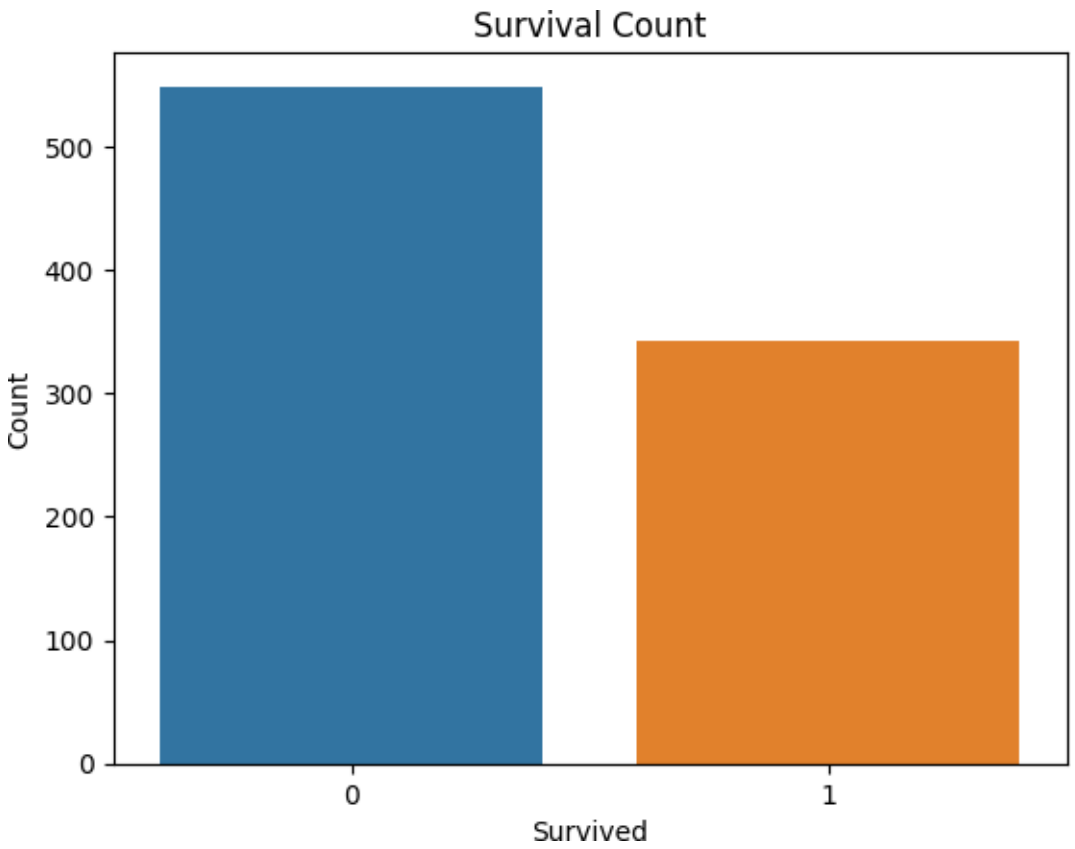
[ ]:
```
df.drop(["Name"],axis=1,inplace=True)
```

