```
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.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
```

```
train = pd.read_csv("train.csv")
test = pd.read_csv("test.csv")
train.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 |

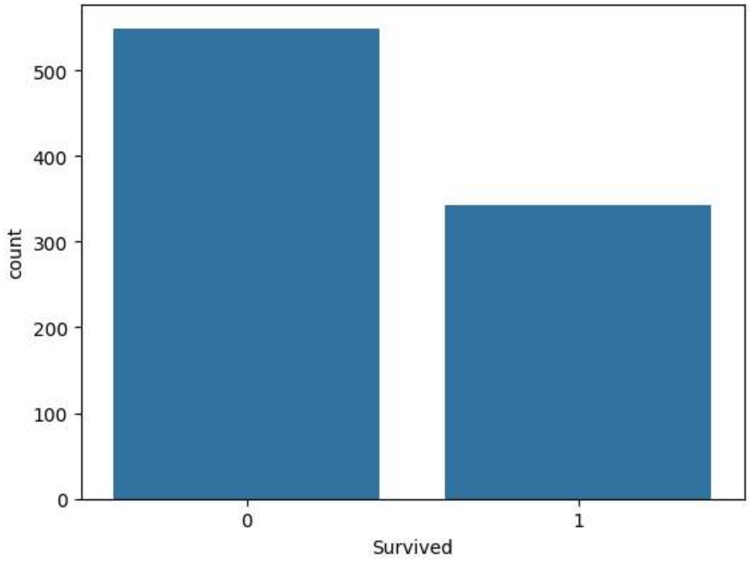
```
train.info()
```

```
<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
```

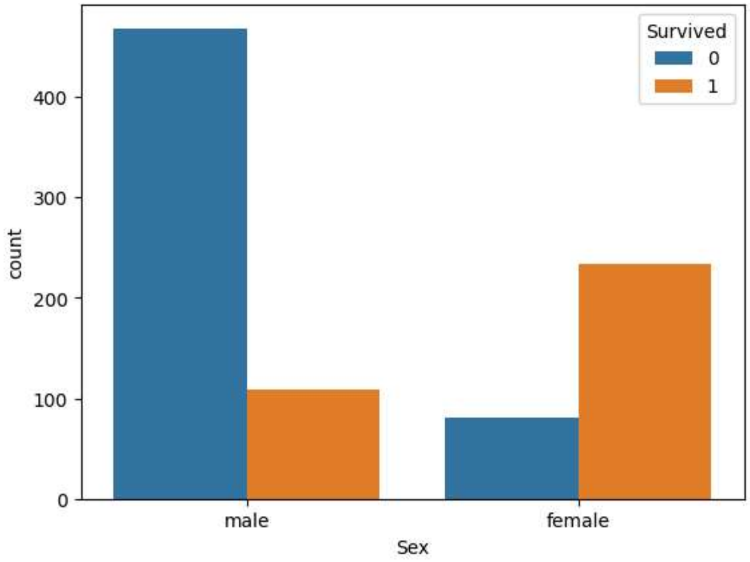
```
train.describe()
```

| | 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 |

```
sns.countplot(x='Survived', data=train)
plt.show()
```



```
sns.countplot(x='Sex', hue='Survived', data=train)
plt.show()
```



```
train['Age'].fillna(train['Age'].median(), inplace=True)
test['Age'].fillna(test['Age'].median(), inplace=True)
```

```
/tmp/ipython-input-3278935906.py:1: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chaine
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are sett

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


  train['Age'].fillna(train['Age'].median(), inplace=True)
/tmp/ipython-input-3278935906.py:2: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chaine
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are sett

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


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

```
train['Embarked'].fillna(train['Embarked'].mode()[0], inplace=True)
test['Fare'].fillna(test['Fare'].median(), inplace=True)
```

```
/tmp/ipython-input-120955544.py:2: FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are sett
```

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


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

```
train['FamilySize'] = train['SibSp'] + train['Parch'] + 1
test['FamilySize'] = test['SibSp'] + test['Parch'] + 1
```

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

```
<>:1: SyntaxWarning: invalid escape sequence '\.'
<>:2: SyntaxWarning: invalid escape sequence '\.'
<>:1: SyntaxWarning: invalid escape sequence '\.'
<>:2: SyntaxWarning: invalid escape sequence '\.'
/tmp/ipython-input-728421299.py:1: SyntaxWarning: invalid escape sequence '\.'
  train['Title'] = train['Name'].str.extract(' ([A-Za-z]+)\.', expand=False)
/tmp/ipython-input-728421299.py:2: SyntaxWarning: invalid escape sequence '\.'
  test['Title'] = test['Name'].str.extract(' ([A-Za-z]+)\.', expand=False)
```

```
common_titles = ['Mr', 'Miss', 'Mrs', 'Master']
train['Title'] = train['Title'].apply(lambda x: x if x in common_titles else 'Other')
test['Title'] = test['Title'].apply(lambda x: x if x in common_titles else 'Other')
```

```
train['Sex'] = train['Sex'].map({'male':0, 'female':1})
test['Sex'] = test['Sex'].map({'male':0, 'female':1})
```

```
train = pd.get_dummies(train, columns=['Embarked','Title'], drop_first=True)
test = pd.get_dummies(test, columns=['Embarked','Title'], drop_first=True)
```

```
X = train.drop(['Survived','PassengerId','Name','Ticket','Cabin'], axis=1)
y = train['Survived']
X_test = test.drop(['PassengerId','Name','Ticket','Cabin'], axis=1)
```

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

```
lr = LogisticRegression(max_iter=1000)
lr.fit(X_train, y_train)
lr_preds = lr.predict(X_val)
```

```
from sklearn.metrics import accuracy_score
accuracy_score(y_val, lr_preds)
```

```
0.7932960893854749
```

```
rf = RandomForestClassifier(
    n_estimators=200,
    max_depth=7,
    random_state=42
)

rf.fit(X_train, y_train)

rf_preds = rf.predict(X_val)
print("Random Forest Accuracy:", accuracy_score(y_val, rf_preds))
```

```
Random Forest Accuracy: 0.8268156424581006
```

```
rf.fit(X, y)
test_predictions = rf.predict(X_test)
```

```
submission = pd.DataFrame({
    "PassengerId": test["PassengerId"],
    "Survived": test_predictions
})

submission.to_csv("submission.csv", index=False)
submission.head()
```

|  | PassengerId | Survived |
|---|---|---|
| **0** | 892 | 0 |
| **1** | 893 | 0 |
| **2** | 894 | 0 |
| **3** | 895 | 0 |
| **4** | 896 | 1 |