

# assignment-3-smartinternz-2

September 20, 2023

## 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.

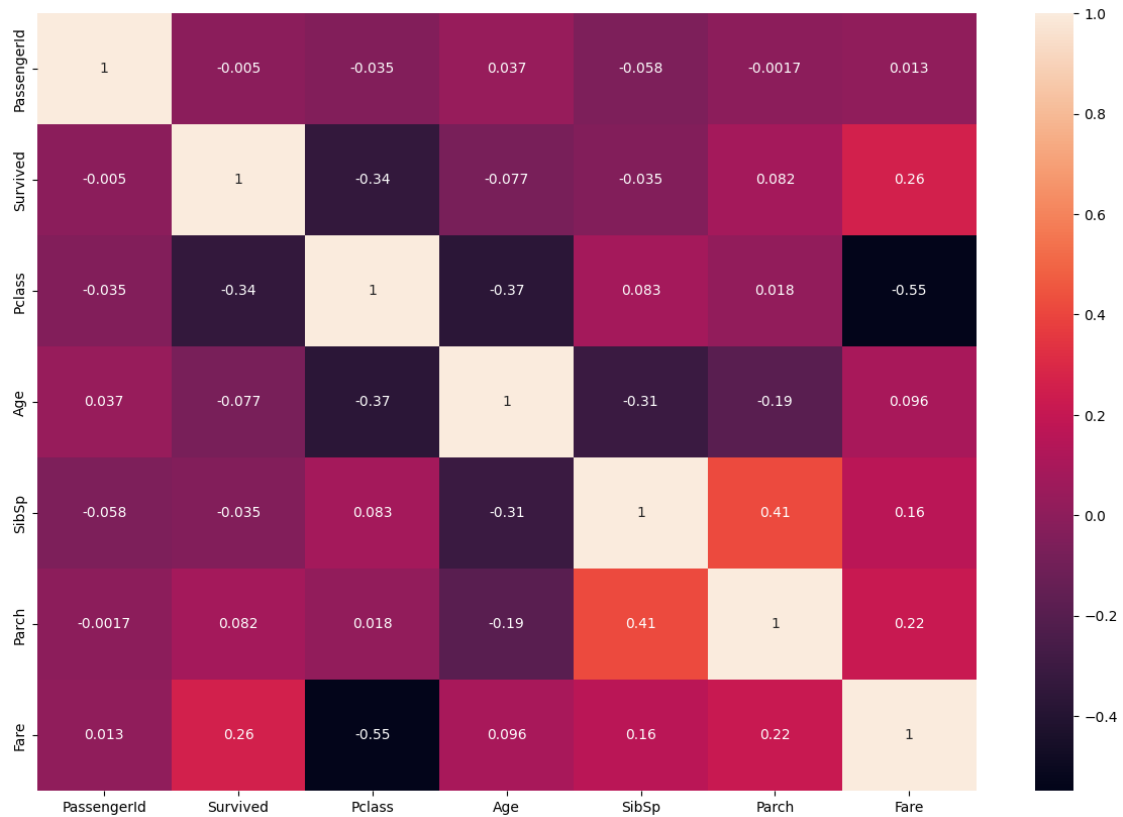
```
corr=df.corr()
```

```
[ ]:
      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)
```

