eda-with-titanic-datset

February 23, 2024

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]:
```
# Load Titanic dataset
data = sns.load_dataset('titanic')
data.head()
```

[2]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_male	deck	embark_town	alive	alone
0	0	3	male	22.0	1	0	7.2500	S	Third	man	True	NaN	Southampton	no	False
1	1	1	female	38.0	1	0	71.2833	C	First	woman	False	C	Cherbourg	yes	False
2	1	3	female	26.0	0	0	7.9250	S	Third	woman	False	NaN	Southampton	yes	True
3	1	1	female	35.0	1	0	53.1000	S	First	woman	False	C	Southampton	yes	False
4	0	3	male	35.0	0	0	8.0500	S	Third	man	True	NaN	Southampton	no	True

Data Cleaning:

[3]:
```
# Data Cleaning: Handle missing values
print("\033[1;4mHandling missing values:\033[0m\n")
print(data.isnull().sum())
```

Handling missing values:

```
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
```

[4]:
```
# Handling missing values: Replace missing 'age' values with median age
median_age = data['age'].median()
data['age'].fillna(median_age, inplace=True)
```

[5]:
```
# Handling missing values in 'embarked' column by filling with mode (most␣
↪frequent value)
mode_embarked = data['embarked'].mode()[0]
data['embarked'].fillna(mode_embarked, inplace=True)
```

[6]:
```
# Dropping the 'deck' column due to a large proportion of missing values
data.drop(columns=['deck'], inplace=True)
```

[7]:
```
# Handling missing values in 'embark_town' column by filling with mode (most␣
↪frequent value)
mode_embark_town = data['embark_town'].mode()[0]
data['embark_town'].fillna(mode_embark_town, inplace=True)
```

[8]:
```
# Verify if there are any remaining missing values
print("\033[1;4mRemaining missing values:\033[0m")
print(data.isnull().sum())
```

Remaining missing values:

```
survived       0
pclass         0
sex            0
age            0
sibsp          0
parch          0
fare           0
embarked       0
class          0
who            0
adult_male     0
embark_town    0
alive          0
alone          0
```

```
dtype: int64
```

Data Exploration:

[9]:
```
# Display basic information about the dataset
print("\033[1;4mBasic information about the Titanic dataset:\033[0m\n")
print(data.info())
```

```
Basic information about the Titanic dataset:

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 14 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          891 non-null    float64
 4   sibsp        891 non-null    int64
 5   parch        891 non-null    int64
 6   fare         891 non-null    float64
 7   embarked     891 non-null    object
 8   class        891 non-null    category
 9   who          891 non-null    object
 10  adult_male   891 non-null    bool
 11  embark_town  891 non-null    object
 12  alive        891 non-null    object
 13  alone        891 non-null    bool
dtypes: bool(2), category(1), float64(2), int64(4), object(5)
memory usage: 79.4+ KB
None
```

[10]:
```
# Display summary statistics
print("\033[1;4mSummary statistics of the Titanic dataset:\033[0m\n")
data.describe()
```

```
Summary statistics of the Titanic dataset:
```

[10]:

	survived	pclass	age	sibsp	parch	fare
count	891.000000	891.000000	891.000000	891.000000	891.000000	891.000000
mean	0.383838	2.308642	29.361582	0.523008	0.381594	32.204208
std	0.486592	0.836071	13.019697	1.102743	0.806057	49.693429
min	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	0.000000	2.000000	22.000000	0.000000	0.000000	7.910400
50%	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	1.000000	3.000000	35.000000	1.000000	0.000000	31.000000

```
max       1.000000     3.000000    80.000000     8.000000     6.000000   512.329200
```

Feature Engineering:

