EDA

June 3, 2025

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, classification_report,␣
 ↪confusion_matrix

# For better plots
sns.set(style="whitegrid")
```

[2]:
```
df = pd.read_csv("train.csv")
df.head()
```

[2]:

	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
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

[3]:
```
# Data info
df.info()

# Summary statistics
df.describe()

# Value counts
print(df['Sex'].value_counts())
print(df['Pclass'].value_counts())
print(df['Embarked'].value_counts())
```

```
<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
Sex
male      577
female    314
Name: count, dtype: int64
Pclass
3    491
1    216
2    184
Name: count, dtype: int64
Embarked
S    644
C    168
Q     77
Name: count, dtype: int64
```

[4]:
```
# Fill missing age with median
df['Age'].fillna(df['Age'].median(), inplace=True)
```

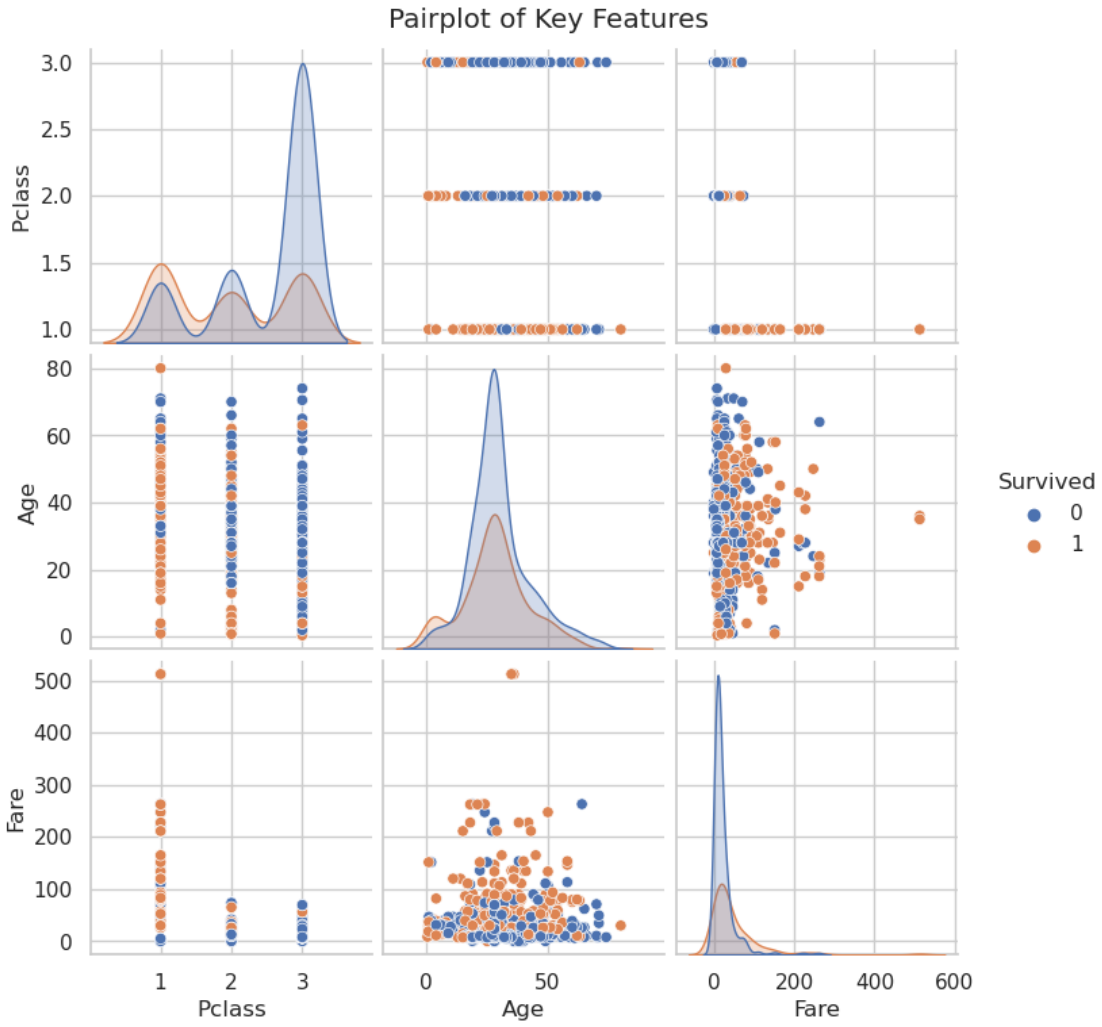
```
# Fill missing embarked with mode
df['Embarked'].fillna(df['Embarked'].mode()[0], inplace=True)