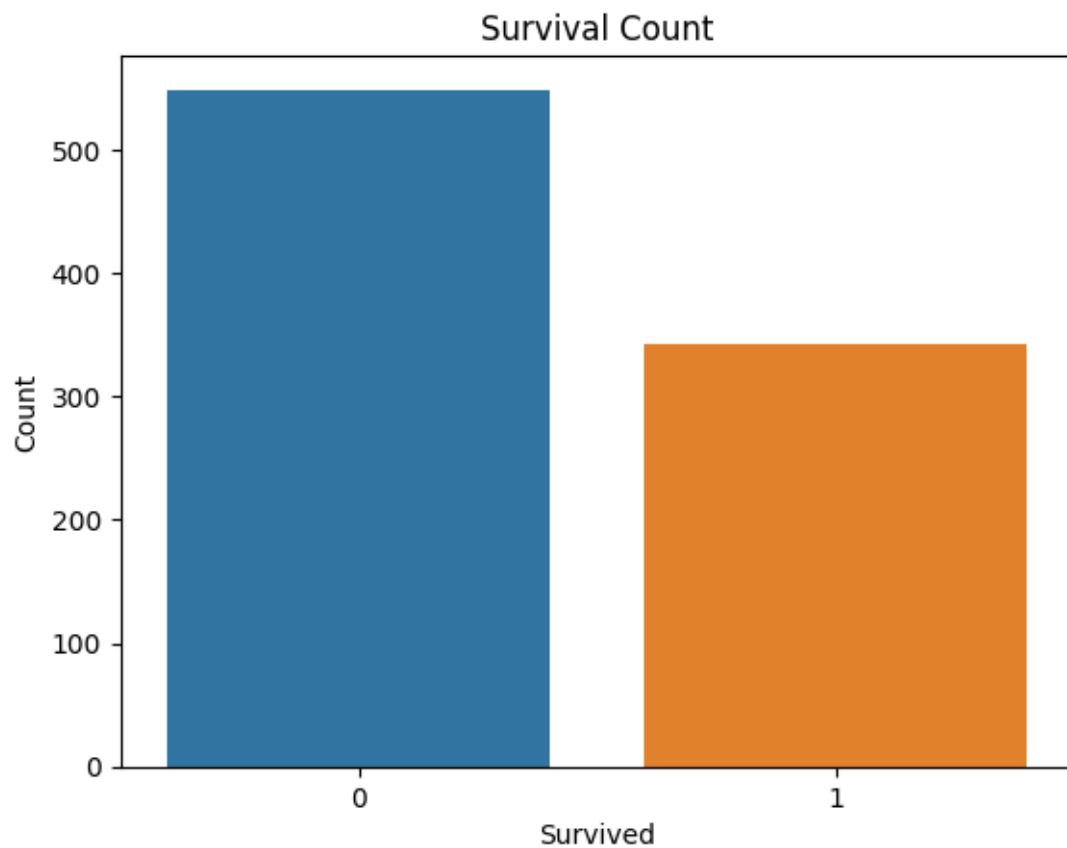
```
[ ]: df.drop(['Name'],axis=1,inplace=True)
```