[11]:
```
# Create new feature 'family_size' by combining 'sibsp' and 'parch'
data['family_size'] = data['sibsp'] + data['parch'] + 1  # Adding 1 for the␣
 ↪passenger itself

# Map titles to 'male' and 'female' categories
title_mapping = {'male': 'Mr', 'female': 'Ms'}
data['title'] = data['sex'].map(title_mapping)

# Categorize 'age' into age groups
age_bins = [0, 18, 35, 60, np.inf]
age_labels = ['Child', 'Young Adult', 'Adult', 'Senior']
data['age_group'] = pd.cut(data['age'], bins=age_bins, labels=age_labels,␣
 ↪right=False)

# Categorize 'fare' into fare groups
fare_bins = [-np.inf, 10, 50, 100, np.inf]
fare_labels = ['Low', 'Medium', 'High', 'Very High']
data['fare_group'] = pd.cut(data['fare'], bins=fare_bins, labels=fare_labels,␣
 ↪right=False)

# Encode 'sex' feature
data['sex'] = data['sex'].map({'male': 0, 'female': 1})

# Encode 'embarked' feature
data['embarked'] = data['embarked'].map({'C': 0, 'Q': 1, 'S': 2})

# Categorize 'family_size' into groups
data['family_size_group'] = pd.cut(data['family_size'], bins=[0, 1, 4, np.inf],␣
 ↪labels=['Alone', 'Small', 'Large'], right=False)
```

[12]:
```
data.head()
```

[12]:

	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who
0	0	3	0	22.0	1	0	7.2500	2	Third	man
1	1	1	1	38.0	1	0	71.2833	0	First	woman
2	1	3	1	26.0	0	0	7.9250	2	Third	woman
3	1	1	1	35.0	1	0	53.1000	2	First	woman
4	0	3	0	35.0	0	0	8.0500	2	Third	man

	adult_male	embark_town	alive	alone	family_size	title	age_group
0	True	Southampton	no	False	2	Mr	Young Adult
1	False	Cherbourg	yes	False	2	Ms	Adult
2	False	Southampton	yes	True	1	Ms	Young Adult

```
3       False  Southampton   yes  False            2    Ms        Adult
4        True  Southampton    no   True            1    Mr        Adult

  fare_group family_size_group
0        Low             Small
1       High             Small
2        Low             Small
3       High             Small
4        Low             Small
```

Hypothesis Testing:

[13]:
```
from scipy.stats import chi2_contingency, f_oneway
```

[14]:
```
# Survival Rate by Passenger Class
contingency_table_class = pd.crosstab(data['survived'], data['pclass'])
chi2_class, p_value_class, _, _ = chi2_contingency(contingency_table_class)
print("\033[1;4mSurvival Rate by Passenger Class:\033[0m")
print("\033[1;3mChi-square statistic:\033[0m", chi2_class)
print("\033[1;3mP-value:\033[0m", p_value_class)
```

Survival Rate by Passenger Class:
Chi-square statistic: 102.88898875696056
P-value: 4.549251711298793e-23

[15]:
```
# Survival Rate by Gender
contingency_table_gender = pd.crosstab(data['survived'], data['sex'])
chi2_gender, p_value_gender, _, _ = chi2_contingency(contingency_table_gender)
print("\033[1;4mSurvival Rate by Gender:\033[0m")
print("\033[1;3mChi-square statistic:\033[0m", chi2_gender)
print("\033[1;3mP-value:\033[0m", p_value_gender)
```

Survival Rate by Gender:
Chi-square statistic: 260.71702016732104
P-value: 1.1973570627755645e-58

[16]:
```
# Survival Rate by Age Group
grouped_age = [data[data['age_group'] == group]['survived'] for group in␣
 ↪age_labels]
f_statistic_age, p_value_age = f_oneway(*grouped_age)
print("\033[1;4mSurvival Rate by Age Group:\033[0m")
print("\033[1;3mF-statistic:\033[0m", f_statistic_age)
print("\033[1;3mP-value:\033[0m", p_value_age)
```

