```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score
from sklearn.linear_model import LogisticRegression
```

```
# Upload files
from google.colab import files
uploaded = files.upload()
```

Choose Files 3 files

- **gender_submission.csv**(text/csv) - 3258 bytes, last modified: 4/28/2025 - 100% done
- **test.csv**(text/csv) - 28629 bytes, last modified: 4/28/2025 - 100% done
- **train.csv**(text/csv) - 61194 bytes, last modified: 4/28/2025 - 100% done

```
Saving gender_submission.csv to gender_submission.csv
Saving test.csv to test.csv
Saving train.csv to train (1).csv
```

```
train_df = pd.read_csv('train.csv')
test_df = pd.read_csv('test.csv')
```

```
train_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 train_df | View recommended plots | New interactive sheet

```
train_df.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
```

```
train_df.describe()
```

	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

```
print(train_df['Survived'].value_counts())
print(train_df['Pclass'].value_counts())
print(train_df['Sex'].value_counts())
```

```
Survived
0    549
1    342
Name: count, dtype: int64
Pclass
3    491
1    216
2    184
Name: count, dtype: int64
Sex
male      577
female    314
Name: count, dtype: int64
```

```
train_df.isnull().sum()
```

	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

- Age has missing values
- Cabin has missing values
- Embarked has missing values

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

train_df['Embarked'].fillna(train_df['Embarked'].mode()[0], inplace=True)
test_df['Embarked'].fillna(test_df['Embarked'].mode()[0], inplace=True)

test_df['Fare'].fillna(test_df['Fare'].median(), inplace=True)


train_df.drop('Cabin', axis=1, inplace=True)
test_df.drop('Cabin', axis=1, inplace=True)
```

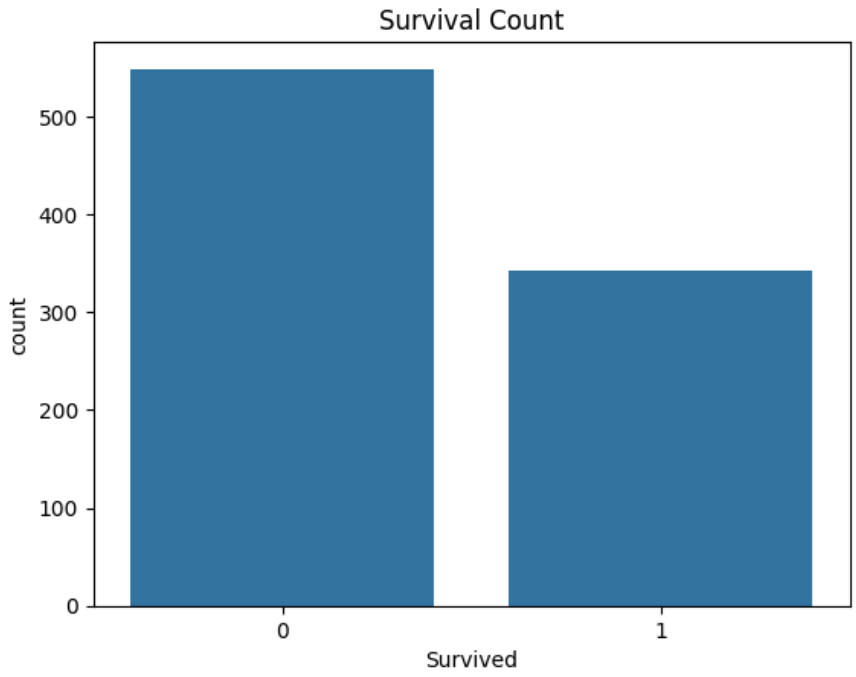
```
<ipython-input-49-ef86464af033>:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series t
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on whi

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' o


  train_df['Age'].fillna(train_df['Age'].median(), inplace=True)
<ipython-input-49-ef86464af033>:2: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series t
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on whi

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' o


  test_df['Age'].fillna(test_df['Age'].median(), inplace=True)
<ipython-input-49-ef86464af033>:4: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series t
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on whi

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' o


  train_df['Embarked'].fillna(train_df['Embarked'].mode()[0], inplace=True)
<ipython-input-49-ef86464af033>:5: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series t
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on whi

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' o


  test_df['Embarked'].fillna(test_df['Embarked'].mode()[0], inplace=True)
<ipython-input-49-ef86464af033>:7: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series t
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on whi

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' o


  test_df['Fare'].fillna(test_df['Fare'].median(), inplace=True)
```

```
label = LabelEncoder()
train_df['Sex'] = label.fit_transform(train_df['Sex'])
test_df['Sex'] = label.transform(test_df['Sex'])

train_df['Embarked'] = label.fit_transform(train_df['Embarked'])
test_df['Embarked'] = label.transform(test_df['Embarked'])



train_df.isnull().sum()
```

