TASK2

September 15, 2025

[2]:

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

%matplotlib inline
sns.set(style="whitegrid")
```

[3]:

```
import os
print(os.getcwd())
print(os.listdir())
```

```
/home/01e8c0d6-55b3-4404-abea-629433cfc2c8/Elevvo
['gender.csv', 'train.csv', 'test.csv', 'TASK2.ipynb', 'Elevvo Task 2.ipynb',
'.ipynb_checkpoints']
```

[5]:

```
df = pd.read_csv("train.csv")
df.head()
```

[5]:

```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         0       3

                                                Name     Sex   Age  SibSp  \
0                            Braund, Mr. Owen Harris    male  22.0      1
1  Cumings, Mrs. John Bradley (Florence Briggs Th…  female  38.0      1
2                             Heikkinen, Miss. Laina  female  26.0      0
3       Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0      1
4                           Allen, Mr. William Henry    male  35.0      0

   Parch            Ticket     Fare Cabin Embarked
0      0         A/5 21171   7.2500   NaN        S
1      0          PC 17599  71.2833   C85        C
2      0  STON/O2. 3101282   7.9250   NaN        S
3      0            113803  53.1000  C123        S
```

```
4      0              373450    8.0500    NaN         S
```

[6]:

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


%matplotlib inline
sns.set(style="whitegrid")

pd.set_option('display.max_columns', None)
```

[7]:

```python
print(os.getcwd())
print(os.listdir())
```

```
/home/01e8c0d6-55b3-4404-abea-629433cfc2c8/Elevvo
['gender.csv', 'train.csv', 'test.csv', 'TASK2.ipynb', 'Elevvo Task 2.ipynb',
'.ipynb_checkpoints']
```

[8]:

```python
df = pd.read_csv('train.csv')
df.head()
df.shape
df.info()
df.describe(include='all').T
```

```
<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
```

[8]:

```
             count unique                 top freq       mean         std  \
PassengerId  891.0    NaN                 NaN  NaN      446.0  257.353842
Survived     891.0    NaN                 NaN  NaN   0.383838    0.486592
Pclass       891.0    NaN                 NaN  NaN   2.308642    0.836071
Name           891    891  Dooley, Mr. Patrick    1        NaN         NaN
Sex            891      2                male  577        NaN         NaN
Age          714.0    NaN                 NaN  NaN  29.699118   14.526497
SibSp        891.0    NaN                 NaN  NaN   0.523008    1.102743
Parch        891.0    NaN                 NaN  NaN   0.381594    0.806057
Ticket         891    681                1601    7        NaN         NaN
Fare         891.0    NaN                 NaN  NaN  32.204208   49.693429
Cabin          204    147             B96 B98    4        NaN         NaN
Embarked       889      3                   S  644        NaN         NaN

              min     25%     50%    75%       max
PassengerId   1.0   223.5   446.0  668.5     891.0
Survived      0.0     0.0     0.0    1.0       1.0
Pclass        1.0     2.0     3.0    3.0       3.0
Name          NaN     NaN     NaN    NaN       NaN
Sex           NaN     NaN     NaN    NaN       NaN
Age          0.42  20.125    28.0   38.0      80.0
SibSp         0.0     0.0     0.0    1.0       8.0
Parch         0.0     0.0     0.0    0.0       6.0
Ticket        NaN     NaN     NaN    NaN       NaN
Fare          0.0  7.9104 14.4542   31.0  512.3292
Cabin         NaN     NaN     NaN    NaN       NaN
Embarked      NaN     NaN     NaN    NaN       NaN
```

[9]:

```
missing_counts = df.isnull().sum().sort_values(ascending=False)
missing_percent = (df.isnull().mean() * 100).sort_values(ascending=False)
pd.concat([missing_counts, missing_percent], axis=1, keys=['missing',␣
 ↪'percent'])
```

[9]:

```
             missing    percent
Cabin            687  77.104377
Age              177  19.865320
Embarked           2   0.224467
PassengerId        0   0.000000
Name               0   0.000000
Pclass             0   0.000000
Survived           0   0.000000
Sex                0   0.000000
Parch              0   0.000000
SibSp              0   0.000000
Fare               0   0.000000
Ticket             0   0.000000
```

[10]:

```python
df['Pclass'] = df['Pclass'].astype('category')
df['Survived'] = df['Survived'].astype('category')


print(df['Sex'].value_counts())
print(df['Pclass'].value_counts())
print(df['Embarked'].value_counts(dropna=False))
```

```
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
NaN      2
Name: count, dtype: int64
```