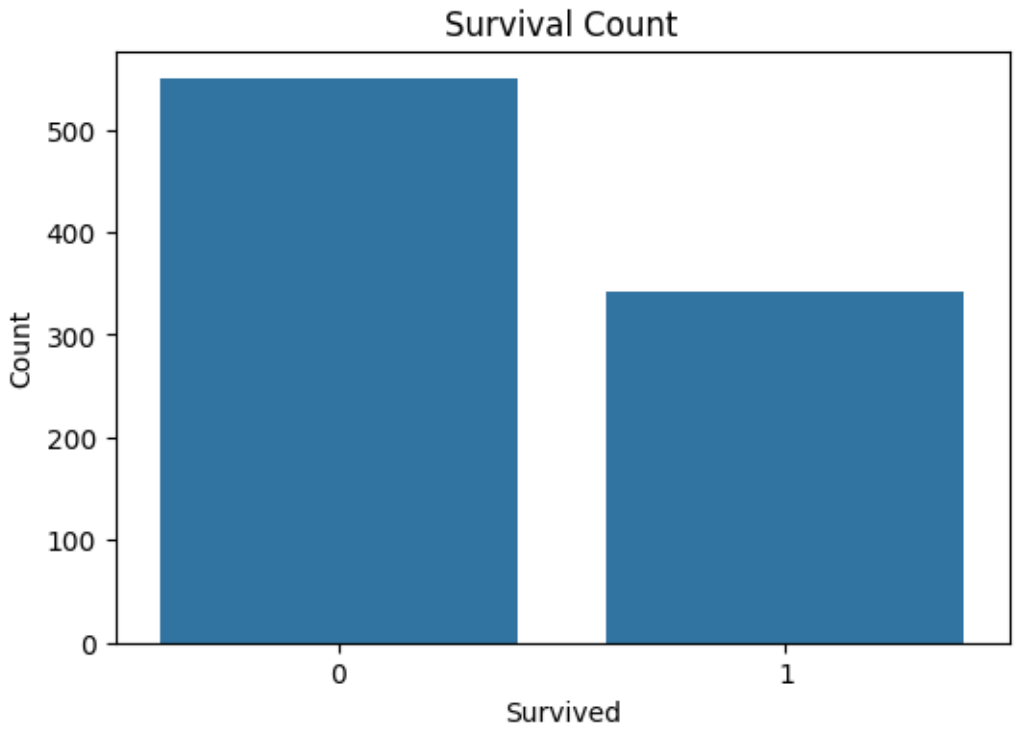
Survival Rate by Age Group:
F-statistic: 5.948557152255324
P-value: 0.0005123773495687209

[17]:
```
# Survival Rate by Family Size
contingency_table_family = pd.crosstab(data['survived'],␣
 ↪data['family_size_group'])
chi2_family, p_value_family, _, _ = chi2_contingency(contingency_table_family)
print("\033[1;4mSurvival Rate by Family Size:\033[0m")
print("\033[1;3mChi-square statistic:\033[0m", chi2_family)
print("\033[1;3mP-value:\033[0m", p_value_family)
```

Survival Rate by Family Size:
Chi-square statistic: 0.6085726774573574
P-value: 0.43532572895966826

Visualization:

