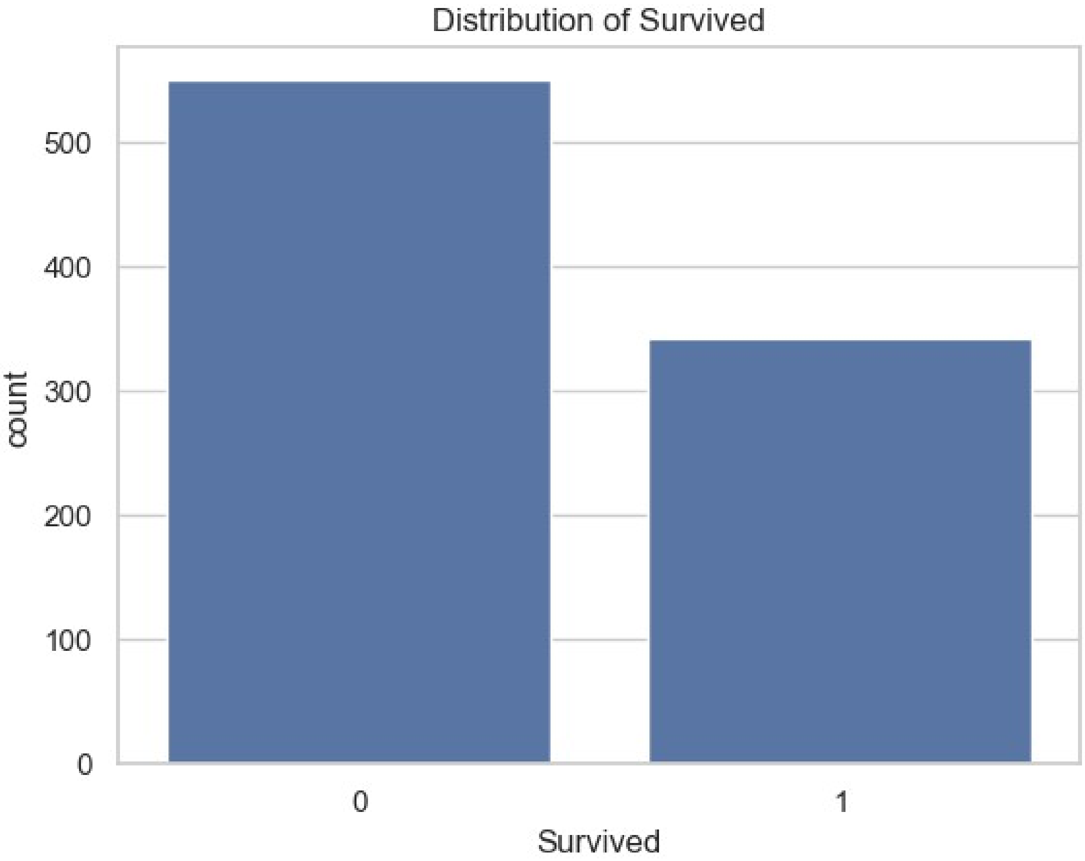
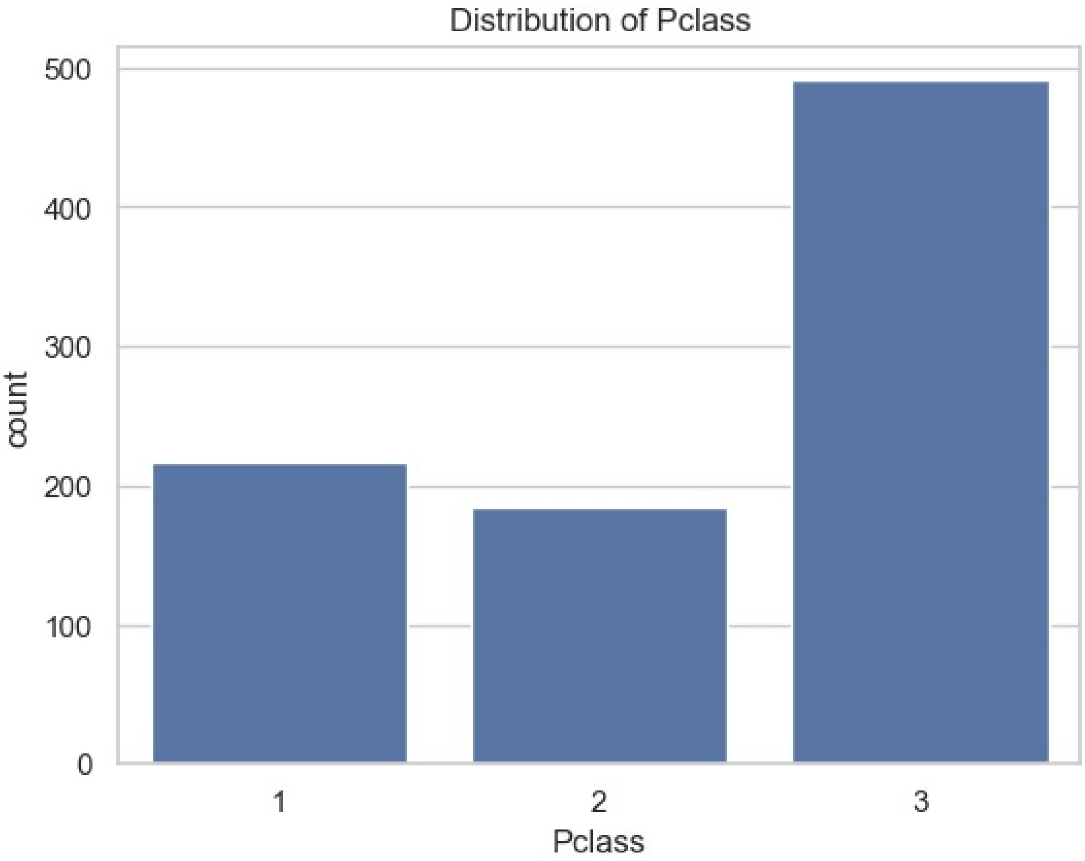
```python
# 1. Import Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# Set styles
sns.set(style="whitegrid")
%matplotlib inline

# 2. Load Dataset
df = pd.read_csv("train.csv")

# 3. Data Overview
print("Dataset Shape:", df.shape)
display(df.head())
display(df.info())
display(df.describe())
print("Missing Values:\n", df.isnull().sum())

# 4. Univariate Analysis

# Plotting categorical features
categorical = ['Survived', 'Pclass', 'Sex', 'Embarked']
for col in categorical:
    sns.countplot(x=col, data=df)
    plt.title(f'Distribution of {col}')
    plt.show()

# Plotting numerical features
numerical = ['Age', 'Fare', 'SibSp', 'Parch']
for col in numerical:
    plt.figure(figsize=(12, 5))
    plt.subplot(1, 2, 1)
    sns.histplot(df[col].dropna(), kde=True)
    plt.title(f'Histogram of {col}')

    plt.subplot(1, 2, 2)
    sns.boxplot(x=col, data=df)
    plt.title(f'Boxplot of {col}')
    plt.show()

# 5. Bivariate Analysis

# Survival vs Sex
sns.countplot(x='Sex', hue='Survived', data=df)
plt.title("Survival Count by Sex")
plt.show()

# Survival vs Pclass
```