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

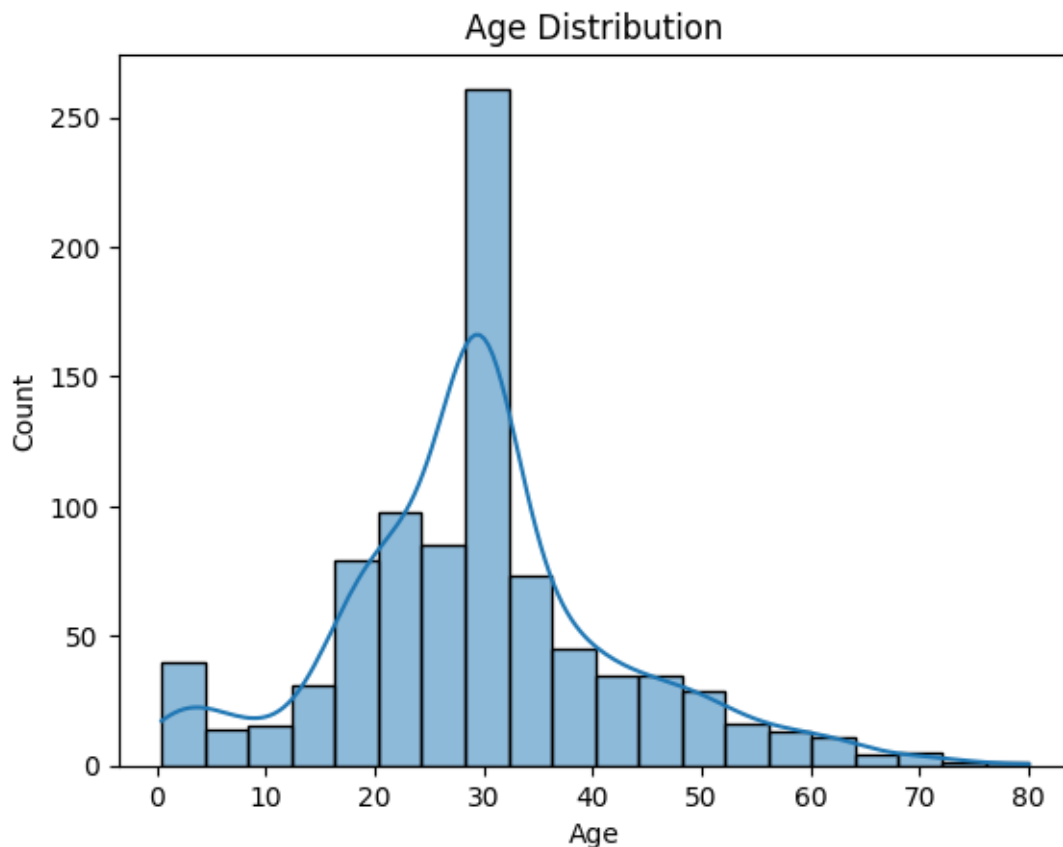
```
PassengerId    0
Survived        0
Pclass          0
Sex             0
Age            0
SibSp           0
Parch           0
Fare            0
Embarked        0
dtype: int64
```

#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()
```

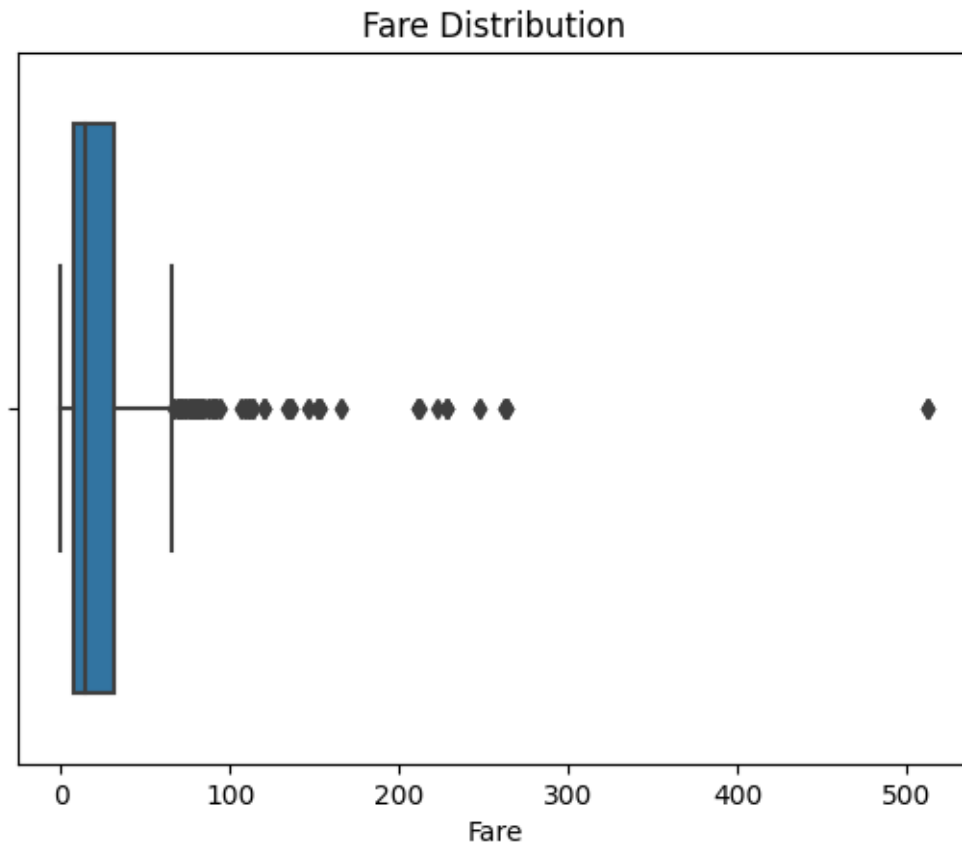


