1 - DEFINE THE PROBLEM

In [1]:
```
# The goal of this project is to predict whether a passenger survived the Titanic disaster.
# We will use demographic and ticket information from the passengers to build a classification model.
```

2 - IMPORT REQUIRED LIBRARIES

2.1 - Base Libraries

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

2.2 - ML/DL Libraries

In [3]:
```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, OneHotEncoder
from sklearn.compose import ColumnTransformer
from sklearn.pipeline import Pipeline
from sklearn.impute import SimpleImputer
from sklearn.metrics import classification_report, confusion_matrix
```

3 - LOAD THE DATA

In [4]:
```
data = pd.read_csv('../datasets/train.csv')
data.head()
```

Out[4]:

	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

4 - EDA (Exploratory Data Analysis)

In [5]:
```
# Basic structure
data.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
```

In [6]:
```
# Summary statistics
data.describe()
```

Out[6]:

	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	29.699113	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526507	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.416700	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

In [7]:
```
# Missing values
data.isnull().sum()
```

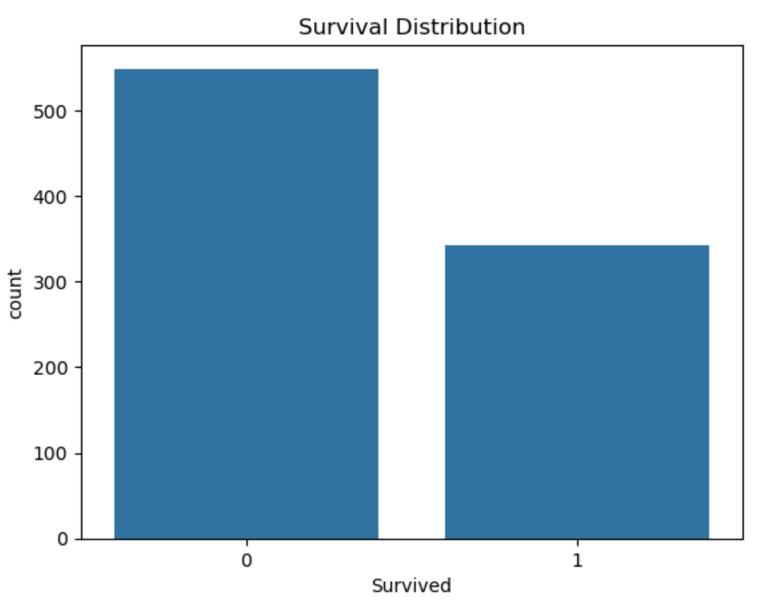
Out[7]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

In [8]:
```
# Categorical summary
data.select_dtypes(include='object').nunique()
```

Out[8]:
```
Name        891
Sex           2
Ticket      681
Cabin       147
Embarked      3
dtype: int64
```

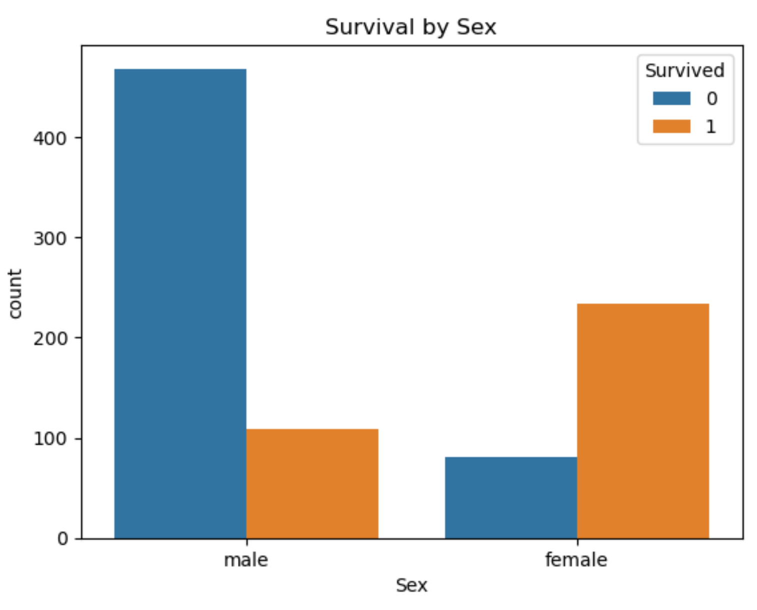
5 - VISUALIZE THE DATA

In [9]:
```
# Distribution of target variable
sns.countplot(x='Survived', data=data)
plt.title('Survival Distribution')
plt.show()
```