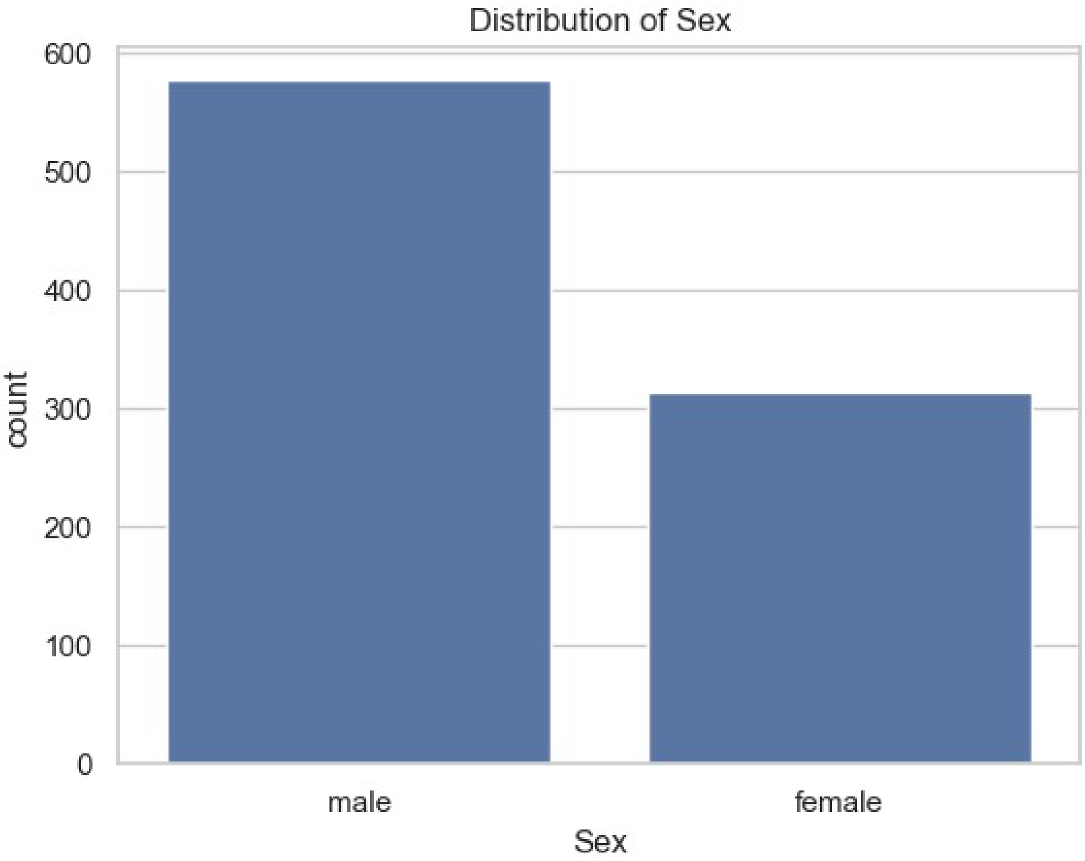
```
sns.countplot(x='Pclass', hue='Survived', data=df)
plt.title("Survival Count by Pclass")
plt.show()

# Age vs Survival
sns.histplot(data=df, x='Age', hue='Survived', kde=True,
element="step")
plt.title("Age Distribution by Survival")
plt.show()

# 6. Correlation and Heatmap
plt.figure(figsize=(10, 6))
numeric_df = df.select_dtypes(include=[np.number])
sns.heatmap(numeric_df.corr(), annot=True, cmap='coolwarm', fmt=".2f")
plt.title("Correlation Heatmap")
plt.show()

# Pairplot (optional, heavy)
# sns.pairplot(df[['Survived', 'Pclass', 'Age', 'Fare', 'SibSp',
'Parch']], hue='Survived')

# 7. Handling Skewness
from scipy.stats import skew

print("Skewness of numerical features:")
for col in ['Age', 'Fare']:
    val = skew(df[col].dropna())
    print(f"{col}: {val:.2f}")

# Apply log1p to fix skewness in 'Fare'
df['Fare_log'] = np.log1p(df['Fare'])

# Before and after log transformation
sns.histplot(df['Fare'], kde=True, color='red', label='Original')
sns.histplot(df['Fare_log'], kde=True, color='blue', label='Log
Transformed')
plt.title("Fare Distribution Before and After Log Transformation")
plt.legend()
plt.show()

# 8. Summary of Findings
summary = """
- Most passengers did not survive (~62%).
- Females had a much higher survival rate than males.
- Passengers in 1st class had a better chance of survival.
- Age and Fare show right skew; Fare was log transformed.
- Missing values found in Age, Cabin, and Embarked.
- Correlation highest between Pclass & Fare, SibSp & Parch.
"""
print(summary)
```

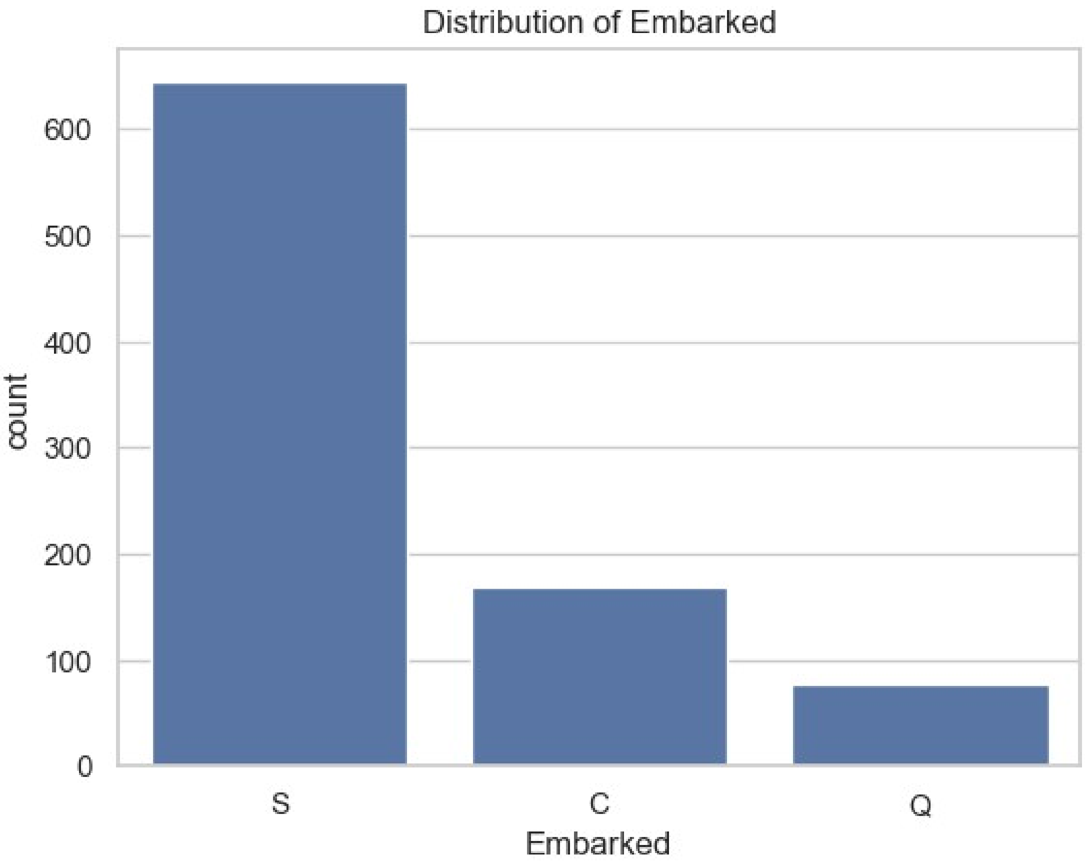
```
Dataset Shape: (891, 12)

   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

<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

None
```