```
[ ]: #Visualize the distribution of the 'Age' column
sns.histplot(data=df, x='Age', bins=20, kde=True)
plt.title('Age Distribution')
plt.xlabel('Age')
plt.ylabel('Count')
plt.show()
```

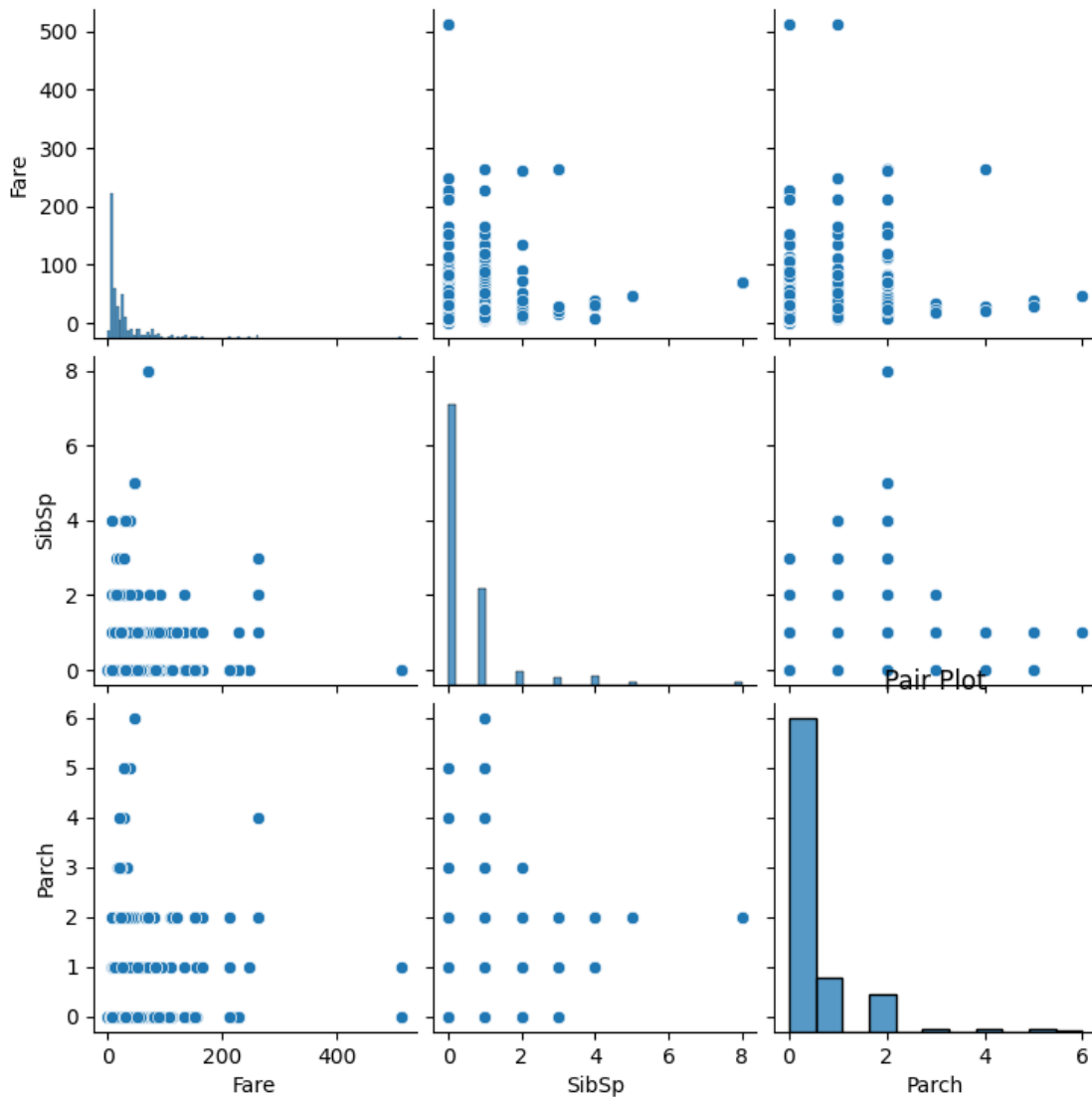