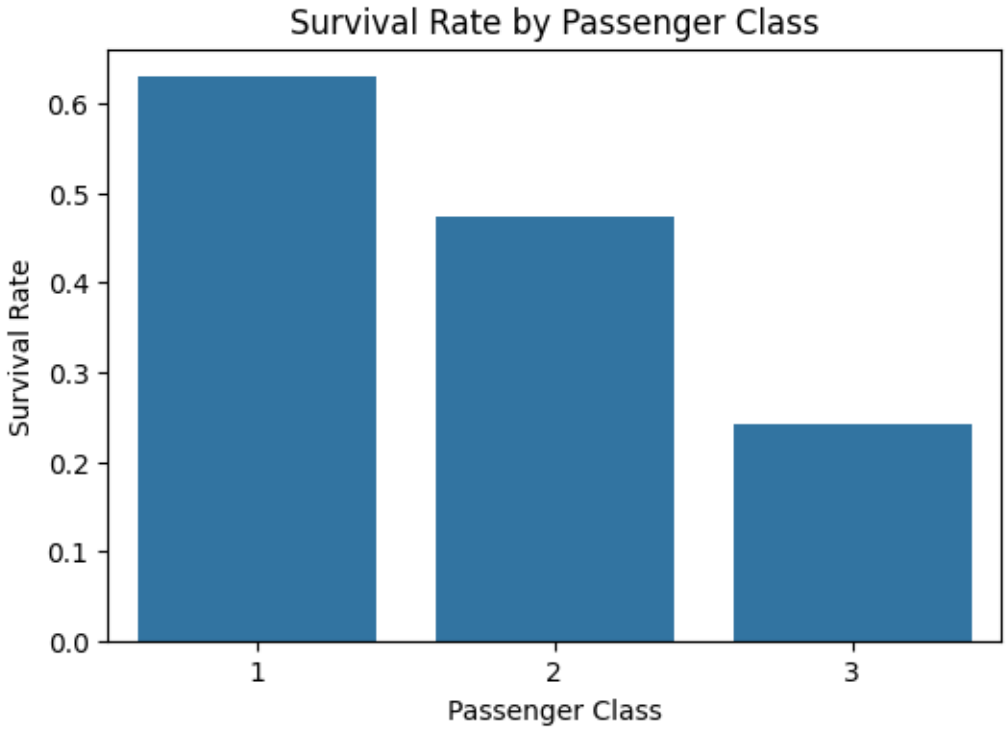
[18]:
```
# Visualization 1: Explore the distribution of 'survived' variable
plt.figure(figsize=(6, 4))
sns.countplot(x='survived', data=data)
plt.title('Survival Count')
plt.xlabel('Survived')
plt.ylabel('Count')
plt.show()
```



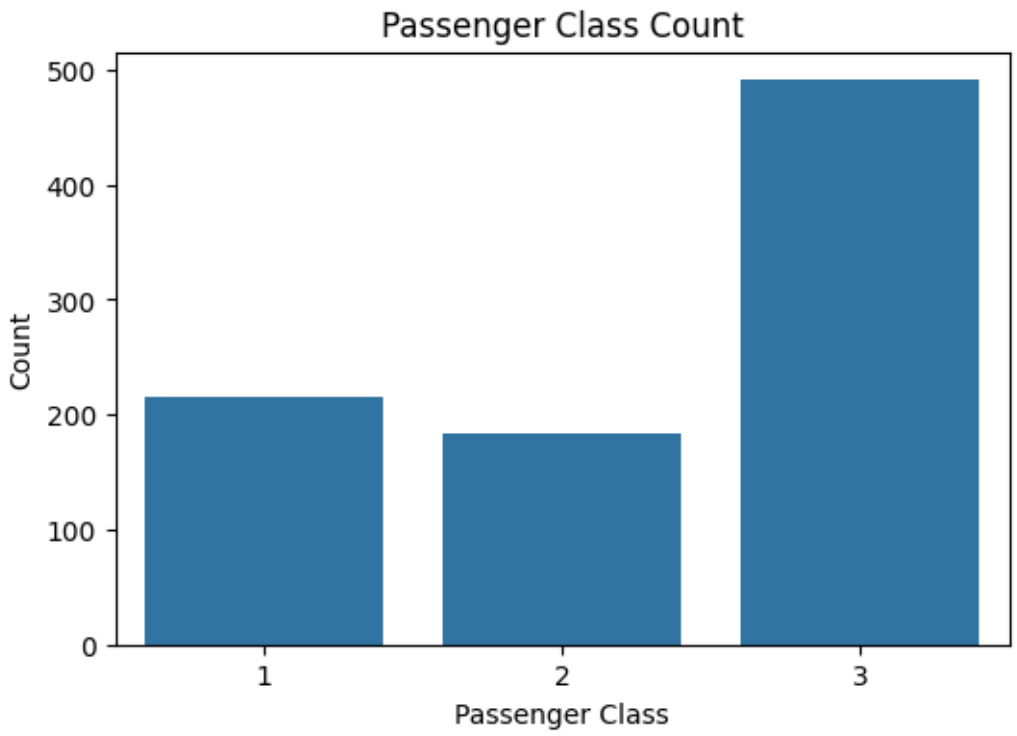
[19]:
```
# Visualization 2: Survival Rate by Passenger Class
plt.figure(figsize=(6, 4))
```

```
sns.barplot(x='pclass', y='survived', data=data, ci=None)
plt.title('Survival Rate by Passenger Class')
plt.xlabel('Passenger Class')
plt.ylabel('Survival Rate')
plt.show()
```

```
<ipython-input-19-e24d4d259ec7>:3: FutureWarning:

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

  sns.barplot(x='pclass', y='survived', data=data, ci=None)
```