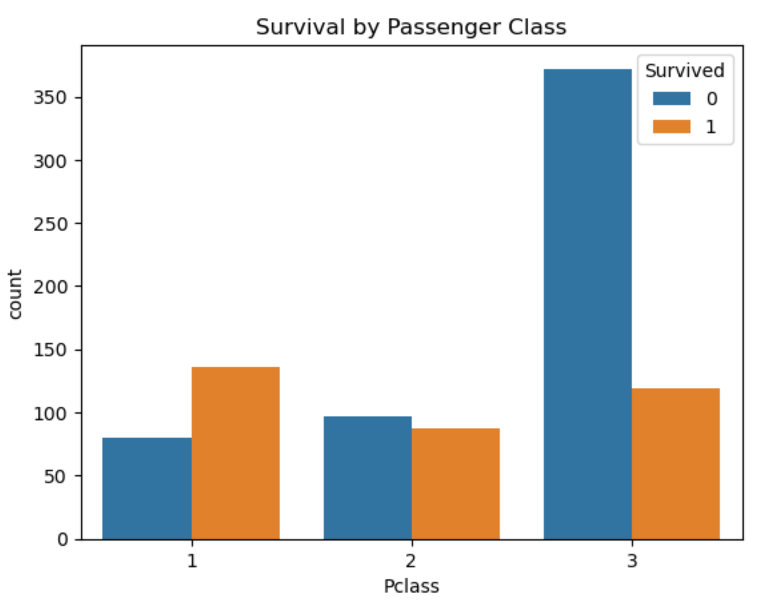


In [10]:
```
# Distribution by Sex and Pclass
```

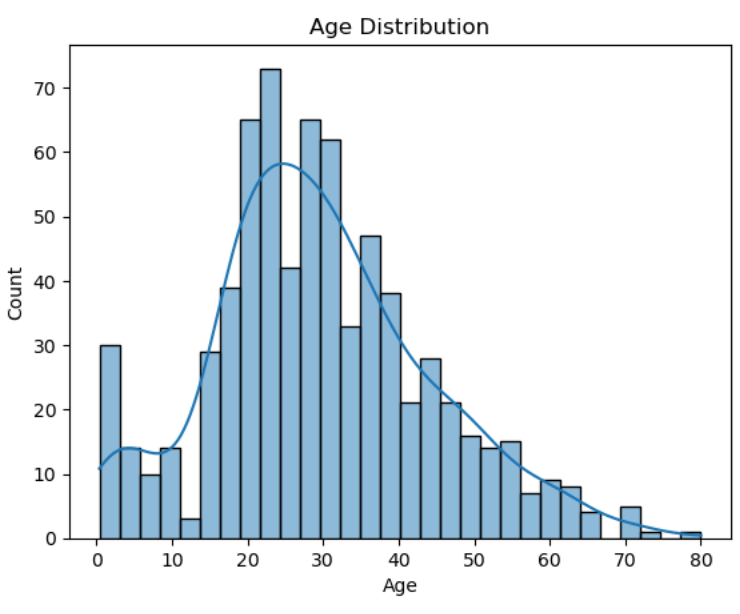
In [11]:
```
sns.countplot(x='Sex', hue='Survived', data=data)
plt.title('Survival by Sex')
plt.show()
```



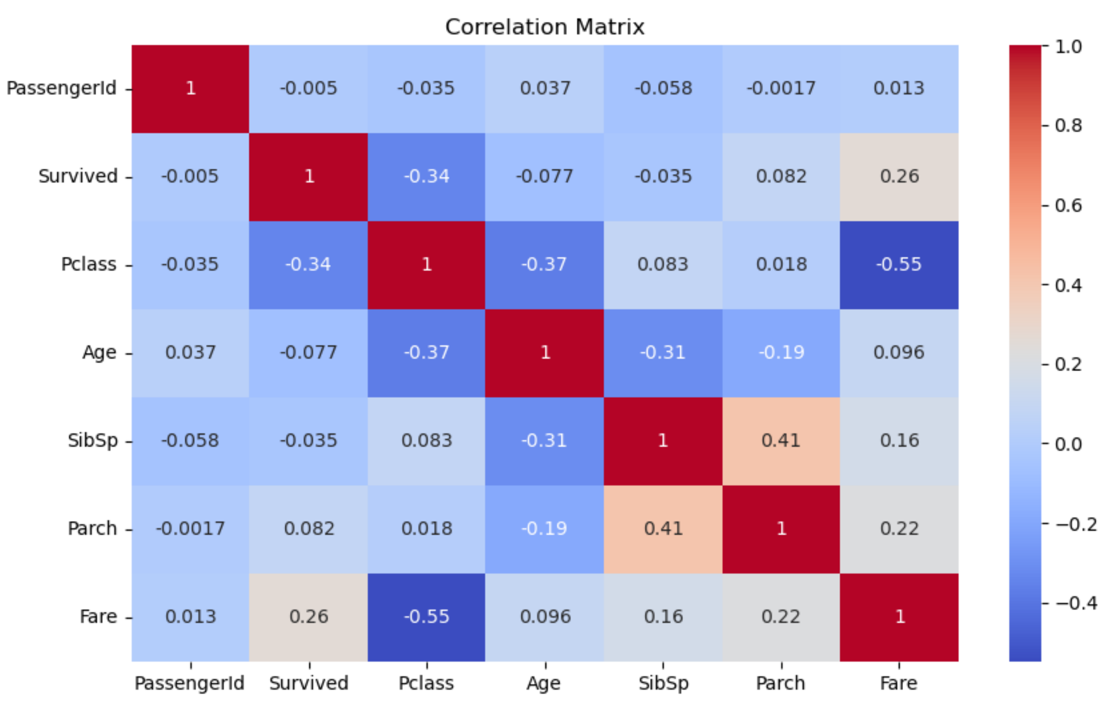
In [12]:
```
sns.countplot(x='Pclass', hue='Survived', data=data)
plt.title('Survival by Passenger Class')
plt.show()
```



In [13]:
```
# Age distribution
sns.histplot(data=data, x='Age', bins=30, kde=True)
plt.title('Age Distribution')
plt.show()
```



In [14]:
```
# Heatmap of correlations
plt.figure(figsize=(10, 6))
sns.heatmap(data.corr(numeric_only=True), annot=True, cmap='coolwarm')
plt.title('Correlation Matrix')
plt.show()
```



6 - PREPROCESS THE DATA

In [15]:
```
# Define features and target
# Drop non-informative or redundant columns
X = data.drop(['Survived', 'PassengerId', 'Name', 'Ticket', 'Cabin'], axis=1)
y = data['Survived']
```

In [16]:
```
# Define column groups
numeric_features = ['Age', 'Fare']
categorical_features = ['Sex', 'Embarked', 'Pclass']
```

In [17]:
```
# Define individual transformers
numeric_transformer = Pipeline(steps=[
    ('imputer', SimpleImputer(strategy='median')),
    ('scaler', StandardScaler())
])
categorical_transformer = Pipeline(steps=[
    ('imputer', SimpleImputer(strategy='most_frequent')),
    ('onehot', OneHotEncoder(handle_unknown='ignore'))  # no 'sparse' ni 'sparse_output'
])
```

In [18]:
```
# Combine into a ColumnTransformer
preprocessor = ColumnTransformer(transformers=[
    ('num', numeric_transformer, numeric_features),
    ('cat', categorical_transformer, categorical_features)
])
```

In [19]:
```
# Fit and transform (optional preview)
X_prepared = preprocessor.fit_transform(X)
print(f'✅ Preprocessing complete. Output shape: {X_prepared.shape}')
```

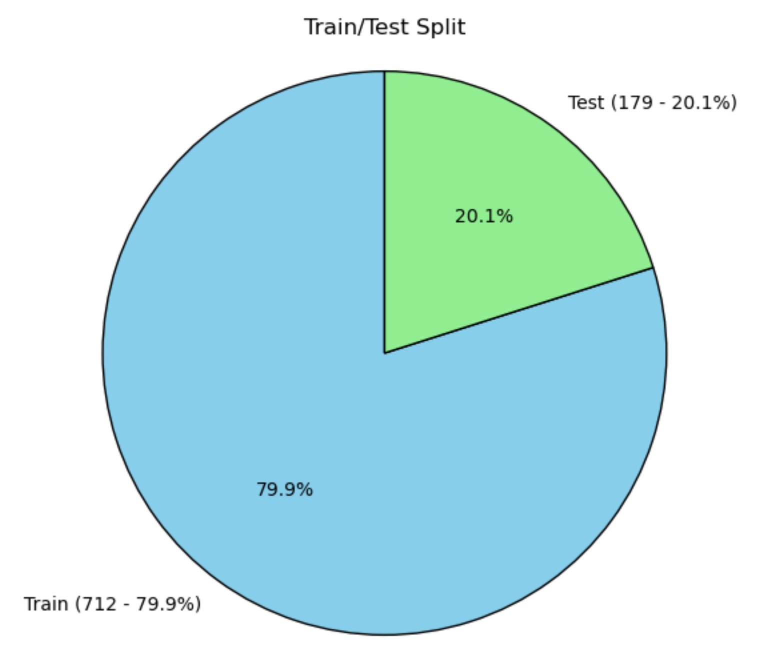
```
✅ Preprocessing complete. Output shape: (891, 10)
```

7 - SPLIT THE DATA

In [20]:
```
# Train/Test Split
X_train, X_test, y_train, y_test = train_test_split(
    X_prepared, y, test_size=0.2, random_state=42
)

print(f'Train shape: {X_train.shape} | Test shape: {X_test.shape}')
```

```
Train shape: (712, 10) | Test shape: (179, 10)
```

In [21]:
```
# Visual Pie Chart of the Split
total = len(data)
train_rows, test_rows = len(X_train), len(X_test)

labels = [
    f'Train ({train_rows} - {100*train_rows/total:.1f}%)',
    f'Test ({test_rows} - {100*test_rows/total:.1f}%)'
]

plt.figure(figsize=(6, 6))
plt.pie(
    [train_rows, test_rows],
    labels=labels,
    autopct='%1.1f%%',
    startangle=90,
    colors=['skyblue', 'lightgreen'],
    wedgeprops={'edgecolor': 'black'}
)
plt.title('Train/Test Split')
plt.axis('equal')
plt.show()
```



In [ ]: