Titanic Dataset EDA: Uncovering Patterns & Predictions from Passenger Data

In [2]:

```python
# importing necessary libraries

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

1. Data Cleaning & Preprocessing

- How would you handle missing values in 'Age', 'Embarked', and 'Cabin'?
- Should you drop or keep the 'Name' column?
- How do you handle outliers in 'Fare'?

In [4]:

```python
# loading titanic data-set from seaborn
titanic=pd.read_csv('./titanic.csv')
titanic.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 [5]:

```python
# some sample from titanic dataset
titanic.sample(5)
```

Out[5]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticl
31	32	1	1	Spencer, Mrs. William Augustus (Marie Eugenie)	female	NaN	1	0	175
447	448	1	1	Seward, Mr. Frederic Kimber	male	34.0	0	0	1137
205	206	0	3	Strom, Miss. Telma Matilda	female	2.0	0	1	3470
308	309	0	2	Abelson, Mr. Samuel	male	30.0	1	0	P 33
863	864	0	3	Sage, Miss. Dorothy Edith "Dolly"	female	NaN	8	2	23

In [6]:

```python
# finding missing values in dataset
titanic.isnull().sum()
```

Out[6]:

```
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
```

as we can see `age` , `cabin` and `embarked` all contains missing values

In [8]:

```python
# filling missing age with values of above row
titanic.Age.ffill(inplace=True)
```

In [9]:

```python
# filling `nan` values of Cabin with `most frequent Cabin` value
most_frequent_Cabin=titanic.Cabin.mode()[0]
most_frequent_Cabin
```

Out[9]:

```
'B96 B98'
```

In [10]:

```
titanic['Cabin'].fillna(most_frequent_Cabin, inplace=True)
```

In [11]:

```
# alternatively we can also fill null values with `unknown` value, to do so
# first we've to update our categorical columns

# titanic['Cabin']=titanic['Cabin'].cat.add_categories(['Unknown'])
# # now we'll update our categorical column values
# titanic['Cabin']=titanic.Cabin.fillna('Unknown')
```

In [12]:

```
# detecting outliers in dataframe
titanic.describe()
```

Out[12]:

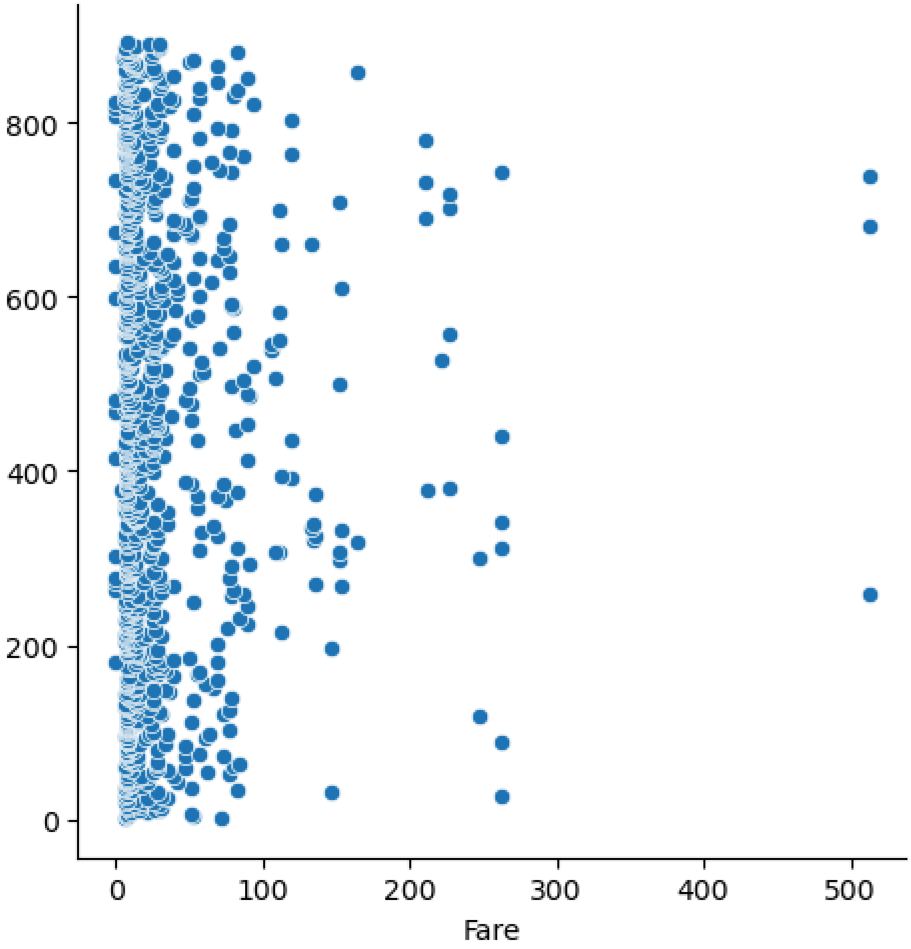
	PassengerId	Survived	Pclass	Age	SibSp	Parch
count	891.000000	891.000000	891.000000	891.00000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.58156	0.523008	0.381594
std	257.353842	0.486592	0.836071	14.55459	1.102743	0.806057
min	1.000000	0.000000	1.000000	0.42000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.00000	0.000000	0.000000
50%	446.000000	0.000000	3.000000	28.00000	0.000000	0.000000
75%	668.500000	1.000000	3.000000	38.00000	1.000000	0.000000
max	891.000000	1.000000	3.000000	80.00000	8.000000	6.000000

In [13]:

```
sns.relplot(kind='scatter', data=titanic, x='Fare', y=np.arange(1, 892))
```

Out[13]:

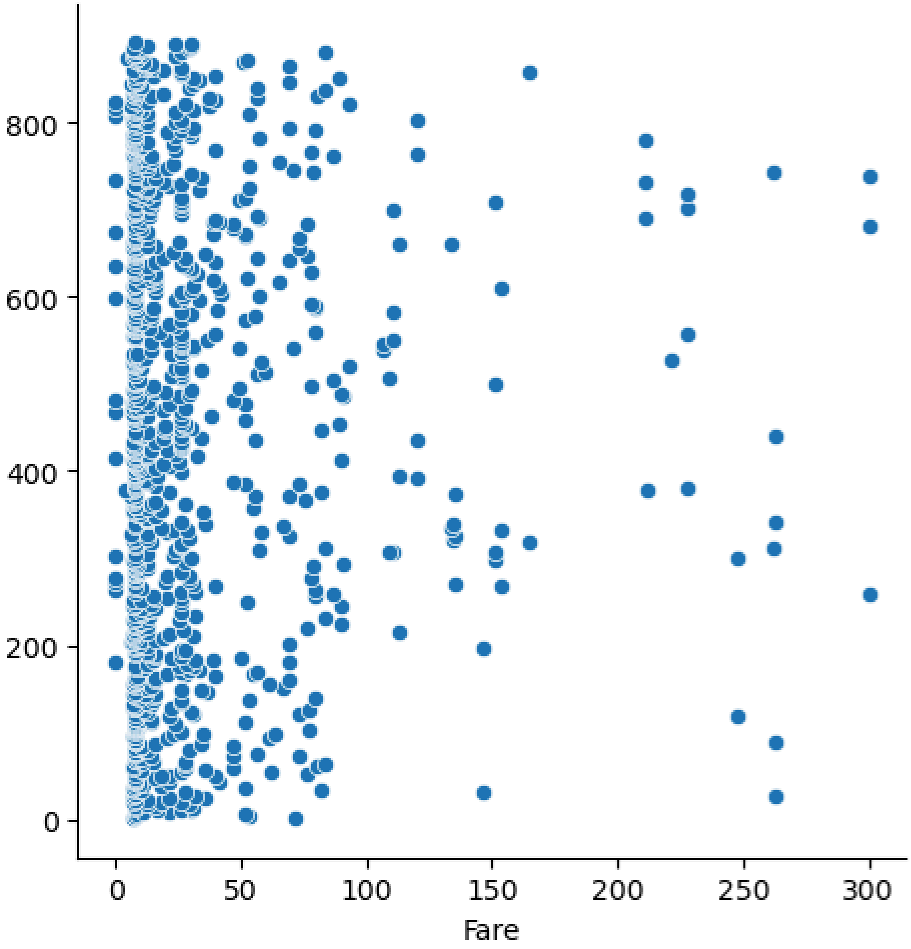
```
<seaborn.axisgrid.FacetGrid at 0x1abede9ff10>
```



In [14]:
```
# from the above observation we can see that the `fare` column contains outl
# we'll handle by clipping values in range 0 to 300

titanic['Fare']=titanic.Fare.clip(0, 300)
```

In [15]:
```
sns.relplot(kind='scatter', data=titanic, x='Fare', y=np.arange(1, 892))
```

Out[15]:
```
<seaborn.axisgrid.FacetGrid at 0x1abede97750>
```



now our data looks better

```
In [17]: titanic.isna().sum()
```

```
Out[17]: PassengerId    0
         Survived       0
         Pclass         0
         Name           0
         Sex            0
         Age            0
         SibSp          0
         Parch          0
         Ticket         0
         Fare           0
         Cabin          0
         Embarked       2
         dtype: int64
```

```
In [18]: # handling null embarked values

         titanic[titanic.Embarked.isna()]
```

Out[18]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticke
61	62	1	1	Icard, Miss. Amelie	female	38.0	0	0	11357
829	830	1	1	Stone, Mrs. George Nelson (Martha Evelyn)	female	62.0	0	0	11357

In [19]:
```
titanic.iloc[[60, 61, 62, 828, 829, 830]]
```

Out[19]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	T
60	61	0	3	Sirayanian, Mr. Orsen	male	22.0	0	0	
61	62	1	1	Icard, Miss. Amelie	female	38.0	0	0	1
62	63	0	1	Harris, Mr. Henry Birkhardt	male	45.0	1	0	
828	829	1	3	McCormack, Mr. Thomas Joseph	male	1.0	0	0	3
829	830	1	1	Stone, Mrs. George Nelson (Martha Evelyn)	female	62.0	0	0	1
830	831	1	3	Yasbeck, Mrs. Antoni (Selini Alexander)	female	15.0	1	0	

as we can see both the `nan` values are of *Sex* `female`, therefore we replace it with most frequest female embarked value

In [21]:
```
# finding most frequent female embarked value
most_frequent_female_embarked=titanic[titanic['Sex']=='female']['Embarked'].
```

In [22]:
```
# replacing values
titanic.Embarked.fillna(
    most_frequent_female_embarked.head(1).reset_index()['Embarked'].iloc[0],
    inplace=True
)
```

In [23]:
```
titanic.isna().sum()
```

Out[23]:
```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Cabin          0
Embarked       0
dtype: int64
```

In [24]:
```
# detecting whether dataset has duplicate rows are not
titanic.duplicated().sum()
```

Out[24]:
```
0
```

There are no duplicate rows present in the dataset, if it's there remove the duplicate using `drop_duplicates`

In [26]:
```
# updating 'Sex', 'Embarked', and 'Pclass' as category
titanic['Sex']=titanic.Sex.astype('category')
titanic['Embarked']=titanic.Embarked.astype('category')
titanic['Pclass']=titanic.Pclass.astype('category')
```

In [27]:
```
titanic['Survived']=titanic.Survived.astype(np.int8)
```

In [28]:
```
titanic['Parch']=titanic.Parch.astype(np.int8)
```

In [29]:
```
titanic['SibSp']=titanic.SibSp.astype(np.int8)
```

In [30]:
```
titanic.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    int8    
 2   Pclass       891 non-null    category
 3   Name         891 non-null    object  
 4   Sex          891 non-null    category
 5   Age          891 non-null    float64 
 6   SibSp        891 non-null    int8    
 7   Parch        891 non-null    int8    
 8   Ticket       891 non-null    object  
 9   Fare         891 non-null    float64 
 10  Cabin        891 non-null    object  
 11  Embarked     891 non-null    category
dtypes: category(3), float64(2), int64(1), int8(3), object(3)
memory usage: 47.5+ KB
```

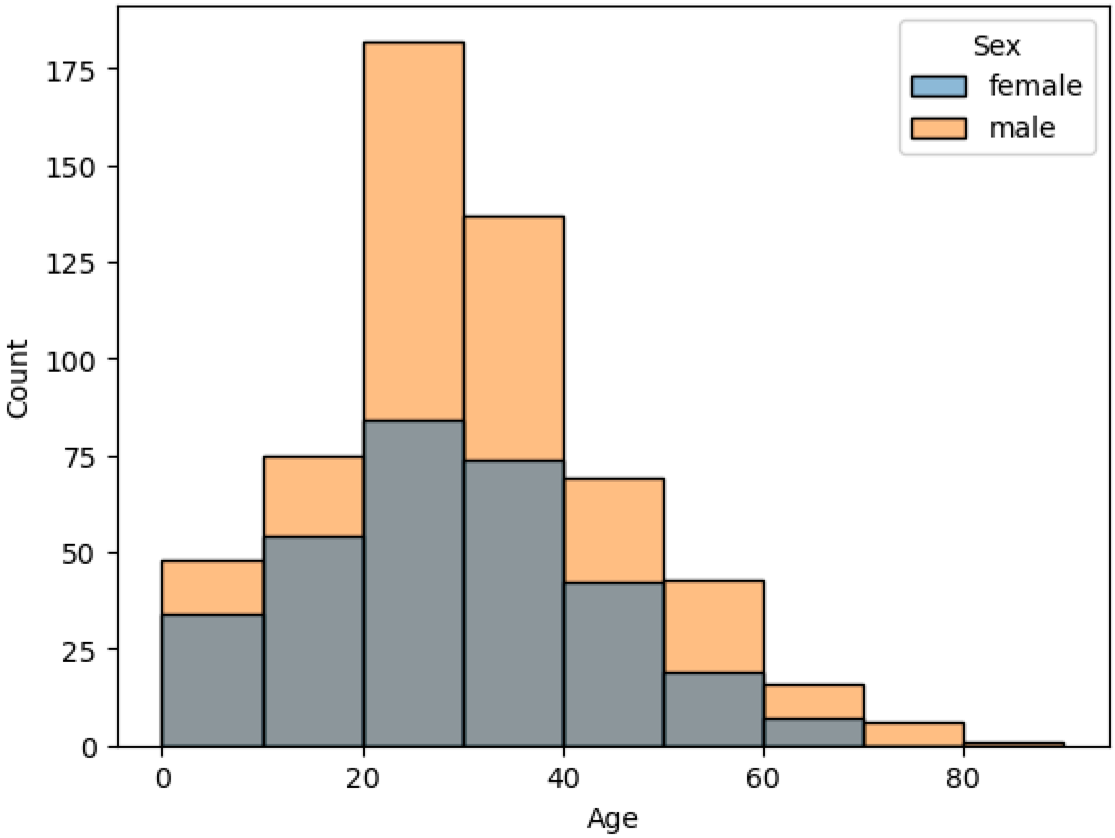
2. Univariate Analysis

- What is the distribution of 'Age' and how does it affect our understanding of the dataset?
- How would you analyze survival rates based on gender and class?

```
In [32]: # distribution of `Age` variable
         sns.histplot(data=titanic, x='Age', bins=np.arange(0, 100, 10), hue='Sex')
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1057: FutureWa
rning: The default of observed=False is deprecated and will be changed to Tr
ue in a future version of pandas. Pass observed=False to retain current beha
vior or observed=True to adopt the future default and silence this warning.
  grouped_data = data.groupby(
```

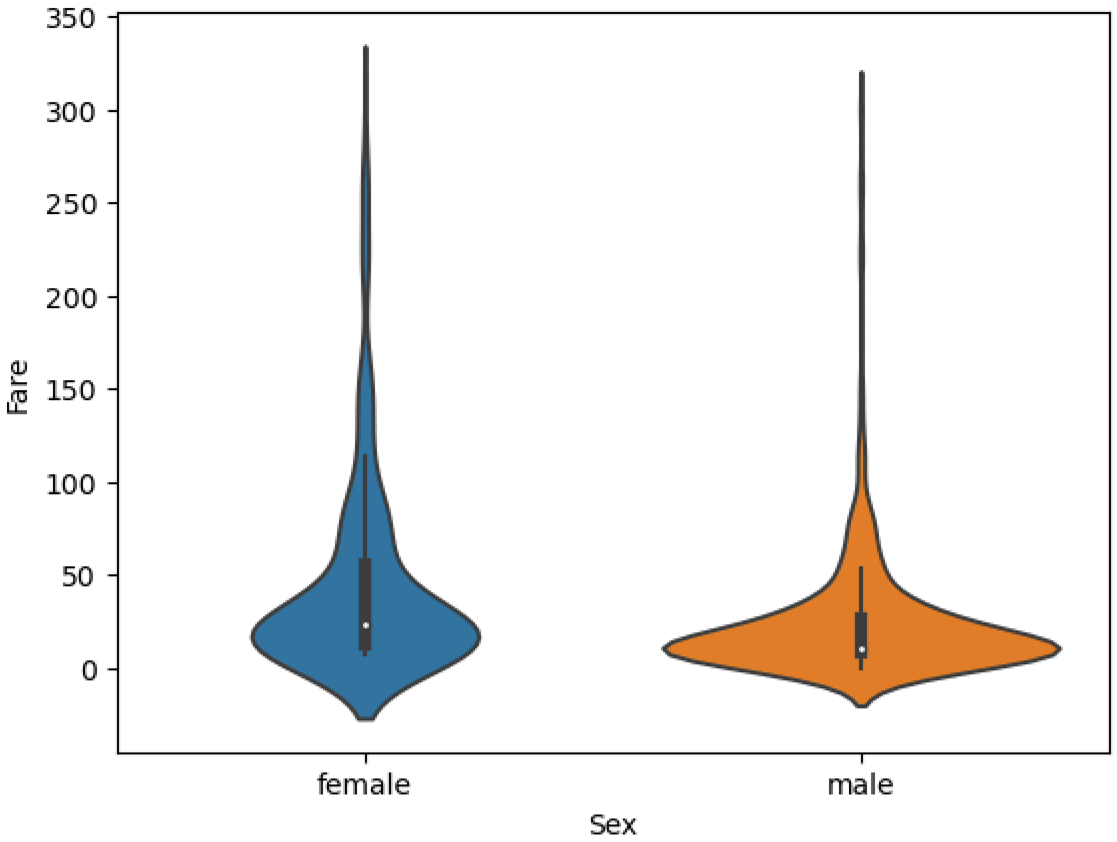
```
Out[32]: <Axes: xlabel='Age', ylabel='Count'>
```



```
In [33]: sns.violinplot(data=titanic, x='Sex', y='Fare')
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```

Out[33]: `<Axes: xlabel='Sex', ylabel='Fare'>`

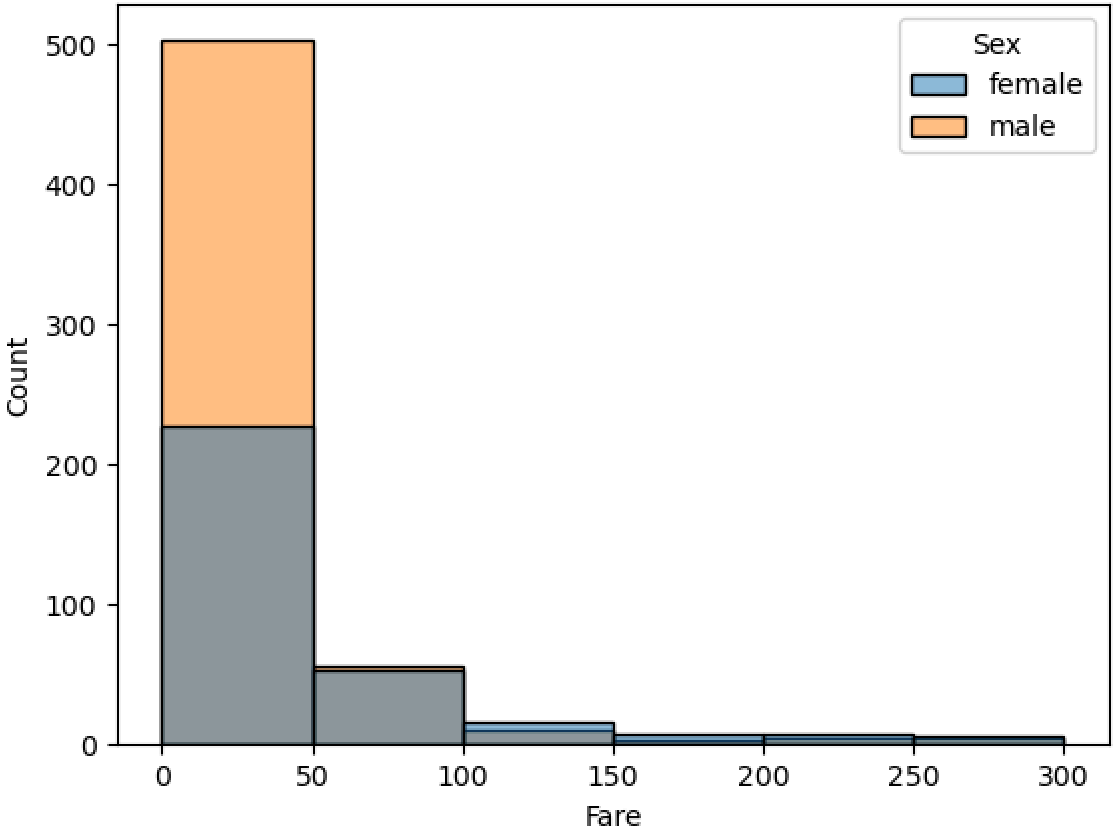


In [34]:
```python
sns.histplot(data=titanic, x='Fare', bins=np.arange(0, 350, 50), hue='Sex')
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1057: FutureWa
rning: The default of observed=False is deprecated and will be changed to Tr
ue in a future version of pandas. Pass observed=False to retain current beha
vior or observed=True to adopt the future default and silence this warning.
  grouped_data = data.groupby(
```

Out[34]: `<Axes: xlabel='Fare', ylabel='Count'>`

Loading [MathJax]/extensions/Safe.js



```
In [35]: # analysis of survival rate based on gender
         male_survived=titanic[titanic['Sex']=='male']['Survived'].mean()
```

```
In [36]: male_survived*=100
```

```
In [37]: female_survived=titanic[titanic['Sex']=='female']['Survived'].mean()*100
         female_survived
```

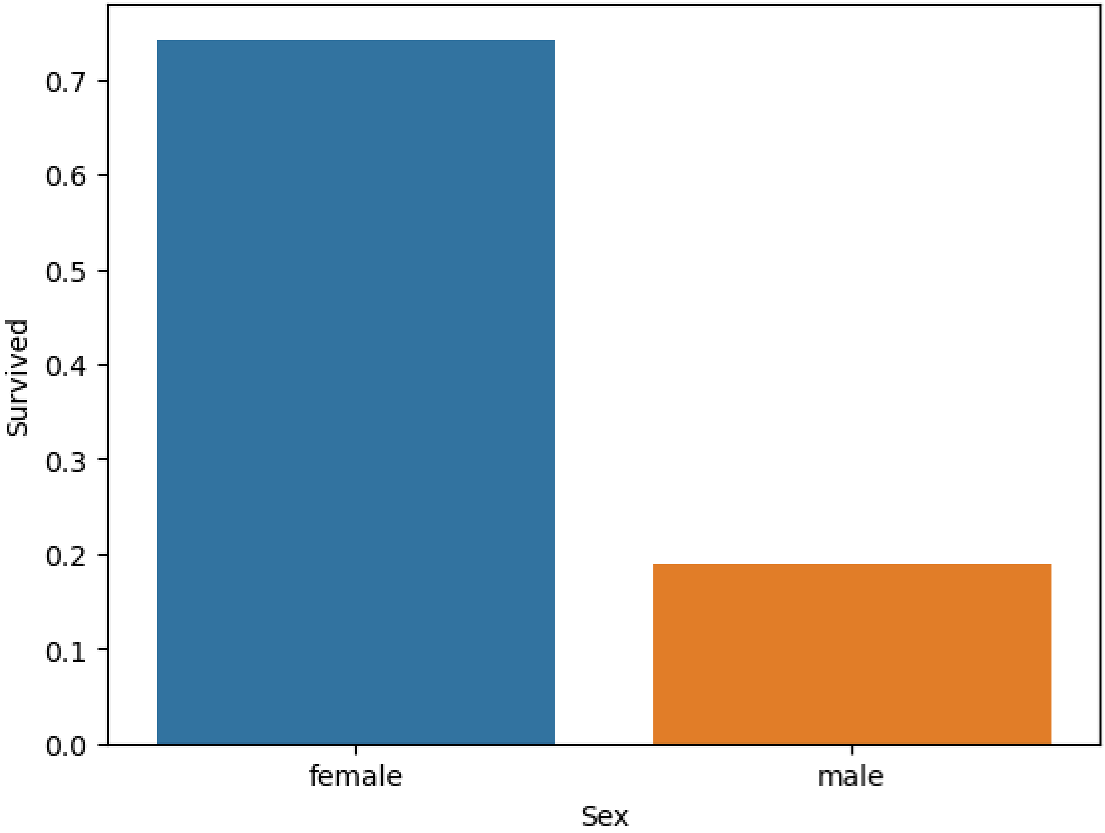
```
Out[37]: 74.20382165605095
```

```
In [38]: sns.barplot(data=titanic, x='Sex', y='Survived', errorbar=None)
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```

```
Out[38]: <Axes: xlabel='Sex', ylabel='Survived'>
```

Loading [MathJax]/extensions/Safe.js



In [39]:

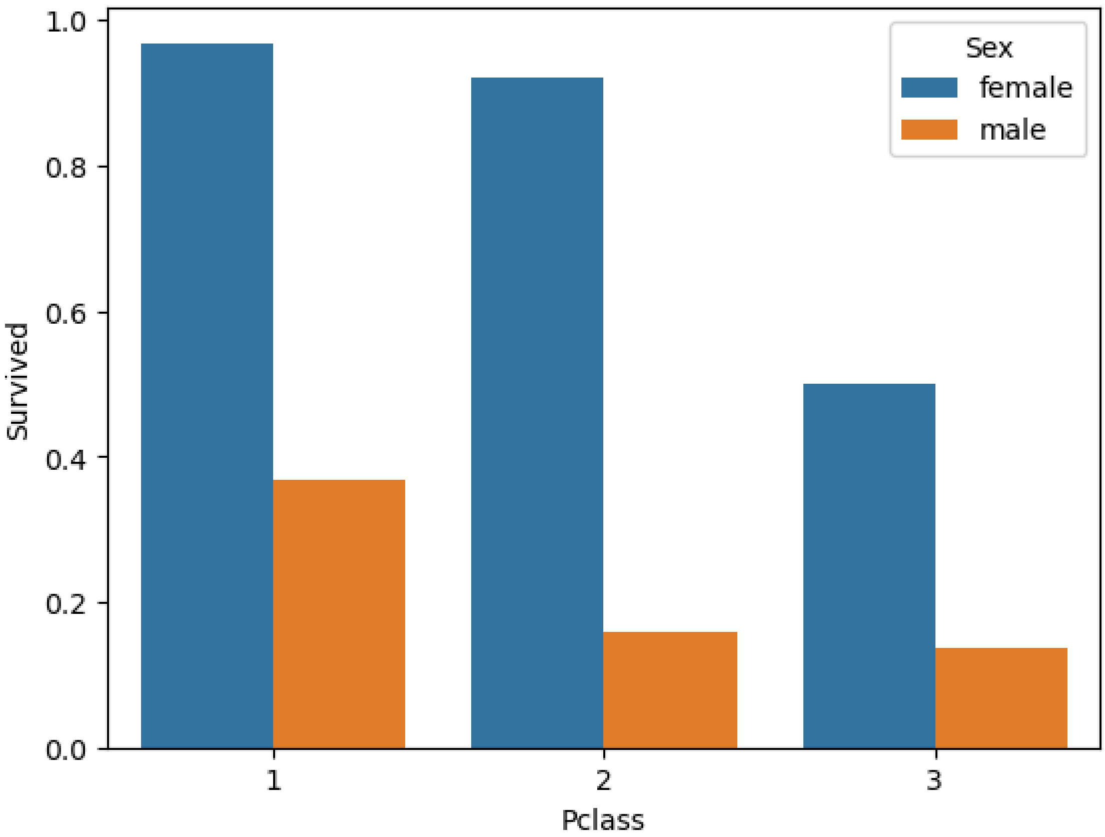
```
# How does the survival rate differ between the different passenger classes
# What are the survival rates for passengers based on their 'Pclass'?

sns.barplot(data=titanic, x='Pclass', y='Survived', hue='Sex', errorbar=None
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```

Out[39]:

```
<Axes: xlabel='Pclass', ylabel='Survived'>
```

Loading [MathJax]/extensions/Safe.js



In [40]:

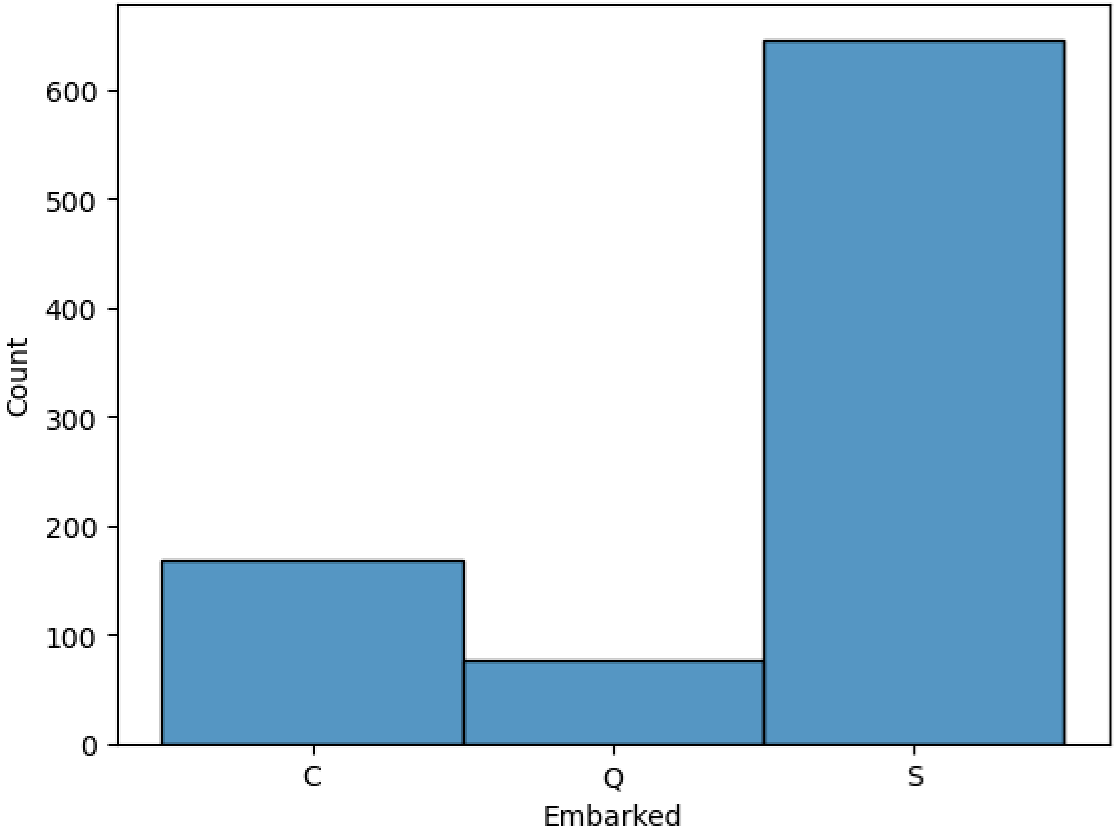
```
# distribution of Embarked variable, and it's impact on Survival rate
sns.histplot(data=titanic, x='Embarked')
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```