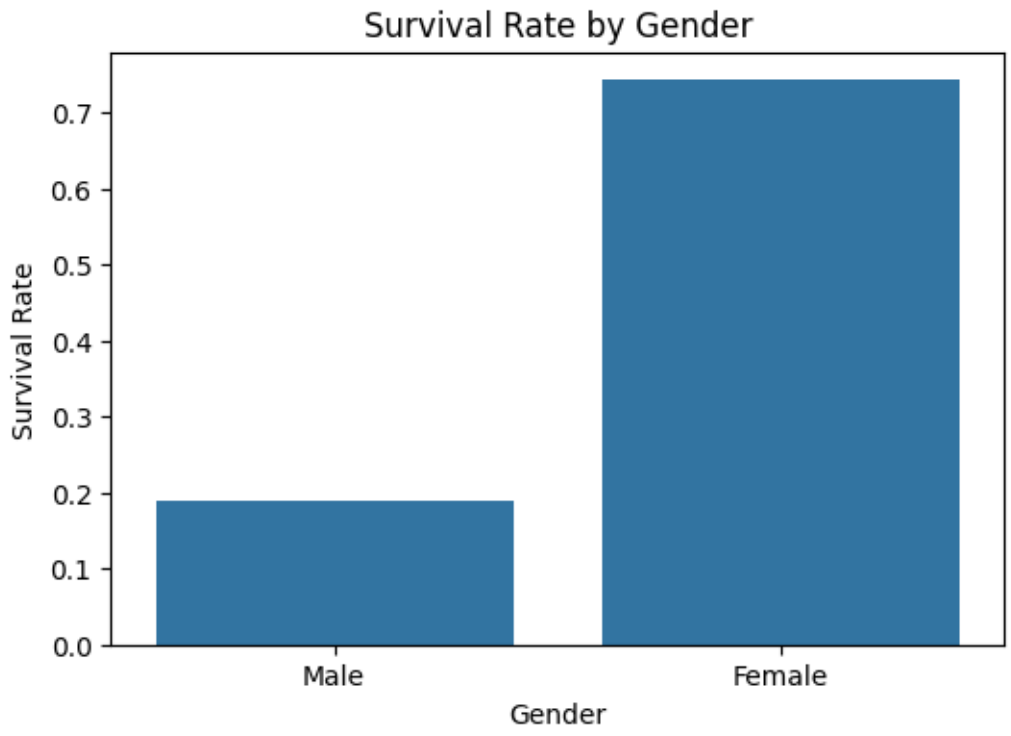


[20]:
```
# Visualization 3: Explore the distribution of 'pclass' variable
plt.figure(figsize=(6, 4))
sns.countplot(x='pclass', data=data)
plt.title('Passenger Class Count')
plt.xlabel('Passenger Class')
plt.ylabel('Count')
plt.show()
```

