Task 02

Titanic Exploratory Data Analysis (EDA)

This project focuses on conducting data cleaning and exploratory data analysis (EDA) on the Titanic dataset.The Titanic dataset is a well-known dataset that provides insights into the demographics and survival rates of passengers aboard the Titanic.

```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import numpy as np
import plotly.express as px
from scipy import stats
```

```
# Preview the dataset
df = pd.read_csv('train.csv')
df.head()
```

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S

Next steps: Generate code with df | View recommended plots | New interactive sheet

```
class DataUnderstanding:
    def __init__(self, df):
        self.df = df

    def get_summary_statistics(self):
        summary_stats = self.df.describe()
        return summary_stats

    def get_missing_values(self):
        missing_values = self.df.isnull().sum()
        return missing_values

    def get_info(self):
        info = self.df.info()
        return info

    def get_dtypes(self):
        dtypes = self.df.dtypes
        return dtypes

    def get_value_counts(self):
        value_counts = {}
        for column in self.df.columns:
            value_counts[column] = self.df[column].value_counts()
        return value_counts


# Initialize the DataUnderstanding class
du = DataUnderstanding(df)
```

```
# Get the summary statistics
summary_stats = du.get_summary_statistics()
print("Summary Statistics:")
summary_stats
```

```
Summary Statistics:
```

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

Next steps: Generate code with `summary_stats` View recommended plots New interactive sheet

```
# get summary of the data
du.get_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
```

```
# Get data types
du.get_dtypes()
```

	0
PassengerId	int64
Survived	int64
Pclass	int64
Name	object
Sex	object
Age	float64
SibSp	int64
Parch	int64
Ticket	object
Fare	float64
Cabin	object
Embarked	object

dtype: object

```
# Those who Survived
df['Survived'].value_counts()
```

Survived	count
0	549
1	342

dtype: int64

```
# Check for missing values
du.get_missing_values()
```

	0
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

```
# Drop the cabin column
df = df.drop('Cabin', axis=1)
```

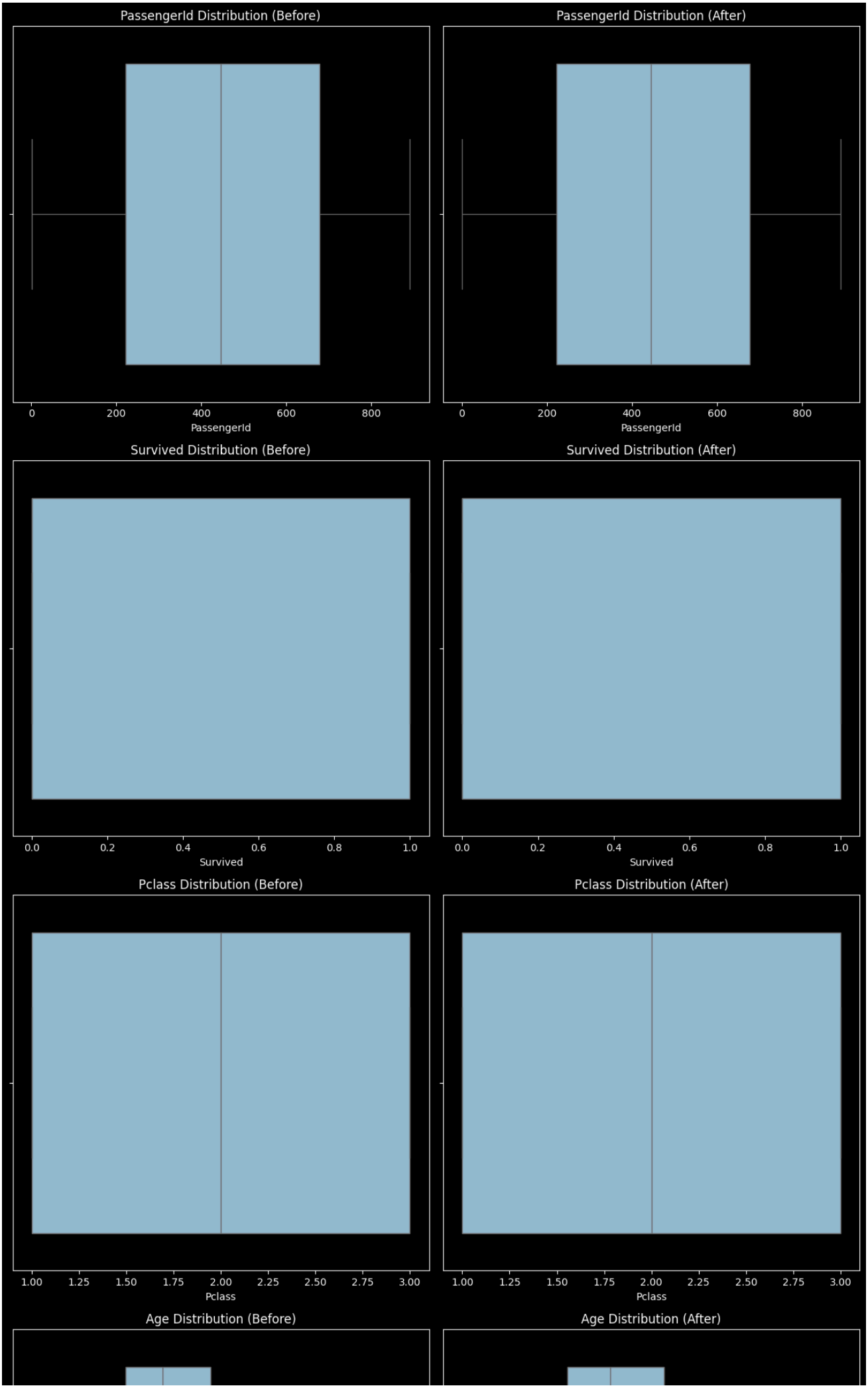
```
# Find the most frequent port (mode) in the Embarked column
most_frequent_port = df['Embarked'].mode()[0]
# Fill missing Embarked values with the most frequent port
df['Embarked'].fillna(most_frequent_port, inplace=True)


# Remove rows with missing ages
df.dropna(subset=['Age'], inplace=True)


# get value counts
du.get_value_counts()
```