	0
PassengerId	0
Survived	0
Pclass	0
Name	0
Sex	0
Age	0
SibSp	0
Parch	0
Ticket	0
Fare	0
Embarked	0

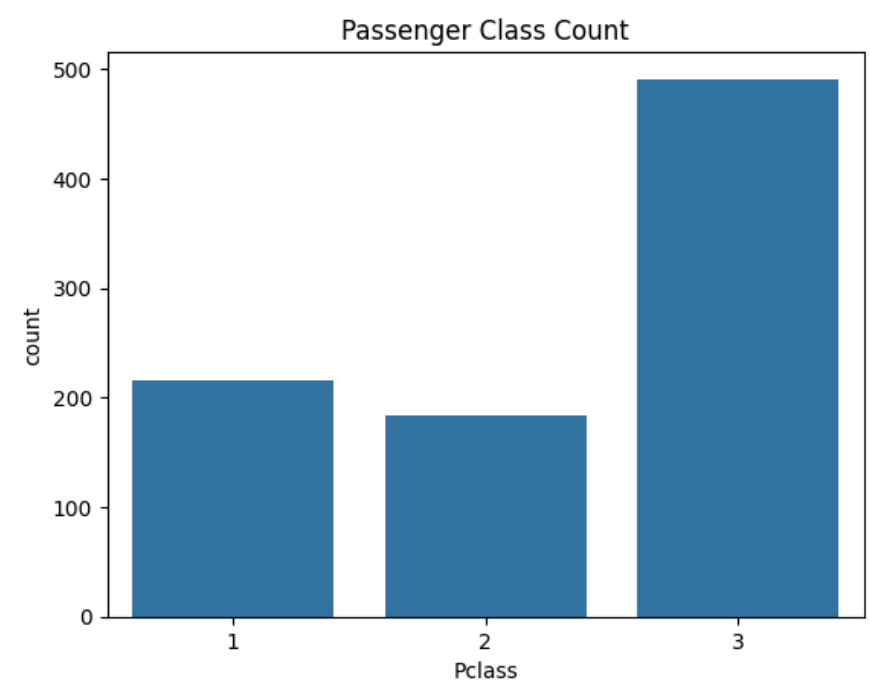
dtype: int64

```
sns.countplot(x='Survived', data=train_df)
plt.title('Survival Count')
plt.show()
```



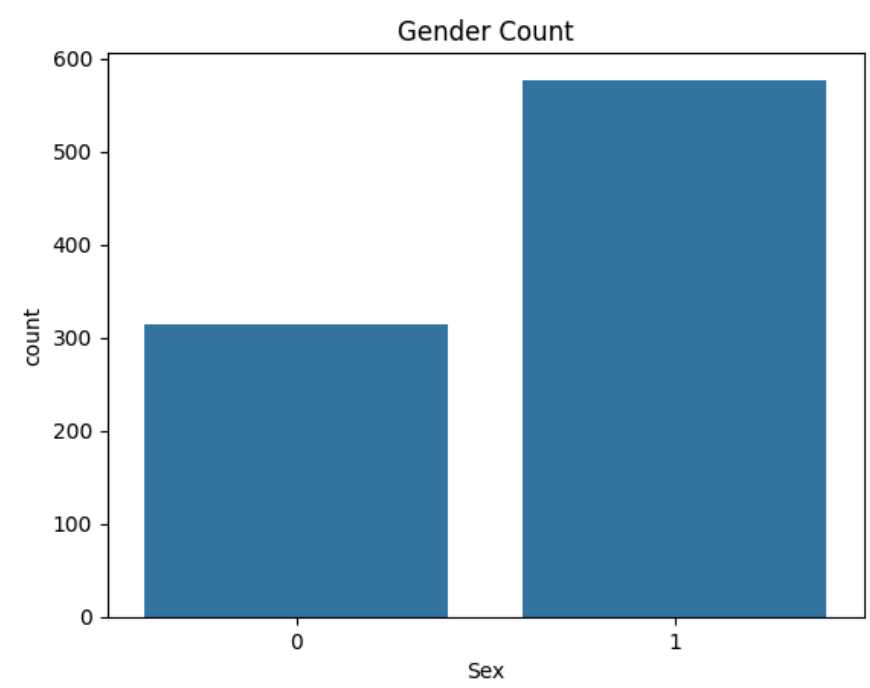
Observation:More People died

```
sns.countplot(x='Pclass', data=train_df)
plt.title('Passenger Class Count')
plt.show()
```



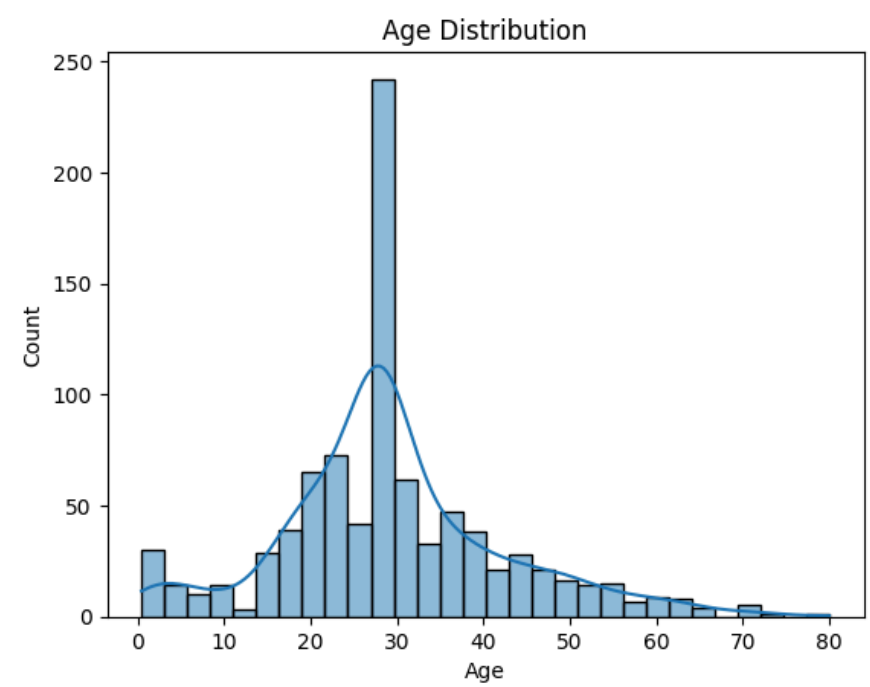
More passengers in class 3

```
sns.countplot(x='Sex', data=train_df)
plt.title('Gender Count')
plt.show()
```