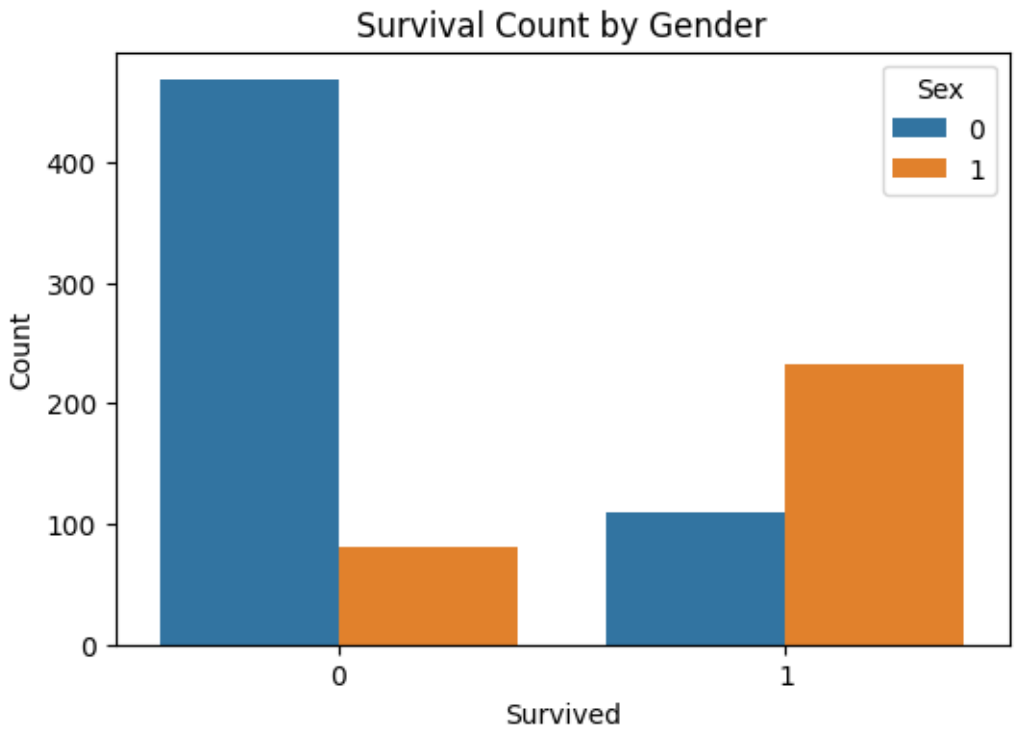


[21]:
```
# Visualization 4: Survival Rate by Gender
plt.figure(figsize=(6, 4))
sns.barplot(x='sex', y='survived', data=data, ci=None)
plt.title('Survival Rate by Gender')
plt.xlabel('Gender')
plt.ylabel('Survival Rate')
plt.xticks(ticks=[0, 1], labels=['Male', 'Female'])
plt.show()
```

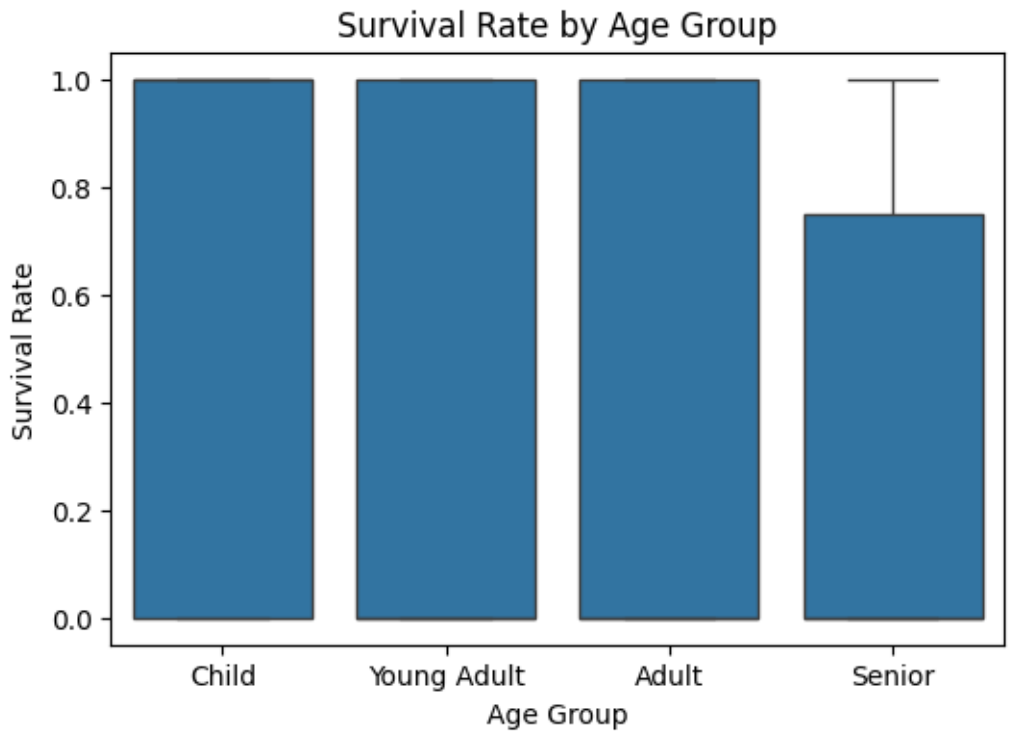
```
<ipython-input-21-3ee67c0dd573>:3: FutureWarning:

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

  sns.barplot(x='sex', y='survived', data=data, ci=None)
```



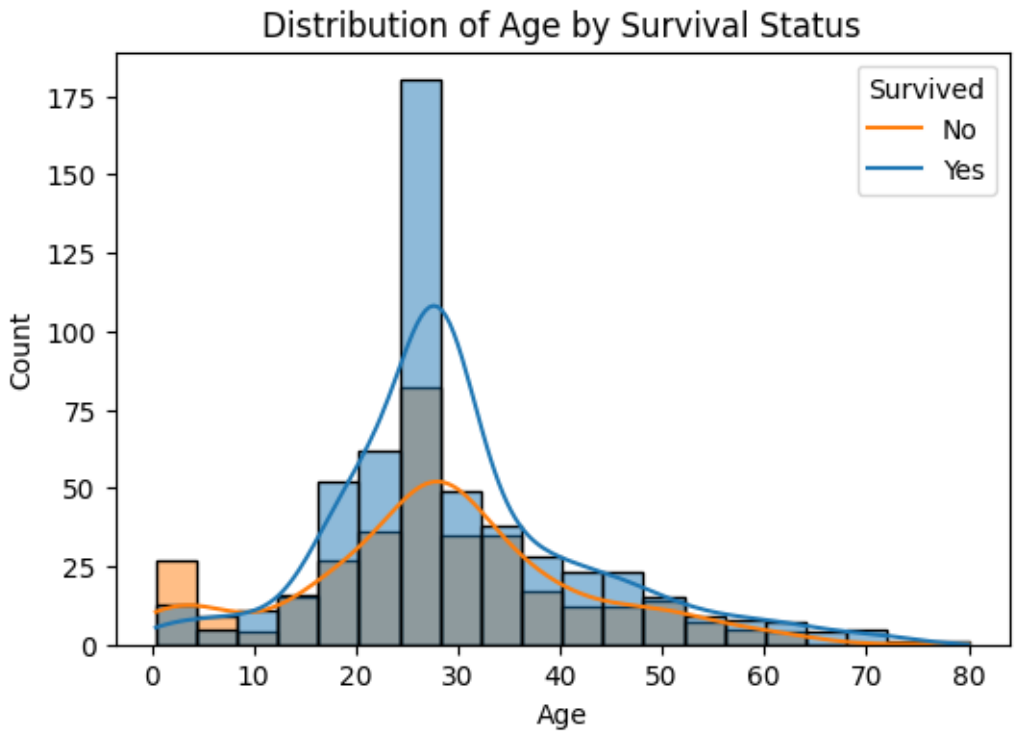
[22]:
```
# Visualization 5: Explore the distribution of 'survived' variable grouped by␣
↪'sex'
plt.figure(figsize=(6, 4))
sns.countplot(x='survived', hue='sex', data=data)
plt.title('Survival Count by Gender')
plt.xlabel('Survived')
plt.ylabel('Count')
plt.legend(title='Sex')
plt.show()
```