[12]:

```python
df['Survived'] = pd.to_numeric(df['Survived'], errors='coerce')


overall_survival_rate = df['Survived'].mean()
print(f"Overall survival rate: {overall_survival_rate:.2%}")

print(df.groupby('Sex')['Survived'].mean())


print(df.groupby('Pclass')['Survived'].mean())
```

```
Overall survival rate: 38.38%
Sex
female    0.742038
male      0.188908
Name: Survived, dtype: float64
Pclass
1    0.629630
2    0.472826
3    0.242363
Name: Survived, dtype: float64
```

```
/tmp/ipykernel_1039/21966423.py:12: FutureWarning: The default of observed=False
is deprecated and will be changed to True in a future version of pandas. Pass
```

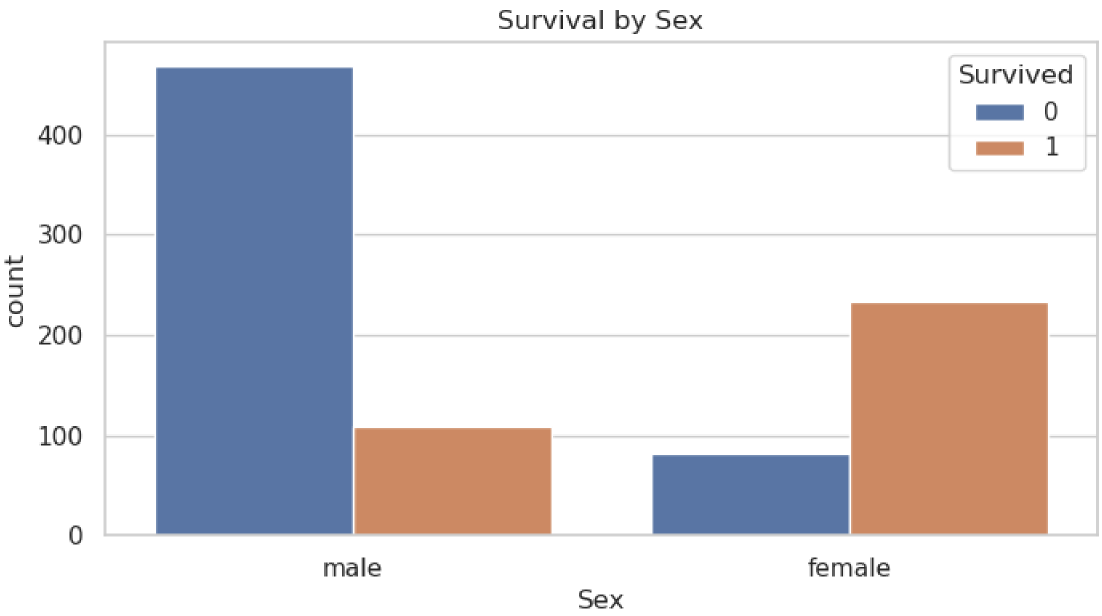
```
observed=False to retain current behavior or observed=True to adopt the future
default and silence this warning.
  print(df.groupby('Pclass')['Survived'].mean())
```

[14]:
```
overall_survival_rate = df['Survived'].astype(int).mean()
print(f"Overall survival rate: {overall_survival_rate:.2%}")

print(df.groupby('Sex')['Survived'].mean())
print(df.groupby('Pclass')['Survived'].mean())
```

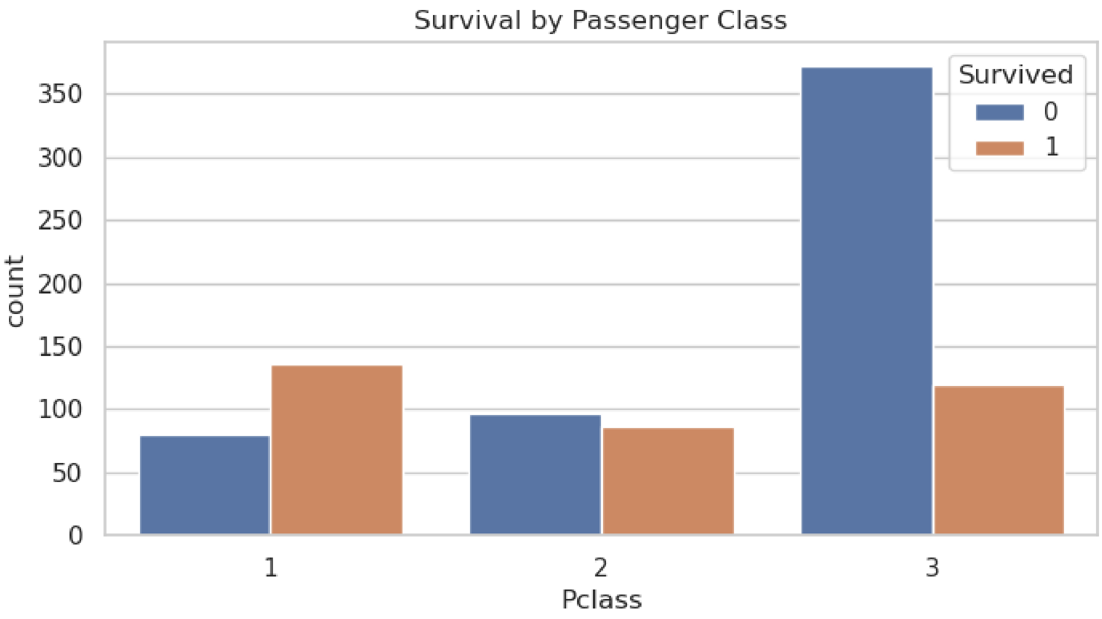
```
Overall survival rate: 38.38%
Sex
female    0.742038
male      0.188908
Name: Survived, dtype: float64
Pclass
1    0.629630
2    0.472826
3    0.242363
Name: Survived, dtype: float64
```

```
/tmp/ipykernel_1039/637620804.py:6: FutureWarning: The default of observed=False
is deprecated and will be changed to True in a future version of pandas. Pass
observed=False to retain current behavior or observed=True to adopt the future
default and silence this warning.
  print(df.groupby('Pclass')['Survived'].mean())
```

[16]:
```
import seaborn as sns
import matplotlib.pyplot as plt


df['Survived'] = df['Survived'].astype(str)

plt.figure(figsize=(8,4))
sns.countplot(x='Sex', hue='Survived', data=df)
plt.title('Survival by Sex')
plt.show()

plt.figure(figsize=(8,4))
sns.countplot(x='Pclass', hue='Survived', data=df)
plt.title('Survival by Passenger Class')
plt.show()
```



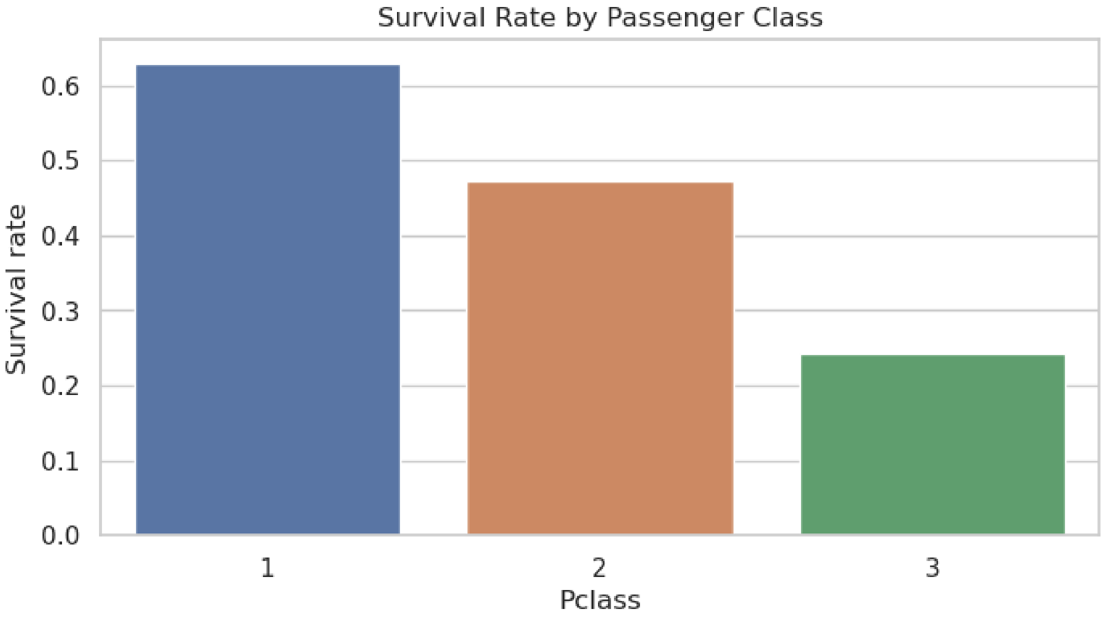
```
/opt/conda/envs/anaconda-2024.02-py310/lib/python3.10/site-
packages/seaborn/categorical.py:641: FutureWarning: The default of
observed=False is deprecated and will be changed to True in a future version of
pandas. Pass observed=False to retain current behavior or observed=True to adopt
the future default and silence this warning.
  grouped_vals = vals.groupby(grouper)
/opt/conda/envs/anaconda-2024.02-py310/lib/python3.10/site-
packages/seaborn/categorical.py:641: FutureWarning: The default of
observed=False is deprecated and will be changed to True in a future version of
pandas. Pass observed=False to retain current behavior or observed=True to adopt
the future default and silence this warning.
  grouped_vals = vals.groupby(grouper)
```