Out[40]:

```
<Axes: xlabel='Embarked', ylabel='Count'>
```

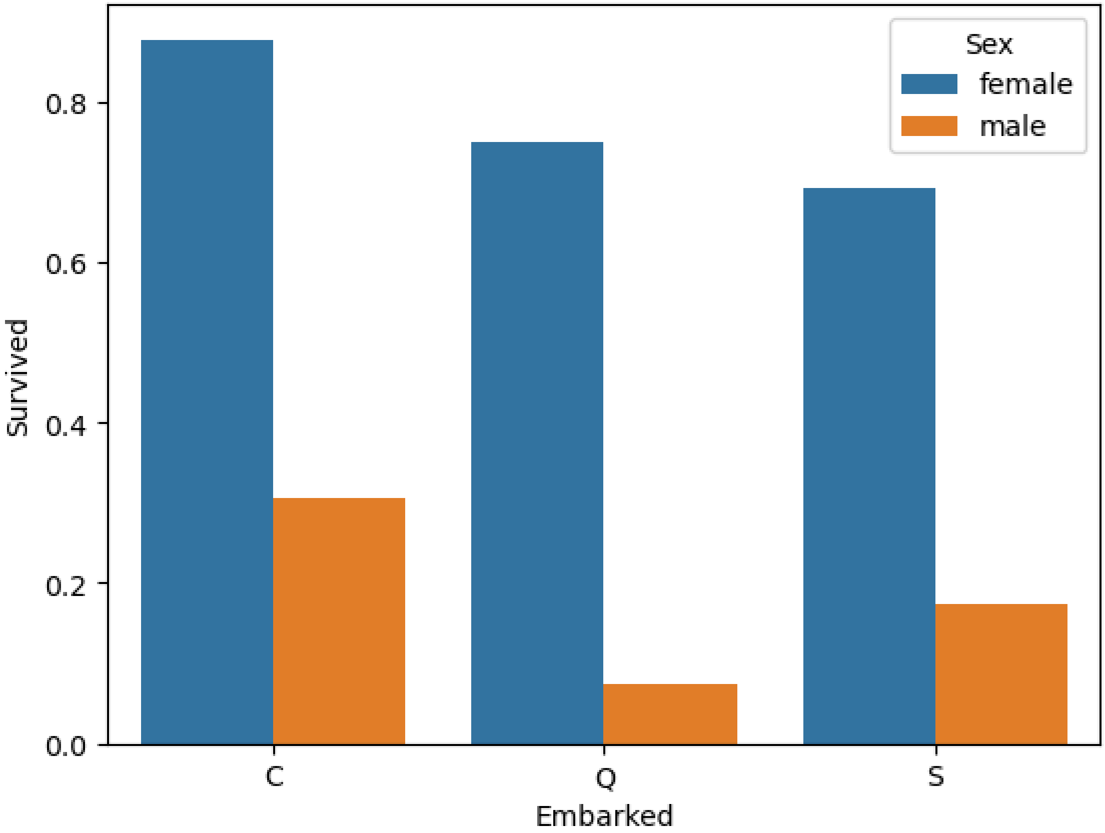
Loading [MathJax]/extensions/Safe.js



In [41]:
```
sns.barplot(data=titanic, x='Embarked', y='Survived', hue='Sex', errorbar=No
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```

Out[41]:
```
<Axes: xlabel='Embarked', ylabel='Survived'>
```



In [42]:

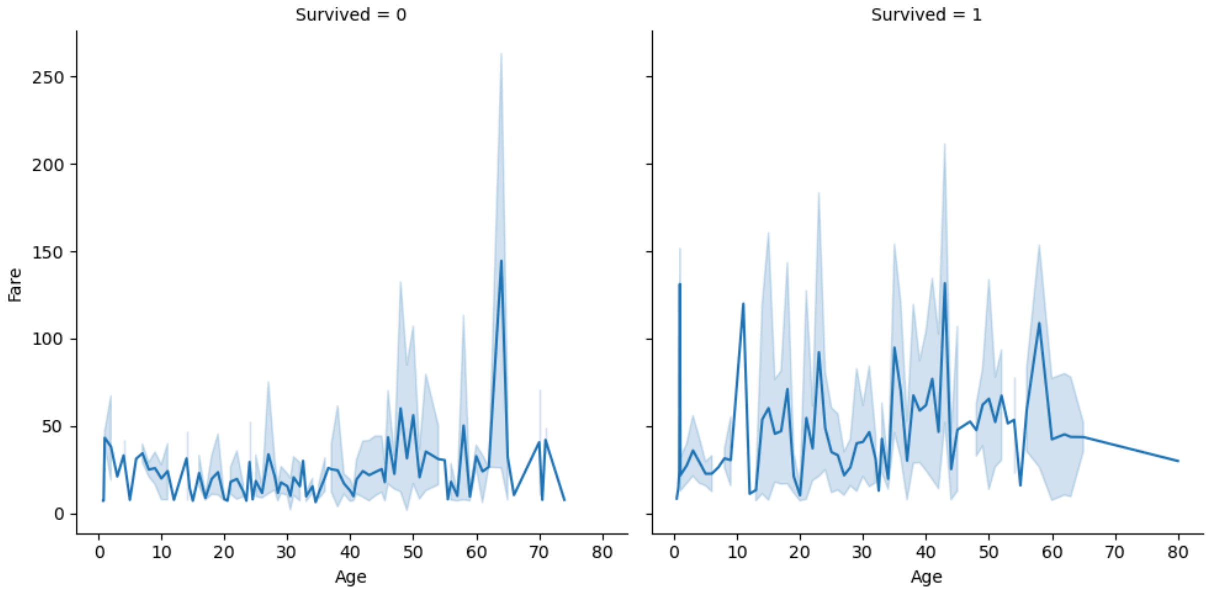
```
# How would you visualize the correlation between numeric features like 'Age
sns.relplot(kind='line', data=titanic, x='Age', y='Fare', col='Survived')
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```

Out[42]:

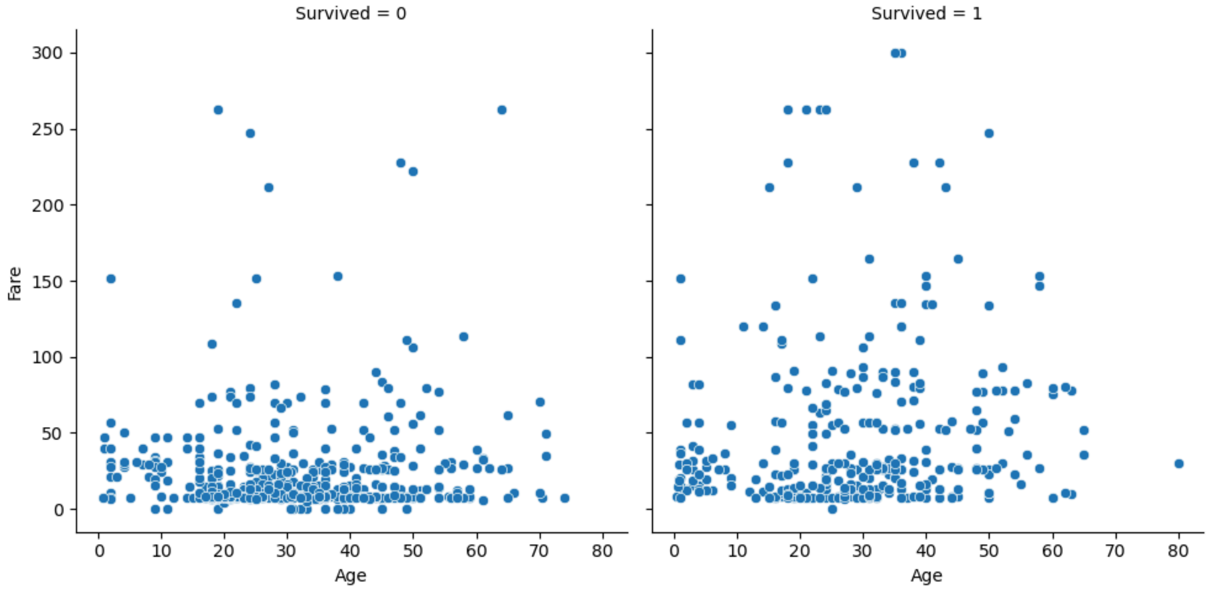
```
<seaborn.axisgrid.FacetGrid at 0x1abee9f11d0>
```

Loading [MathJax]/extensions/Safe.js



```
In [43]: sns.relplot(kind='scatter', data=titanic, x='Age', y='Fare', col='Survived')
```

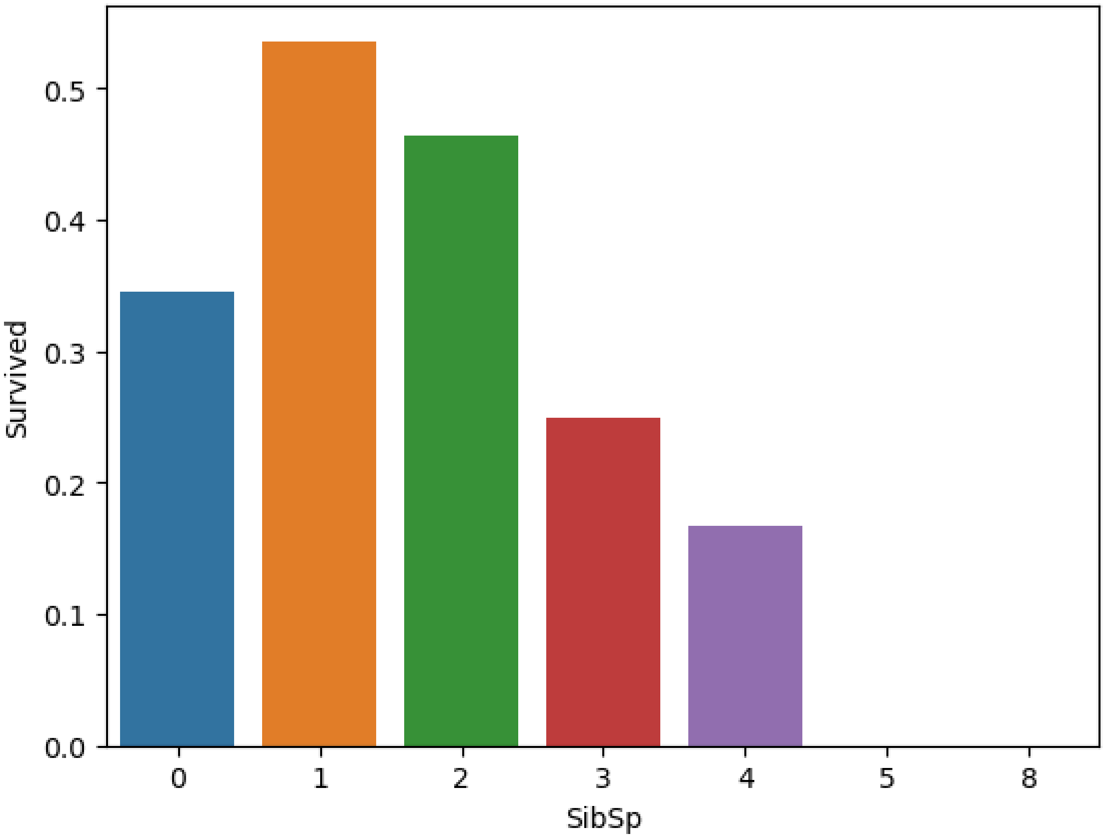
```
Out[43]: <seaborn.axisgrid.FacetGrid at 0x1abeeaaf110>
```



```
In [44]: titanic['Survive']=titanic['Survived'].apply(
             lambda x: "Yes" if x==0 else "No"
         )
```

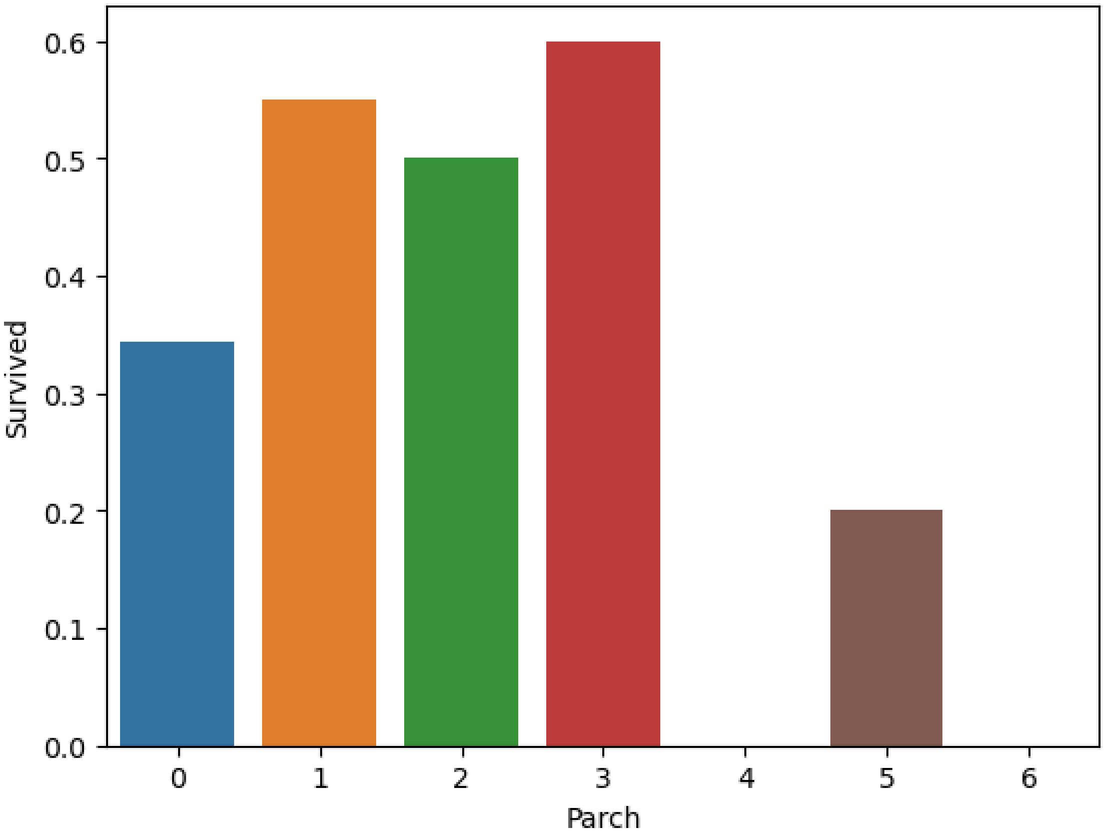
```
In [45]: # What patterns can you find from the 'SibSp' and 'Parch' columns in relatio
         sns.barplot(data=titanic, x='SibSp', y='Survived', errorbar=None)
```

```
Out[45]: <Axes: xlabel='SibSp', ylabel='Survived'>
```



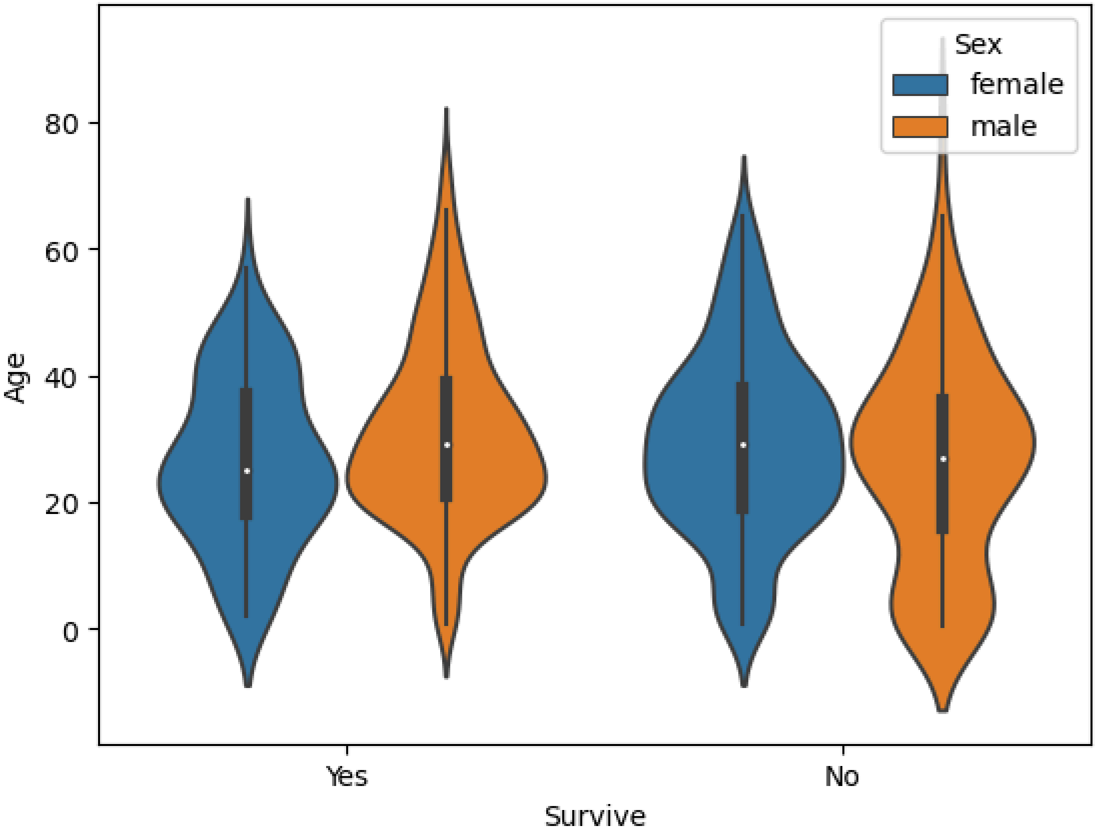
In [46]:
```
sns.barplot(data=titanic, x='Parch', y='Survived', errorbar=None)
```