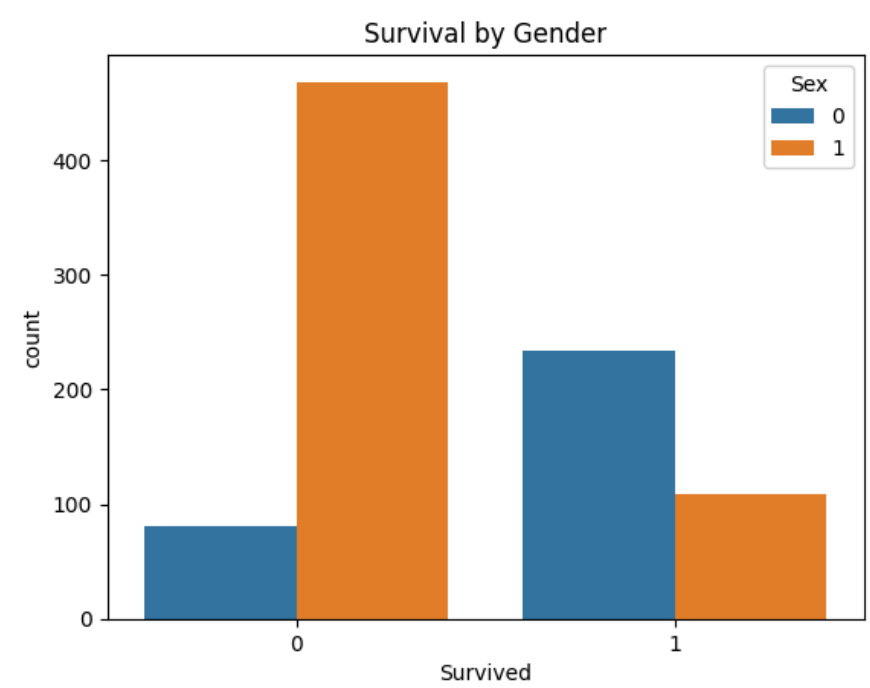
More Male Passengers

```
sns.histplot(train_df['Age'], bins=30, kde=True)
plt.title('Age Distribution')
plt.show()
```



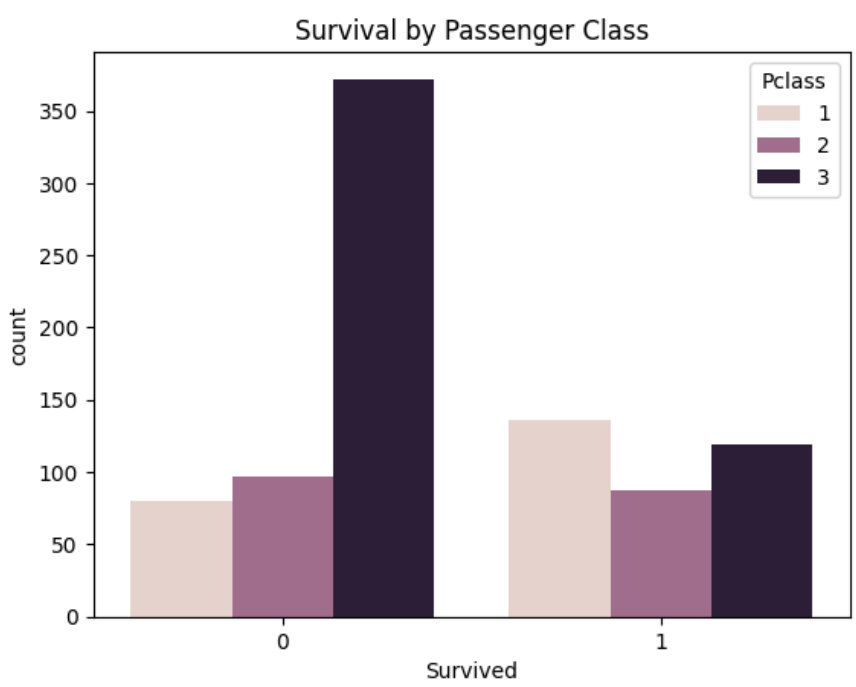
Most Passengers were young and adults

```
sns.countplot(x='Survived', hue='Sex', data=train_df)
plt.title('Survival by Gender')
plt.show()
```