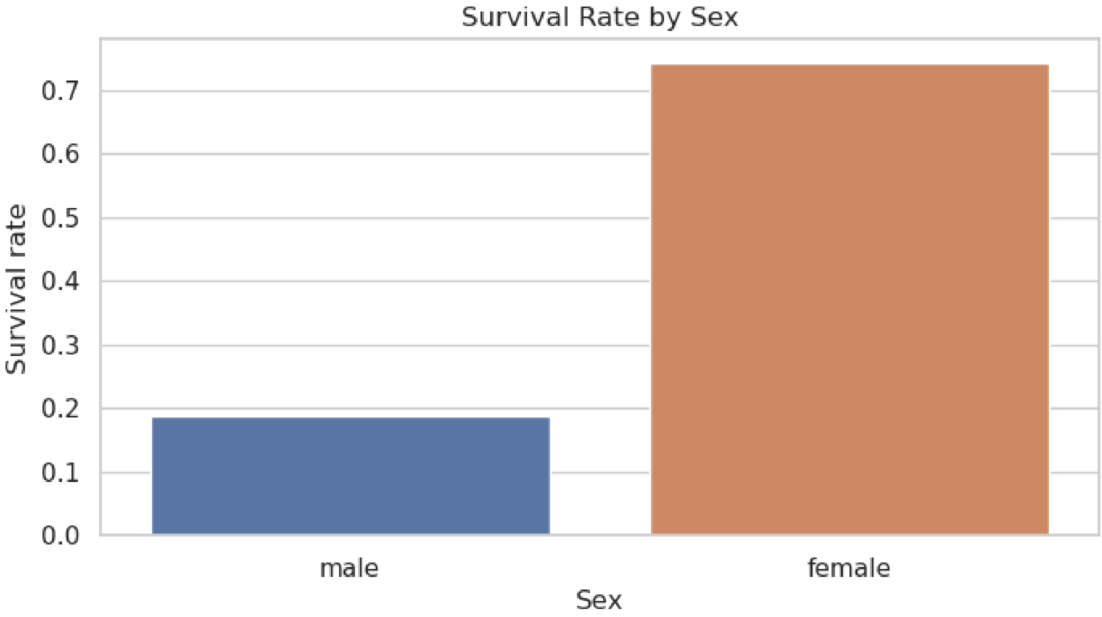
[19]:

```
df['Survived_num'] = df['Survived'].astype(int)

plt.figure(figsize=(8,4))
sns.barplot(x='Pclass', y='Survived_num', data=df, estimator=np.mean, ci=None)
plt.title('Survival Rate by Passenger Class')
plt.ylabel('Survival rate')
plt.show()

plt.figure(figsize=(8,4))
sns.barplot(x='Sex', y='Survived_num', data=df, estimator=np.mean, ci=None)
plt.title('Survival Rate by Sex')
plt.ylabel('Survival rate')
plt.show()
```

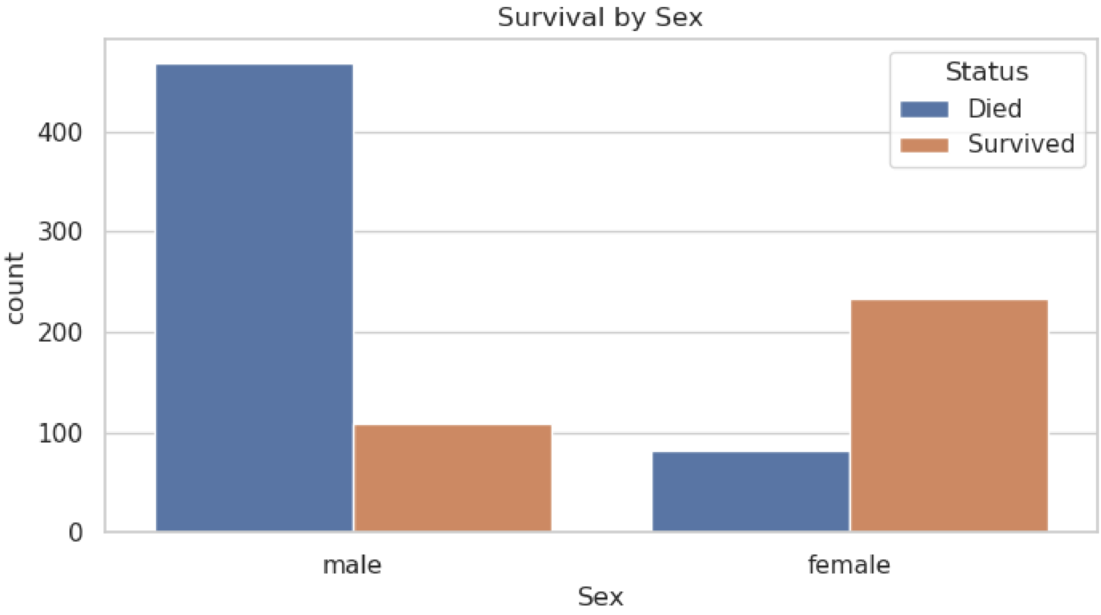
```
/tmp/ipykernel_1039/1198649755.py:5: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(x='Pclass', y='Survived_num', data=df, estimator=np.mean, ci=None)
/opt/conda/envs/anaconda-2024.02-py310/lib/python3.10/site-
packages/seaborn/categorical.py:641: FutureWarning: The default of
observed=False is deprecated and will be changed to True in a future version of
pandas. Pass observed=False to retain current behavior or observed=True to adopt
the future default and silence this warning.
  grouped_vals = vals.groupby(grouper)
```



```
/tmp/ipykernel_1039/1198649755.py:11: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(x='Sex', y='Survived_num', data=df, estimator=np.mean, ci=None)
```