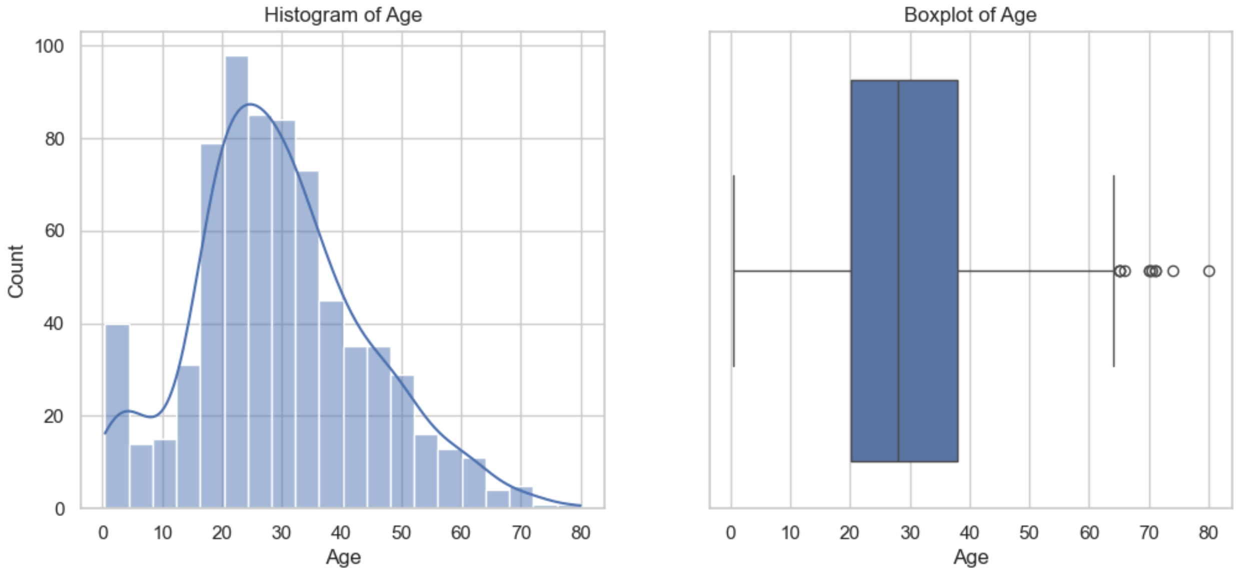
```
       PassengerId    Survived      Pclass         Age       SibSp  \
count   891.000000  891.000000  891.000000  714.000000  891.000000   
mean    446.000000    0.383838    2.308642   29.699118    0.523008   
std     257.353842    0.486592    0.836071   14.526497    1.102743   
min       1.000000    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  

Missing Values:
 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
```

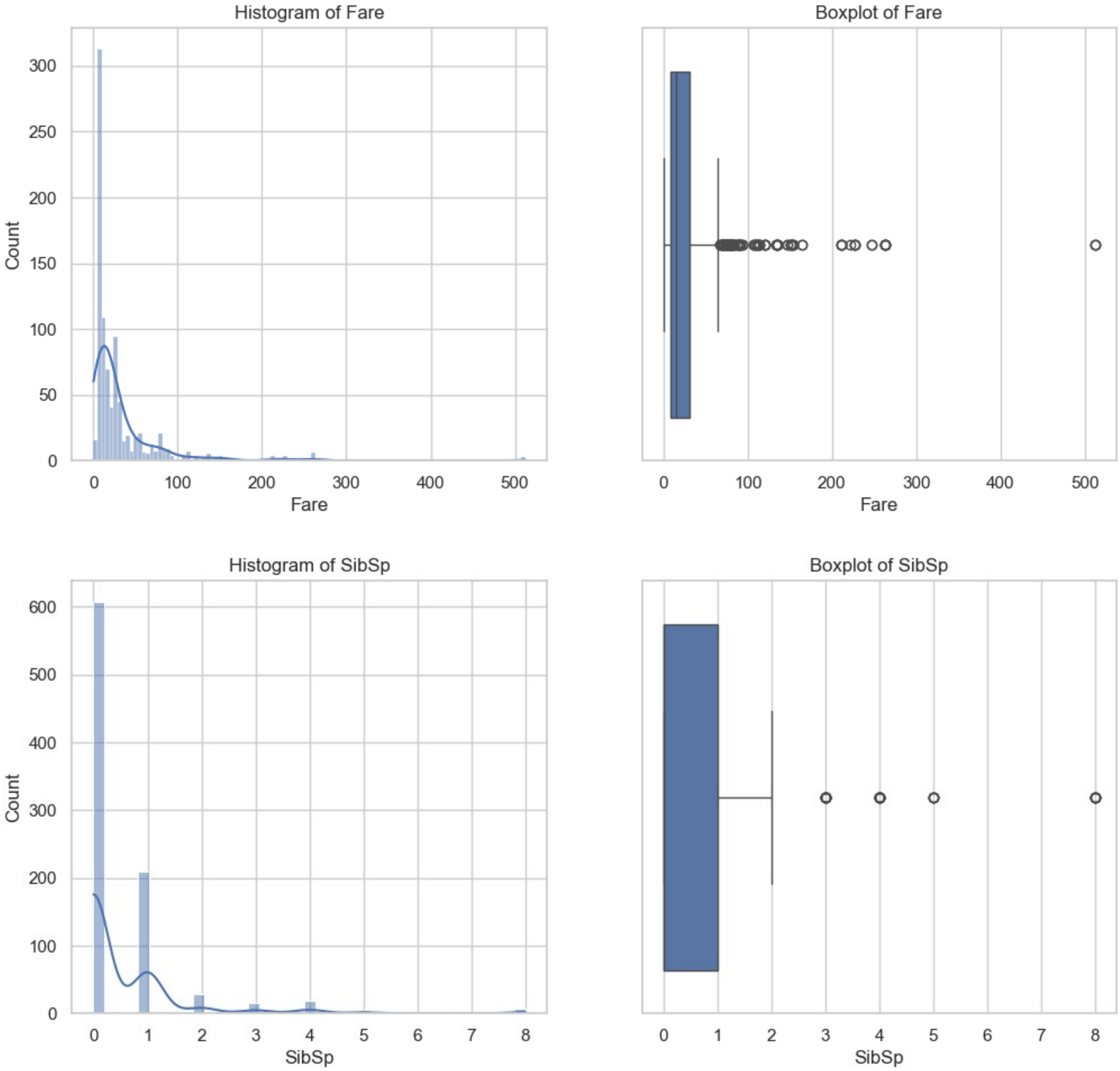

Distribution of Survived
500
400
300
200
100
0
count
0
1
Survived

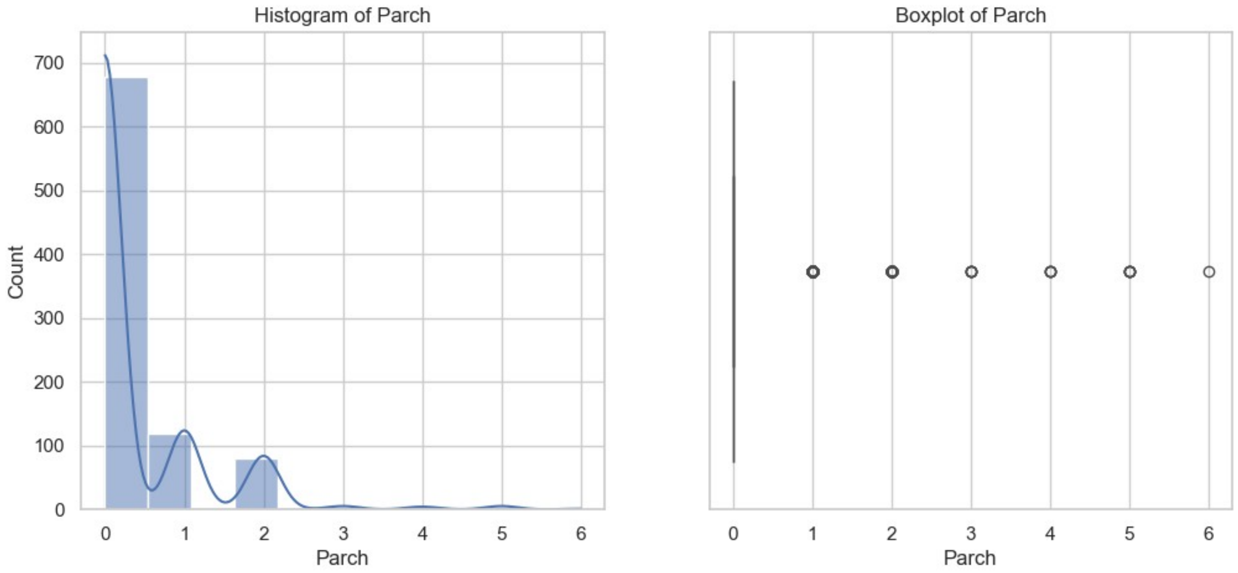

Distribution of Pclass
count
0
100
200
300
400
500
1
2
3
Pclass

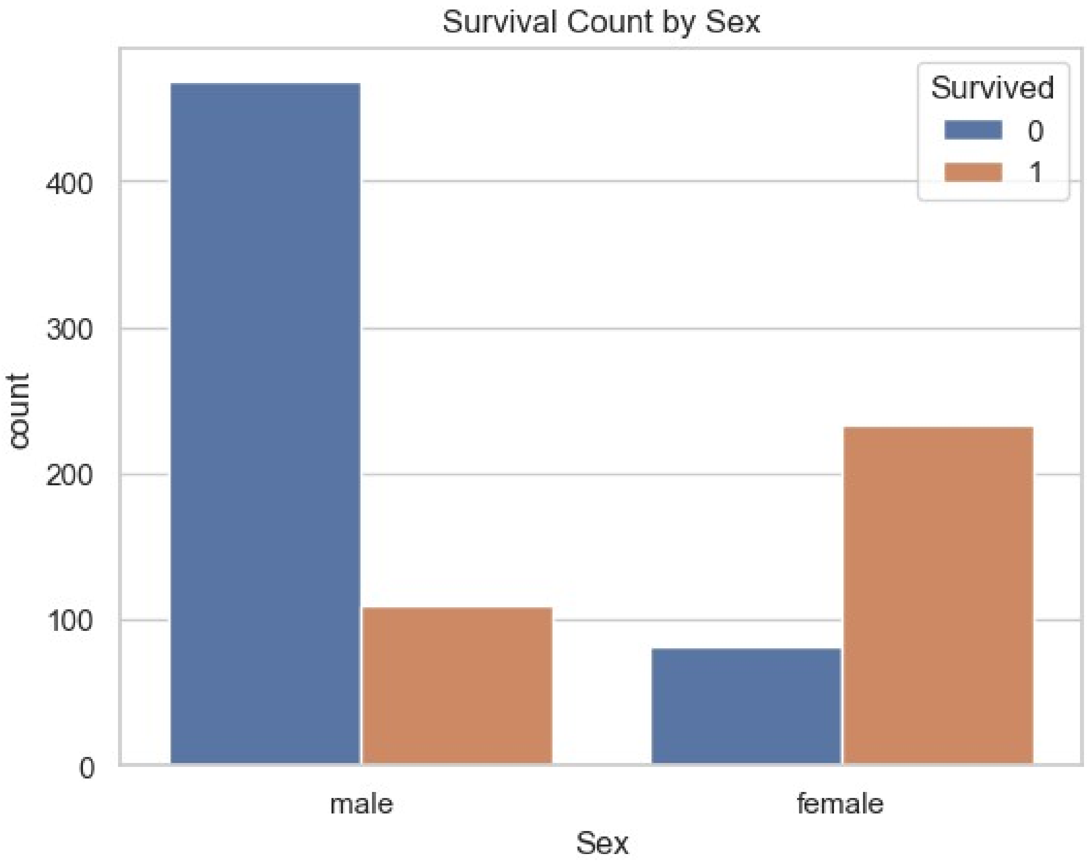

Distribution of Sex
