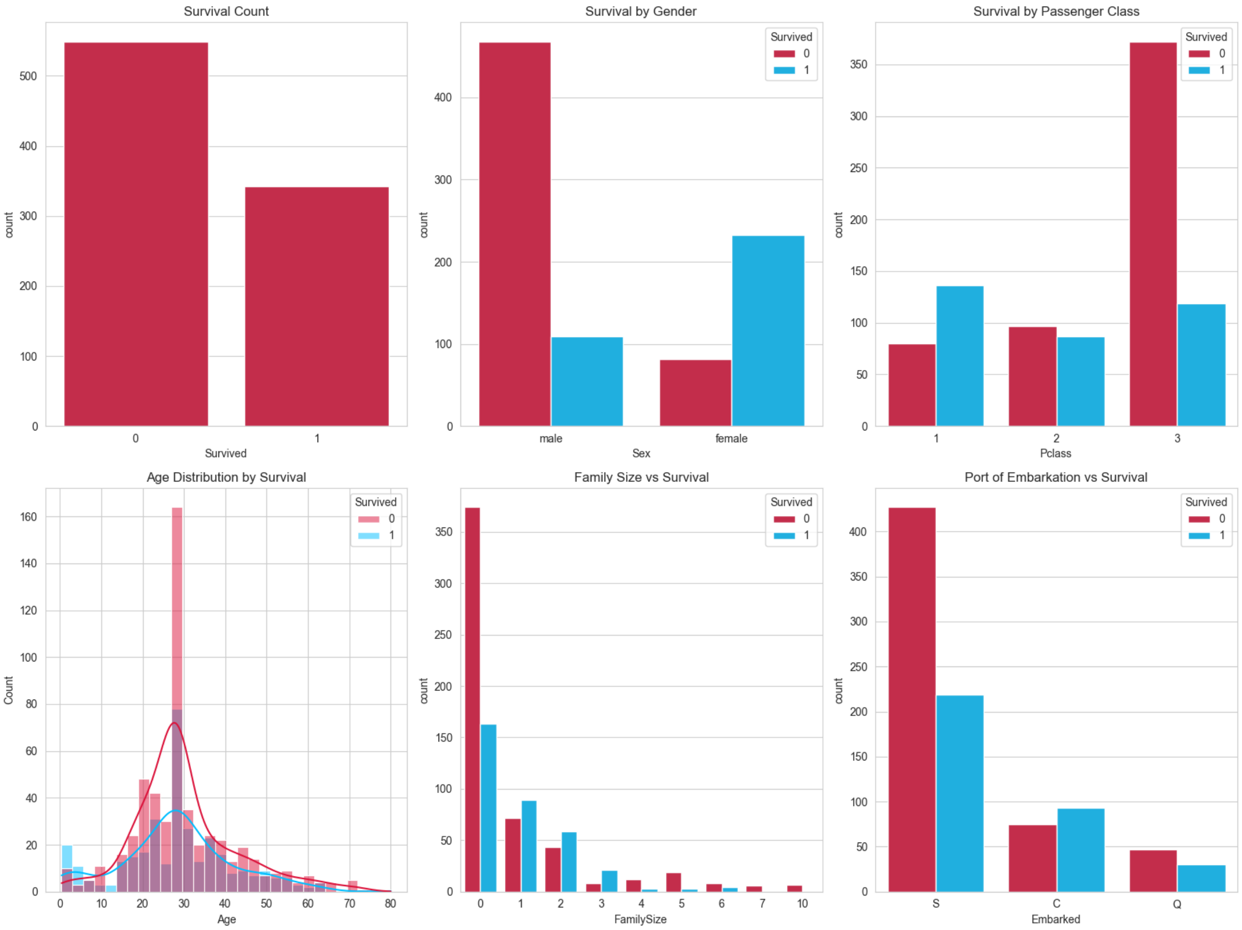
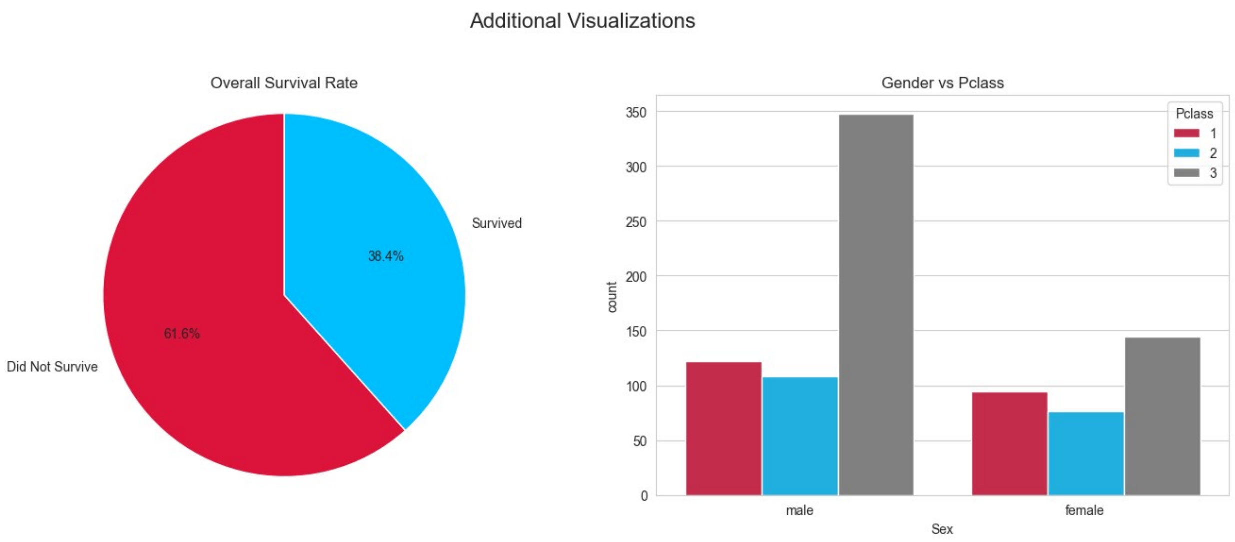
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from matplotlib.backends.backend_pdf import PdfPages
from IPython.display import display

%matplotlib inline

plt.style.use("default")
sns.set_style("whitegrid")
sns.set_palette(['crimson', 'deepskyblue'])

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

from IPython.display import HTML, display

display(df.head())
display(df.describe())
df.info()

df['Age'] = df['Age'].fillna(df['Age'].median())
df['Embarked'] = df['Embarked'].fillna(df['Embarked'].mode()[0])
df = df.drop(columns=['Cabin'])
df['FamilySize'] = df['SibSp'] + df['Parch']

df.describe().to_csv("describe.csv")
df.head().to_csv("head.csv", index=False)

with PdfPages("Titanic_EDA_Clean.pdf") as pdf:
    plt.figure(figsize=(16, 12))

    plt.subplot(2, 3, 1)
    sns.countplot(x='Survived', data=df)
    plt.title('Survival Count')

    plt.subplot(2, 3, 2)
    sns.countplot(x='Sex', hue='Survived', data=df)
    plt.title('Survival by Gender')

    plt.subplot(2, 3, 3)
    sns.countplot(x='Pclass', hue='Survived', data=df)
    plt.title('Survival by Passenger Class')

    plt.subplot(2, 3, 4)
    sns.histplot(data=df, x='Age', hue='Survived', kde=True, bins=30)
    plt.title('Age Distribution by Survival')

    plt.subplot(2, 3, 5)
    sns.countplot(x='FamilySize', hue='Survived', data=df)
    plt.title('Family Size vs Survival')

    plt.subplot(2, 3, 6)
    sns.countplot(x='Embarked', hue='Survived', data=df)
    plt.title('Port of Embarkation vs Survival')

    plt.tight_layout()
    pdf.savefig()
    plt.show()
    plt.close()

    fig, axes = plt.subplots(1, 2, figsize=(14, 6))
    fig.suptitle('Additional Visualizations', fontsize=16)

    survived_counts = df['Survived'].value_counts()
    labels = ['Did Not Survive', 'Survived']
    colors = ['crimson', 'deepskyblue']
    axes[0].pie(survived_counts, labels=labels, colors=colors,
autopct='%1.1f%%', startangle=90)
    axes[0].set_title('Overall Survival Rate')
    axes[0].axis('equal')

    sns.countplot(data=df, x='Sex', hue='Pclass', palette=['crimson',
'deepskyblue', 'gray'], ax=axes[1])
    axes[1].set_title('Gender vs Pclass')

    plt.tight_layout(rect=[0, 0.03, 1, 0.95])
    pdf.savefig()
    plt.show()
    plt.close()

    plt.figure(figsize=(8, 6))
    sns.heatmap(df.corr(numeric_only=True), annot=True,
cmap='coolwarm', fmt=".2f")
    plt.title("Correlation Between Numerical Features", fontsize=14)
    plt.tight_layout()
    pdf.savefig()
    plt.show()
    plt.close()
```

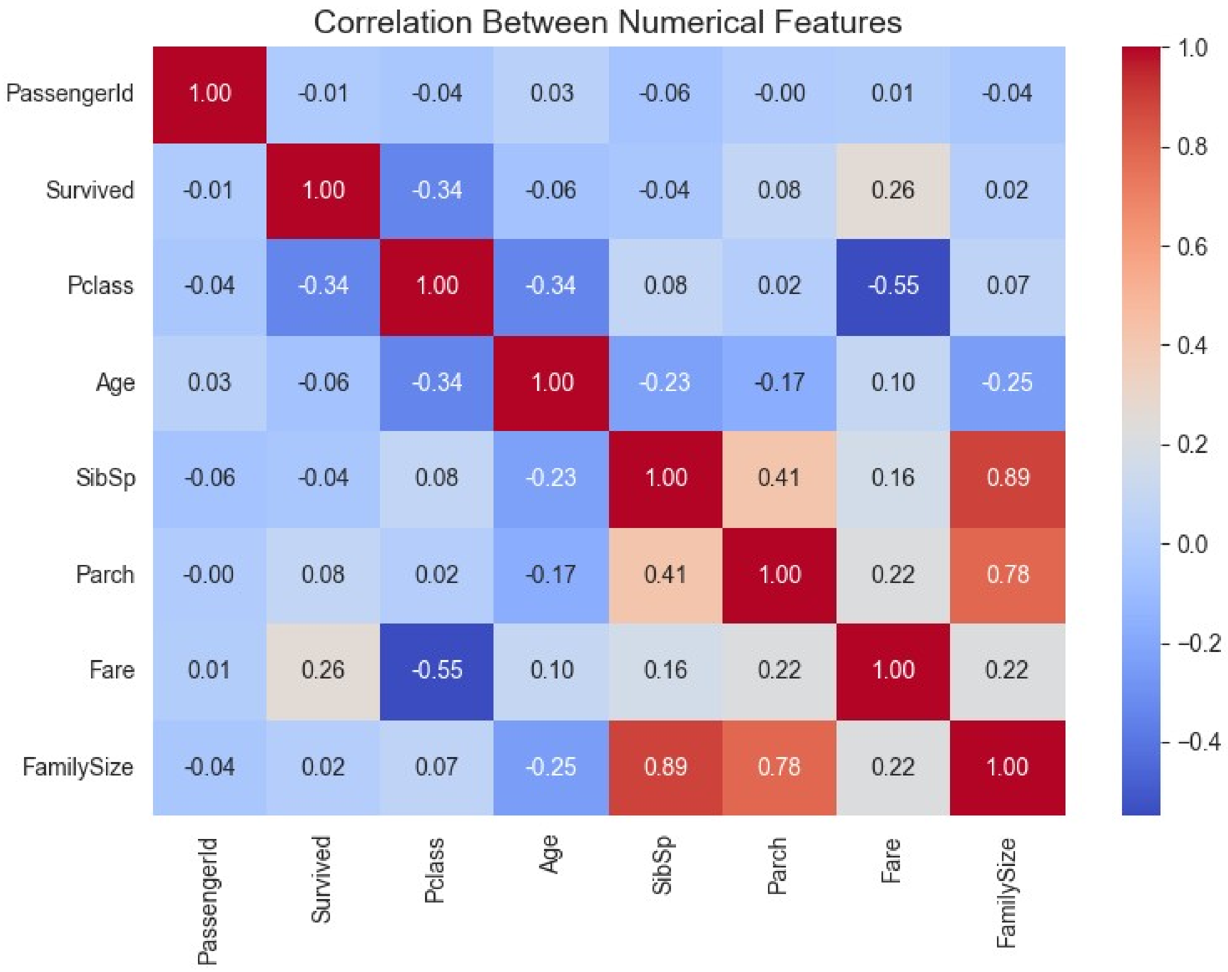
```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         0       3

                                                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

       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

<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
```





Additional Visualizations



Correlation Between Numerical Features

| | PassengerId | Survived | Pclass | Age | SibSp | Parch | Fare | FamilySize |
|---|---|---|---|---|---|---|---|---|
| PassengerId | 1.00 | -0.01 | -0.04 | 0.03 | -0.06 | -0.00 | 0.01 | -0.04 |
| Survived | -0.01 | 1.00 | -0.34 | -0.06 | -0.04 | 0.08 | 0.26 | 0.02 |
| Pclass | -0.04 | -0.34 | 1.00 | -0.34 | 0.08 | 0.02 | -0.55 | 0.07 |
| Age | 0.03 | -0.06 | -0.34 | 1.00 | -0.23 | -0.17 | 0.10 | -0.25 |
| SibSp | -0.06 | -0.04 | 0.08 | -0.23 | 1.00 | 0.41 | 0.16 | 0.89 |
| Parch | -0.00 | 0.08 | 0.02 | -0.17 | 0.41 | 1.00 | 0.22 | 0.78 |
| Fare | 0.01 | 0.26 | -0.55 | 0.10 | 0.16 | 0.22 | 1.00 | 0.22 |
| FamilySize | -0.04 | 0.02 | 0.07 | -0.25 | 0.89 | 0.78 | 0.22 | 1.00 |