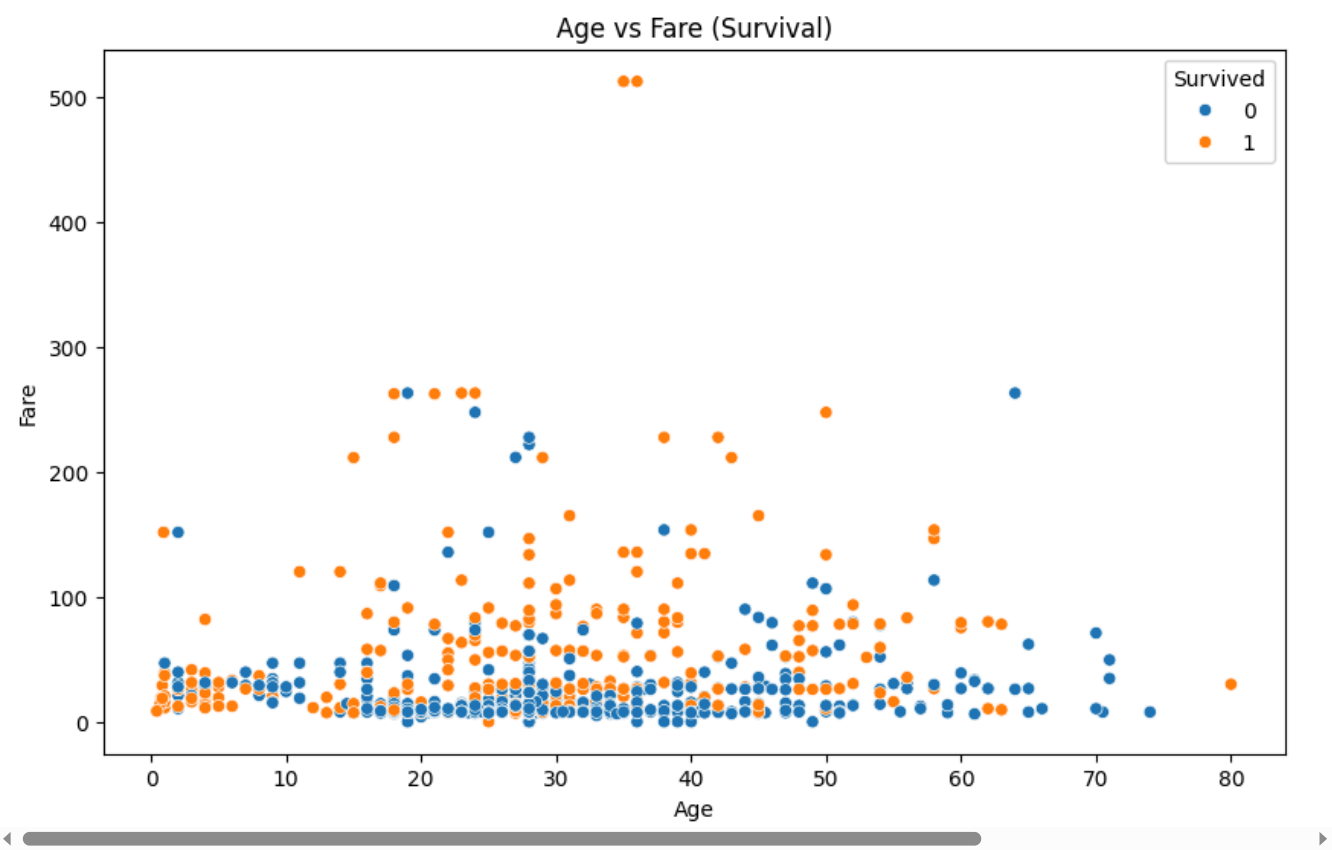
Females survived more than males

```
sns.countplot(x='Survived', hue='Pclass', data=train_df)
plt.title('Survival by Passenger Class')
plt.show()
```