```
[ ]: #Visualize the distribution of the 'Fare' column and detect outliers we will
     ↪ handle outliers in the next step
sns.boxplot(data=df, x='Fare')
plt.title('Fare Distribution')
plt.xlabel('Fare')
plt.show()
```





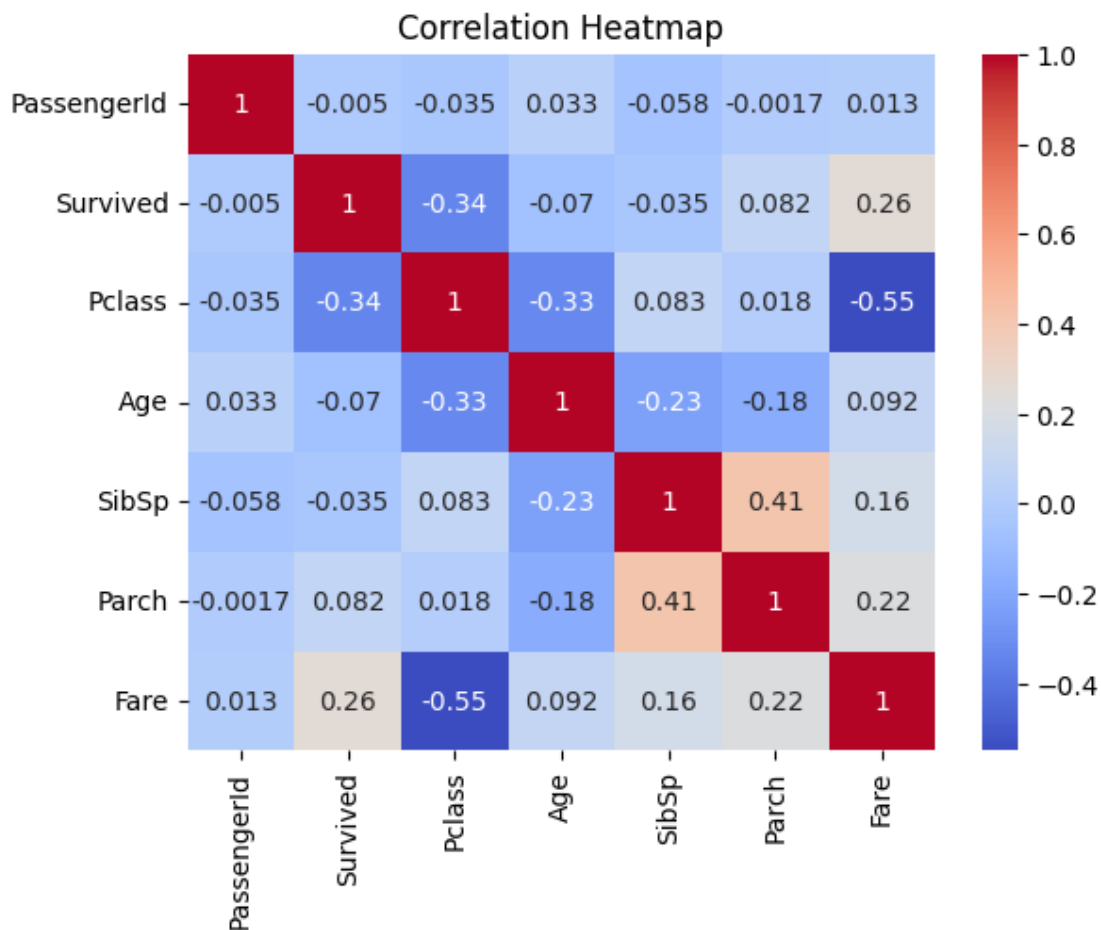
```
[ ]: #Pair plot for selected numerical columns
sns.pairplot(data=df[['Fare', 'SibSp', 'Parch']])
plt.title('Pair Plot')
plt.show()
```



