# Titanic Dataset – Exploratory Data Analysis (EDA)

## 1. Dataset Loading & Overview

In [1]:
```
# Importing major liberaries
import seaborn as sns
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import plotly.express as px
```

In [2]:
```
# Load dataset
df = sns.load_dataset("titanic")
```

In [3]:
```
# First 5 records
df.head()
```

Out[3]:

| | survived | pclass | sex | age | sibsp | parch | fare | embarked | class | whc |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 0 | 3 | male | 22.0 | 1 | 0 | 7.2500 | S | Third | mar |
| **1** | 1 | 1 | female | 38.0 | 1 | 0 | 71.2833 | C | First | womar |
| **2** | 1 | 3 | female | 26.0 | 0 | 0 | 7.9250 | S | Third | womar |
| **3** | 1 | 1 | female | 35.0 | 1 | 0 | 53.1000 | S | First | womar |
| **4** | 0 | 3 | male | 35.0 | 0 | 0 | 8.0500 | S | Third | mar |

In [4]:
```
# Dataset shape
df.shape
```

Out[4]:
```
(891, 15)
```

### Observation:

The dataset contains information about passengers such as age, gender, class, fare, and survival status.

## 2. Data Structure Understanding

In [5]:
```
# Column names and data types
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 15 columns):
 #   Column       Non-Null Count  Dtype   
---  ------       --------------  -----   
 0   survived     891 non-null    int64   
 1   pclass       891 non-null    int64   
 2   sex          891 non-null    object  
 3   age          714 non-null    float64 
 4   sibsp        891 non-null    int64   
 5   parch        891 non-null    int64   
 6   fare         891 non-null    float64 
 7   embarked     889 non-null    object  
 8   class        891 non-null    category
 9   who          891 non-null    object  
 10  adult_male   891 non-null    bool    
 11  deck         203 non-null    category
 12  embark_town  889 non-null    object  
 13  alive        891 non-null    object  
 14  alone        891 non-null    bool    
dtypes: bool(2), category(2), float64(2), int64(4), object(5)
memory usage: 80.7+ KB
```

# Numerical Variables

- age
- fare
- sibsp
- parch

# Categorical Variables

- sex
- class
- embarked
- who
- deck
- embark_town
- alive

## 3. Missing Value Analysis

In [8]:
```
# Missing values count
df.isnull().sum()
```

Out[8]:
```
survived         0
pclass           0
sex              0
age            177
sibsp            0
parch            0
fare             0
embarked         2
class            0
who              0
adult_male       0
deck           688
embark_town      2
alive            0
alone            0
dtype: int64
```

In [9]:
```python
# Missing value percentage
(df.isnull().mean() * 100).sort_values(ascending=False)
```