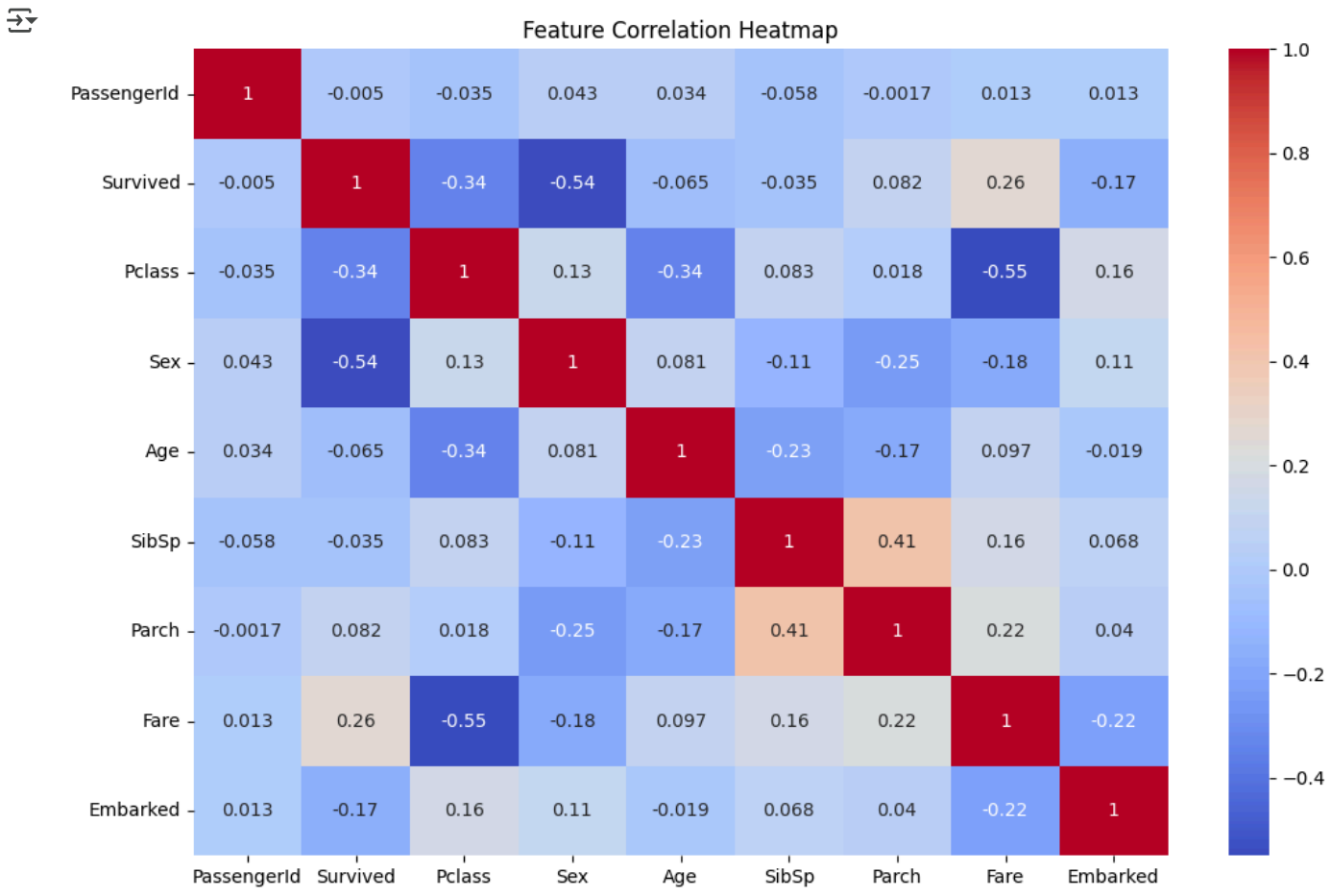
1st class passengers survived more

```
plt.figure(figsize=(10,6))
sns.scatterplot(x='Age', y='Fare', hue='Survived', data=train_df)
plt.title('Age vs Fare (Survival)')
plt.show()
```



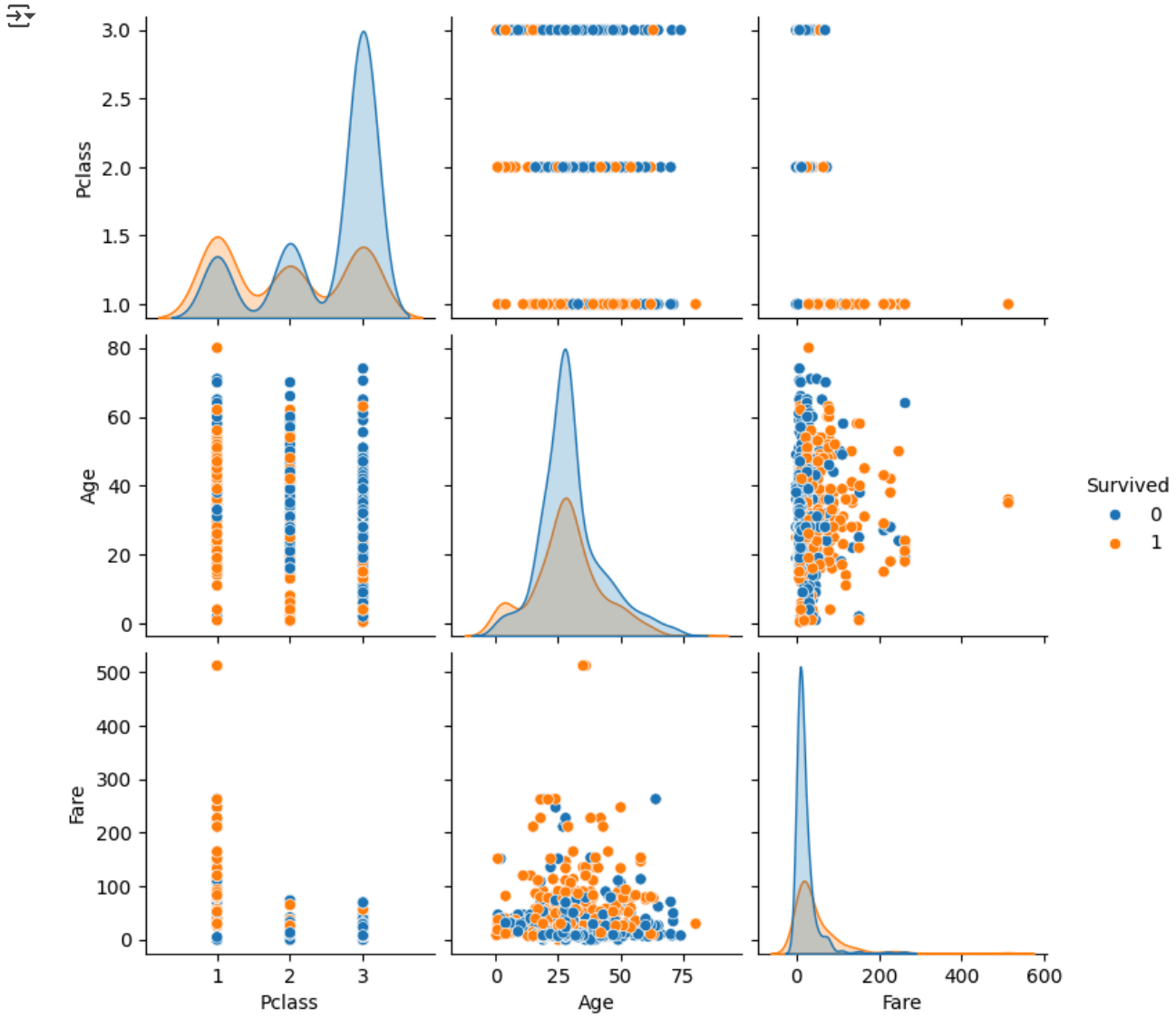

```
numeric_df=train_df.select_dtypes(include=['number'])

numeric_df=numeric_df.dropna()

corr_matrix=numeric_df.corr()

plt.figure(figsize=(12,8))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm')
```

```
plt.title('Feature Correlation Heatmap')
plt.show()
```