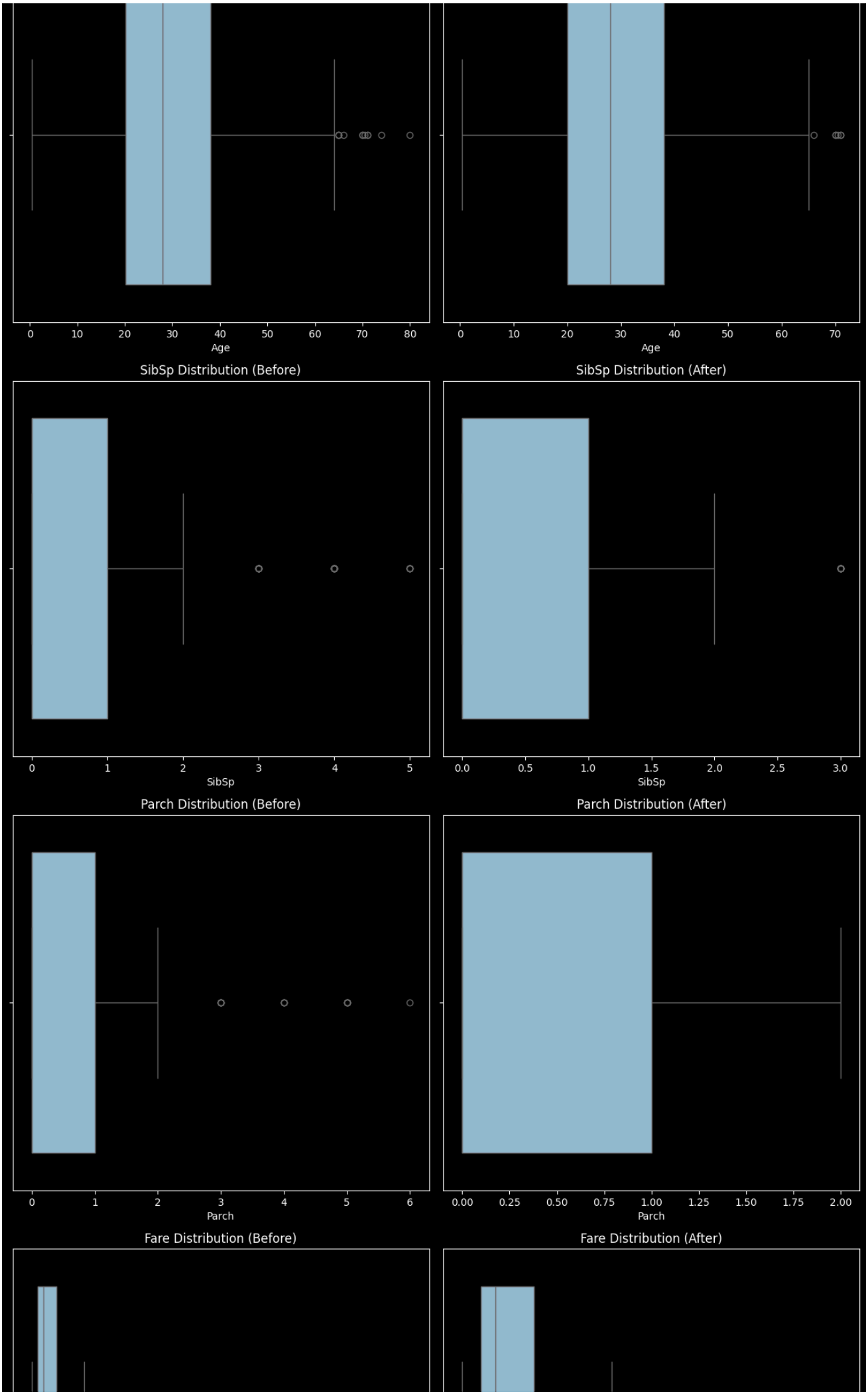
```
4     18
3     16
8      7
5      5
Name: count, dtype: int64,
'Parch': Parch
0    678
1    118
2     80
5      5
3      5
4      4
6      1
Name: count, dtype: int64,
'Ticket': Ticket
347082      7
CA. 2343    7
1601        7
3101295     6
CA 2144     6
           ..
9234        1
19988       1
2693        1
PC 17612    1
370376      1
Name: count, Length: 681, dtype: int64,
'Fare': Fare
8.0500     43
13.0000    42
7.8958     38
7.7500     34
26.0000    31
           ..
35.0000     1
28.5000     1
6.2375      1
14.0000     1
10.5167     1
Name: count, Length: 248, dtype: int64,
'Cabin': Cabin
B96 B98        4
G6             4
C23 C25 C27    4
C22 C26        3
F33            3
              ..
E34            1
C7             1
C54            1
E36            1
C148           1
Name: count, Length: 147, dtype: int64,
'Embarked': Embarked
S    644
C    168
Q     77
Name: count, dtype: int64}
```