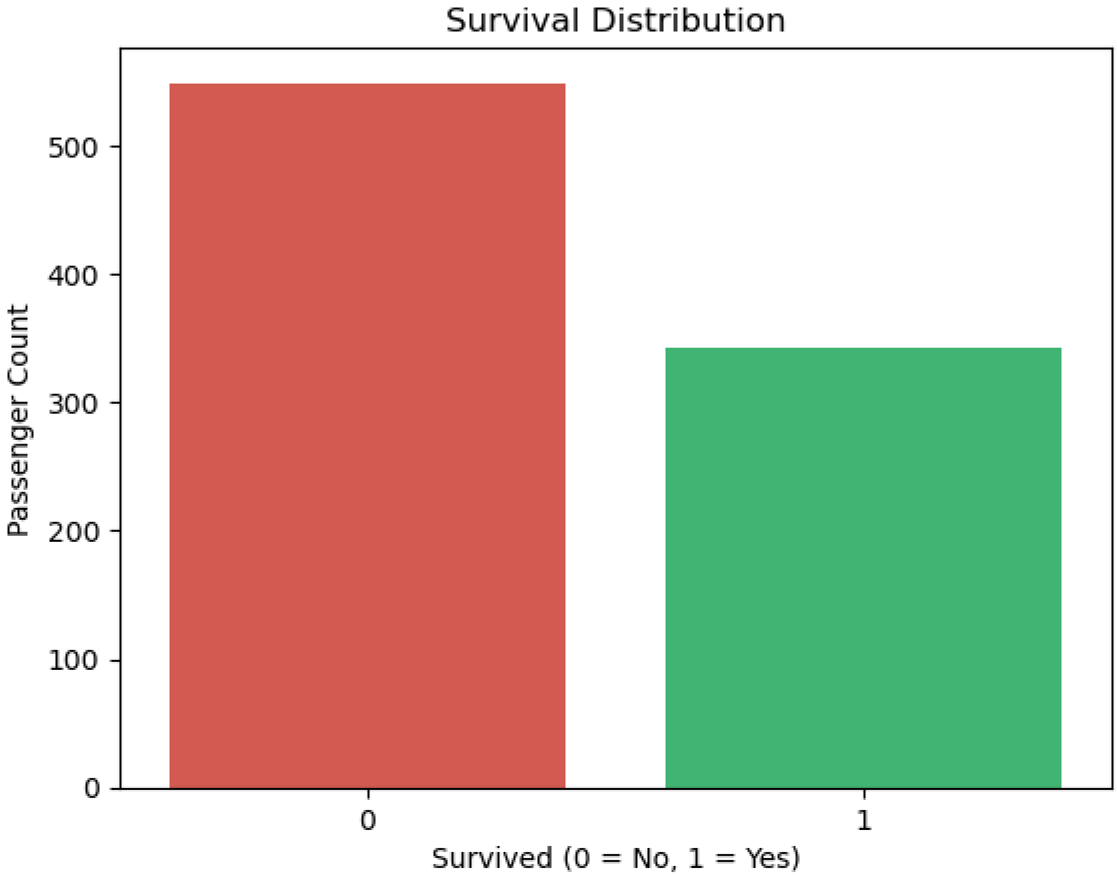
Out[9]:
```
deck           77.216611
age            19.865320
embarked        0.224467
embark_town     0.224467
sex             0.000000
pclass          0.000000
survived        0.000000
fare            0.000000
parch           0.000000
sibsp           0.000000
class           0.000000
adult_male      0.000000
who             0.000000
alive           0.000000
alone           0.000000
dtype: float64
```

### Observation:

- deck has the highest percentage of missing values
- age also has a significant number of missing values

## 4. Survival Distribution

In [16]:
```python
colors=["#E74C3C", "#2ECC71"]
sns.countplot(x="survived",hue="survived", data=df,palette=colors,legend=False
plt.xlabel("Survived (0 = No, 1 = Yes)")
plt.ylabel("Passenger Count")
plt.title("Survival Distribution")
plt.show()
```