# Drop 'Cabin' due to too many missing values
df.drop(columns=['Cabin'], inplace=True)
```

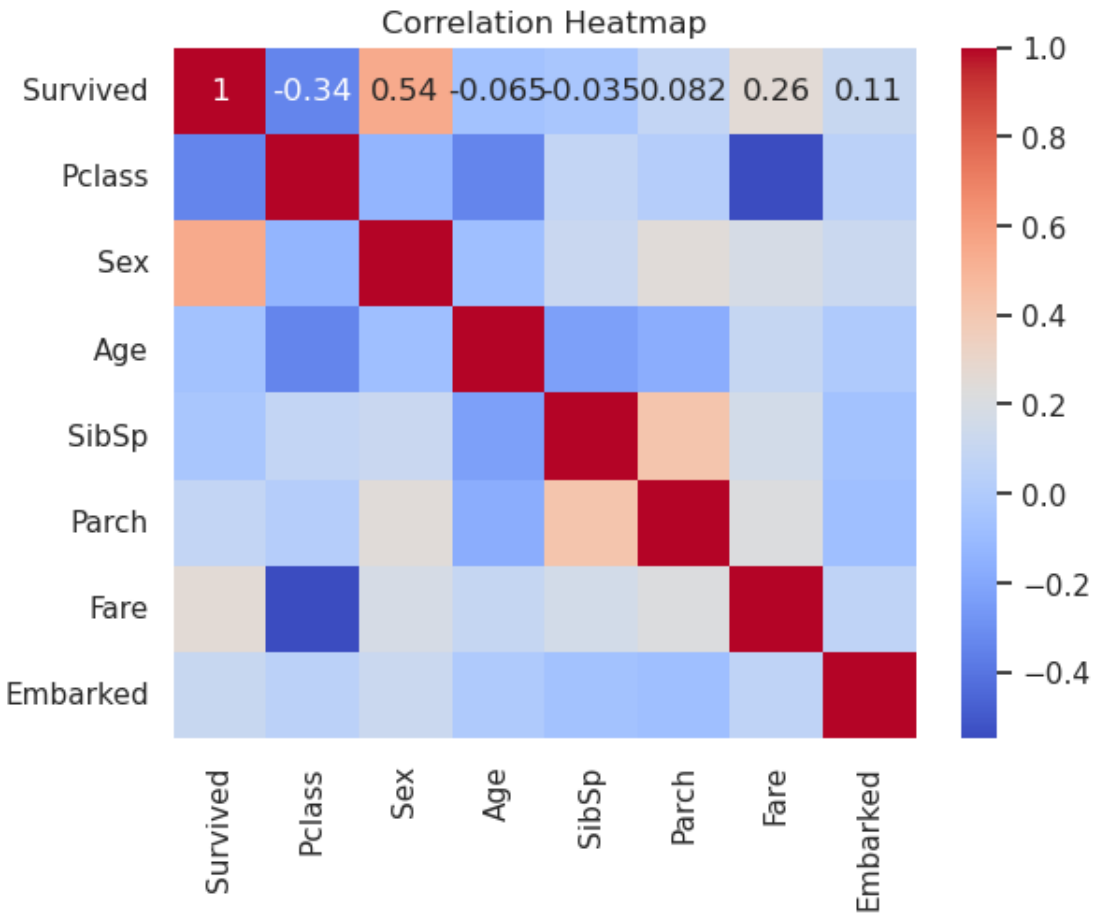
[5]:
```
df.drop(columns=['PassengerId', 'Name', 'Ticket'], inplace=True)
```

[6]:
```
# Encode 'Sex'
df['Sex'] = df['Sex'].map({'male': 0, 'female': 1})

# Encode 'Embarked'
df['Embarked'] = df['Embarked'].map({'S': 0, 'C': 1, 'Q': 2})
```

[7]:
```
# Pairplot
sns.pairplot(df[['Survived', 'Pclass', 'Age', 'Fare']], hue='Survived')
plt.suptitle("Pairplot of Key Features", y=1.02)
plt.show()