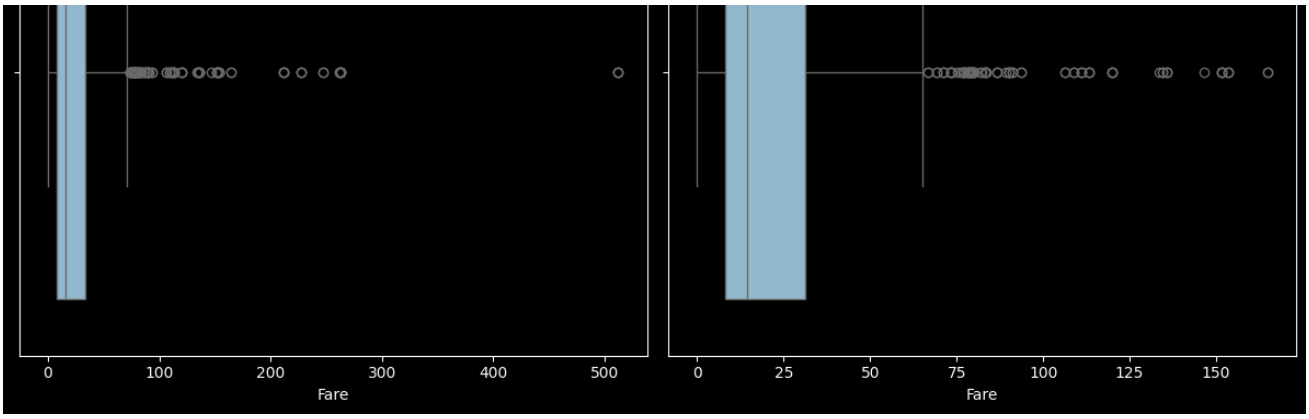
```
# check for duplicates
df.duplicated(subset='PassengerId').sum()
```

```
0
```

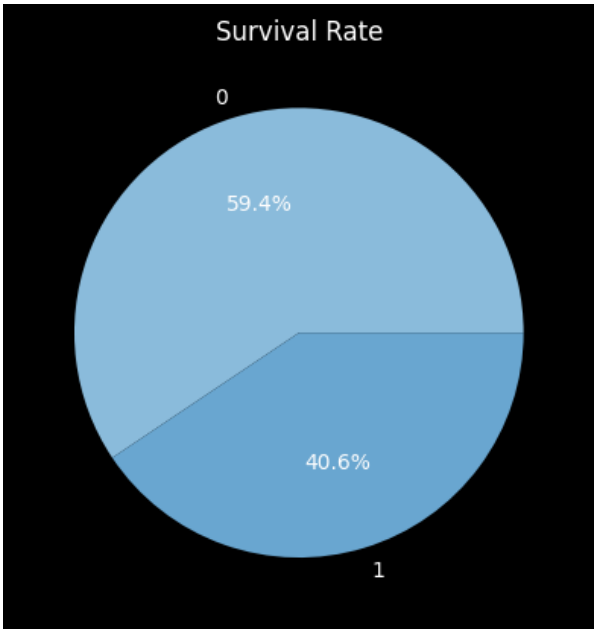
```
numerical_columns = ['PassengerId', 'Survived', 'Pclass', 'Age', 'SibSp', 'Parch', 'Fare']


# Set the plot style to a dark theme
plt.style.use('dark_background')
# Define a custom color palette with darker shades of blue
custom_palette = sns.color_palette("Blues_d")
sns.set_palette(custom_palette)
# Function to check for outliers by plotting
def outlier_plot_box(df, column_name, ax=None):
    sns.boxplot(x=df[column_name], ax=ax)

# Function to remove outliers
def remove_outliers(data, cols, threshold=3):
    for col in cols:
        z_scores = np.abs(stats.zscore(data[col]))
        data = data[(z_scores < threshold)]
    return data

# Function to plot outliers before and after removal
def plot_outliers_before_and_after(df, numerical_columns, threshold=3):
    fig, axes = plt.subplots(len(numerical_columns), 2, figsize=(12, len(numerical_columns) * 6))

    for i, column in enumerate(numerical_columns):
        ax1 = axes[i][0]
        ax2 = axes[i][1]

        # Plot boxplot before removing outliers
        outlier_plot_box(df, column, ax=ax1)
        ax1.set_title(f"{column} Distribution (Before)")

        # Remove outliers
        df_cleaned = remove_outliers(df, [column], threshold=threshold)

        # Plot boxplot after removing outliers
        outlier_plot_box(df_cleaned, column, ax=ax2)
        ax2.set_title(f"{column} Distribution (After)")

    plt.tight_layout()
    plt.show()

# Call the function to plot outliers before and after removal
plot_outliers_before_and_after(df, numerical_columns)
```


PassengerId Distribution (Before)
0
200
400
600
800
PassengerId
PassengerId Distribution (After)
0
200
400
600
800
PassengerId
Survived Distribution (Before)
0.0
0.2
0.4
0.6
0.8
1.0
Survived
Survived Distribution (After)
0.0
0.2
0.4
0.6
0.8
1.0
Survived
Pclass Distribution (Before)
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
Pclass
Pclass Distribution (After)
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
Pclass
Age Distribution (Before)
Age Distribution (After)

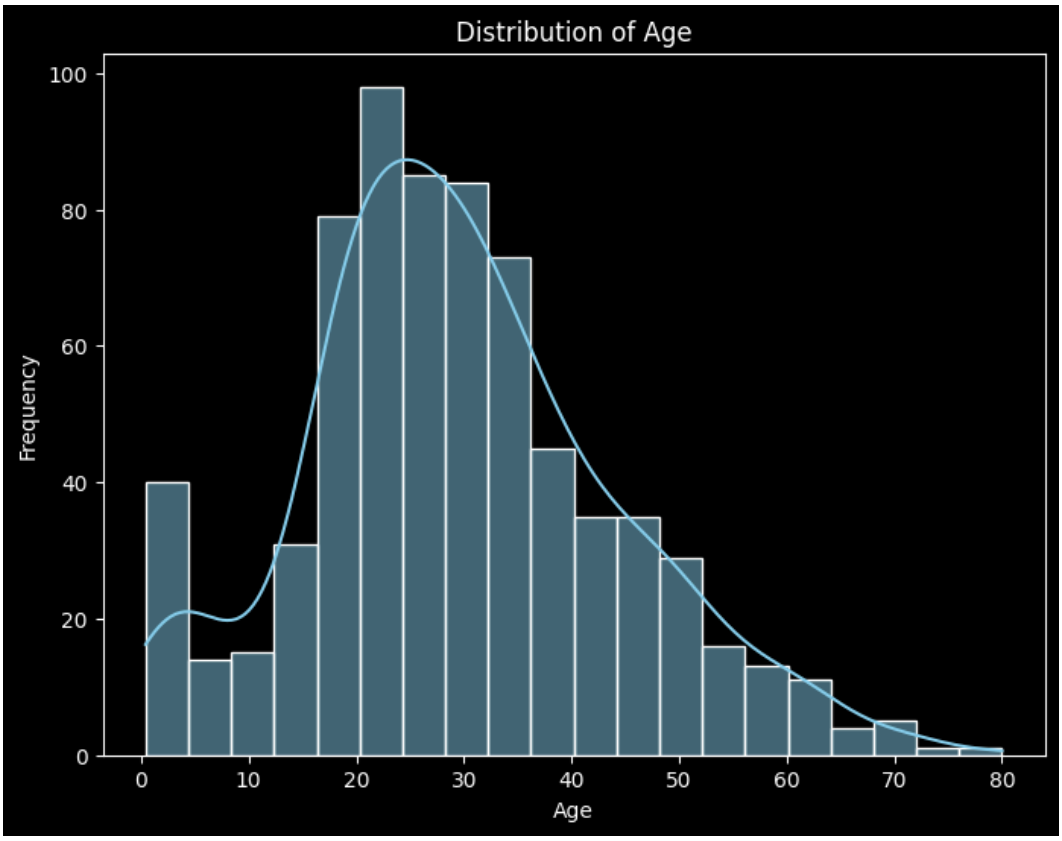

0 10 20 30 40 50 60 70 80
Age
0 10 20 30 40 50 60 70
Age
SibSp Distribution (Before)
0 1 2 3 4 5
SibSp
SibSp Distribution (After)
0.0 0.5 1.0 1.5 2.0 2.5 3.0
SibSp
Parch Distribution (Before)
0 1 2 3 4 5 6
Parch
Parch Distribution (After)
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00
Parch
Fare Distribution (Before)
Fare Distribution (After)




```
# Plot of Survival Rate
def plot_survival_rate(df):
    #Create a figure
    fig, ax = plt.subplots()

    # Plot the churn rate
    ax.pie(df['Survived'].value_counts(), labels=df['Survived'].value_counts().index, autopct='%1.1f%%')

    # Add a title
    ax.set_title('Survival Rate')

    # Show the plot
    plt.show()
plot_survival_rate(df)
```

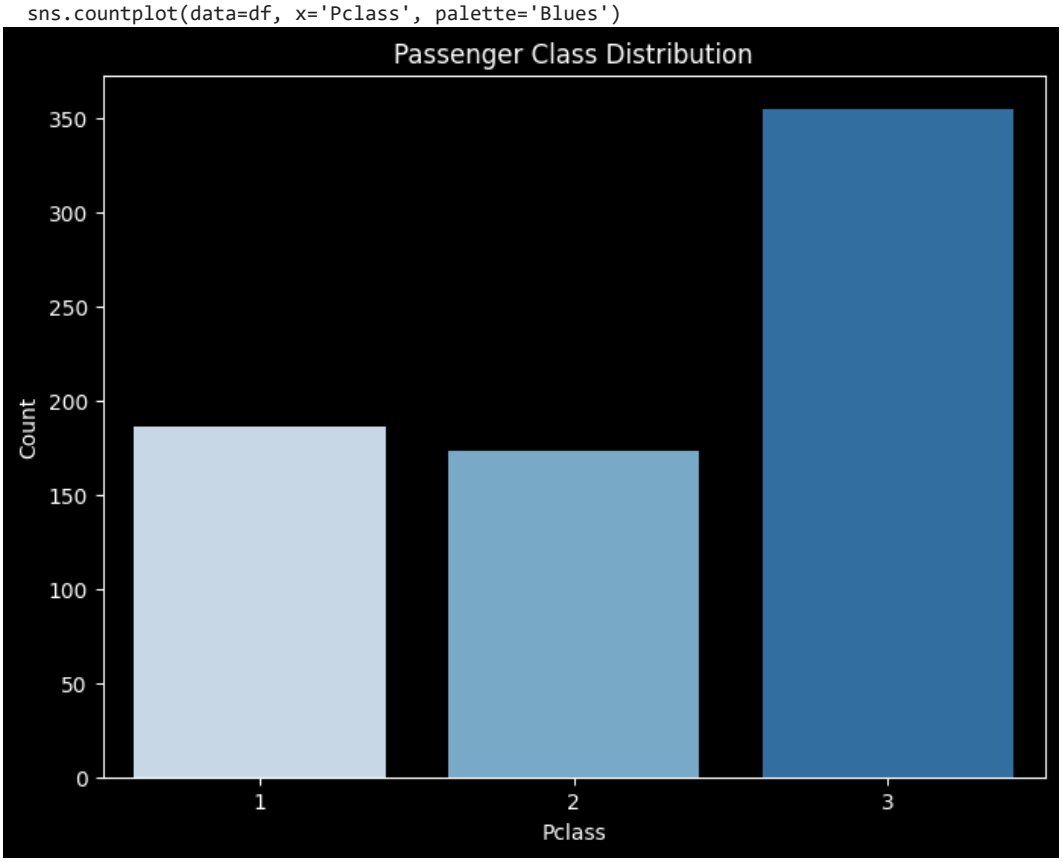


```
# Histogram for Age
plt.figure(figsize=(8, 6))
sns.histplot(data=df, x='Age', bins=20, kde=True, color='skyblue')
plt.xlabel('Age')
plt.ylabel('Frequency')
plt.title('Distribution of Age')
plt.show()
```

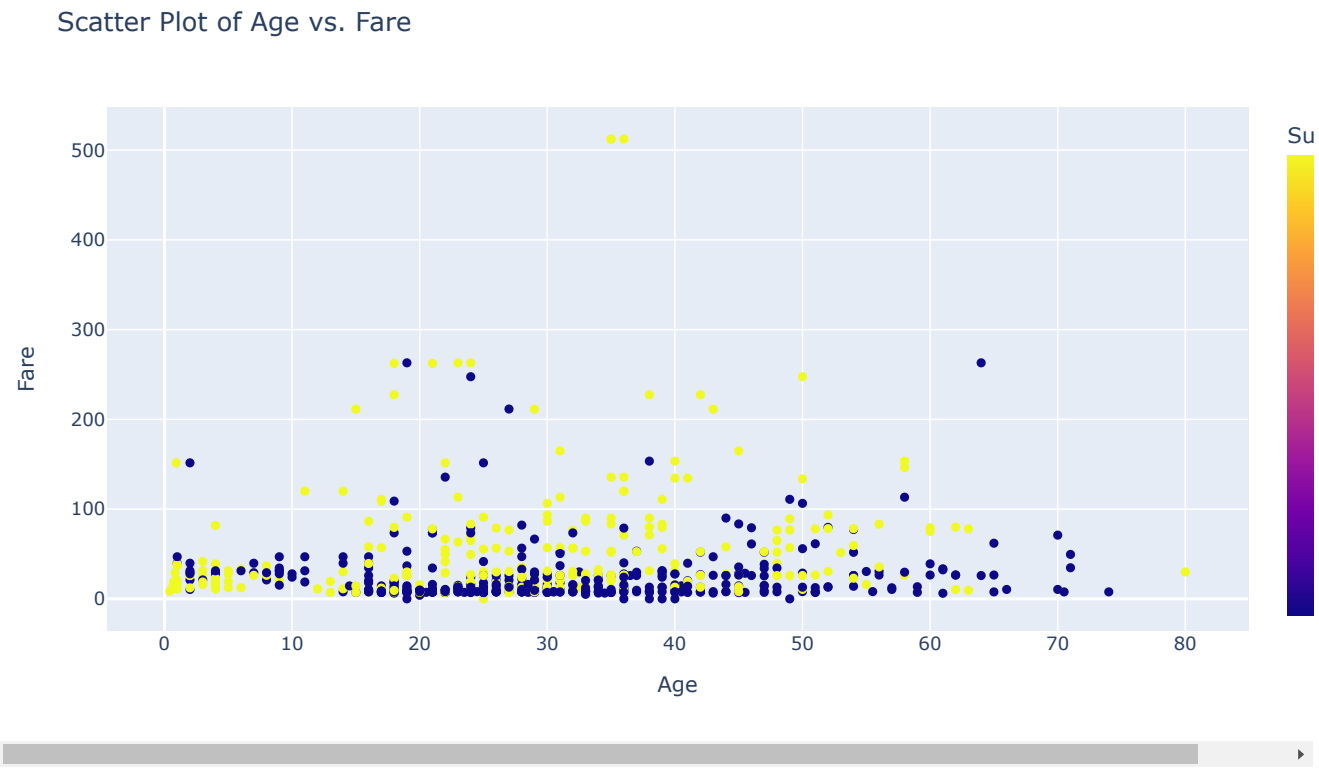



```
# Bar plot for Pclass
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='Pclass', palette='Blues')
plt.xlabel('Pclass')
plt.ylabel('Count')
plt.title('Passenger Class Distribution')
plt.show()
```

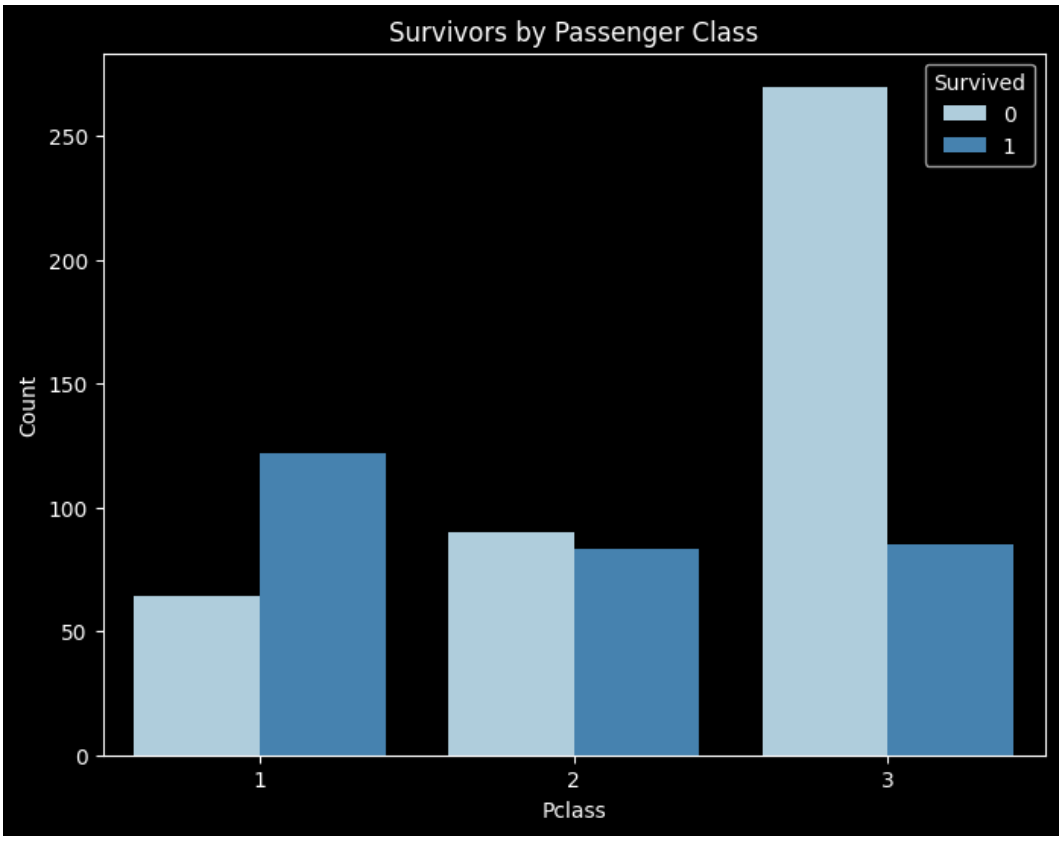
```
<ipython-input-21-85b68bfccff1>:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to

  sns.countplot(data=df, x='Pclass', palette='Blues')
```




```
# Scatter Plot
fig = px.scatter(df, x='Age', y='Fare', color='Survived', title='Scatter Plot of Age vs. Fare')
fig.show()
```

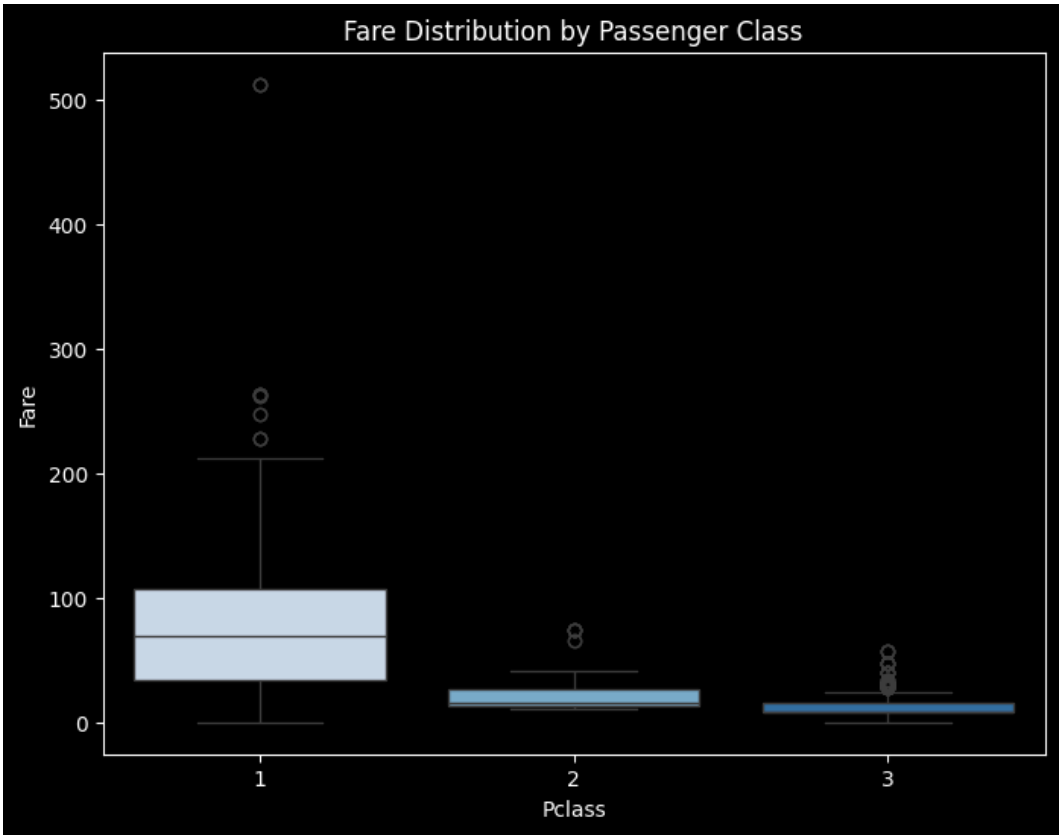


```
# Bar plot comparing the number of survivors by Pclass
plt.figure(figsize=(8, 6))
sns.countplot(data=df, x='Pclass', hue='Survived', palette='Blues')
plt.xlabel('Pclass')
plt.ylabel('Count')
plt.title('Survivors by Passenger Class')
plt.show()
```




```
# Box plot comparing fares by passenger class
plt.figure(figsize=(8, 6))
sns.boxplot(data=df, x='Pclass', y='Fare', palette='Blues')
plt.xlabel('Pclass')
plt.ylabel('Fare')
plt.title('Fare Distribution by Passenger Class')
plt.show()
```

```
<ipython-input-24-a794c376cbb8>:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to
```



Correlation heatmap between Age and Fare

```
# Correlation heatmap between Age and Fare
correlation_matrix = df[['Age', 'Fare']].corr()
plt.figure(figsize=(8, 6))
sns.heatmap(correlation_matrix, annot=True, cmap='Blues', fmt='.2f')
plt.title('Correlation Heatmap between Age and Fare')
plt.show()
```