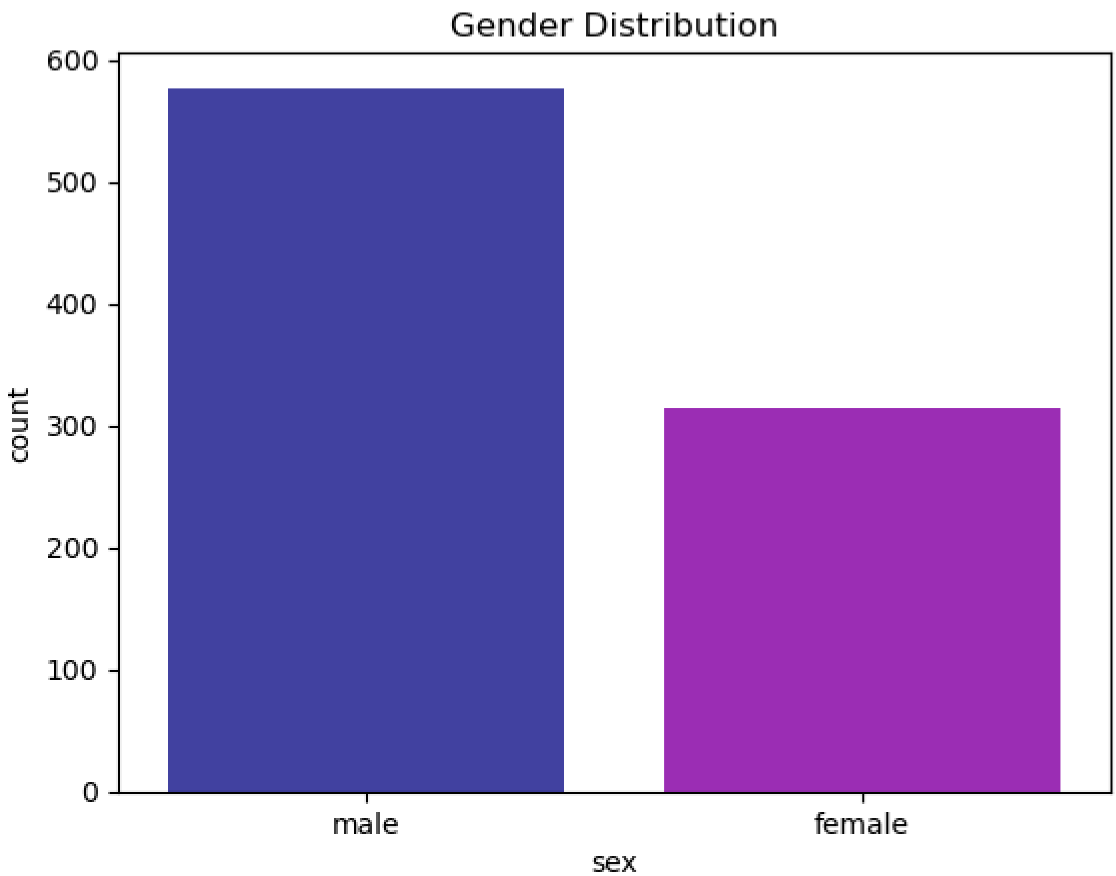



Comment:

More passengers did not survive compared to those who survived.

## 5. Gender Distribution

In [31]:
```
colors=["#3333B0","#A91BCC"]
sns.countplot(x="sex",hue="sex",data=df,palette=colors,legend=False)
plt.title("Gender Distribution")
plt.show()
```