- Fare and Pclass have some correlation survived
- Age has very weak correlation

```
sns.pairplot(train_df[['Survived', 'Pclass', 'Age', 'Fare']], hue='Survived')
plt.show()
```



Clear Pattern by Pclass and Fare

```
summary = """
1. Women had much higher survival rates than men.
2. 1st class passengers survived more than 2nd and 3rd class.
3. Younger passengers had slightly better survival chances.
4. Higher fares were associated with survival (richer passengers survived more).
5. Missing data were mainly in 'Age', 'Embarked', and 'Cabin'.
6. 'Cabin' was dropped because too many missing values.
"""
print(summary)
```

```
1. Women had much higher survival rates than men.
2. 1st class passengers survived more than 2nd and 3rd class.
3. Younger passengers had slightly better survival chances.
4. Higher fares were associated with survival (richer passengers survived more).
5. Missing data were mainly in 'Age', 'Embarked', and 'Cabin'.
6. 'Cabin' was dropped because too many missing values.
```

DATA MODELLING

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

for df in [train_df, test_df]:
```

```
    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')
```

```
for df in [train_df, test_df]:
    df['FamilySize'] = df['SibSp'] + df['Parch'] + 1
```

```
label = LabelEncoder()

train_df['Sex'] = label.fit_transform(train_df['Sex'])
test_df['Sex'] = label.transform(test_df['Sex'])

train_df['Embarked'] = label.fit_transform(train_df['Embarked'])
test_df['Embarked'] = label.transform(test_df['Embarked'])

train_df['Title'] = label.fit_transform(train_df['Title'])
test_df['Title'] = label.transform(test_df['Title'])
```

```
train_df.drop(['Name', 'Ticket', 'PassengerId'], axis=1, inplace=True)
test_passenger_id = test_df['PassengerId']  # Save for submission
test_df.drop(['Name', 'Ticket', 'PassengerId'], axis=1, inplace=True)
```

```
X = train_df.drop('Survived', axis=1)
y = train_df['Survived']

X_test_final = test_df
```

```
X_train, X_val, y_train, y_val = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
model = RandomForestClassifier(n_estimators=100, random_state=42)
model.fit(X_train, y_train)
```

```
RandomForestClassifier
RandomForestClassifier(random_state=42)
```

```
y_pred_val = model.predict(X_val)
accuracy = accuracy_score(y_val, y_pred_val)
print(f'Validation Accuracy: {accuracy:.2f}')
```

```
Validation Accuracy: 0.83
```

```
test_predictions = model.predict(X_test_final)
```

```
submission = pd.DataFrame({
```

```
        "PassengerId": test_passenger_id,
        "Survived": test_predictions
    })

    submission.to_csv("submission_improved.csv", index=False)
    print("Improved submission file created successfully!")
```

```
Improved submission file created successfully!
```

```
    importances = model.feature_importances_


    feature_importance_df = pd.DataFrame({
        'Feature': X.columns,
        'Importance': importances
    }).sort_values(by='Importance', ascending=False)
```