count
600
500
400
300
200
100
0
male
female
Sex

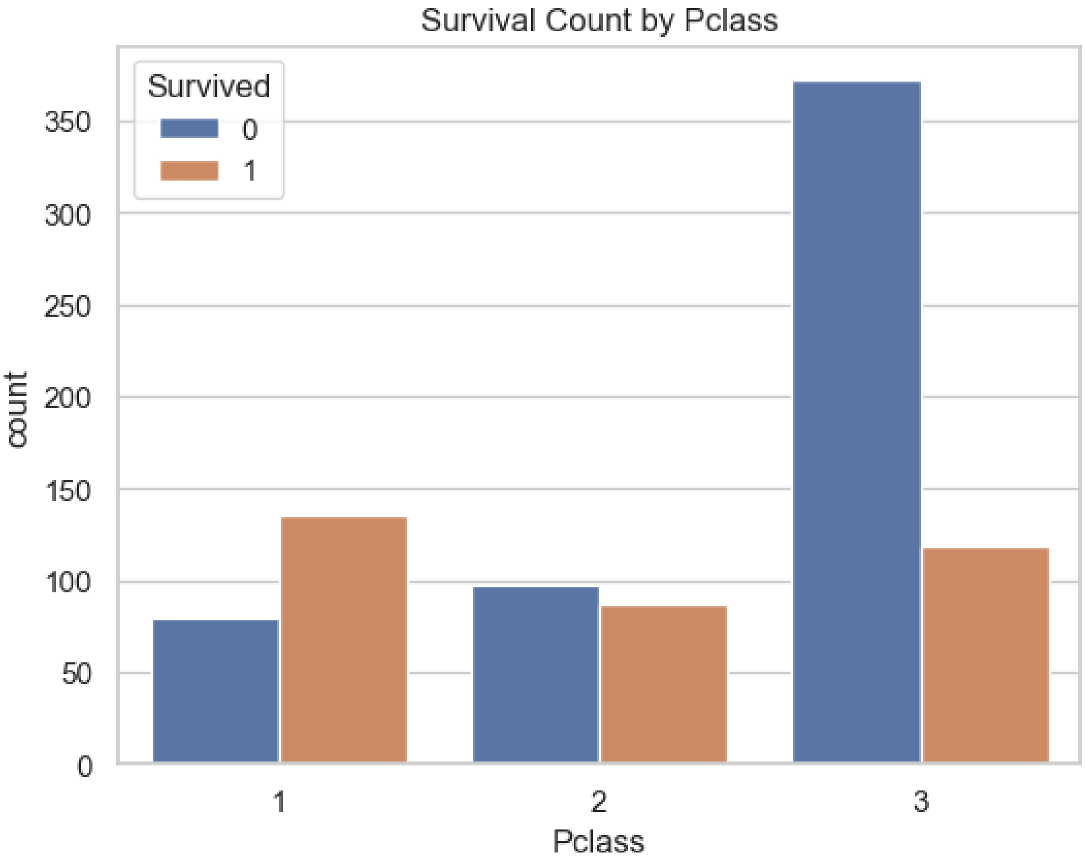

Distribution of Embarked
count
600
500
400
300
200
100
0
S
C
Q
Embarked

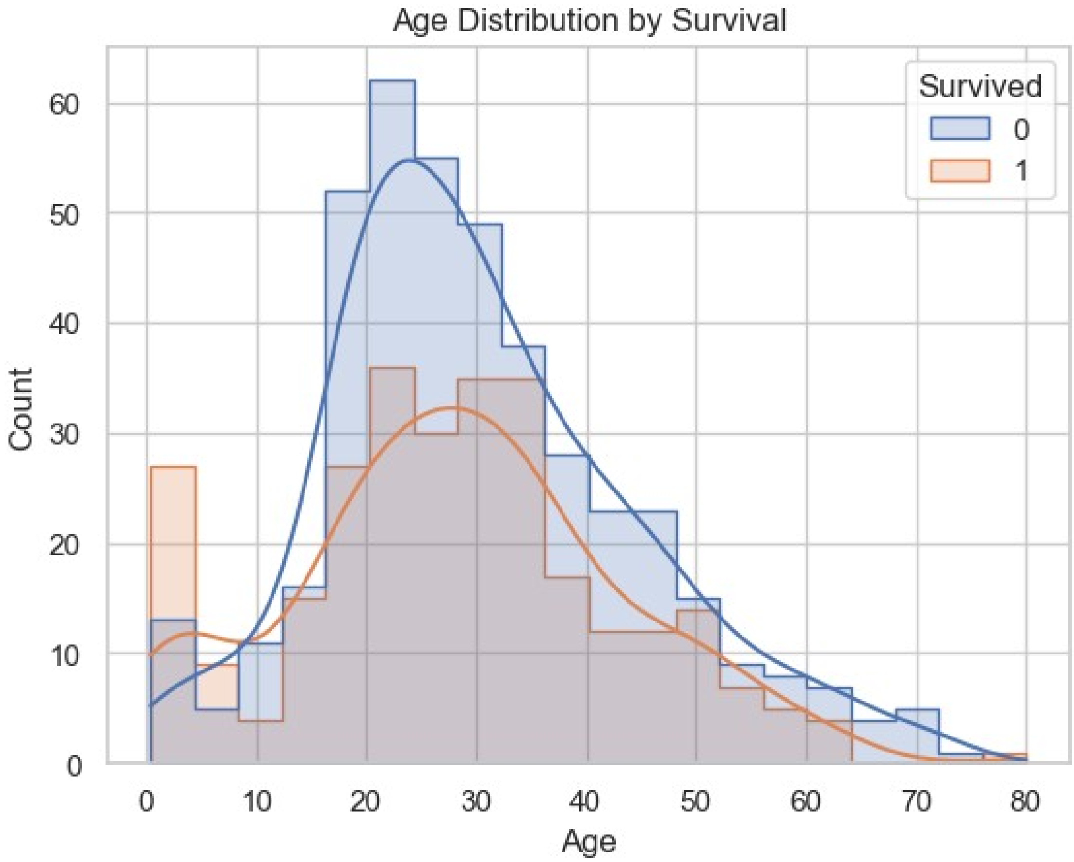

Histogram of Age
Count
100
80
60
40
20
0
0
10
20
30
40
50
60
70
80
Age
Boxplot of Age
0
10
20
30
40
50
60
70
80
Age


Histogram of Fare
Count
0
50
100
150
200
250
300
0
100
200
300
400
500
Fare
Boxplot of Fare
0
100
200
300
400
500
Fare
Histogram of SibSp
Count
0
100
200
300
400
500
600
0
1
2
3
4
5
6
7
8
SibSp
Boxplot of SibSp
0
1
2
3
4
5
6
7
8
SibSp

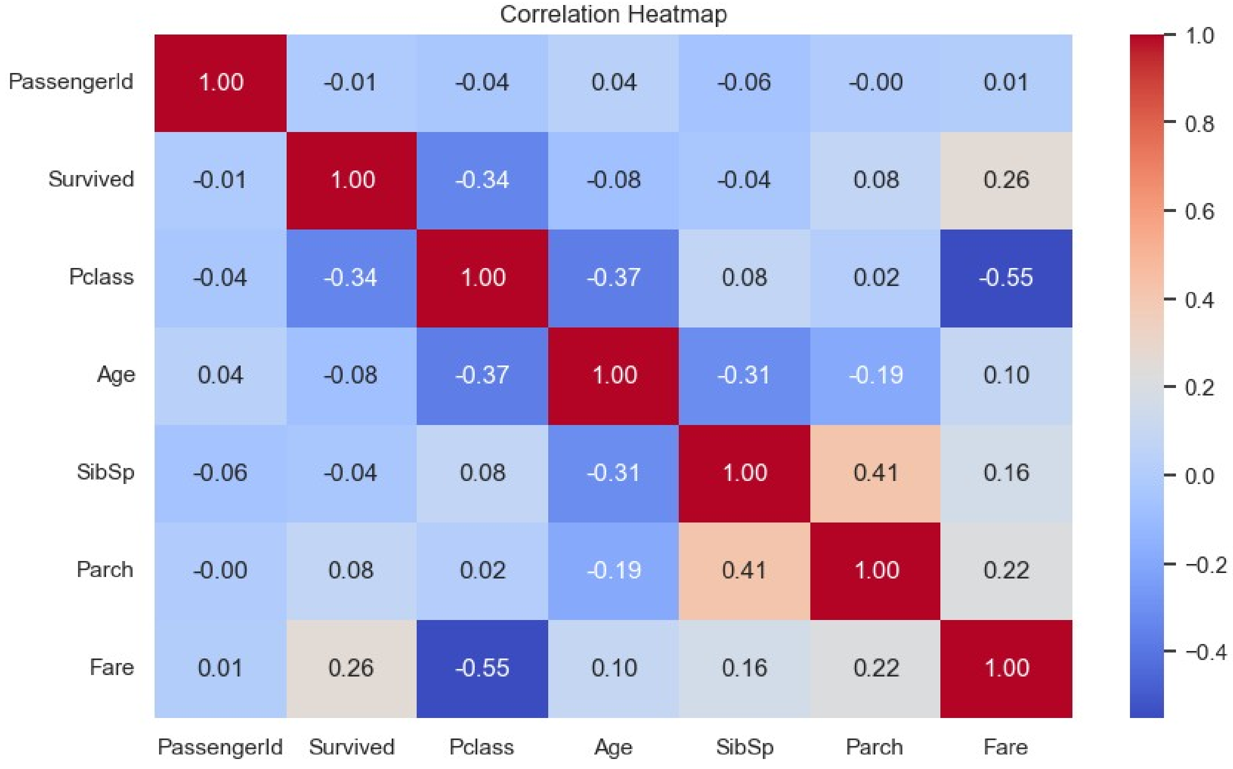

Histogram of Parch
Count
700
600
500
400
300
200
100
0
0
1
2
3
4
5
6
Parch
Boxplot of Parch
0
1
2
3
4
5
6
Parch


Survival Count by Sex
Survived
0
1
count
400
300
200
100
0
male
female
Sex


Survival Count by Pclass
Survived
0
1
count
350
300
250
200
150
100
50
0
1
2
3
Pclass



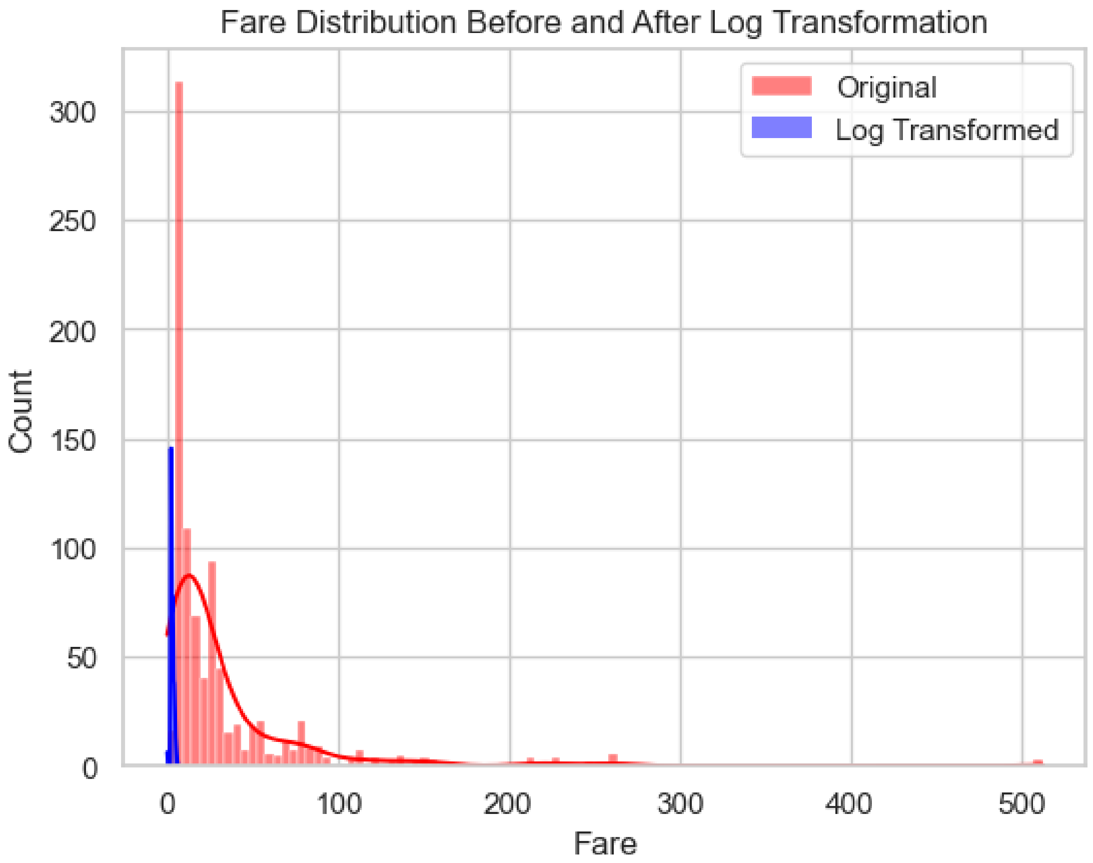
Age Distribution by Survival



Correlation Heatmap

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	1.00	-0.01	-0.04	0.04	-0.06	-0.00	0.01
Survived	-0.01	1.00	-0.34	-0.08	-0.04	0.08	0.26
Pclass	-0.04	-0.34	1.00	-0.37	0.08	0.02	-0.55
Age	0.04	-0.08	-0.37	1.00	-0.31	-0.19	0.10
SibSp	-0.06	-0.04	0.08	-0.31	1.00	0.41	0.16
Parch	-0.00	0.08	0.02	-0.19	0.41	1.00	0.22
Fare	0.01	0.26	-0.55	0.10	0.16	0.22	1.00

```
Skewness of numerical features:
Age: 0.39
Fare: 4.78
```



```
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- Passengers in 1st class had a better chance of survival.
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```