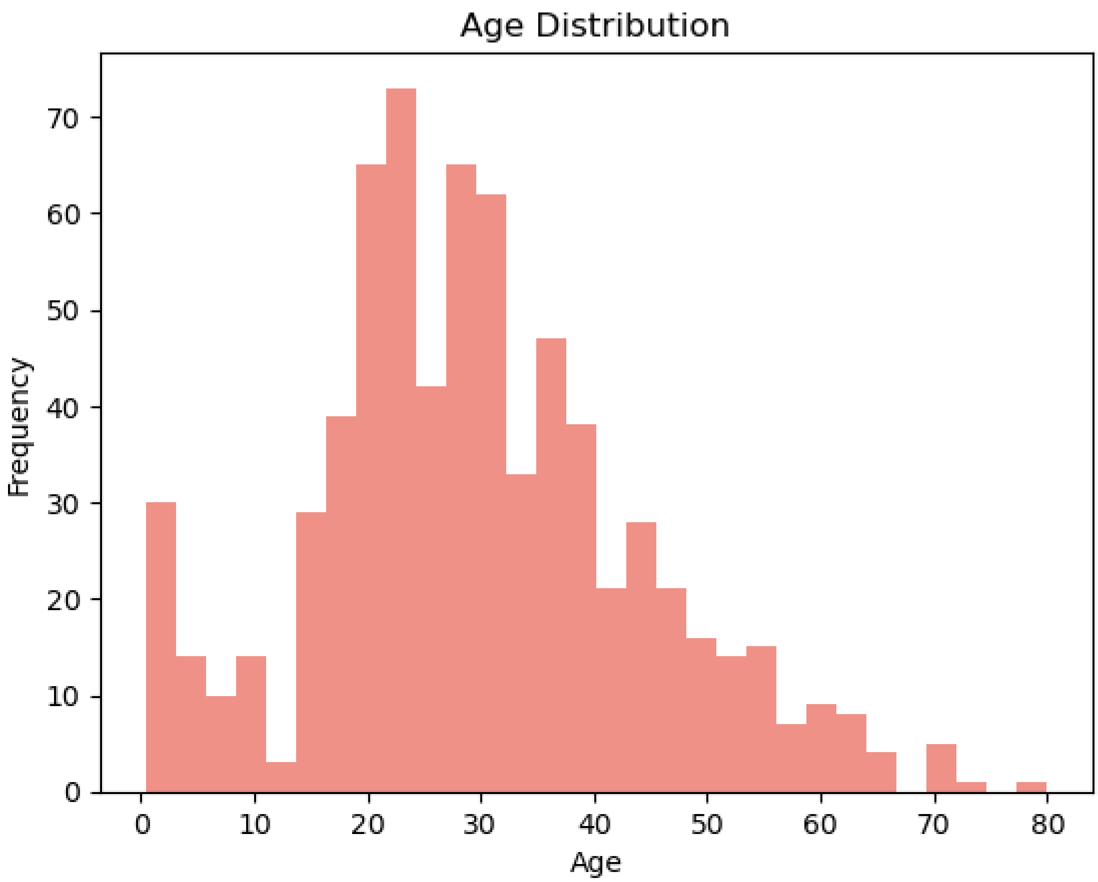



### Observation:

Male passengers were dominant onboard.

## 6. Age Distribution

In [32]:
```
colors = ["#F1948A"]
plt.hist(df["age"].dropna(),color=colors, bins=30)
plt.xlabel("Age")
plt.ylabel("Frequency")
plt.title("Age Distribution")
plt.show()
```

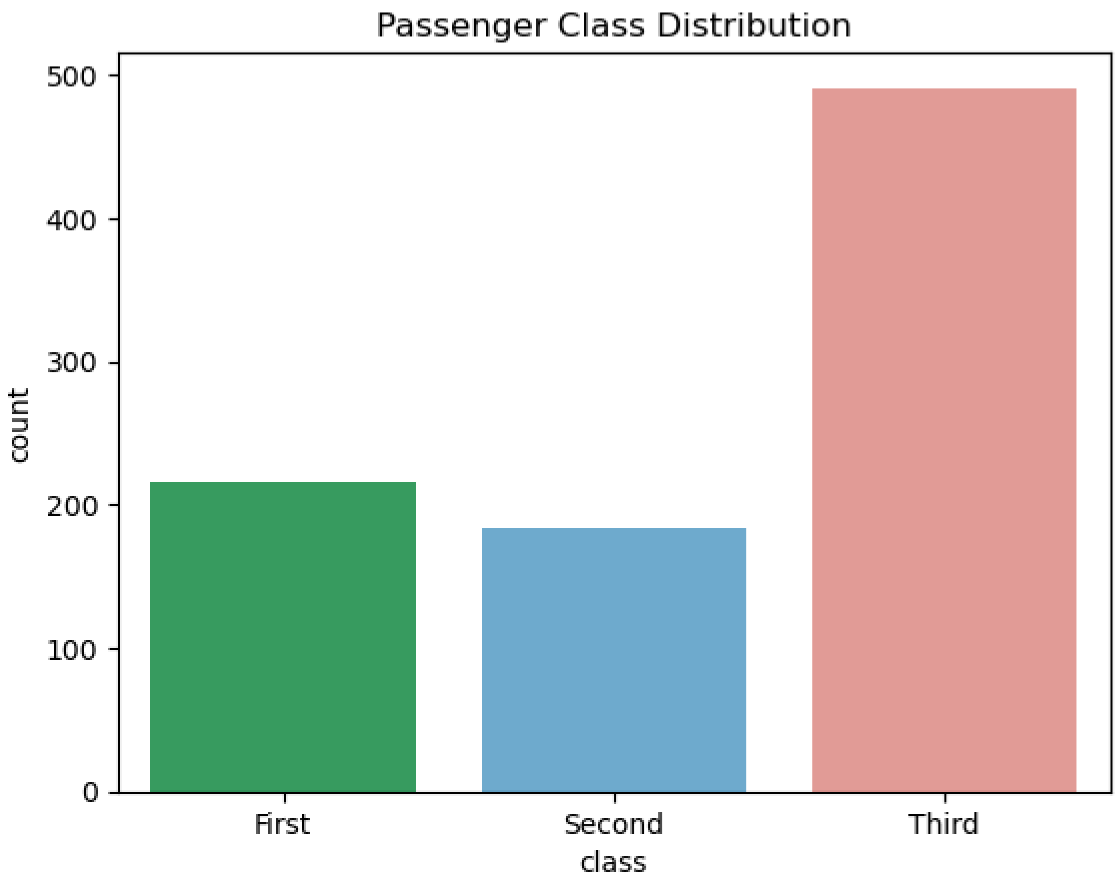



Observation:

Most passengers were between 20–40 years, which is the most frequent age group.

## 7. Passenger Class Distribution

In [37]:
```
colors=["#27AE60","#5DADE2", "#F1948A"]
sns.countplot(x="class", data=df,palette=colors,hue="class",legend=False)
plt.title("Passenger Class Distribution")
plt.show()
```

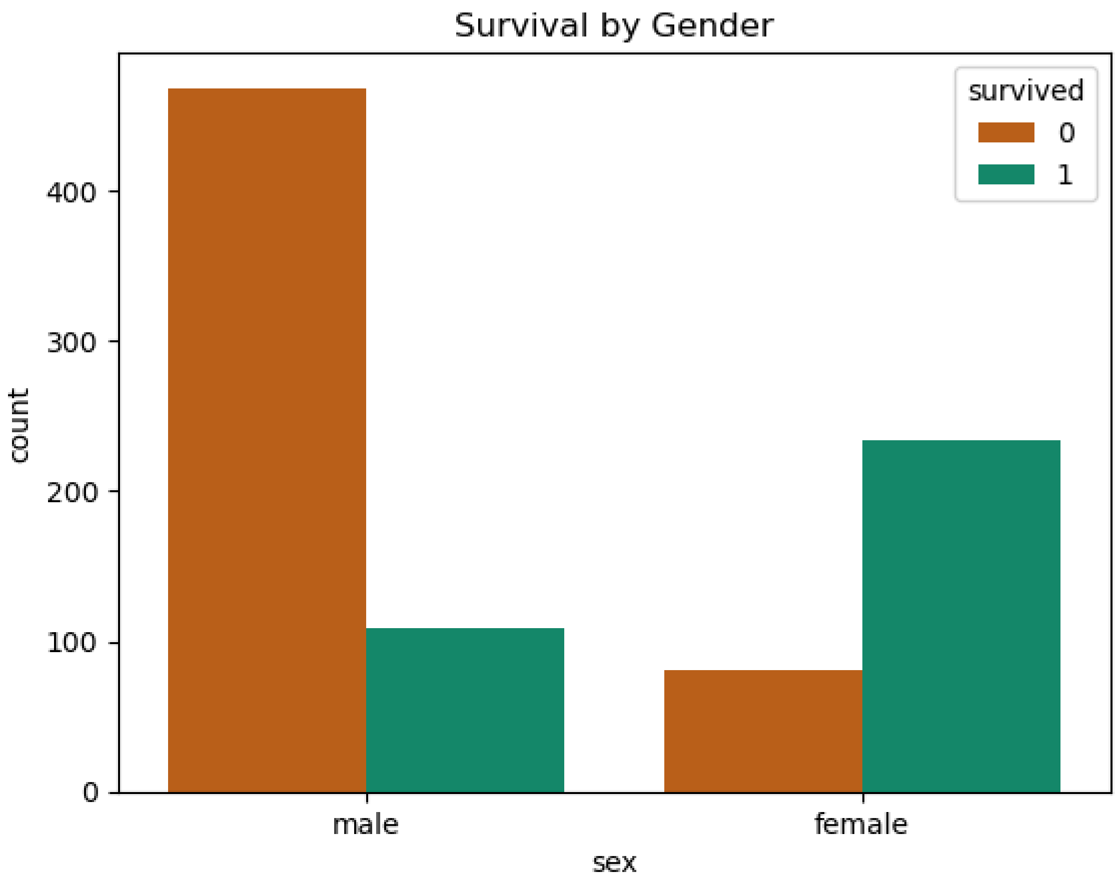



Observation:

Third class had the maximum number of passengers.

## 8. Survival vs Gender

In [41]:
```
colors=["#D55E00", "#009E73"]
sns.countplot(x="sex", hue="survived", data=df,palette=colors)
plt.title("Survival by Gender")
plt.show()
```

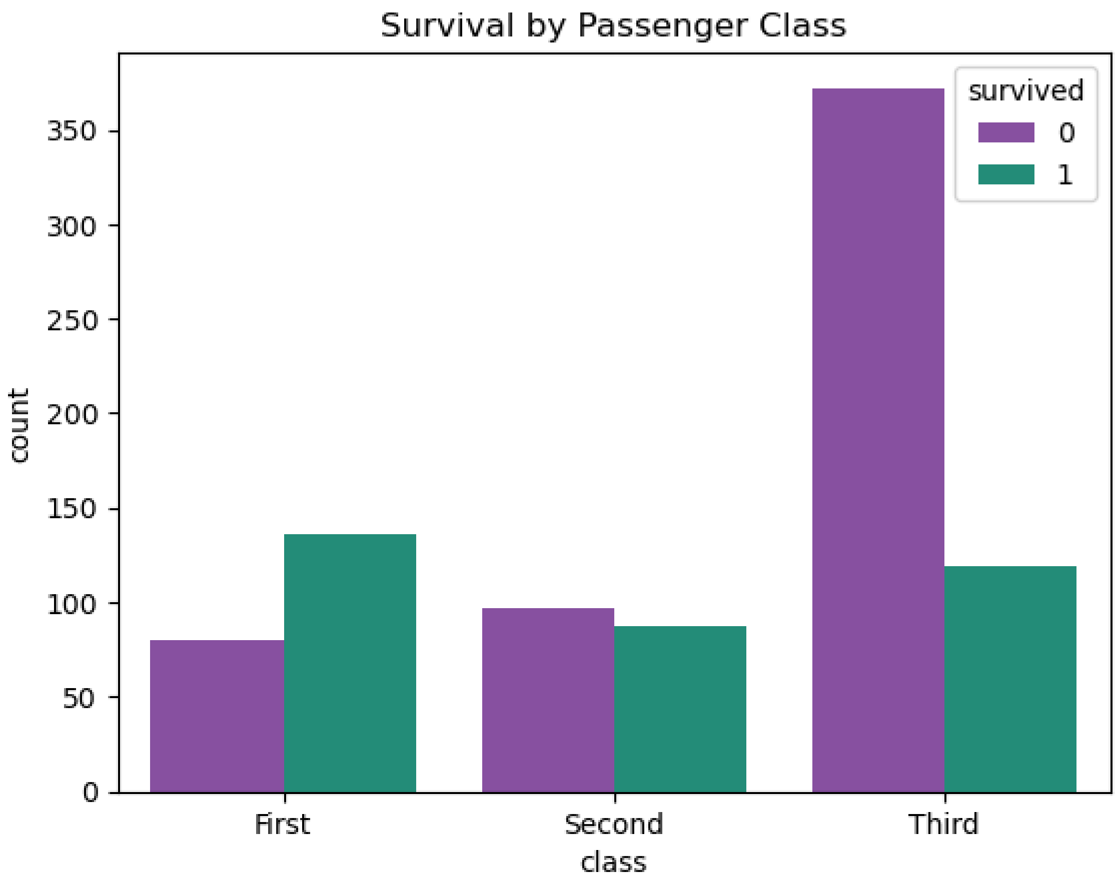



## Observation:

Female passengers had a much higher survival rate than males.

## 9. Survival vs Passenger Class

In [44]:
```
colors=["#8E44AD", "#16A085"]
sns.countplot(x="class", hue="survived", data=df,palette=colors)
plt.title("Survival by Passenger Class")
plt.show()
```




### Observation:

First-class passengers had the best survival chances.

## 10. GroupBy Analysis – Gender

In [45]:
```
df.groupby("sex")["survived"].mean()
```

Out[45]:
```
sex
female    0.742038
male      0.188908
Name: survived, dtype: float64
```

### Observation:

Females had a much higher survival rate compared to males

## 11. Interactive Visualization (Plotly)

In [53]:
```
survival_gender = df.groupby("sex")["survived"].mean().reset_index()
fig = px.bar(data_frame=survival_gender,
    x="sex",
    y="survived",
```

```
    title="Survival Rate by Gender",
    labels={"survived": "Survival Rate"},
    color="sex",
    color_discrete_map={"male": "#5DADE2","female": "#F1948A"})
fig.show()
```

## 12. Business Insights

- Gender was a major factor in survival — females had significantly higher survival rates.
- Passenger class strongly influenced survival, with first-class passengers having the best chances.
- Fare and class are correlated, indicating socio-economic status played an important role.

### Most Influential Factor:

- Passenger class and gender were the most influential factors affecting survival.

```
In [ ]:
```