# Heatmap
sns.heatmap(df.corr(), annot=True, cmap="coolwarm")
plt.title("Correlation Heatmap")
plt.show()
```

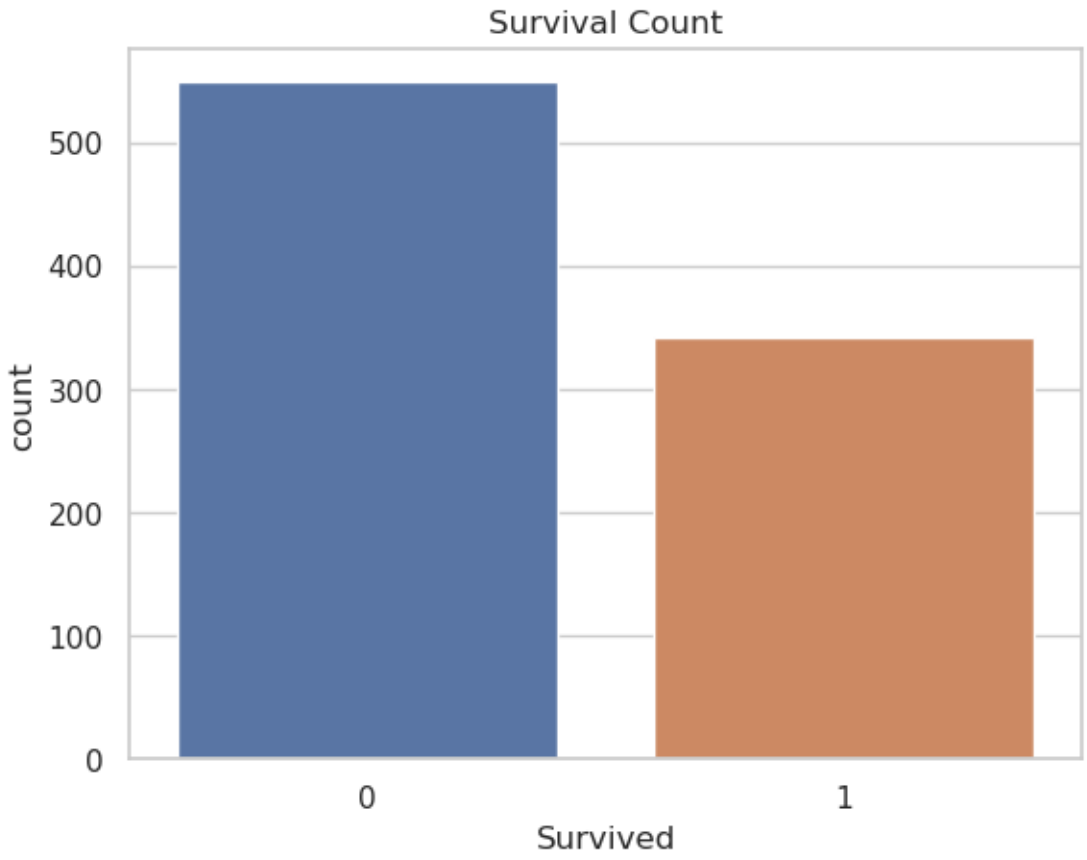
```
/opt/conda/envs/anaconda-2024.02-py310/lib/python3.10/site-
packages/seaborn/_oldcore.py:1119: FutureWarning: use_inf_as_na option is
deprecated and will be removed in a future version. Convert inf values to NaN
before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
/opt/conda/envs/anaconda-2024.02-py310/lib/python3.10/site-
packages/seaborn/_oldcore.py:1119: FutureWarning: use_inf_as_na option is
deprecated and will be removed in a future version. Convert inf values to NaN
before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
/opt/conda/envs/anaconda-2024.02-py310/lib/python3.10/site-
packages/seaborn/_oldcore.py:1119: FutureWarning: use_inf_as_na option is
deprecated and will be removed in a future version. Convert inf values to NaN
before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```

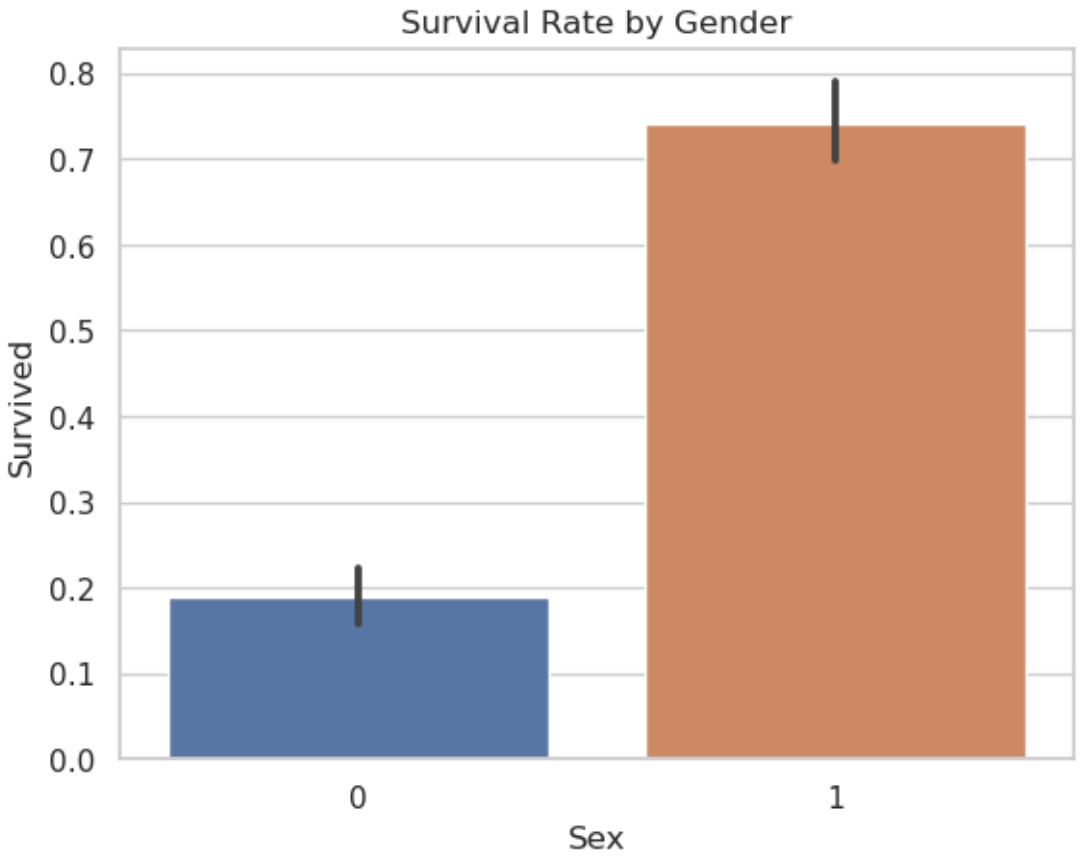

Pairplot of Key Features
Pclass
Age
Fare
Survived
0
1
1
2
3
0
50
0
200
400
600

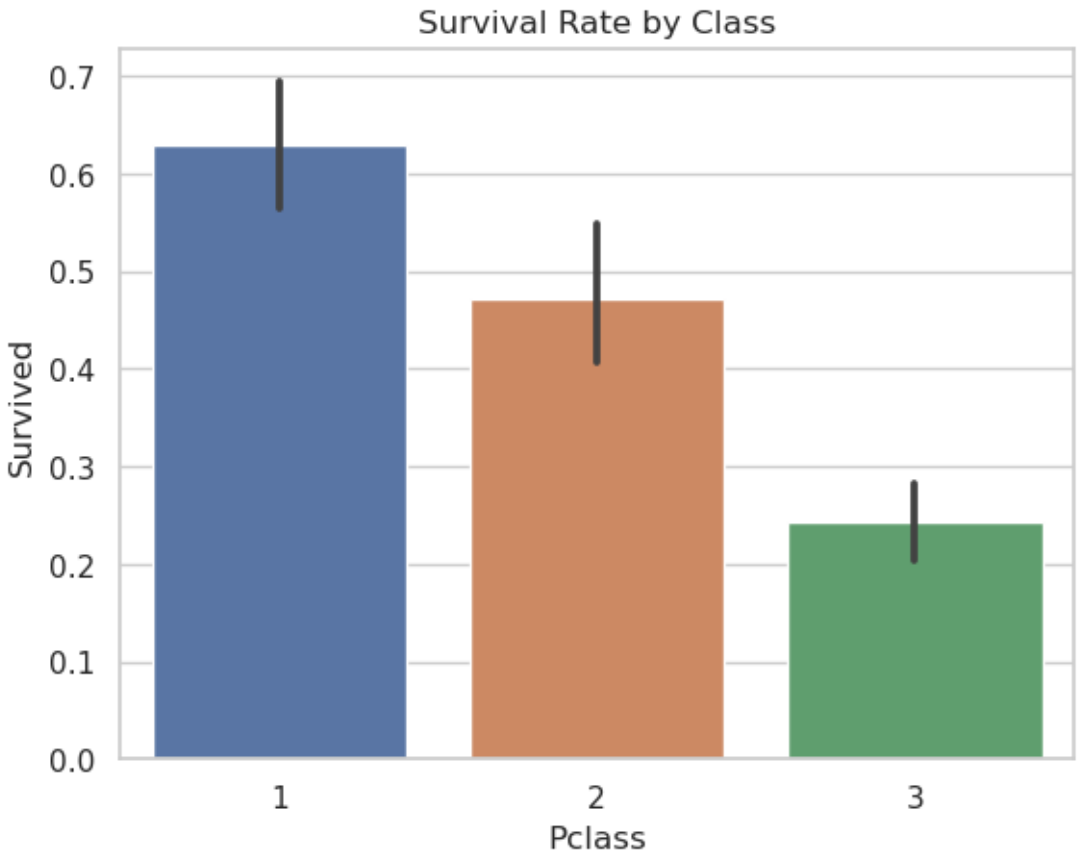


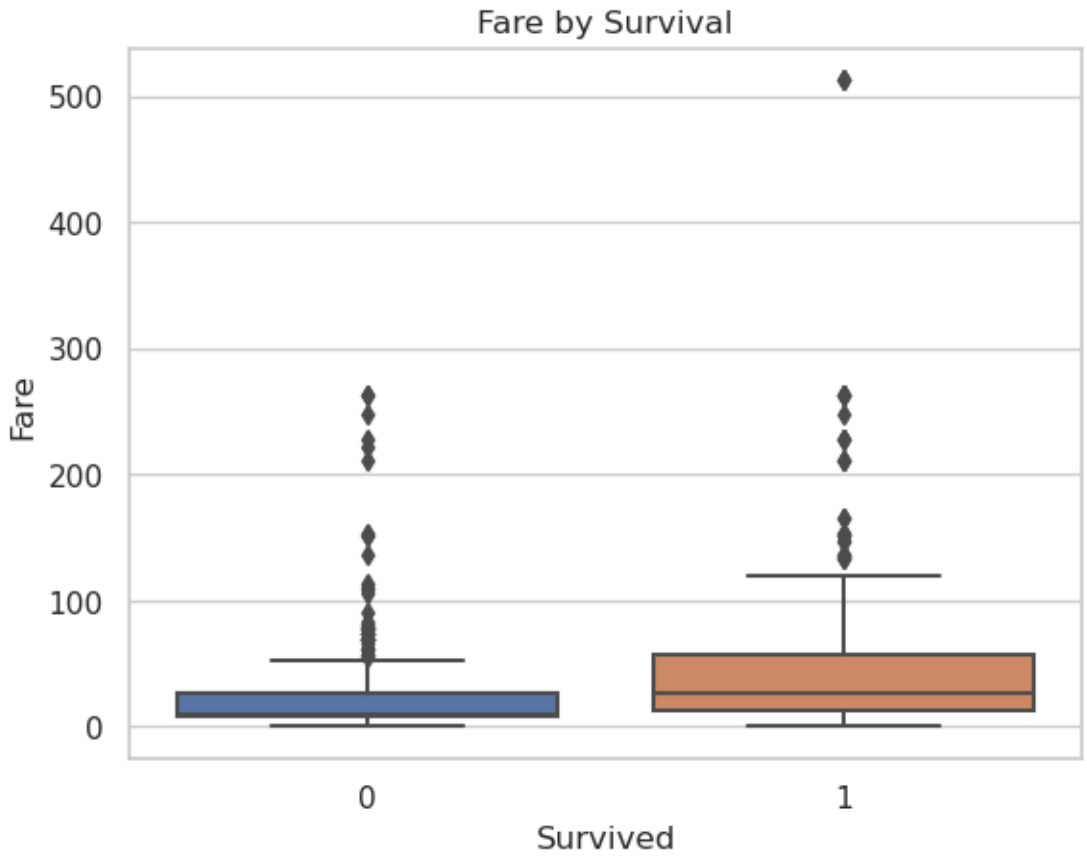
[8]:
```
# Survival count
sns.countplot(x='Survived', data=df)
plt.title("Survival Count")
plt.show()

# Gender vs Survival
sns.barplot(x='Sex', y='Survived', data=df)
plt.title("Survival Rate by Gender")
plt.show()

# Pclass vs Survival
sns.barplot(x='Pclass', y='Survived', data=df)
plt.title("Survival Rate by Class")
plt.show()

# Fare boxplot
sns.boxplot(x='Survived', y='Fare', data=df)
plt.title("Fare by Survival")
```

```
plt.show()

# Age histogram
sns.histplot(data=df, x='Age', hue='Survived', bins=30, kde=True)
plt.title("Age Distribution by Survival")
plt.show()
```