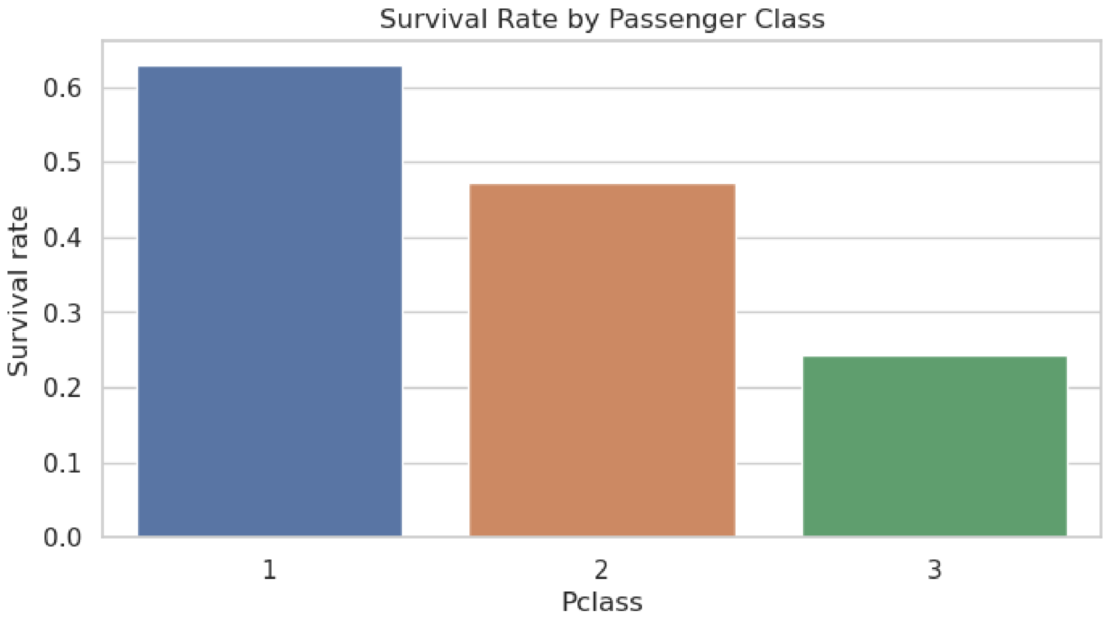


```
[21]: df['Survived_num'] = df['Survived'].astype(int)


      df['Survived_label'] = df['Survived_num'].map({0: "Died", 1: "Survived"})


      plt.figure(figsize=(8,4))
      sns.countplot(x='Sex', hue='Survived_label', data=df)
      plt.title('Survival by Sex')
      plt.legend(title="Status")
      plt.show()


      plt.figure(figsize=(8,4))
      sns.barplot(x='Pclass', y='Survived_num', data=df, estimator=np.mean, ci=None)
      plt.title('Survival Rate by Passenger Class')
      plt.ylabel('Survival rate')
      plt.show()


      plt.figure(figsize=(8,4))
      sns.barplot(x='Sex', y='Survived_num', data=df, estimator=np.mean, ci=None)
      plt.title('Survival Rate by Sex')
      plt.ylabel('Survival rate')
      plt.show()
```

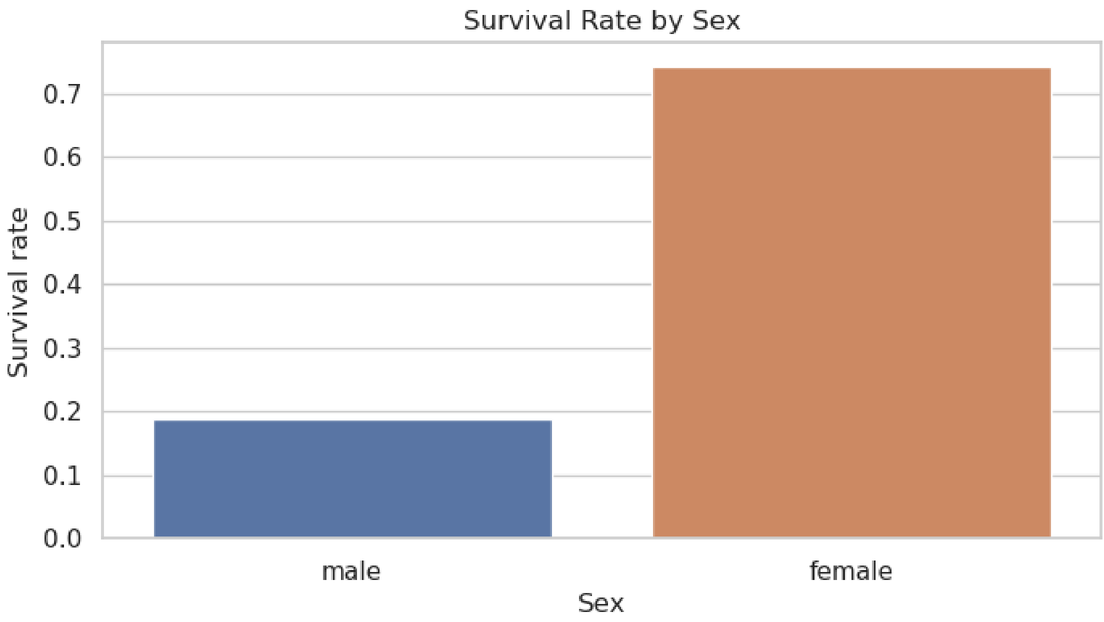


```
/tmp/ipykernel_1039/169356799.py:16: FutureWarning:
```

```
The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(x='Pclass', y='Survived_num', data=df, estimator=np.mean, ci=None)
/opt/conda/envs/anaconda-2024.02-py310/lib/python3.10/site-
packages/seaborn/categorical.py:641: FutureWarning: The default of
observed=False is deprecated and will be changed to True in a future version of
pandas. Pass observed=False to retain current behavior or observed=True to adopt
the future default and silence this warning.
  grouped_vals = vals.groupby(grouper)
```



```
/tmp/ipykernel_1039/169356799.py:23: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(x='Sex', y='Survived_num', data=df, estimator=np.mean, ci=None)
```



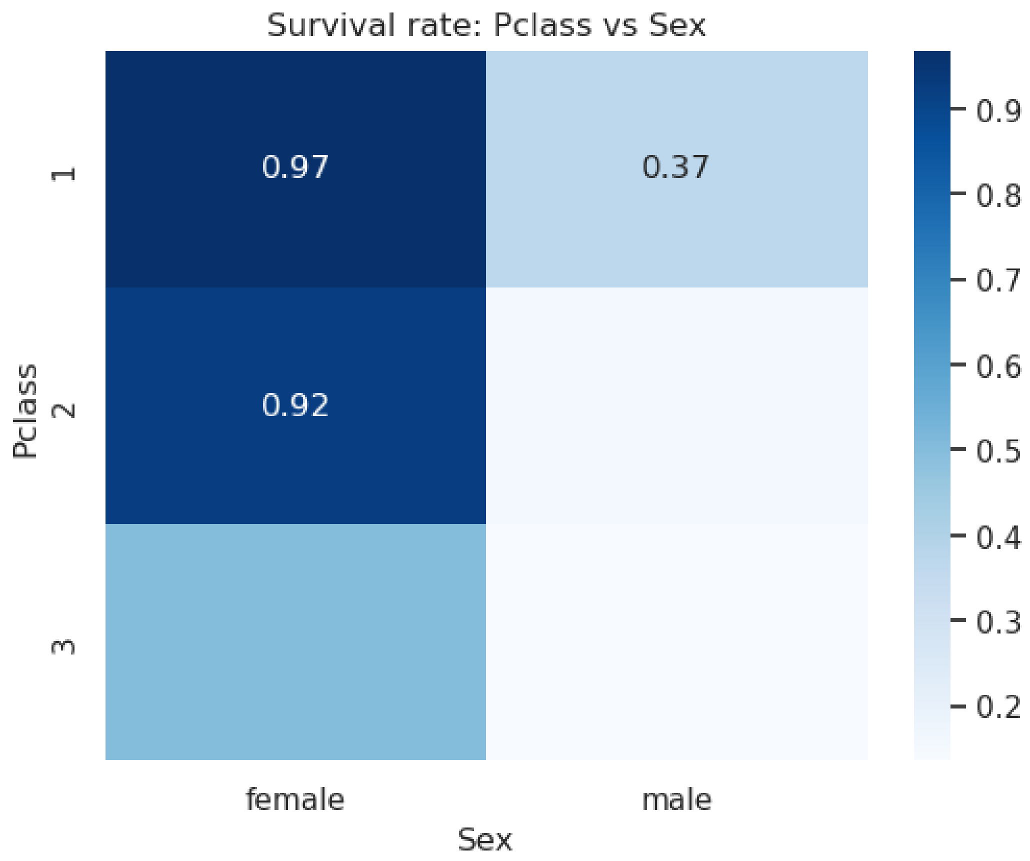
[23]:

```
df['Survived'] = pd.to_numeric(df['Survived'], errors='coerce')

print(df['Survived'].unique())
print(df['Survived'].dtype)
```

```
[0 1]
int64
```

[24]:

```
pivot = df.pivot_table(values='Survived', index='Pclass', columns='Sex',␣
  ↪aggfunc='mean')

sns.heatmap(pivot, annot=True, fmt='.2f', cmap="Blues")
plt.title('Survival rate: Pclass vs Sex')
plt.show()
```



```
[27]: df['Embarked'].fillna(df['Embarked'].mode()[0], inplace=True)


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

```
[29]: df['Age'] = df.groupby('Title')['Age'].transform(lambda x: x.fillna(x.median()))


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

```
[31]: df.isnull().sum()
```

```
[31]: PassengerId    0
      Survived       0
      Pclass         0
      Name           0
      Sex            0
      Age            0
      SibSp          0
      Parch          0
```

```
Ticket              0
Fare                0
Cabin             687
Embarked            0
Survived_num        0
Survived_label      0
Title               0
dtype: int64
```

[32]:

```
df['FamilySize'] = df['SibSp'] + df['Parch'] + 1
df['IsAlone'] = (df['FamilySize'] == 1).astype(int)


df['AgeBin'] = pd.cut(df['Age'], bins=[0,12,20,40,60,120],␣
 ↪labels=['Child','Teen','Adult','Middle','Senior'])

pd.crosstab(df['AgeBin'], df['Survived'], normalize='index')
```

[32]:

```
Survived         0         1
AgeBin
Child     0.424658  0.575342
Teen      0.618182  0.381818
Adult     0.635548  0.364452
Middle    0.612403  0.387597
Senior    0.772727  0.227273
```

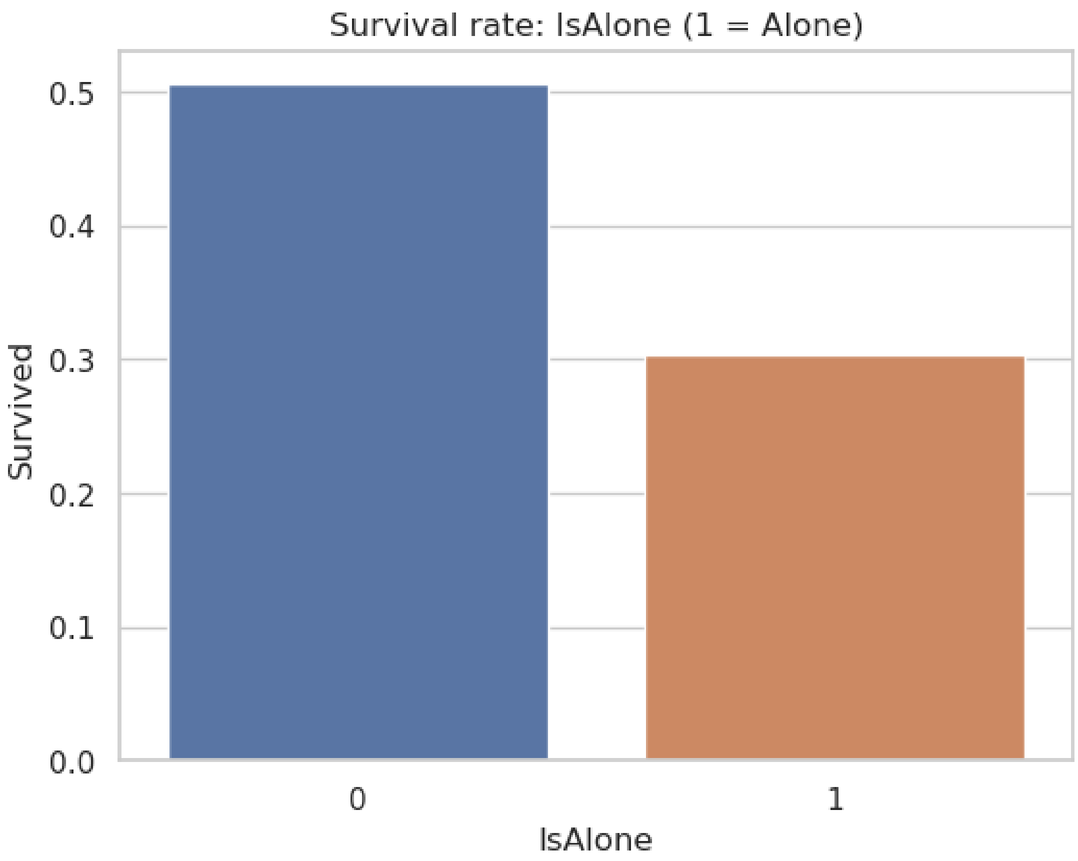
[34]:

```
df['FamilySize'] = df['SibSp'] + df['Parch'] + 1


df['IsAlone'] = 0
df.loc[df['FamilySize'] == 1, 'IsAlone'] = 1
```