Out[46]:
```
<Axes: xlabel='Parch', ylabel='Survived'>
```



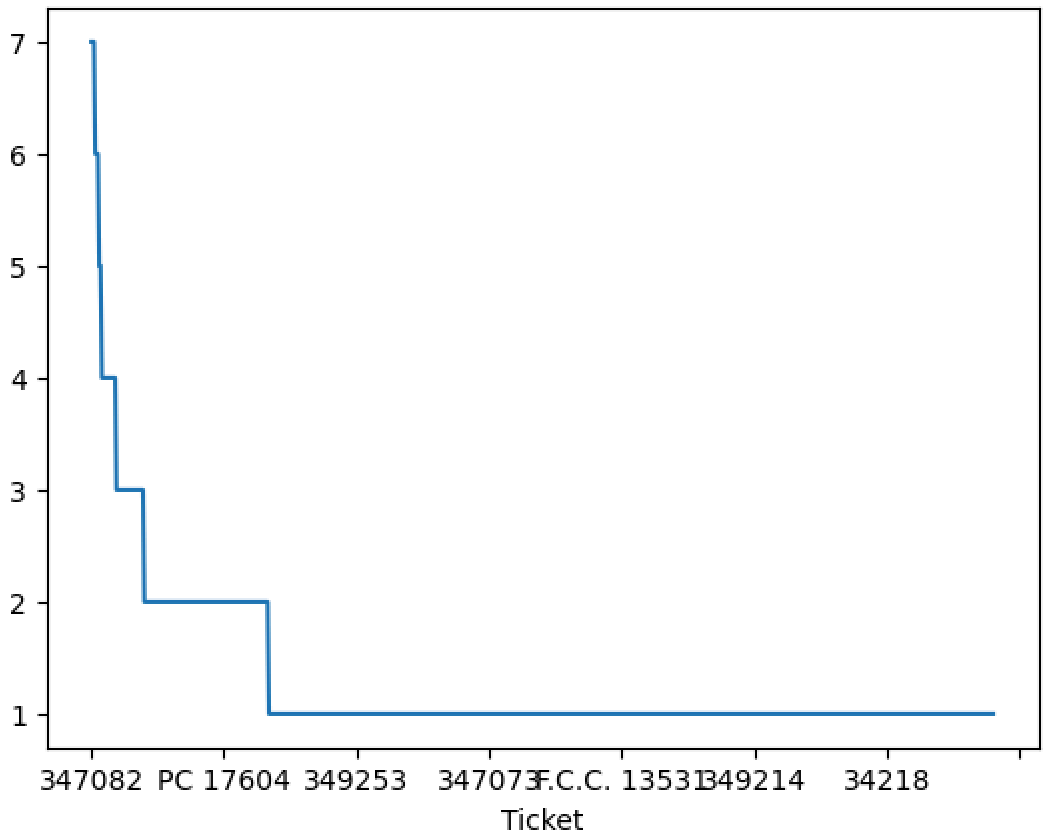
In [47]:
```
# How would you summarize the age distribution for survivors vs. non-surviv
sns.violinplot(data=titanic, x='Survive', y='Age', hue='Sex')
```

Out[47]:
```
<Axes: xlabel='Survive', ylabel='Age'>
```



In [48]:
```
# What is the distribution of the 'Ticket' feature, and does it provide any
titanic.Ticket.value_counts().sort_values(ascending=False).plot()
```

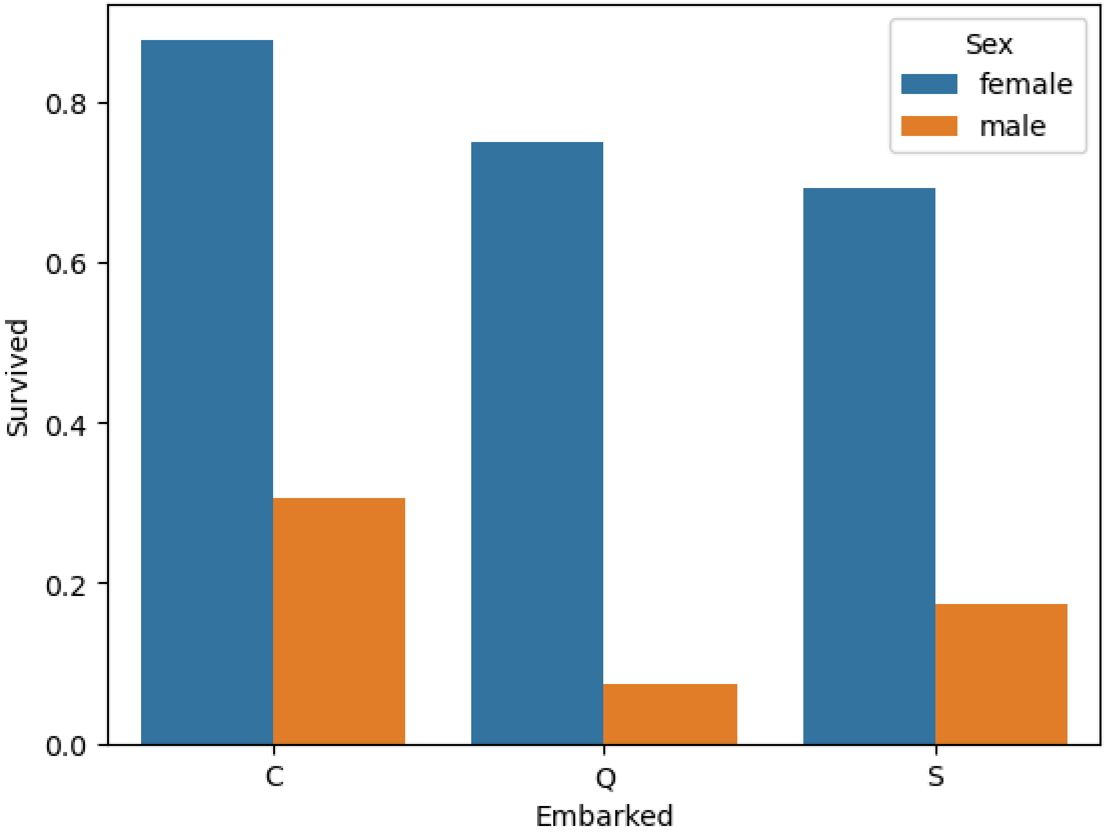
Out[48]:
```
<Axes: xlabel='Ticket'>
```



```
In [338…
# Can you visualize and compare the survival rate based on the 'Embarked' fe
sns.barplot(data=titanic, x='Embarked', y='Survived', hue='Sex', errorbar=No
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```

```
Out[338…  <Axes: xlabel='Embarked', ylabel='Survived'>
```



```
In [340…  # survial rate difference between males and females
          males=titanic[titanic['Sex']=='male']
          females=titanic[titanic['Sex']=='female']
```

```
In [350…  percentage_of_males_survived=males.Survived.sum()/males.shape[0]*100
          percentage_of_females_survived=females.Survived.sum()/females.shape[0]*100
```

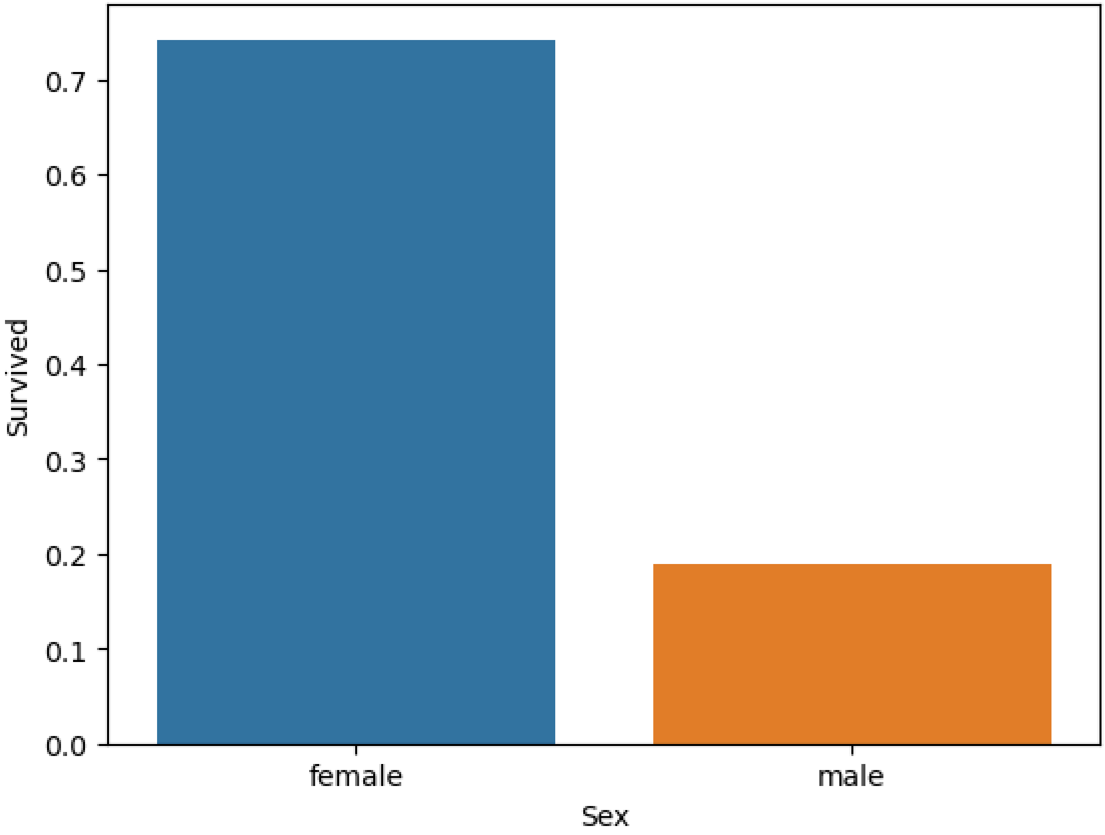
```
In [352…  percentage_of_females_survived, percentage_of_males_survived
```

```
Out[352…  (74.20382165605095, 18.890814558058924)
```

```
In [356…  # visualising the above data
          sns.barplot(data=titanic, x='Sex', y='Survived', errorbar=None)
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```

```
Out[356…  <Axes: xlabel='Sex', ylabel='Survived'>
```



In [362…

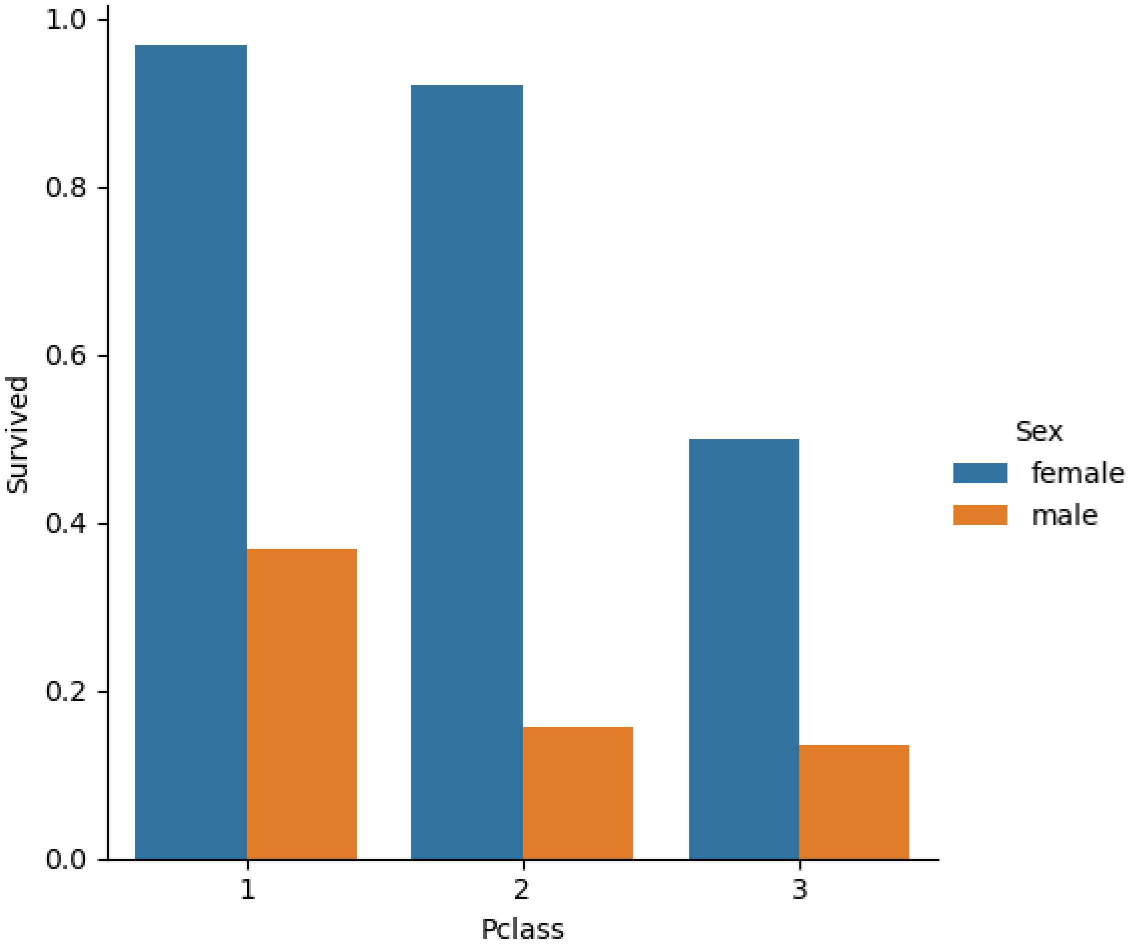
```
# relationship between Pclass and survival rate
sns.catplot(kind='bar', data=titanic, x='Pclass', y='Survived', hue='Sex', e
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```

Out[362…

```
<seaborn.axisgrid.FacetGrid at 0x1ab886d5e90>
```

Loading [MathJax]/extensions/Safe.js

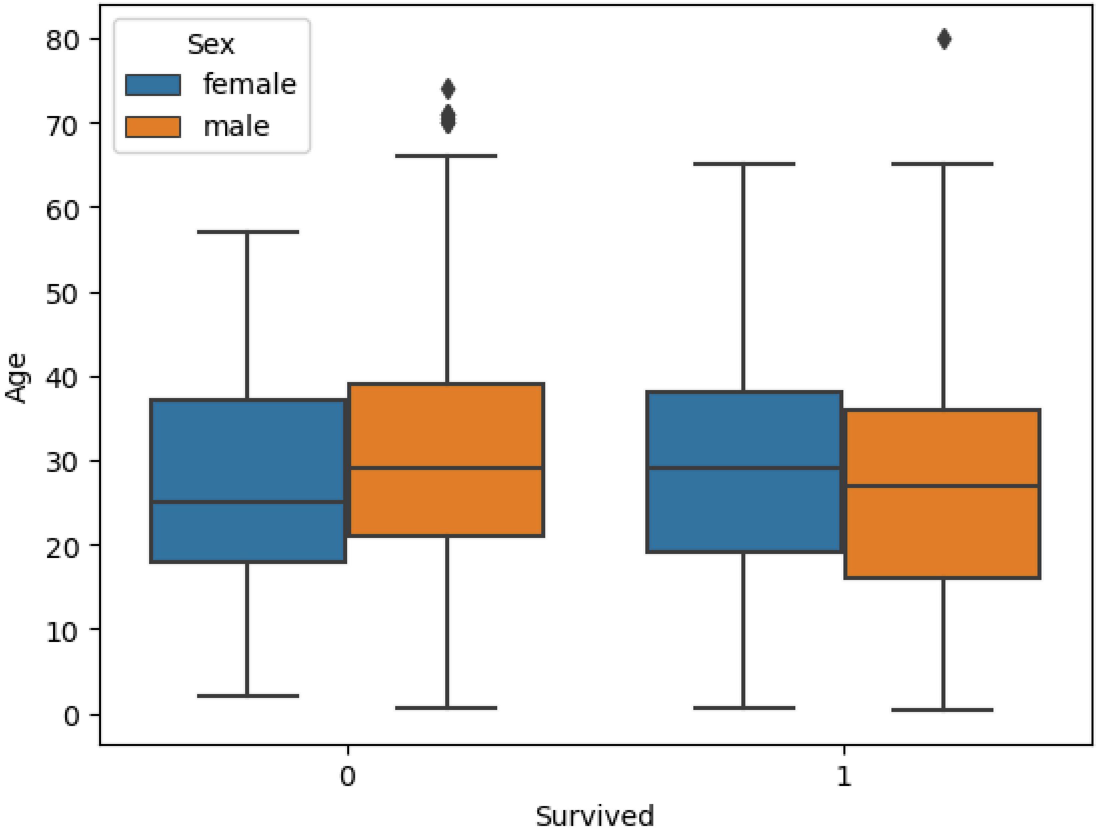


In [366…

```
# Age distribution across different survival outcome
sns.boxplot(data=titanic, x='Survived', y='Age', hue='Sex')
```

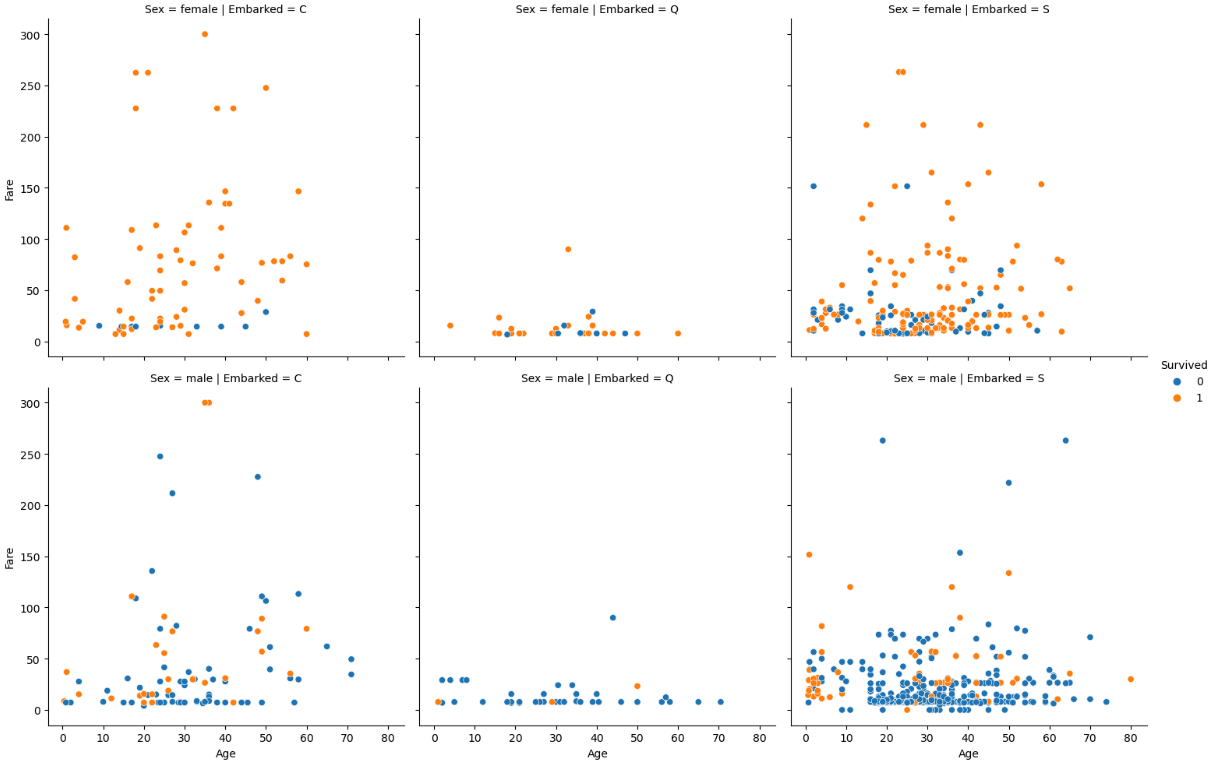
Out[366…

```
<Axes: xlabel='Survived', ylabel='Age'>
```



```
In [378…  # What is the correlation between 'Age' and 'Fare'? Does it suggest any unde
          sns.relplot(kind='scatter', data=titanic, x='Age', y='Fare', col='Embarked',
```

```
Out[378…  <seaborn.axisgrid.FacetGrid at 0x1ab8aa01490>
```



Loading [MathJax]/extensions/Safe.js

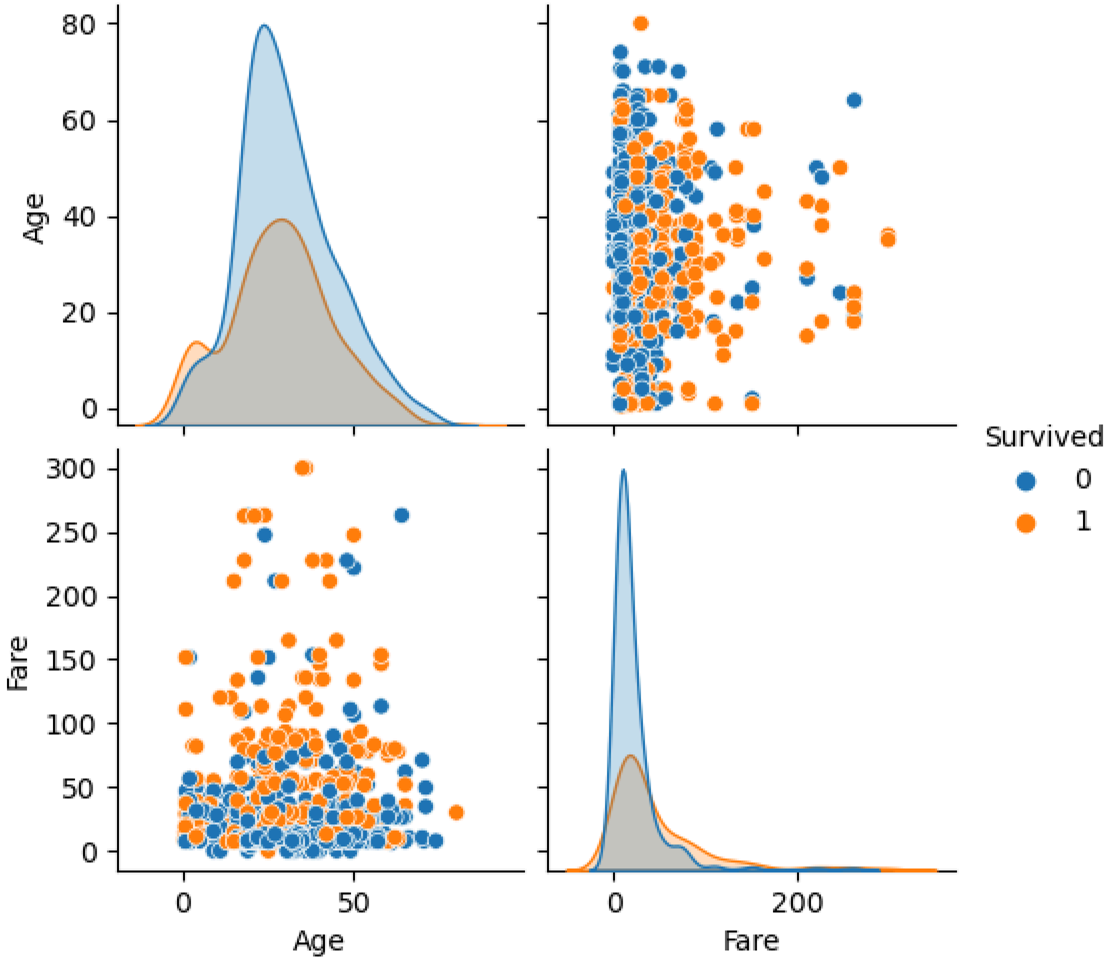
In [386…

```
# Can you use Seaborn’s pairplot to explore relationships between 'Age', 'Fa
sns.pairplot(
    data=titanic[['Age', 'Fare', 'Survived']],
    hue='Survived'
)
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```

Out[386…

```
<seaborn.axisgrid.PairGrid at 0x1ab8ec35f10>
```



In [390…

```
# visualising Pclass and Fare
sns.catplot(kind='bar', data=titanic, x='Pclass', y='Fare', hue='Survive', c
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
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g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
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g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```
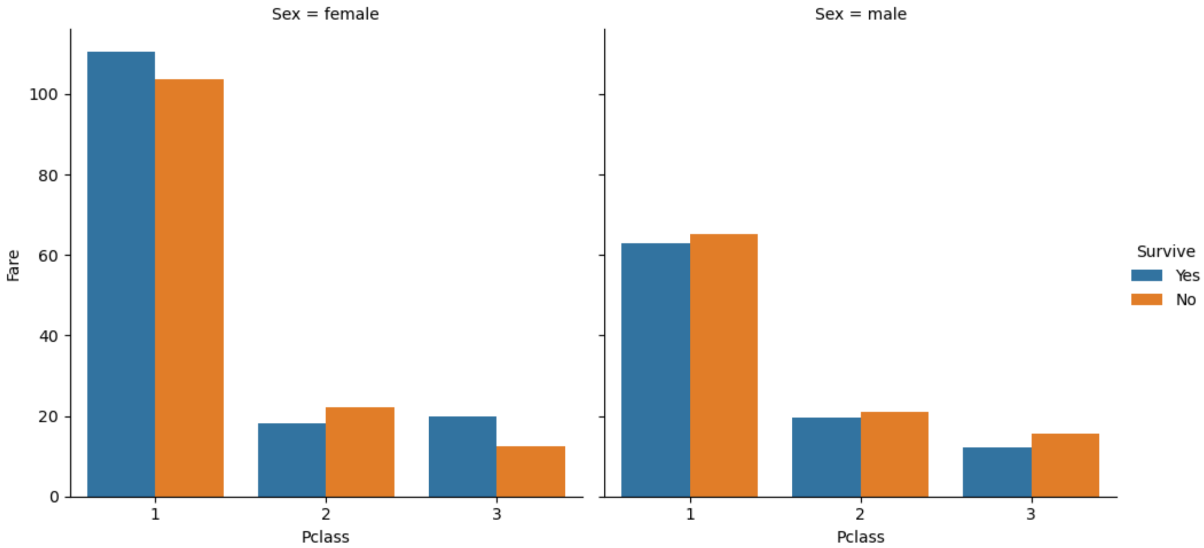
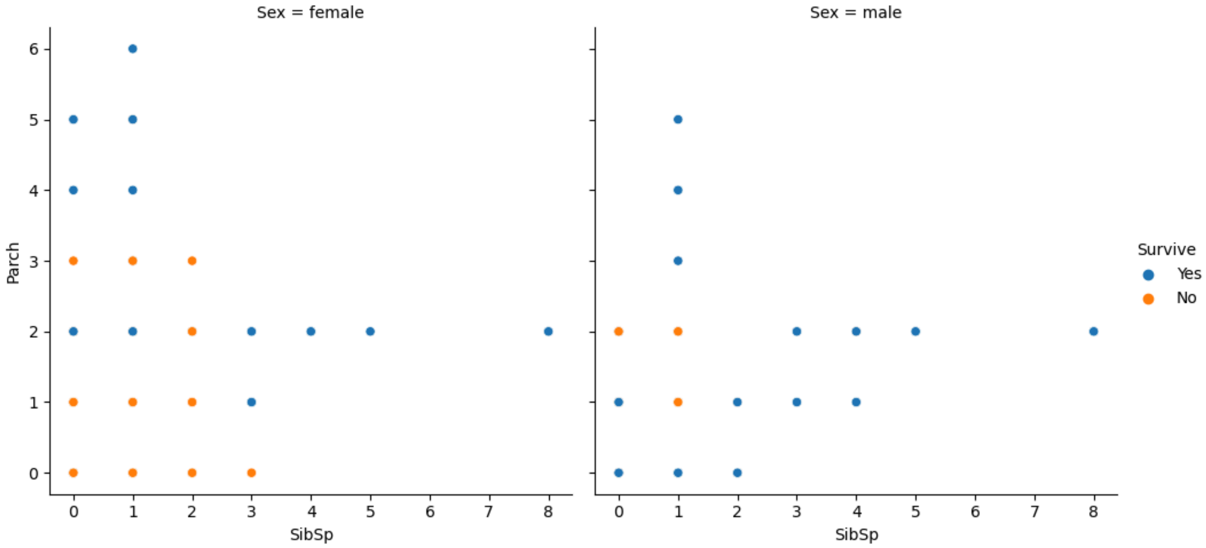

```
Out[390…  <seaborn.axisgrid.FacetGrid at 0x1ab8f94e5d0>
```



```
In [406…  # How does the survival rate vary with both 'SibSp' and 'Parch' columns toge

          sns.relplot(kind='scatter', data=titanic, x='SibSp', y='Parch', hue='Survive
```

```
Out[406…  <seaborn.axisgrid.FacetGrid at 0x1ab8eefec90>
```

Loading [MathJax]/extensions/Safe.js



```
In [412… # How does the 'Embarked' feature influence survival, and does it differ acr
         sns.catplot(kind='bar', data=titanic, x='Pclass', y='Survived', errorbar=Nor
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
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g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```
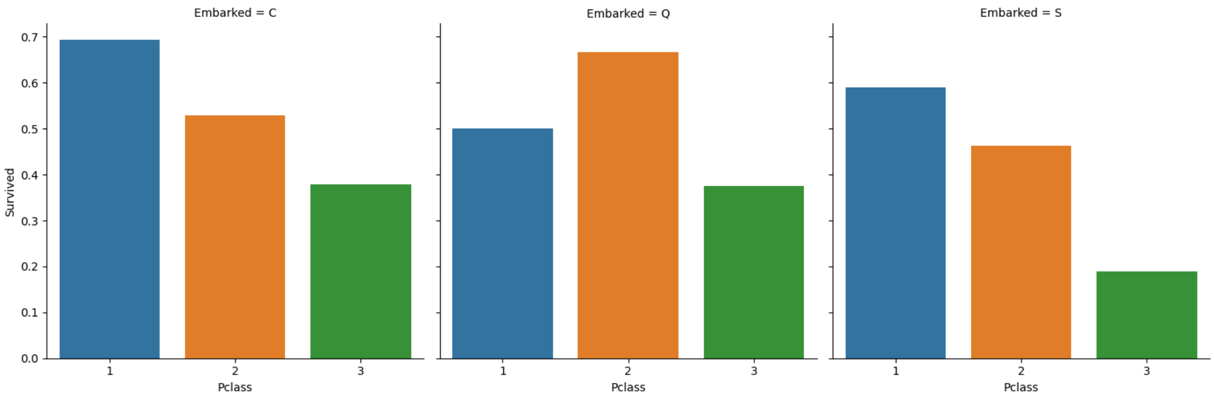

```
Out[412… <seaborn.axisgrid.FacetGrid at 0x1ab9183a990>
```

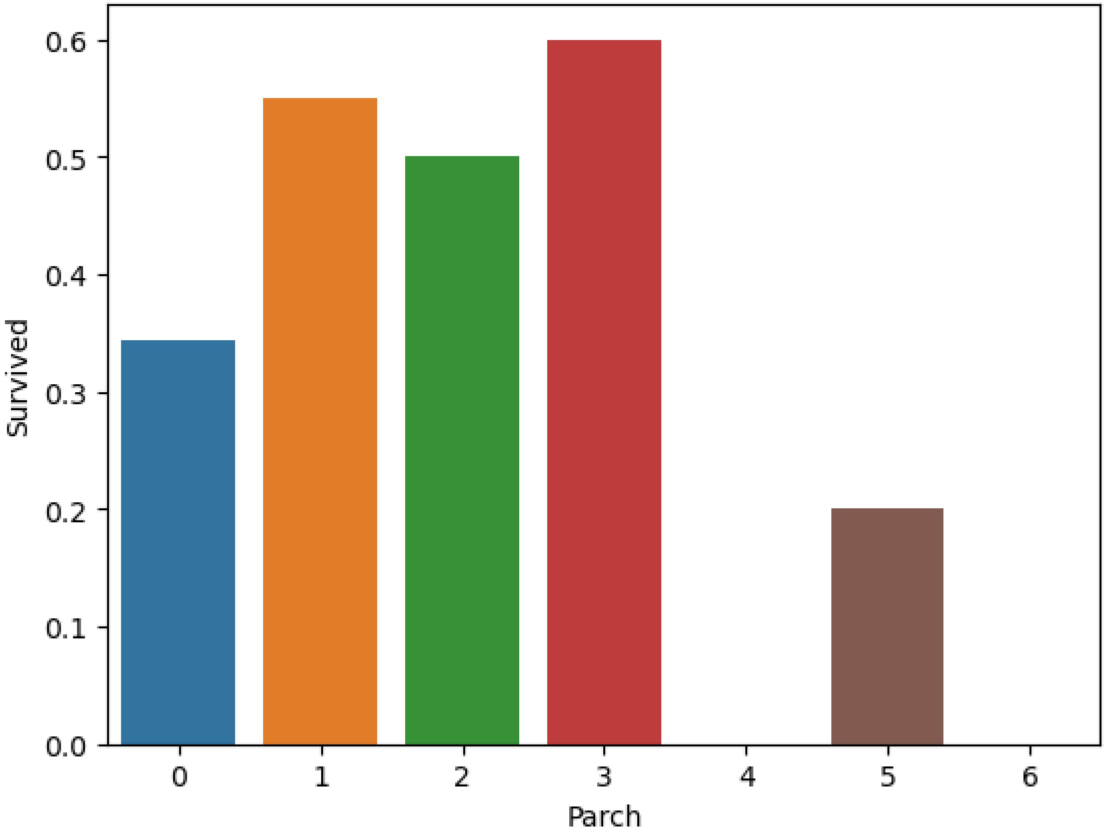


In [416…

```
# Parch relation with survival, SibSp relation with survival

sns.barplot(data=titanic, x='Parch', y='Survived', errorbar=None)
```

Out[416…

```
<Axes: xlabel='Parch', ylabel='Survived'>
```



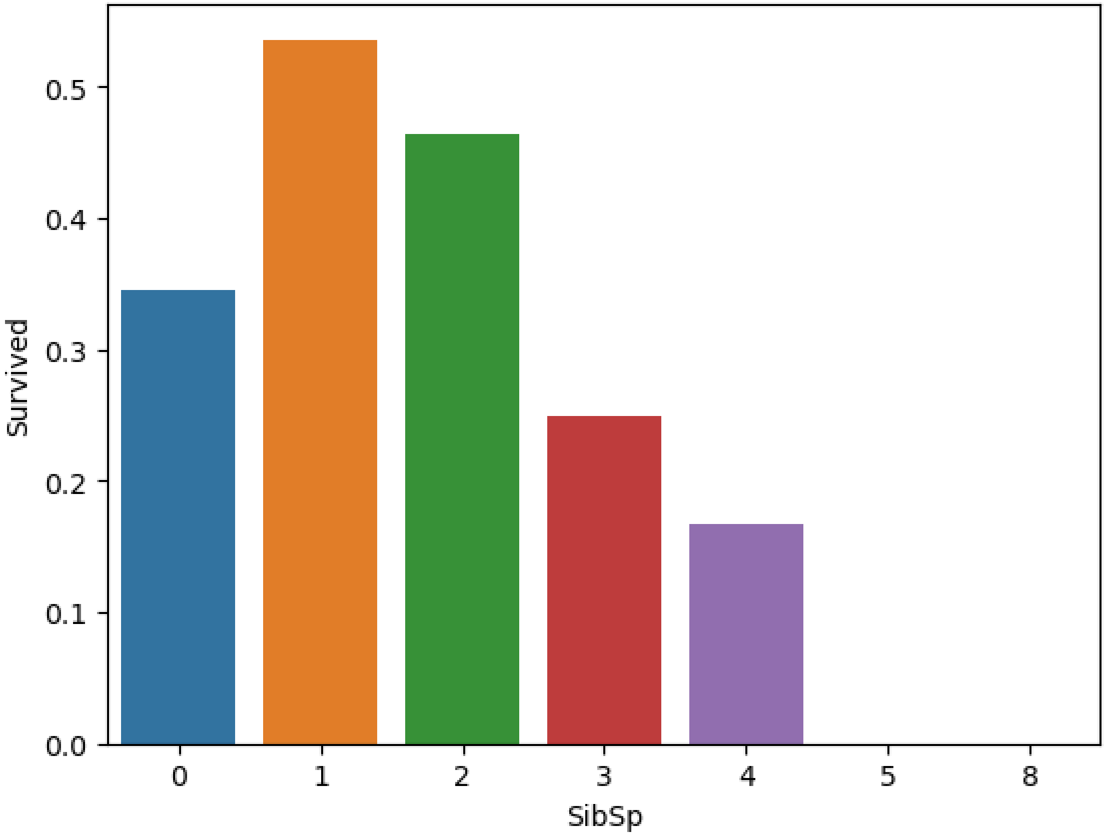
In [418…

```
sns.barplot(data=titanic, x='SibSp', y='Survived', errorbar=None)
```

Out[418…

```
<Axes: xlabel='SibSp', ylabel='Survived'>
```

Loading [MathJax]/extensions/Safe.js

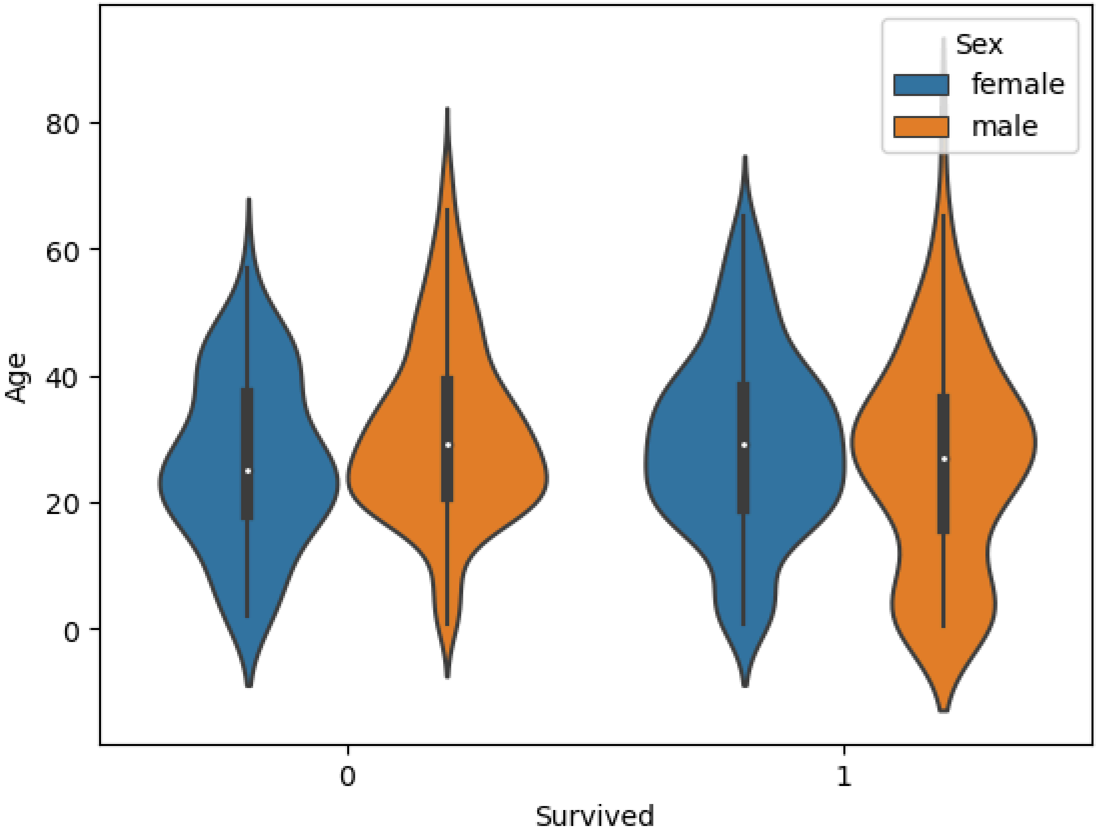


In [424…

```
# Age and Fare Distribution

sns.violinplot(data=titanic, x='Survived', y='Age', hue='Sex')
```

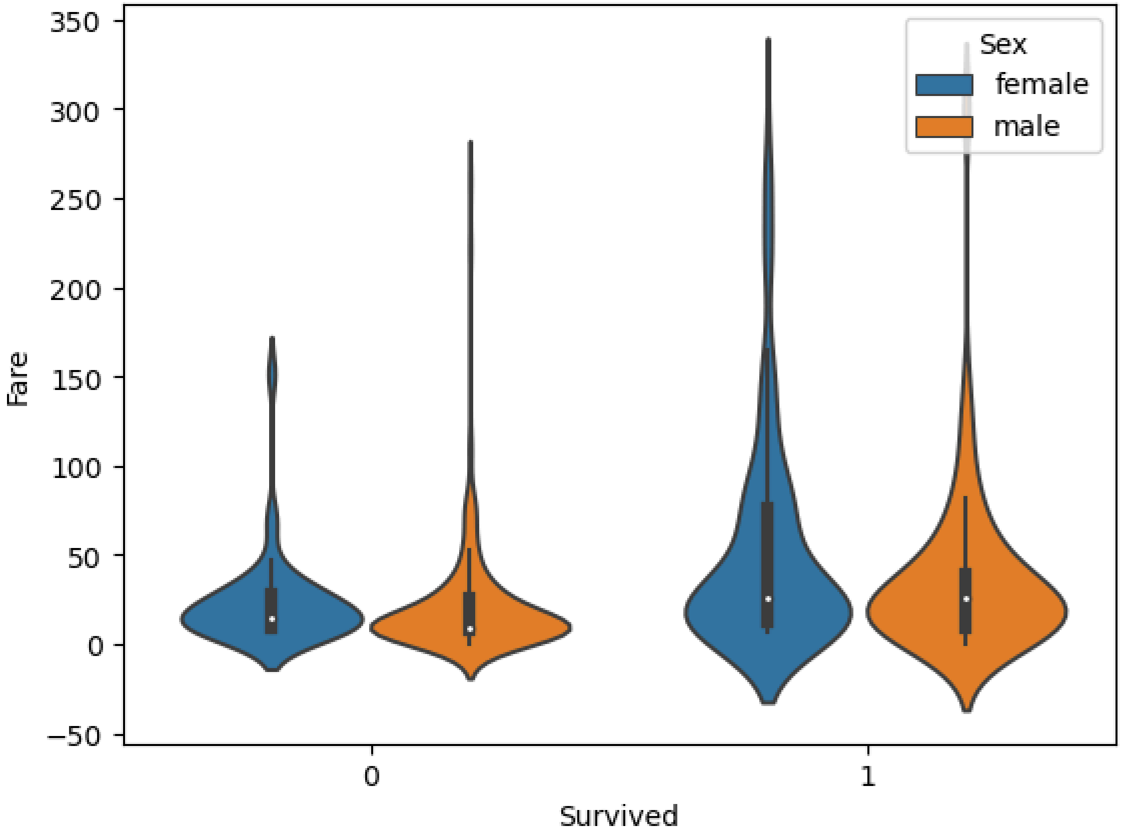
Out[424…

```
<Axes: xlabel='Survived', ylabel='Age'>
```



```
In [426…  sns.violinplot(data=titanic, x='Survived', y='Fare', hue='Sex')
```

```
Out[426…  <Axes: xlabel='Survived', ylabel='Fare'>
```



Loading [MathJax]/extensions/Safe.js

In [ ]:

```

```

3. Feature Engineering

- Can you create a 'Family Size' feature by combining 'SibSp' and 'Parch'?
- How would you extract titles from the 'Name' column and use them in the analysis?

In [51]:

```
# creating new feature using SibSp and Parch
titanic['FamilySize']=titanic.SibSp+titanic.Parch
```

In [114…

```
# Can you create a 'Title' feature from the 'Name' column (e.g., Mr., Mrs.,
# first extract the names from the given dataframe
fullname=titanic.Name
fullname
```

Out[114…

```
0                                  Braund, Mr. Owen Harris
1        Cumings, Mrs. John Bradley (Florence Briggs Th...
2                                   Heikkinen, Miss. Laina
3             Futrelle, Mrs. Jacques Heath (Lily May Peel)
4                                 Allen, Mr. William Henry
                             ...
886                                  Montvila, Rev. Juozas
887                           Graham, Miss. Margaret Edith
888               Johnston, Miss. Catherine Helen "Carrie"
889                                  Behr, Mr. Karl Howell
890                                    Dooley, Mr. Patrick
Name: Name, Length: 891, dtype: object
```

In [122…

```
# now split the name on the basis of (,)
lastname=fullname.apply(
    lambda name: name.split(',')[0]
)
```

In [132…

```
firstname=fullname.apply(
    lambda name: name.split(',')[1]
)
firstname=firstname.str.strip() # this will remove the trailing spaces from
```

In [148…

```
title=firstname.apply(lambda val: val.split(" ", 1)[0]).str.strip('.')
titanic['Title']=title
```

In [152…

```
titanic.sample(5)
```

Out[152…

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Tick
677	678	1	3	Turja, Miss. Anna Sofia	female	18.0	0	0	41
105	106	0	3	Mionoff, Mr. Stoytcho	male	28.0	0	0	3492
129	130	0	3	Ekstrom, Mr. Johan	male	45.0	0	0	3470
329	330	1	1	Hippach, Miss. Jean Gertrude	female	16.0	0	1	1113
141	142	1	3	Nysten, Miss. Anna Sofia	female	22.0	0	0	3470

In [162…
```
# Would you create a 'Fare per Person' feature? If so, how would it be usefu
total_fare=titanic.Fare.sum()
total_fare
```

Out[162…
```
28056.9617
```

In [164…
```
# fare per person, calculating using total_fare/total_persons
total_fare/titanic.shape[0]
```

Out[164…
```
31.489294837261504
```

In [177…
```
# How can you extract useful information from the 'Cabin' column by splittir
cabin_letter=titanic.Cabin.str.strip().apply(lambda cabin_name: cabin_name[0
```

In [201…
```
def filter_cabin_no(vals):
    res=[]

    for name in vals.strip().split(" "):
        res.append(name[1:])
    return ",".join(res)
```

In [207…
```
cabin_no=titanic.Cabin.str.strip().apply(filter_cabin_no)
```

In [216…
```
titanic['Cabin No.']=cabin_no
titanic['Deck']=cabin_letter
```

In [222…
```
titanic.sample(5)
```

Loading [MathJax]/extensions/Safe.js

Out[222…

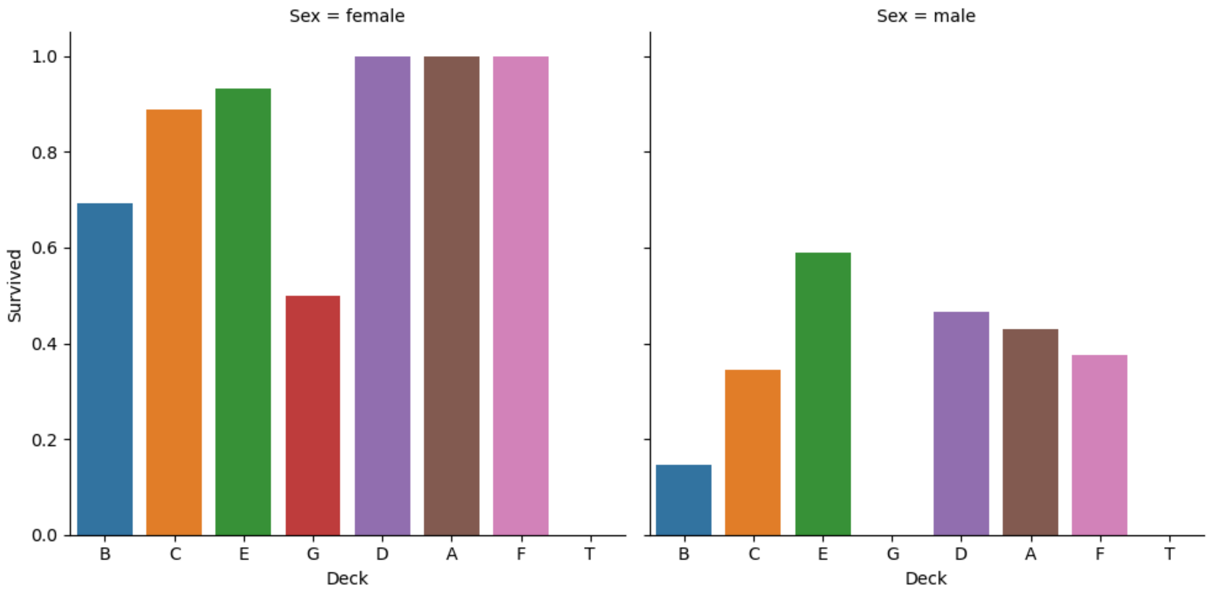
	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Tic
388	389	0	3	Sadlier, Mr. Matthew	male	36.0	0	0	367
532	533	0	3	Elias, Mr. Joseph Jr	male	17.0	1	1	2
616	617	0	3	Danbom, Mr. Ernst Gilbert	male	34.0	1	1	347
867	868	0	1	Roebling, Mr. Washington Augustus II	male	31.0	0	0	17
509	510	1	3	Lang, Mr. Fang	male	26.0	0	0	1

In [232…

```
# how deck impact survival analysis
sns.catplot(kind='bar', data=titanic, x='Deck', y='Survived', errorbar=None,
```

Out[232…

```
<seaborn.axisgrid.FacetGrid at 0x1abf58d1d50>
```



In [269…

```
# How could you categorize passengers into different age groups (e.g., child

# considering the child: whose age is below or equal to 18
# adult: age greater than or equal to 50
# seniors: age greater than 50 are all considered as seniors
```

In [251…

```
def categorise_age_into_groups(age):
    if age<=18:
        return 'C' # means it's a children
    elif age>18 and age<=50:
        return 'A' # meaning an adult
    else:
        return 'S' # otherwise it would be a senior
```

In [259…

```
res=titanic.Age.apply(categorise_age_into_groups)
```

In [265…

```
titanic['AgeGroup']=res.astype('category')
```

In [267…

```
titanic.sample(5)
```

Out[267…

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	T
591	592	1	1	Stephenson, Mrs. Walter Bertram (Martha Eustis)	female	52.0	1	0	
418	419	0	2	Matthews, Mr. William John	male	30.0	0	0	
112	113	0	3	Barton, Mr. David John	male	22.0	0	0	3
823	824	1	3	Moor, Mrs. (Beila)	female	27.0	0	1	3
412	413	1	1	Minahan, Miss. Daisy E	female	33.0	1	0	

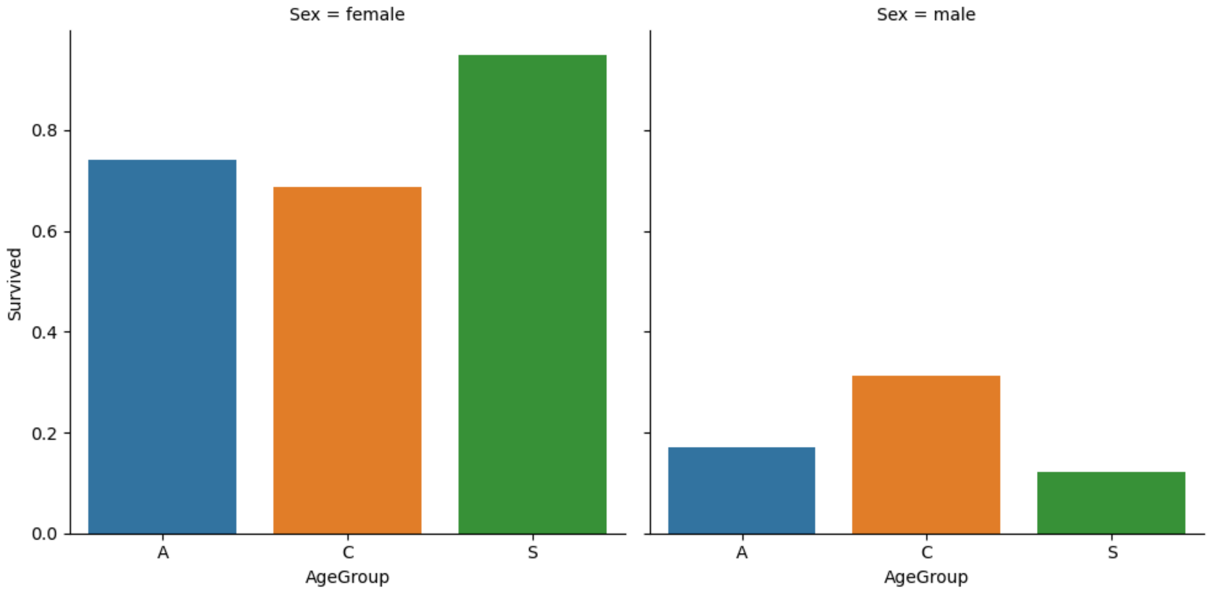
In [273…

```
# visulaising survival rate of age groups
sns.catplot(kind='bar', data=titanic, x='AgeGroup', y='Survived', col='Sex',
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```

Out[273…

```
<seaborn.axisgrid.FacetGrid at 0x1abf58e8310>
```



```
In [ ]:
```

4. Data Visualization

- How do you visualize the correlation between 'Age' and 'Survived'?
- Can you use a stacked bar plot to compare survival rates across classes and genders?

```
In [279…
# What can you conclude from visualizing survival rates using a heatmap of c
titanic.info()
```

Loading [MathJax]/extensions/Safe.js

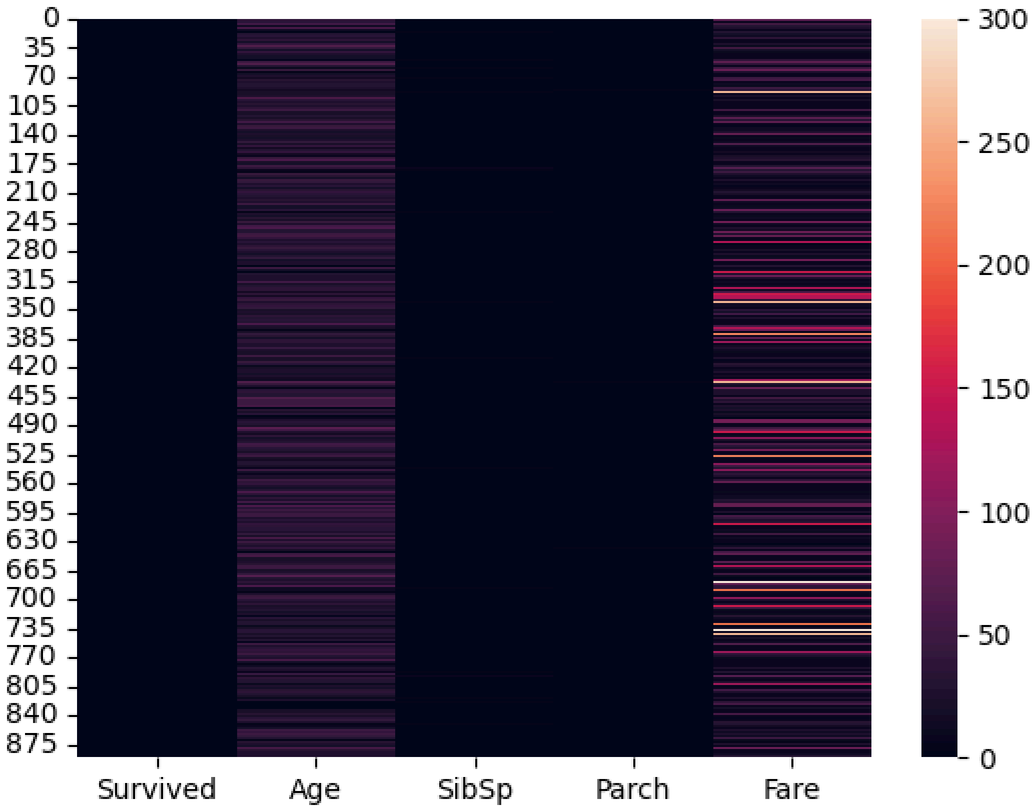
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 18 columns):
 #   Column       Non-Null Count  Dtype   
---  ------       --------------  -----   
 0   PassengerId  891 non-null    int64   
 1   Survived     891 non-null    int8    
 2   Pclass       891 non-null    category
 3   Name         891 non-null    object  
 4   Sex          891 non-null    category
 5   Age          891 non-null    float64 
 6   SibSp        891 non-null    int8    
 7   Parch        891 non-null    int8    
 8   Ticket       891 non-null    object  
 9   Fare         891 non-null    float64 
 10  Cabin        891 non-null    object  
 11  Embarked     891 non-null    category
 12  Survive      891 non-null    object  
 13  FamilySize   891 non-null    int8    
 14  Title        891 non-null    object  
 15  Cabin No.    891 non-null    object  
 16  Deck         891 non-null    object  
 17  AgeGroup     891 non-null    category
dtypes: category(4), float64(2), int64(1), int8(4), object(7)
memory usage: 77.2+ KB
```

In [287…

```
sns.heatmap(data=titanic[
    [ 'Survived', 'Age', 'SibSp', 'Parch', 'Fare']
])
```

Out[287…

```
<Axes: >
```



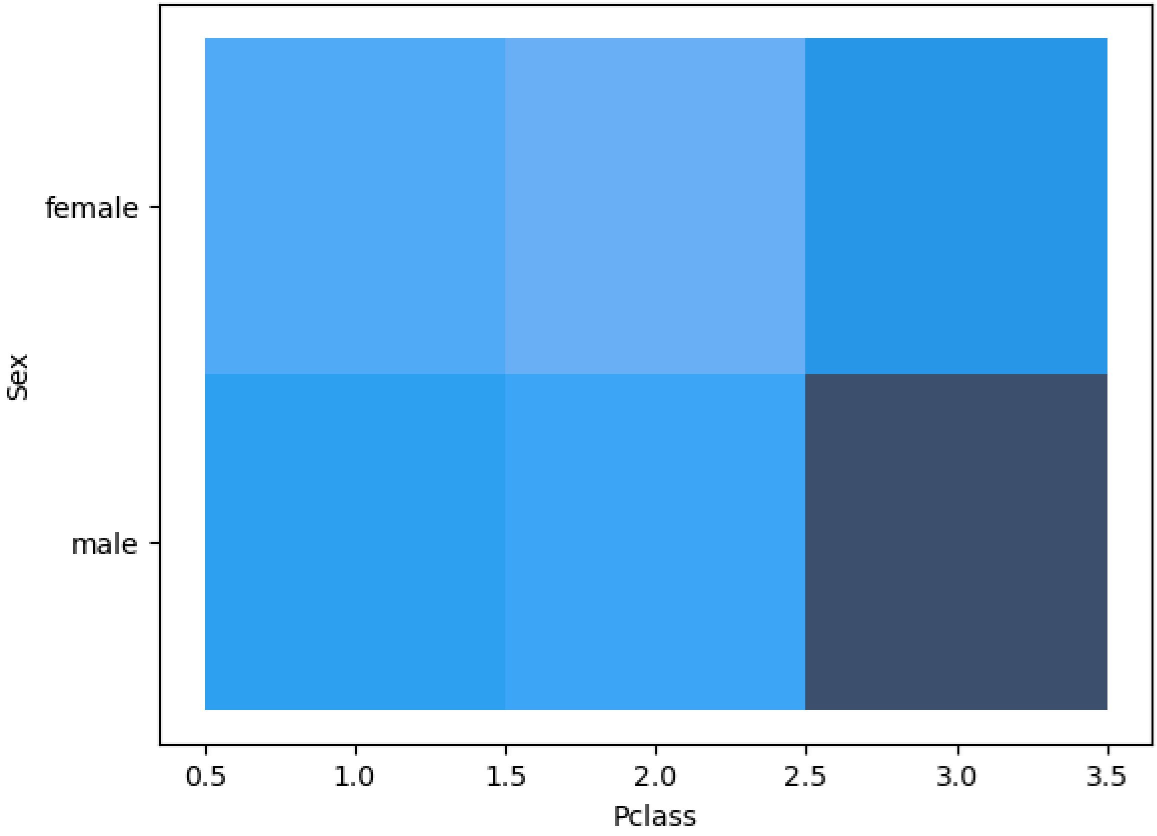
In [297…

```
# stacked bar chart for gender and passenger class
sns.histplot(
    multiple='stack',
    data=titanic,
    y='Sex',
    x='Pclass'
)
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
C:\Users\user\anaconda3\Lib\site-packages\seaborn\_oldcore.py:1119: FutureWa
rning: use_inf_as_na option is deprecated and will be removed in a future ve
rsion. Convert inf values to NaN before operating instead.
  with pd.option_context('mode.use_inf_as_na', True):
```

Out[297…

```
<Axes: xlabel='Pclass', ylabel='Sex'>
```

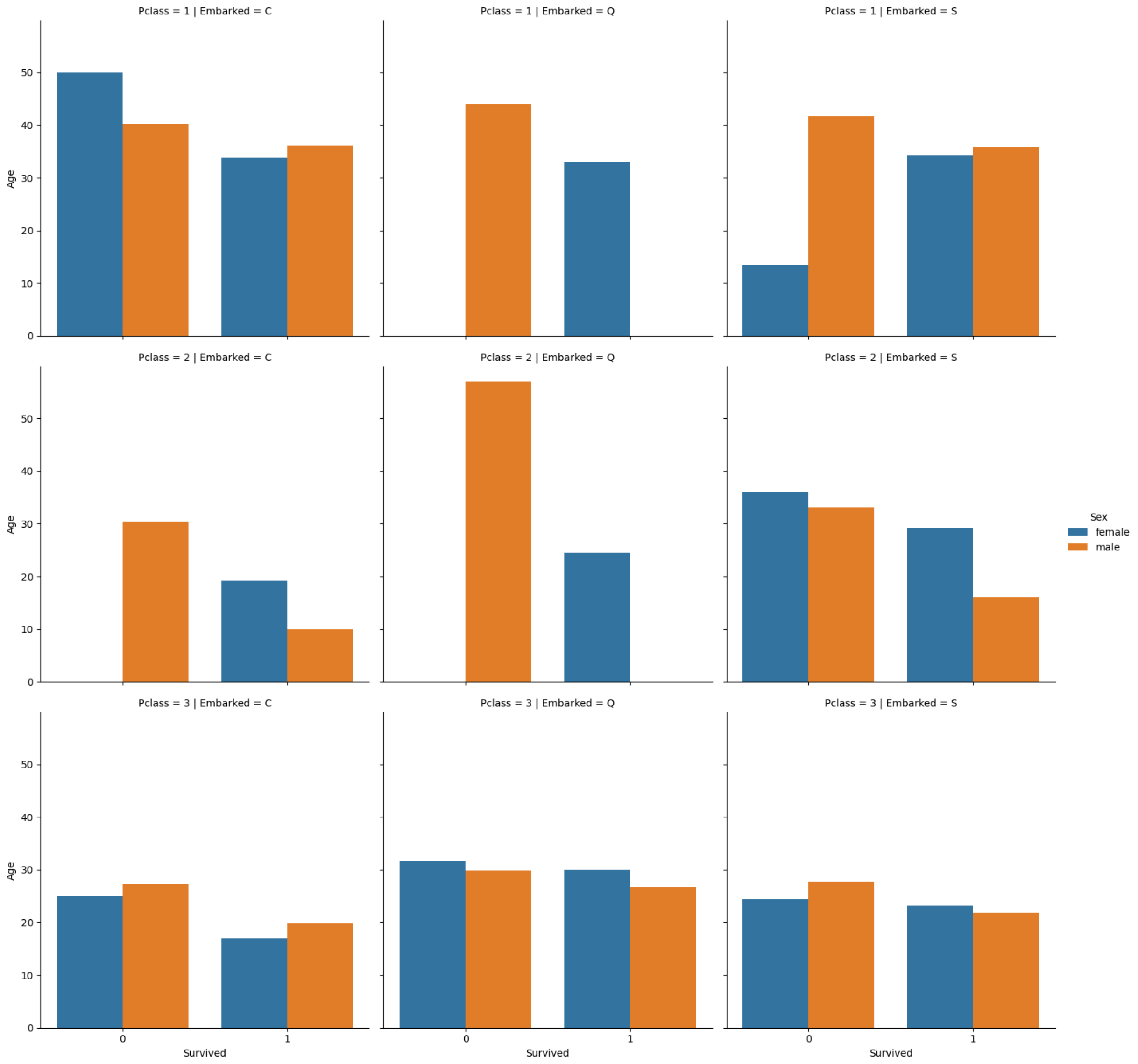


In [306…

```
# What insights can you derive from plotting survival against 'Age' using Se
sns.catplot(
    kind='bar',
    data=titanic,
    y='Age',
    x='Survived',
    hue='Sex',
    row='Pclass',
    col='Embarked',
    errorbar=None
)
```