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

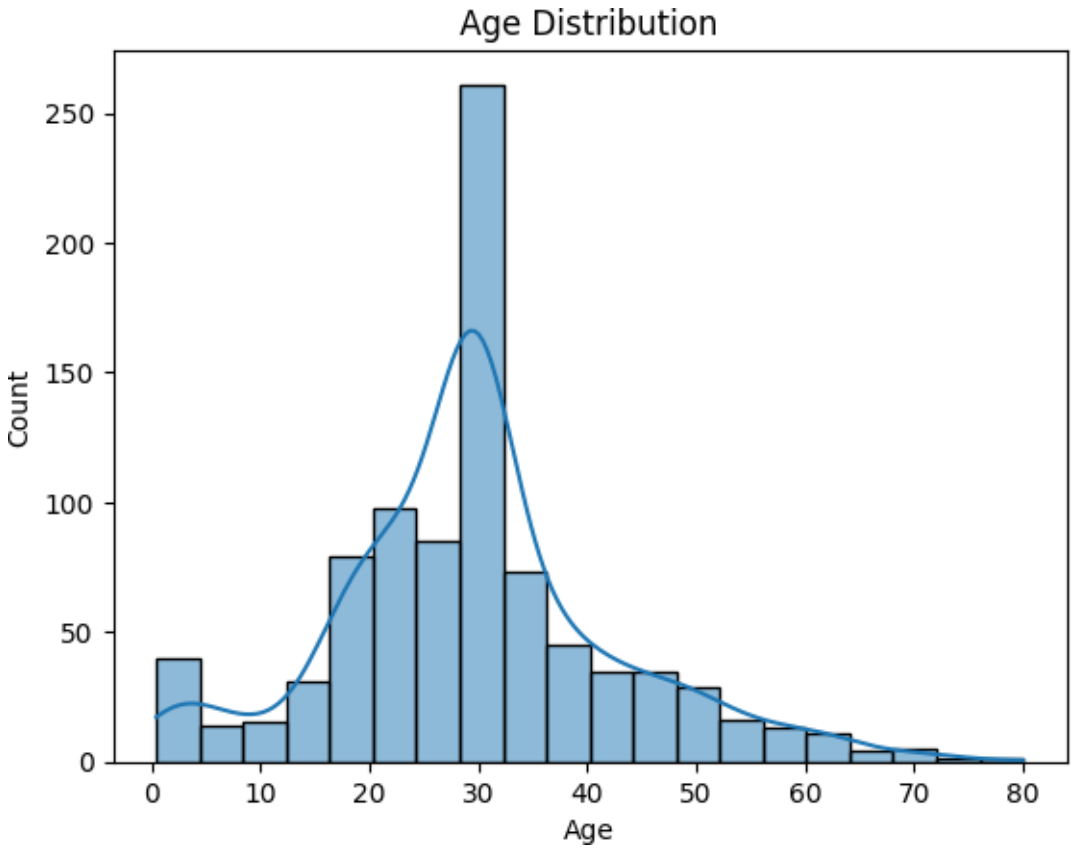
```
PassengerId    0
Survived       0
Pclass         0
Sex            0
Age            0
SibSp          0
Parch          0
Fare           0
Embarked       0
dtype: int64
```

#4. Data Visualization

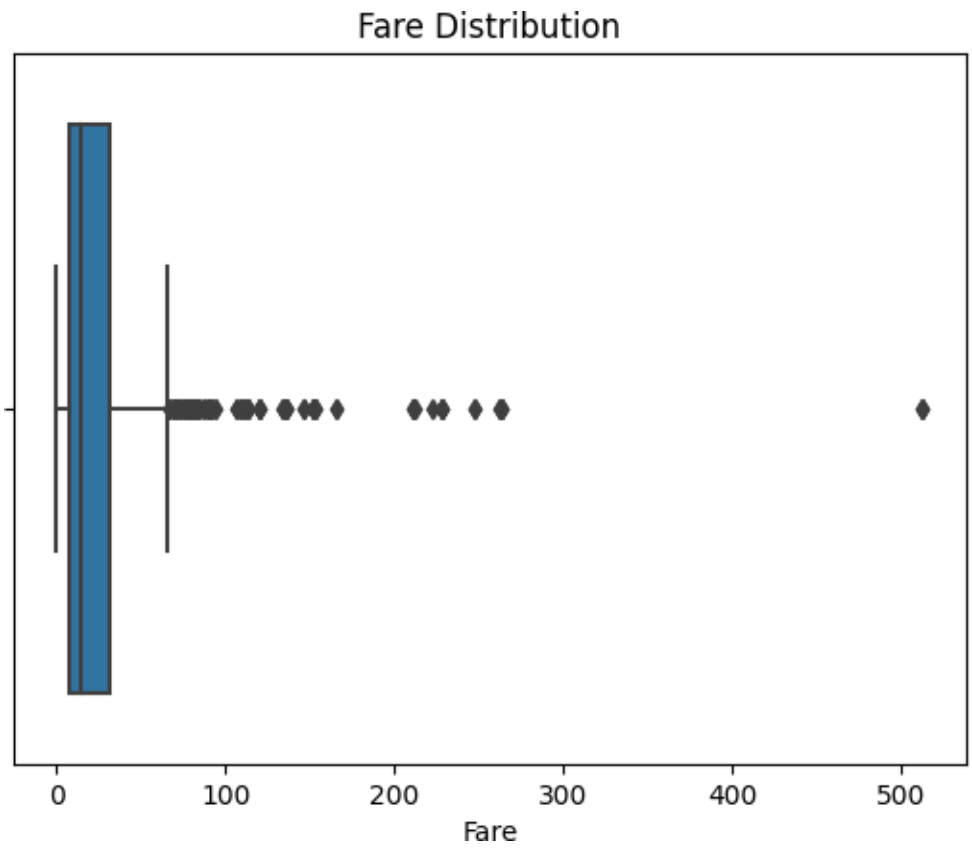
[ ]:
```
# Visualize the distribution of the 'Survived' column (0 = Not Survived, 1 = Survived)
sns.countplot(data=df, x="Survived")
plt.title("Survival Count")
plt.xlabel("Survived")
plt.ylabel("Count")
plt.show()
```



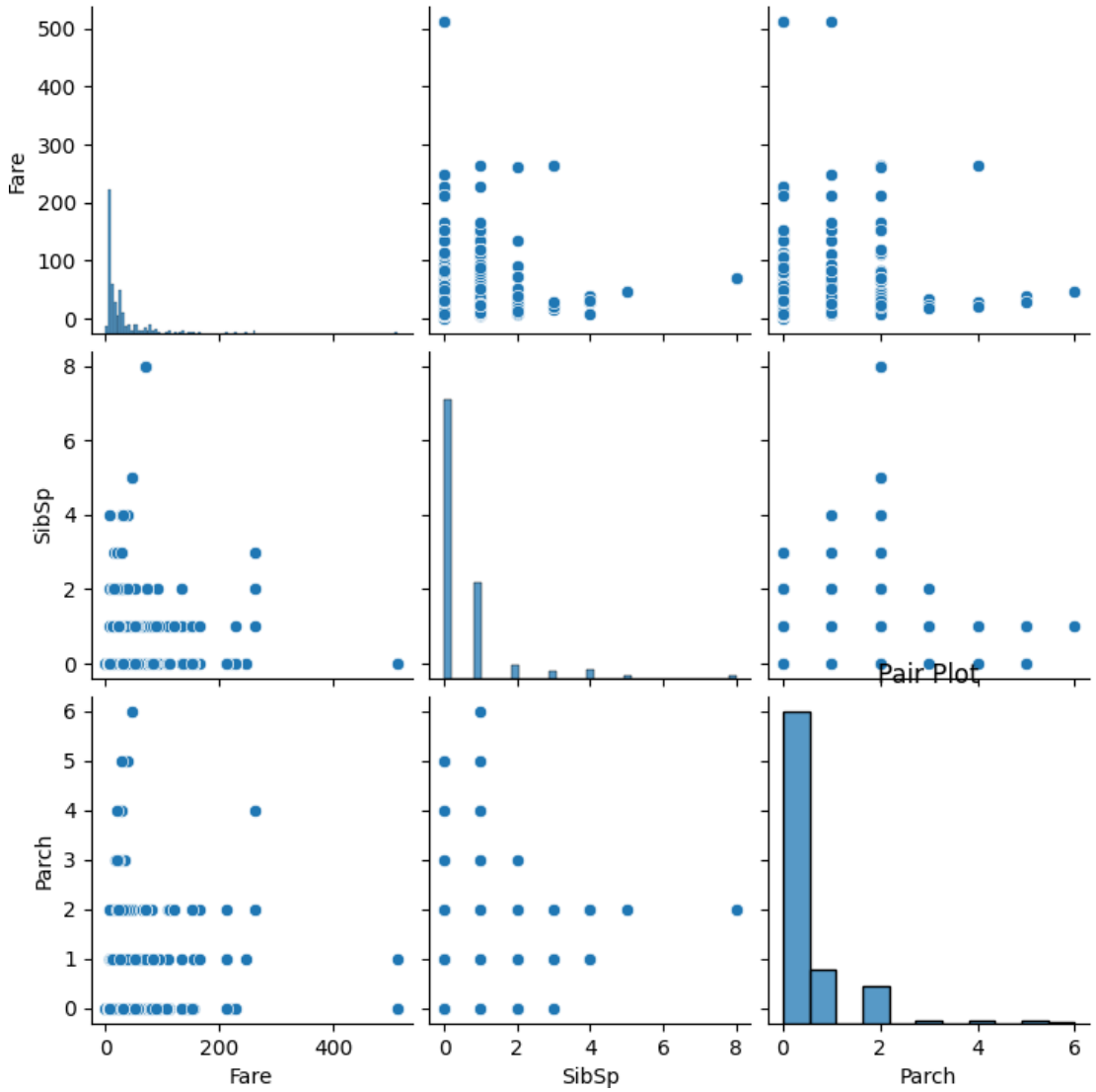
[ ]:
```
#Visualize the distribution of the 'Age' column
sns.histplot(data=df, x="Age", bins=20, kde=True)
plt.title("Age Distribution")
plt.xlabel("Age")
plt.ylabel("Count")
plt.show()
```



[ ]:
```
#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()
```

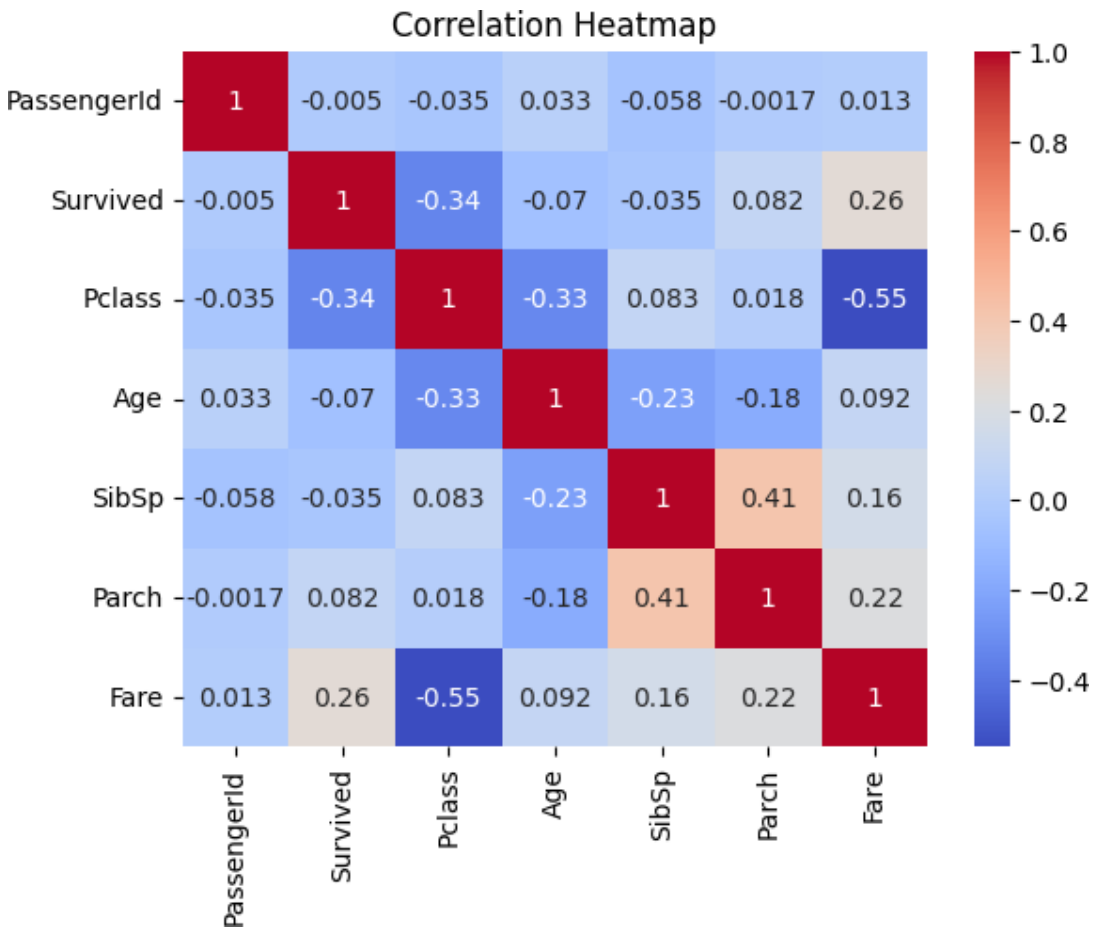


[ ]:
```
#Pair plot for selected numerical columns
sns.pairplot(data=df[['Fare', 'SibSp', 'Parch']])
plt.title('Pair Plot')
plt.show()
```



[ ]:
```
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

[ ]:
```
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
```

[ ]:
```
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
```

[ ]:
```
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)
```

[ ]:

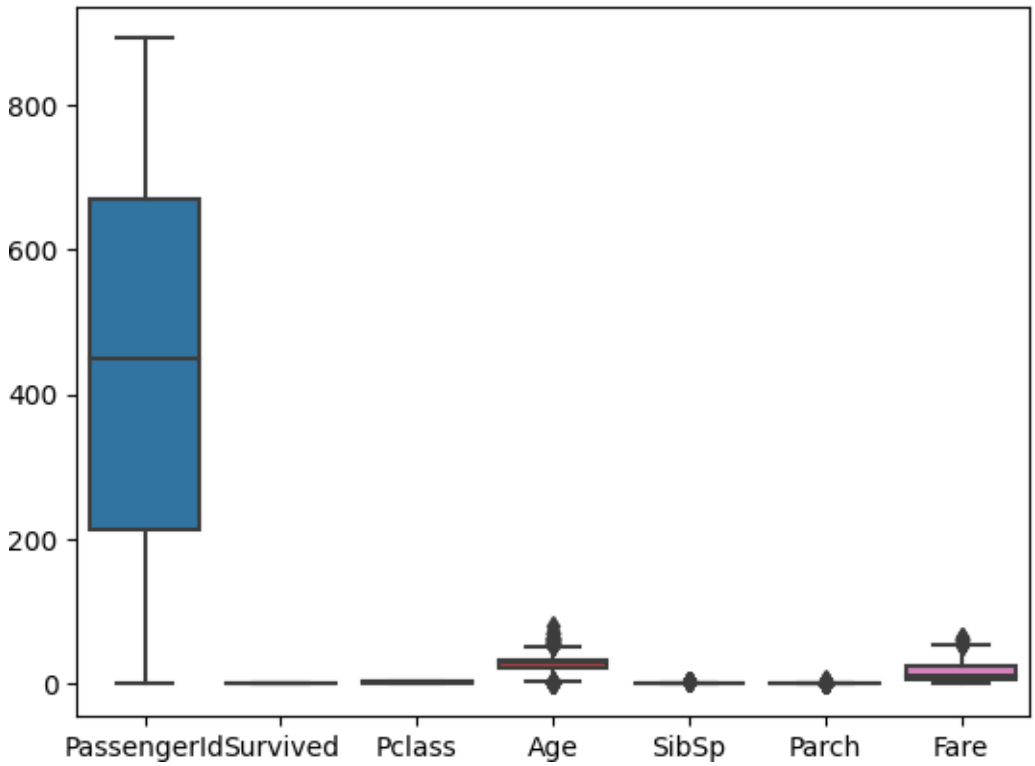
	PassengerId	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	\
0	1	0	3	male	22.000000	1	0	7.2500	
2	3	1	3	female	26.000000	0	0	7.9250	
3	4	1	1	female	35.000000	1	0	53.1000	
4	5	0	3	male	35.000000	0	0	8.0500	
5	6	0	3	male	29.699118	0	0	8.4583	
..	...	...	...	...	...	...	...	...	
886	887	0	2	male	27.000000	0	0	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]

[ ]:
```
sns.boxplot(df_cleaned)
```

[ ]: <Axes: >



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

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

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

[ ]:

	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

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

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

#7. Perform Encoding

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

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

[ ]:
```
   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
```

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

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

[ ]:
```
   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

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

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

[ ]:
```
   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

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

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

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