[35]:

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

sns.barplot(x='IsAlone', y='Survived', data=df, estimator=np.mean, ci=None)
plt.title('Survival rate: IsAlone (1 = Alone)')
plt.show()
```

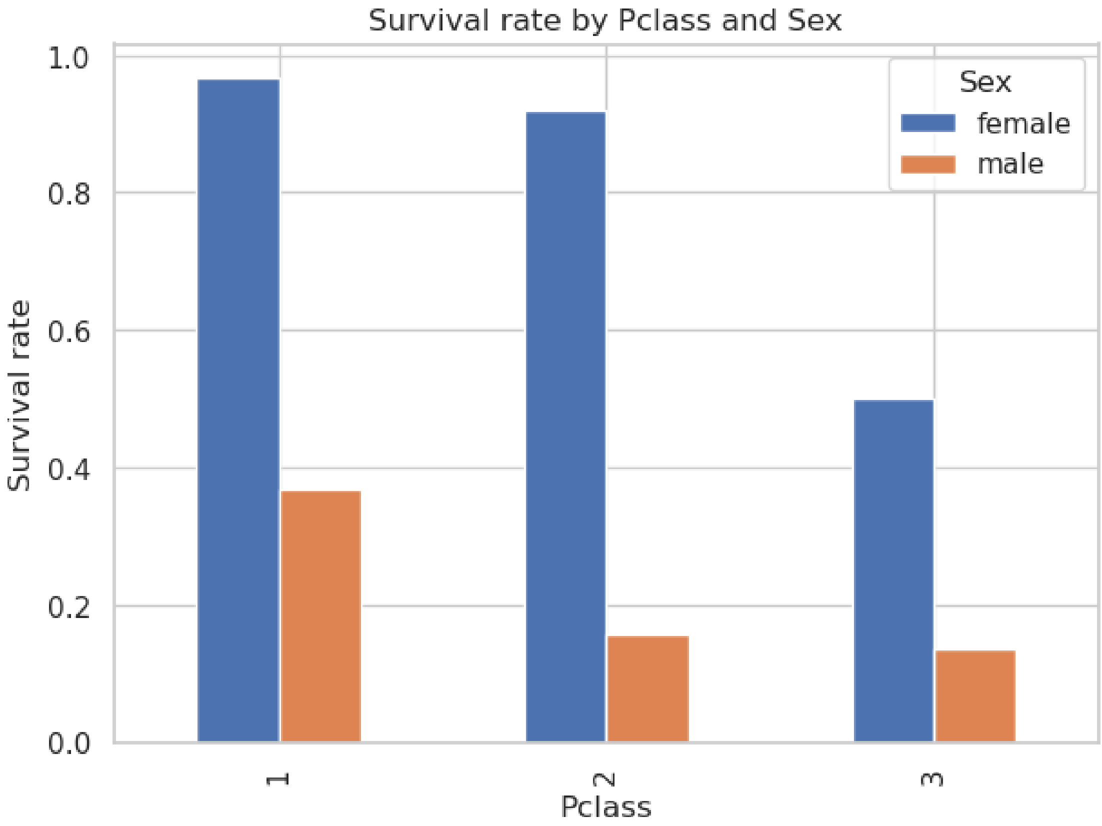
```
/tmp/ipykernel_1039/110853439.py:5: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(x='IsAlone', y='Survived', data=df, estimator=np.mean, ci=None)
```



[36]:
```
grouped = df.groupby(['Pclass','Sex'])['Survived'].mean().unstack()
print(grouped)


grouped.plot(kind='bar', figsize=(7,5))
plt.ylabel('Survival rate')
plt.title('Survival rate by Pclass and Sex')
plt.show()
```

```
Sex       female      male
Pclass
1       0.968085  0.368852
2       0.921053  0.157407
3       0.500000  0.135447
```

```
/tmp/ipykernel_1039/3686383830.py:2: FutureWarning: The default of
observed=False is deprecated and will be changed to True in a future version of
pandas. Pass observed=False to retain current behavior or observed=True to adopt
the future default and silence this warning.
  grouped = df.groupby(['Pclass','Sex'])['Survived'].mean().unstack()
```



```
[37]: df.to_csv('train_cleaned.csv', index=False)
```

```
[ ]:
```