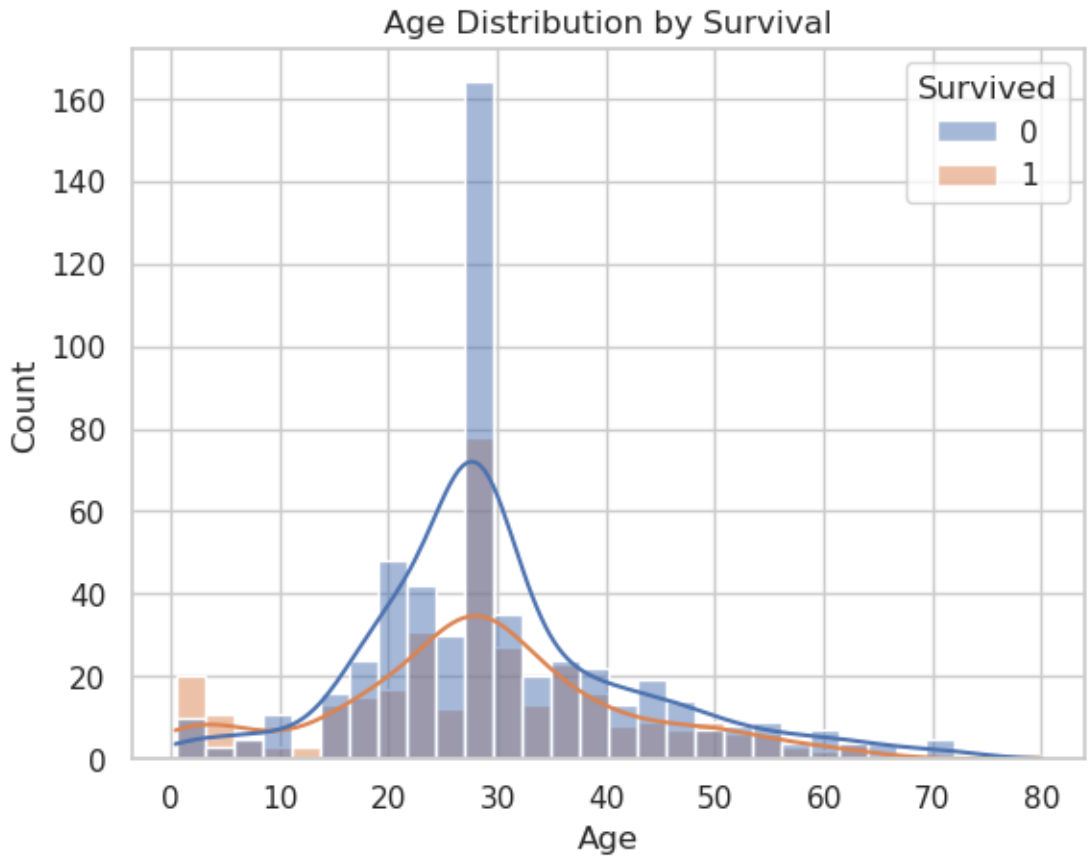



Survival Rate by Gender
Survived
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0
1
Sex


Survival Rate by Class
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Survived
1
2
3
Pclass




```
/opt/conda/envs/anaconda-2024.02-py310/lib/python3.10/site-
packages/seaborn/_oldcore.py:1119: FutureWarning: use_inf_as_na option is
deprecated and will be removed in a future version. Convert inf values to NaN
before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```



[9]:
```
X = df.drop(columns='Survived')
y = df['Survived']
```

[10]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
↪random_state=42)
```

[11]:
```
model = LogisticRegression(max_iter=1000)
model.fit(X_train, y_train)
```

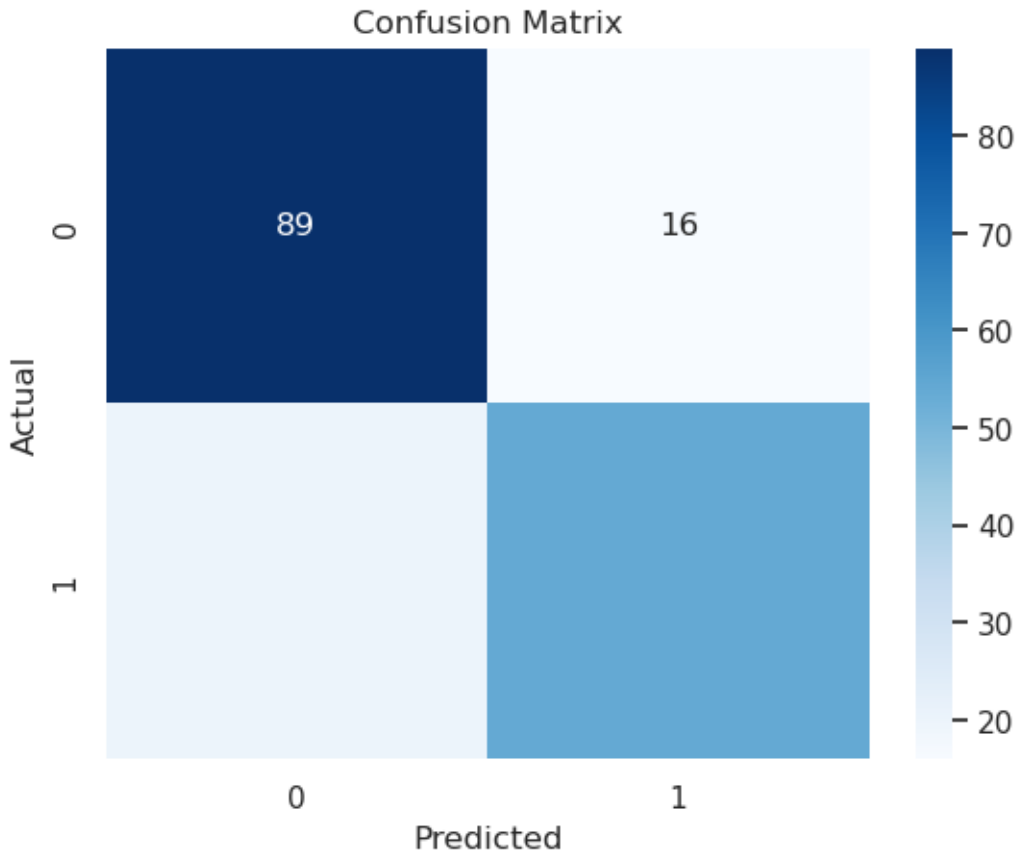
[11]:
```
LogisticRegression(max_iter=1000)
```

[12]:
```
y_pred = model.predict(X_test)

# Accuracy
print("Accuracy:", accuracy_score(y_test, y_pred))

# Classification Report
print("\nClassification Report:\n", classification_report(y_test, y_pred))

# Confusion Matrix
```

```
print("\nConfusion Matrix:\n", confusion_matrix(y_test, y_pred))
```

```
Accuracy: 0.7988826815642458

Classification Report:
              precision    recall  f1-score   support

           0       0.82      0.85      0.83       105
           1       0.77      0.73      0.75        74

    accuracy                           0.80       179
   macro avg       0.79      0.79      0.79       179
weighted avg       0.80      0.80      0.80       179


Confusion Matrix:
 [[89 16]
 [20 54]]
```

[13]:
```
sns.heatmap(confusion_matrix(y_test, y_pred), annot=True, fmt='d', cmap='Blues')
plt.title("Confusion Matrix")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.show()
```


Confusion Matrix
89
16
Actual
0
1
0
1
Predicted
80
70
60
50
40
30
20

[ ]: