Task 5

```
# Import necessary libraries

import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns

from matplotlib.ticker import PercentFormatter
```

```
#Set style for plots

sns.set_style('whitegrid')

plt.rcParams['figure.figsize'] = (10, 6)
```

```
#Load the dataset

df = pd.read_csv('train.csv')
```

```
#Basic data exploration

print("=== Dataset Overview ===")

print(f"Shape of dataset: {df.shape}")

print("\nFirst 5 rows:")

print(df.head())

print("\n=== Data Types ===")

print(df.info())

print("\n=== Summary Statistics ===")

print(df.describe(include='all'))

print("\n=== Missing Values ===")

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

```
=== Dataset Overview ===
Shape of dataset: (891, 12)

First 5 rows:
   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
...
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

Output is truncated. View as a scrollable element or open in a text editor. Adjust cell output settings...

#Data Cleaning

#Fill missing age values with median

df['Age'].fillna(df['Age'].median(), inplace=True)

C:\Users\Alpha\AppData\Local\Temp\ipykernel_9652\1933487976.py:1:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting values always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.

```
df['Age'].fillna(df['Age'].median(), inplace=True)
```

#Fill missing embarked with mode

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

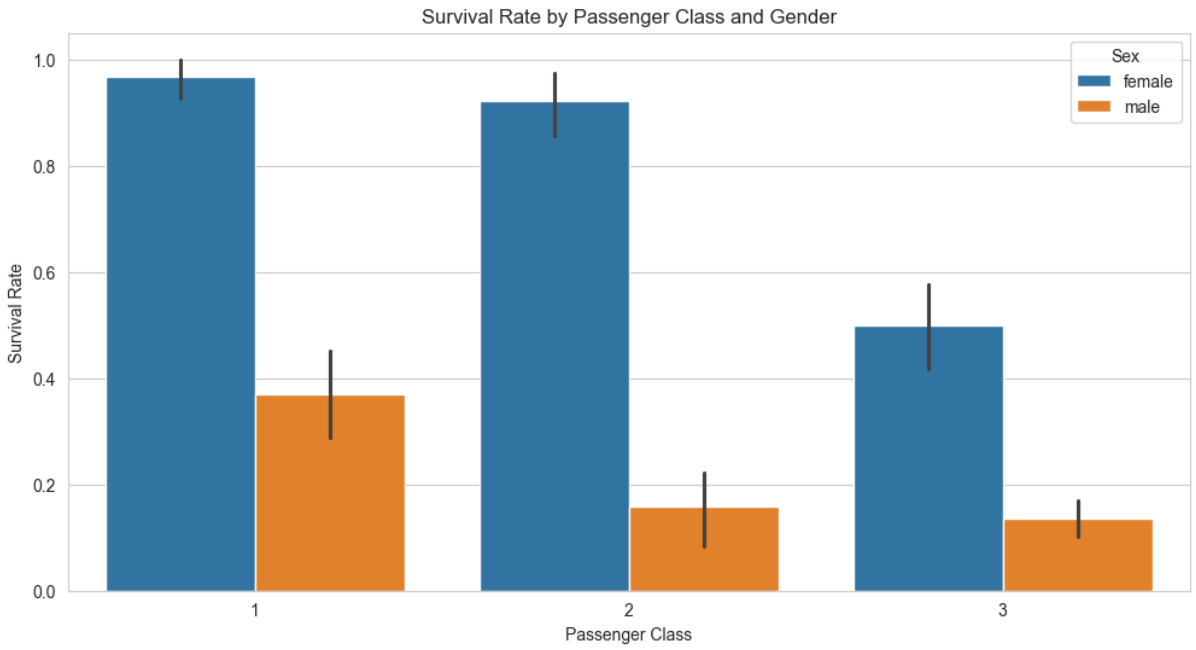
```
C:\Users\Alpha\AppData\Local\Temp\ipykernel_9652\3744086084.py:1:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series
through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work
because the intermediate object on which we are setting values always behaves
as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try using
'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value)
instead, to perform the operation inplace on the original object.


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

```
#Cabin has too many missing values, we'll drop it

df.drop('Cabin', axis=1, inplace=True)


#Survival Analysis

print("\n=== Survival Rate ===")

print(f"Overall survival rate: {df['Survived'].mean():.2%}")

print("\nSurvival by gender:")

print(df.groupby('Sex')['Survived'].mean())

print("\nSurvival by passenger class:")

print(df.groupby('Pclass')['Survived'].mean())
```

```
=== Survival Rate ===
Overall survival rate: 38.38%

Survival by gender:
Sex
female    0.742038
male      0.188908
Name: Survived, dtype: float64

Survival by passenger class:
Pclass
1    0.629630
2    0.472826
3    0.242363
Name: Survived, dtype: float64
```

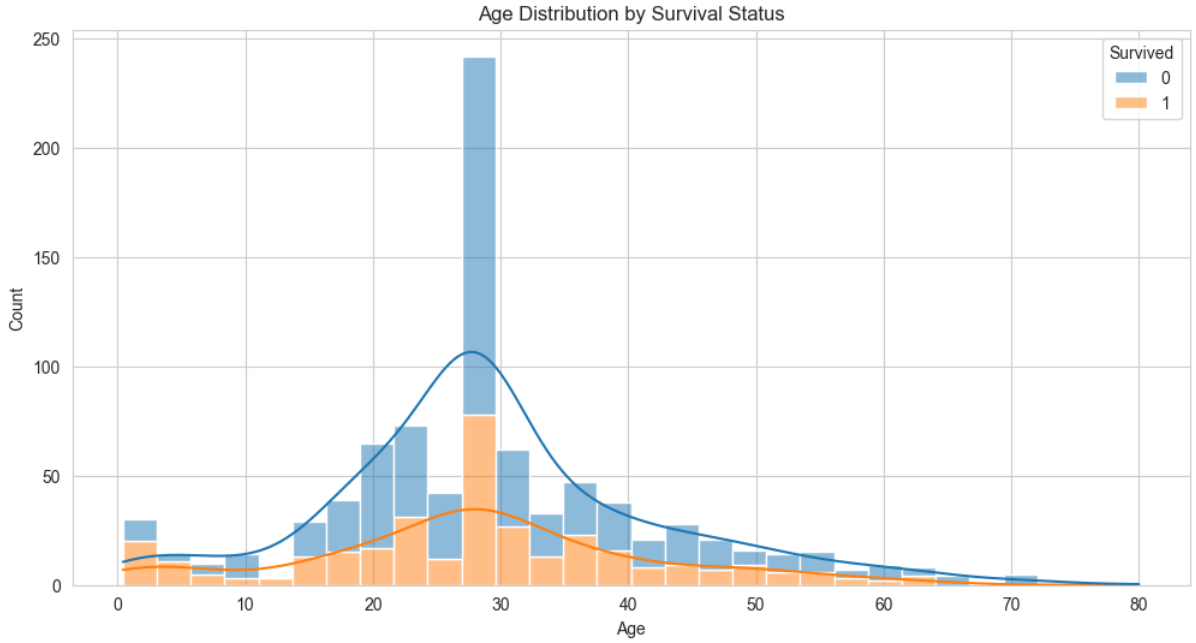
#Visualization 1: Survival by Gender and Class

```
plt.figure(figsize=(12, 6))

sns.barplot(x='Pclass', y='Survived', hue='Sex', data=df)

plt.title('Survival Rate by Passenger Class and Gender')

plt.ylabel('Survival Rate')

plt.xlabel('Passenger Class')

plt.show()
```



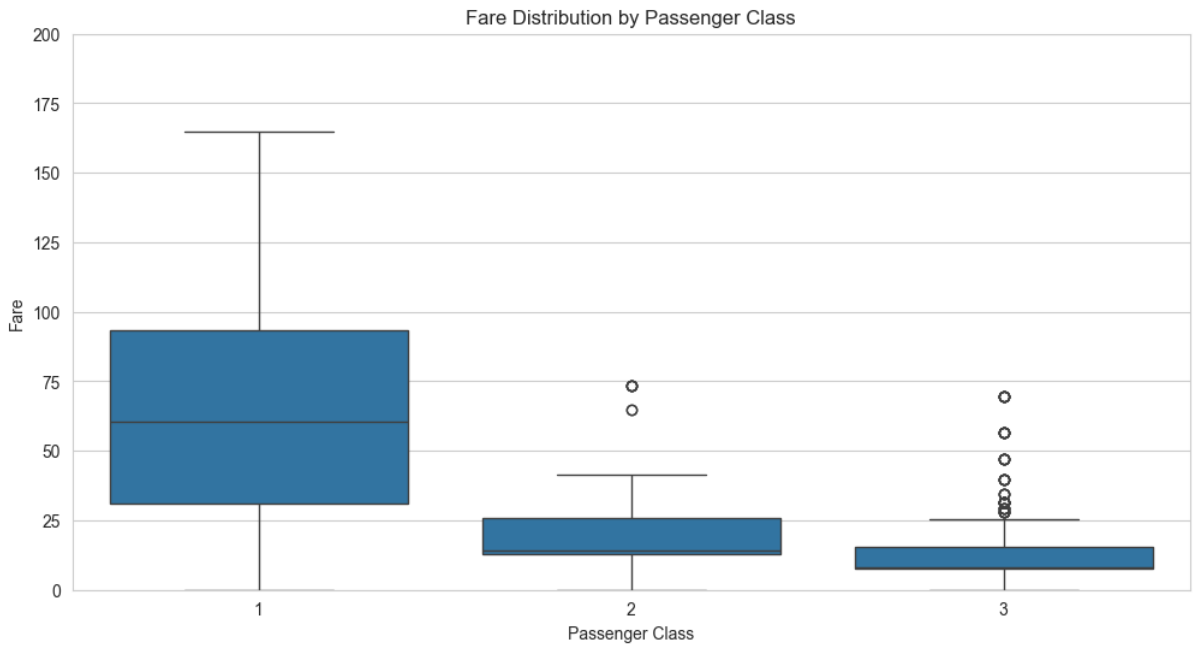
#Visualization 2: Age Distribution by Survival

```
plt.figure(figsize=(12, 6))

sns.histplot(data=df, x='Age', hue='Survived', bins=30, kde=True, multiple='stack')

plt.title('Age Distribution by Survival Status')

plt.xlabel('Age')

plt.ylabel('Count')

plt.show()
```



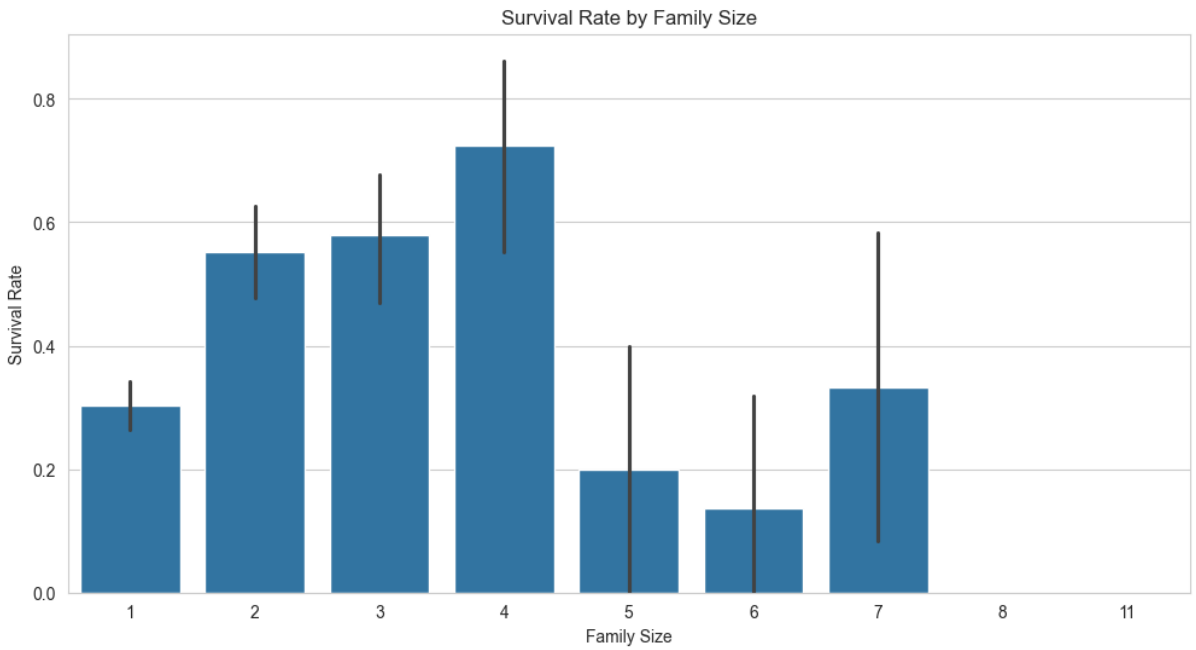
#Visualization 3: Fare Distribution by Passenger Class

```
plt.figure(figsize=(12, 6))

sns.boxplot(x='Pclass', y='Fare', data=df)

plt.title('Fare Distribution by Passenger Class')

plt.xlabel('Passenger Class')

plt.ylabel('Fare')

plt.ylim(0, 200)  # Limit y-axis to better visualize most fares

plt.show()
```



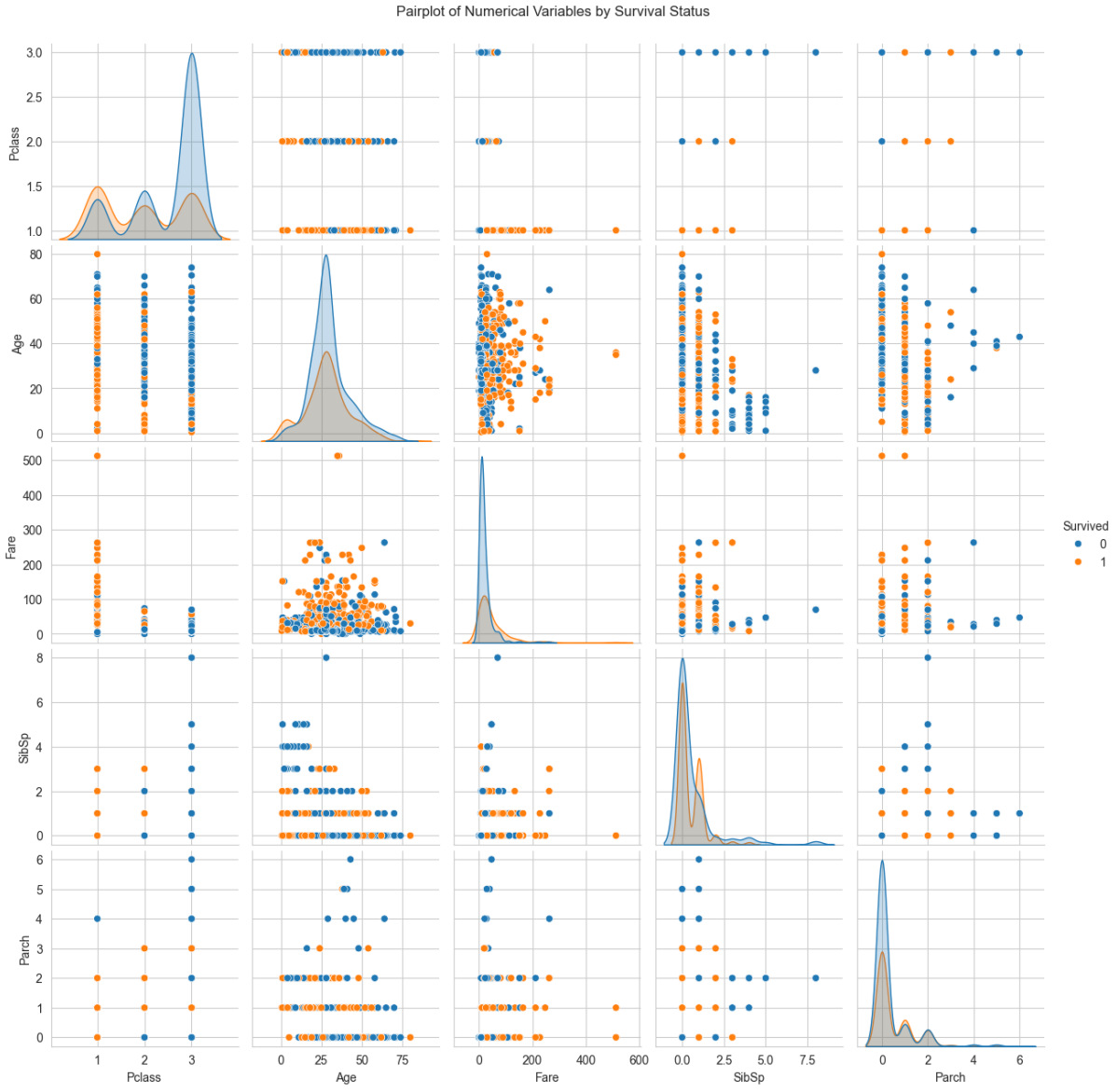
#Visualization 4: Family Size Analysis

```
df['FamilySize'] = df['SibSp'] + df['Parch'] + 1

plt.figure(figsize=(12, 6))

sns.barplot(x='FamilySize', y='Survived', data=df)

plt.title('Survival Rate by Family Size')

plt.xlabel('Family Size')

plt.ylabel('Survival Rate')

plt.show()
```



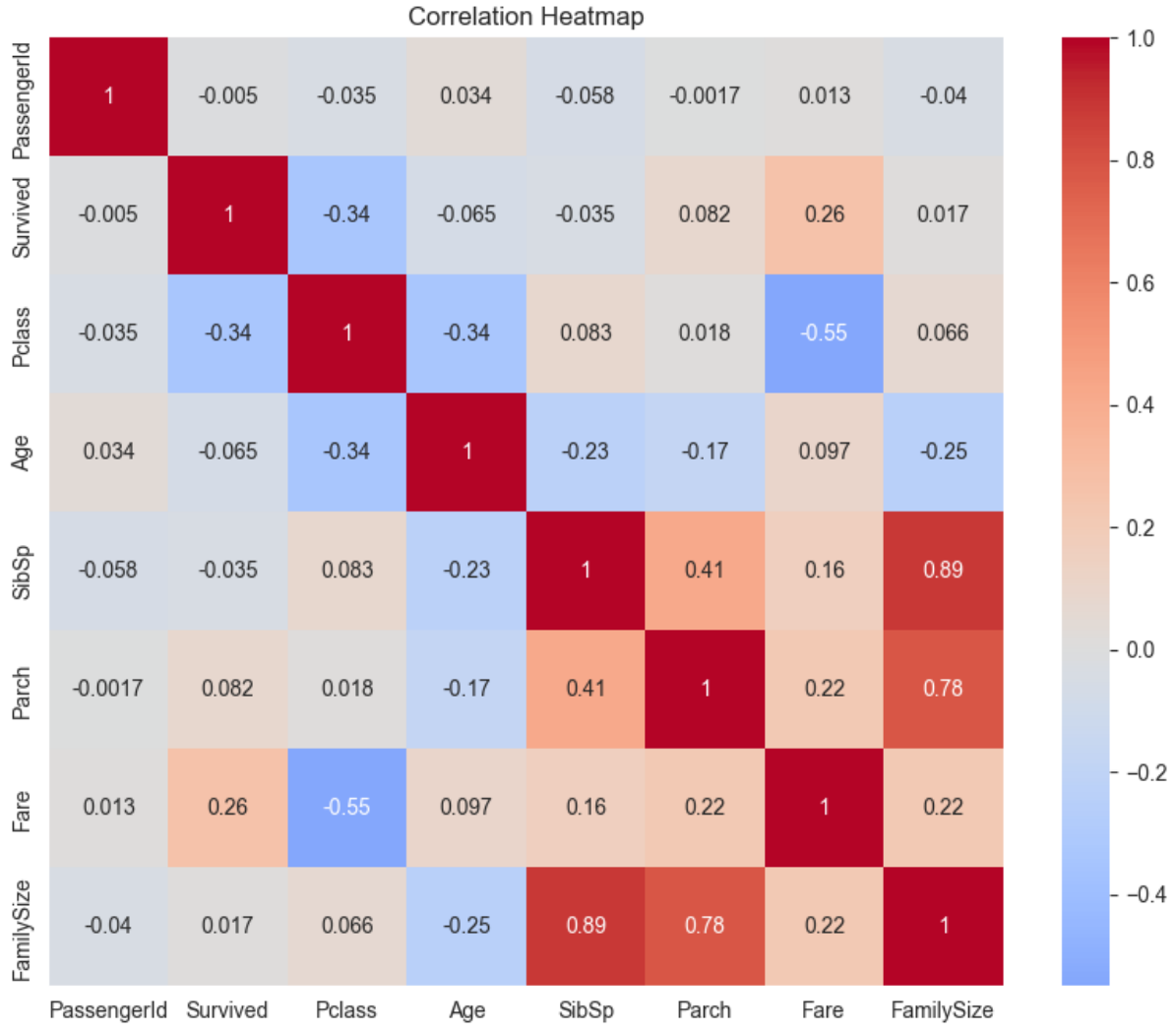
#Visualization 5: Pairplot of Numerical Variables

```
sns.pairplot(df[['Survived', 'Pclass', 'Age', 'Fare', 'SibSp', 'Parch']], hue='Survived')
plt.suptitle('Pairplot of Numerical Variables by Survival Status', y=1.02)
plt.show()
```



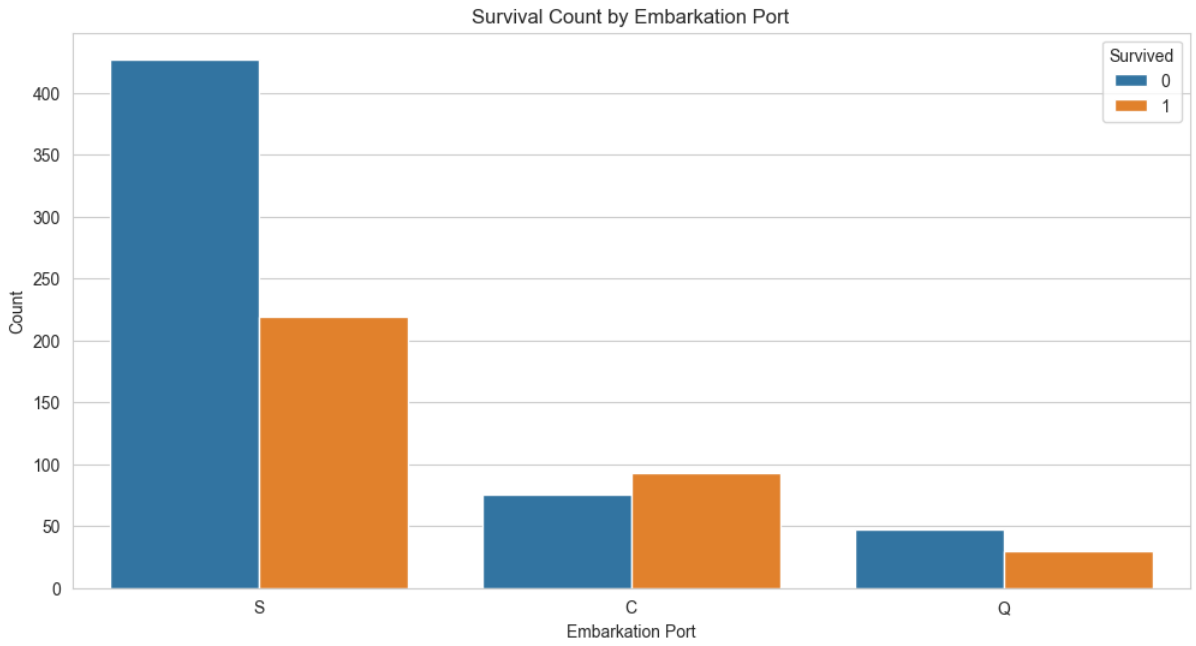
#Visualization 6: Correlation Heatmap

```
plt.figure(figsize=(10, 8))
corr = df.corr(numeric_only=True)
sns.heatmap(corr, annot=True, cmap='coolwarm', center=0)
plt.title('Correlation Heatmap')
plt.show()
```



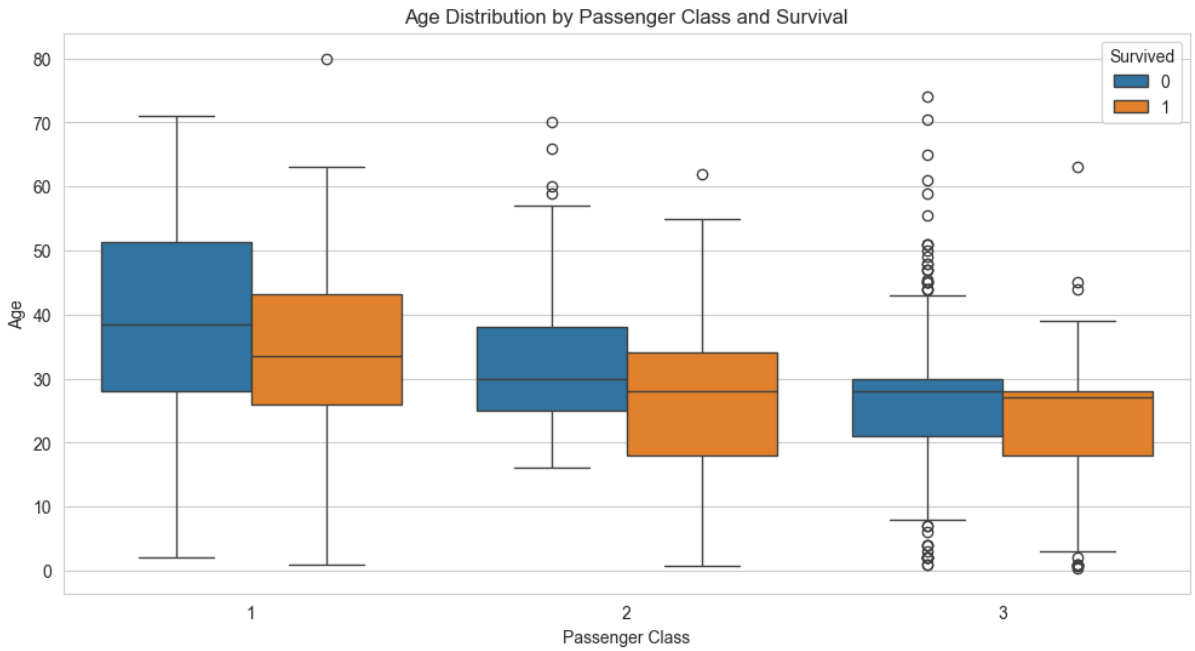
#Visualization 7: Embarkation Port Analysis

```
plt.figure(figsize=(12, 6))

sns.countplot(x='Embarked', hue='Survived', data=df)

plt.title('Survival Count by Embarkation Port')

plt.xlabel('Embarkation Port')

plt.ylabel('Count')

plt.show()
```



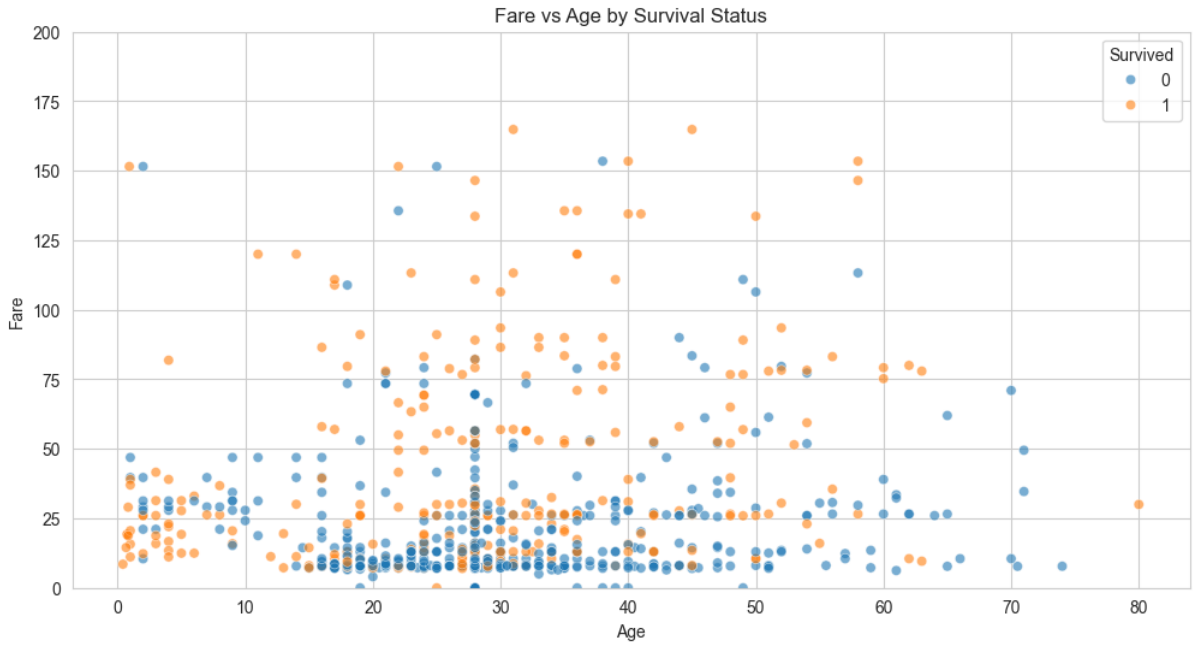
#Visualization 8: Age Distribution by Class and Survival

```
plt.figure(figsize=(12, 6))

sns.boxplot(x='Pclass', y='Age', hue='Survived', data=df)

plt.title('Age Distribution by Passenger Class and Survival')

plt.xlabel('Passenger Class')

plt.ylabel('Age')

plt.show()
```



#Visualization 9: Fare vs Age with Survival

```
plt.figure(figsize=(12, 6))

sns.scatterplot(x='Age', y='Fare', hue='Survived', data=df, alpha=0.6)

plt.title('Fare vs Age by Survival Status')

plt.xlabel('Age')

plt.ylabel('Fare')

plt.ylim(0, 200)

plt.show()
```



#Visualization 10: Title Extraction and Analysis

```
df['Title'] = df['Name'].str.extract(' ([A-Za-z]+)\.', expand=False)

df['Title'] = df['Title'].replace(['Lady', 'Countess','Capt', 'Col', 'Don', 'Dr',
                                   'Major', 'Rev', 'Sir', 'Jonkheer', 'Dona'], 'Rare')

df['Title'] = df['Title'].replace('Mlle', 'Miss')

df['Title'] = df['Title'].replace('Ms', 'Miss')

df['Title'] = df['Title'].replace('Mme', 'Mrs')


plt.figure(figsize=(12, 6))

sns.countplot(x='Title', hue='Survived', data=df)

plt.title('Survival Count by Title')

plt.xlabel('Title')

plt.ylabel('Count')

plt.show()
```