```
[ ]: 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)

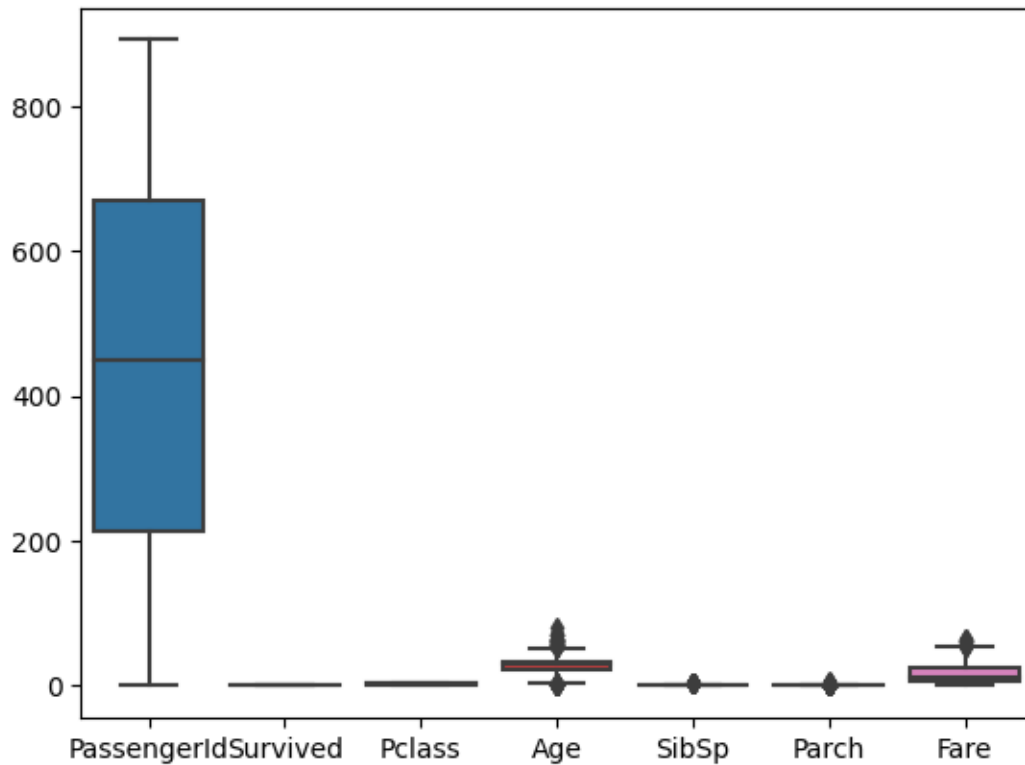
```
[ ]:      PassengerId  Survived  Pclass    Sex     Age  SibSp  Parch    Fare  \
0             1         0         3   male  22.000000     1     0    7.2500
2             3         1         3  female  26.000000     0     0    7.9250
3             4         1         1  female  35.000000     1     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,)