Out[306…

```
<seaborn.axisgrid.FacetGrid at 0x1ab814e2210>
```



In [318…

```
# Can you use a *countplot* to visualize the relationship between 'Embarked
# How would you interpret the results?

sns.countplot(data=titanic, x='Embarked', hue='Survive')
```

```
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
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g.
  grouped_vals = vals.groupby(grouper)
C:\Users\user\anaconda3\Lib\site-packages\seaborn\categorical.py:641: Future
Warning: 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 be
havior or observed=True to adopt the future default and silence this warnin
g.
  grouped_vals = vals.groupby(grouper)
```
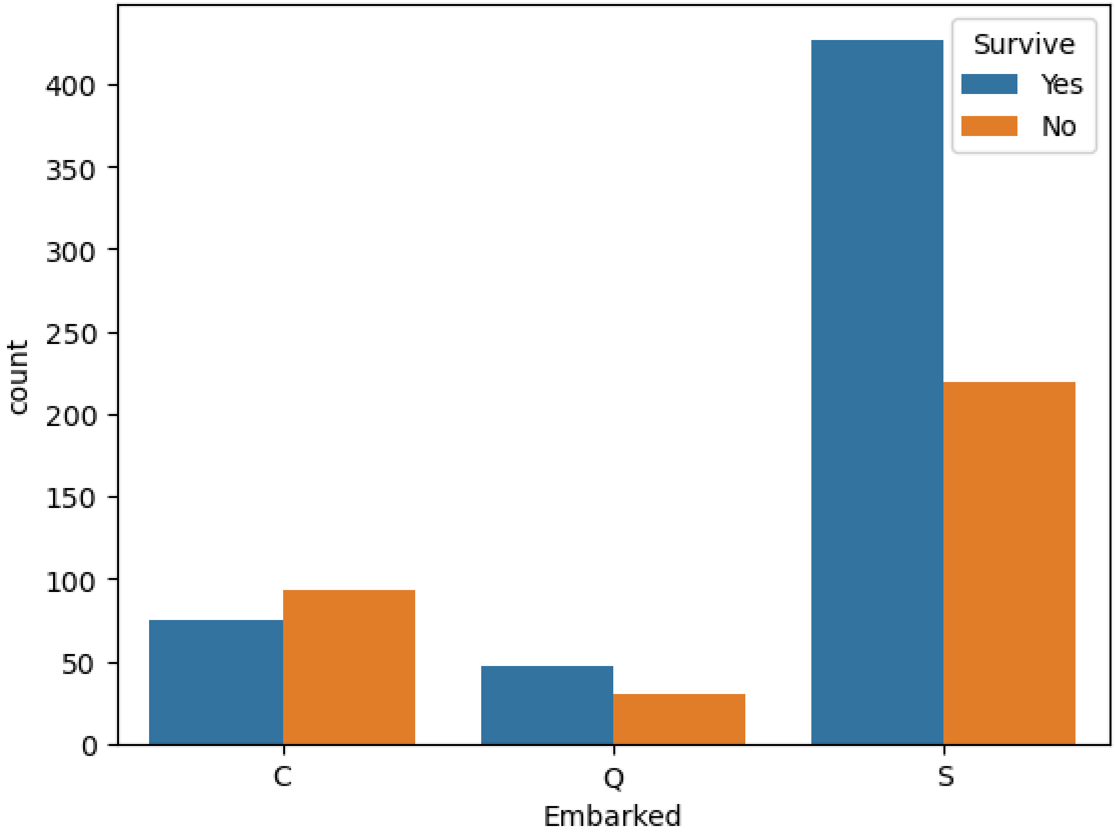

Out[318…

```
<Axes: xlabel='Embarked', ylabel='count'>
```

Loading [MathJax]/extensions/Safe.js

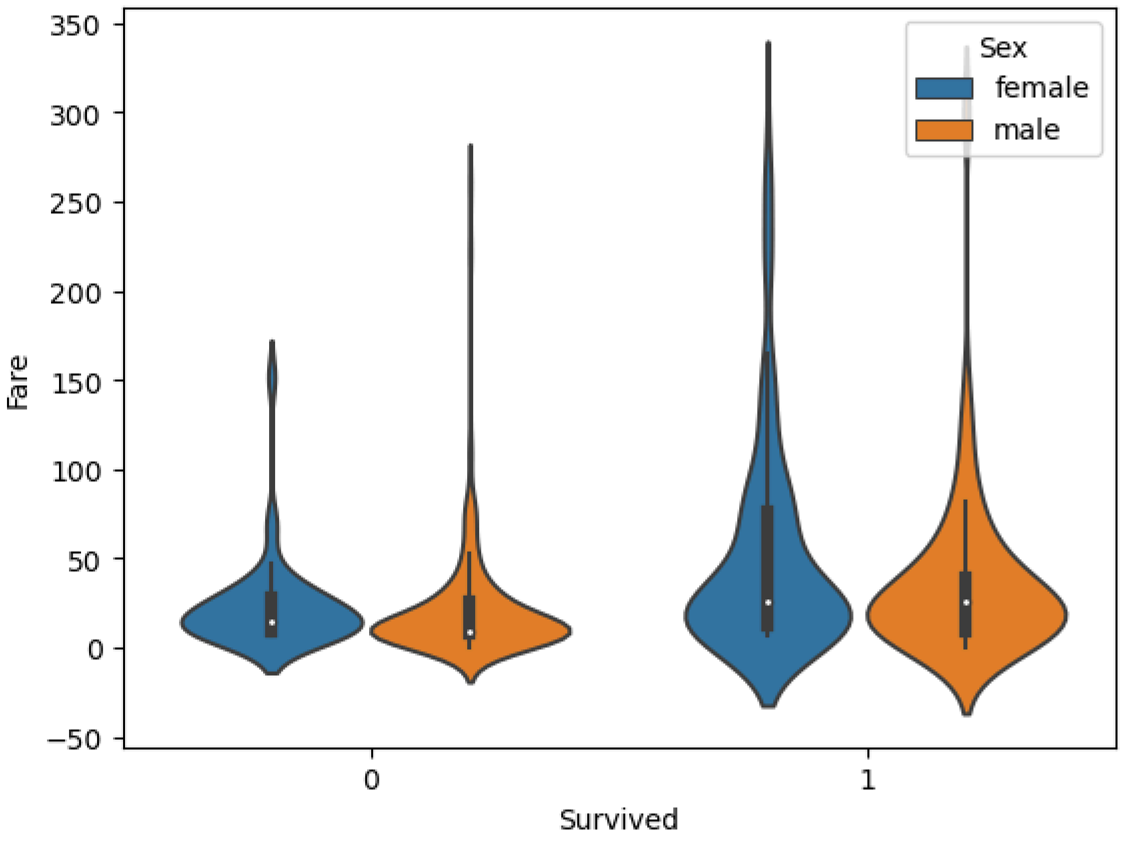


In [324…

```python
# Can you create a violin plot to show the spread of 'Fare' for both survivo
sns.violinplot(data=titanic, x='Survived', y='Fare', hue='Sex')
```

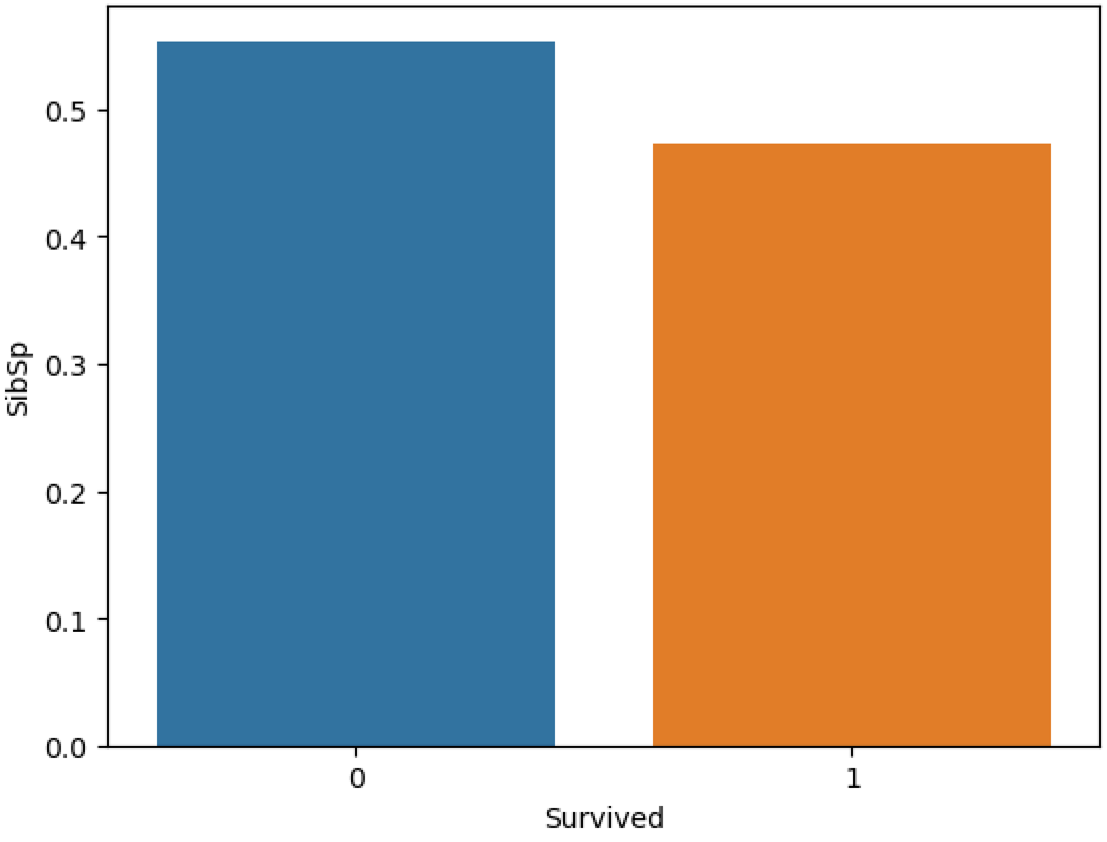
Out[324…

```
<Axes: xlabel='Survived', ylabel='Fare'>
```



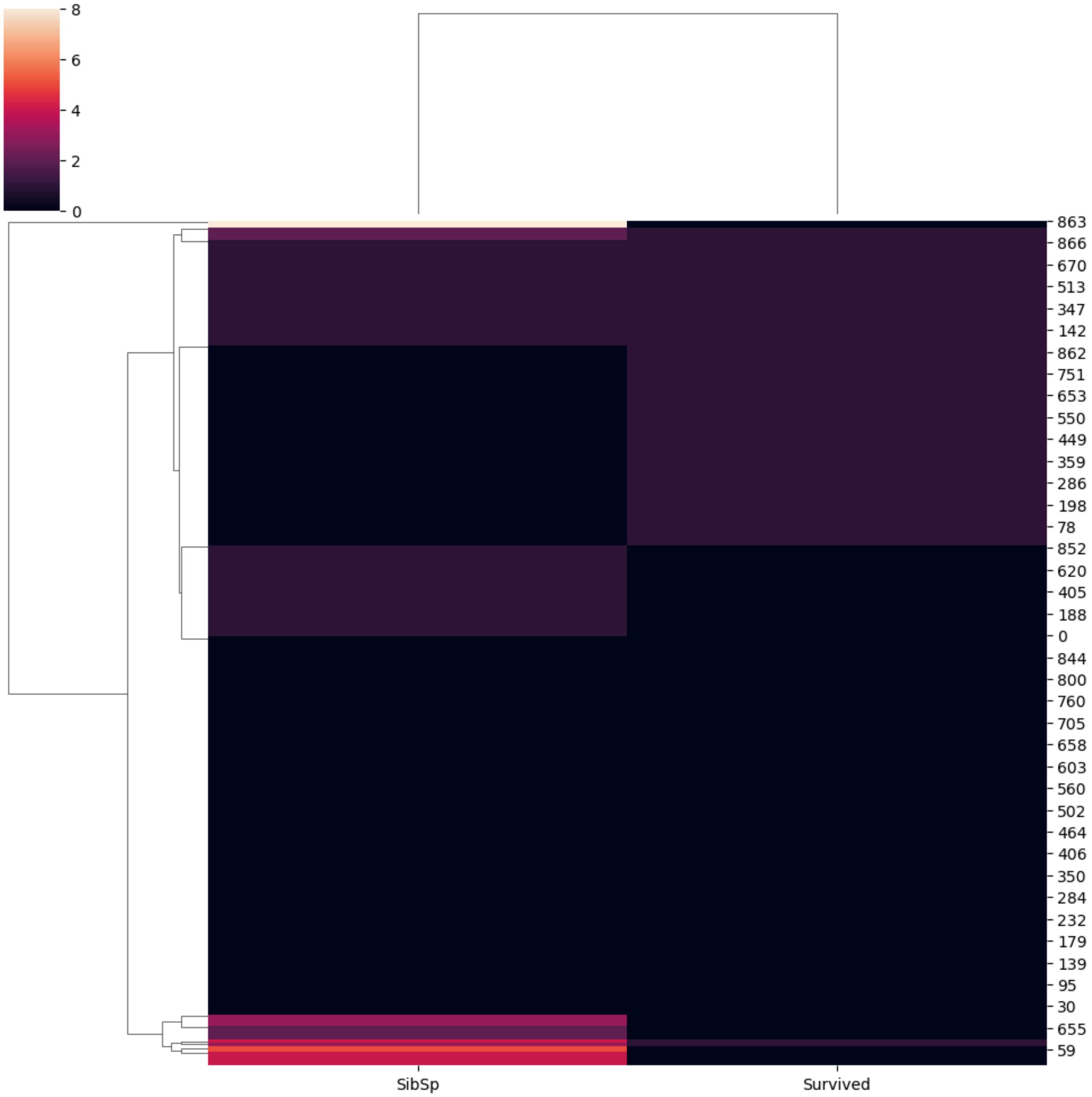
```
In [336…  sns.barplot(data=titanic, x='Survived', y='SibSp', errorbar=None)
```

```
Out[336…  <Axes: xlabel='Survived', ylabel='SibSp'>
```



```
In [332…  # heatmap for relationship between SibSp and survival
          sns.clustermap(data=titanic[['SibSp', 'Survived']])
```

```
Out[332…  <seaborn.matrix.ClusterGrid at 0x1ab81df5f10>
```



```
In [ ]:
```

Conclusion & Key Insights

Through the exploration of key questions such as the relationship between 'Fare' and survival, the impact of passenger class on survival rates, and the handling of missing data in 'Age', I was able to uncover valuable insights that inform the likelihood of survival.