[23]:
```
# Visualization 6: Survival Rate by Age Group
plt.figure(figsize=(6, 4))
sns.boxplot(x='age_group', y='survived', data=data, order=['Child', 'Young␣
↪Adult', 'Adult', 'Senior'])
plt.title('Survival Rate by Age Group')
plt.xlabel('Age Group')
plt.ylabel('Survival Rate')
plt.show()
```

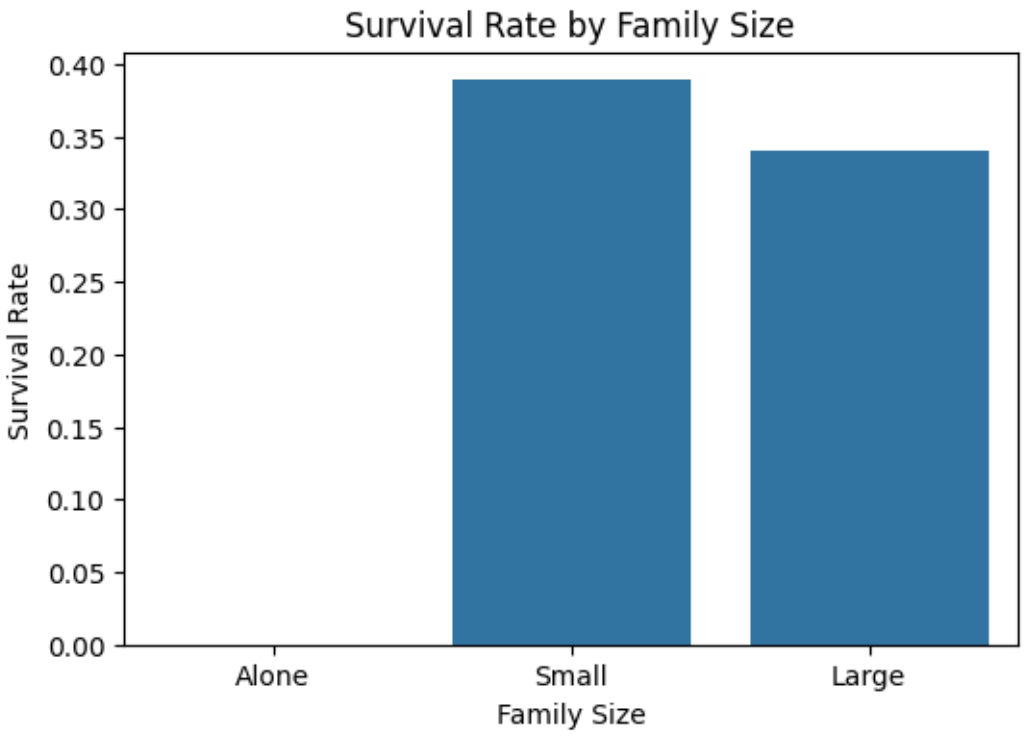


[24]:
```
# Visualization 6: Explore the relationship between 'age' and 'survived'␣
↪variables
plt.figure(figsize=(6, 4))
sns.histplot(x='age', hue='survived', data=data, bins=20, kde=True)
plt.title('Distribution of Age by Survival Status')
plt.xlabel('Age')
plt.ylabel('Count')
plt.legend(title='Survived', labels=['No', 'Yes'])
plt.show()
```

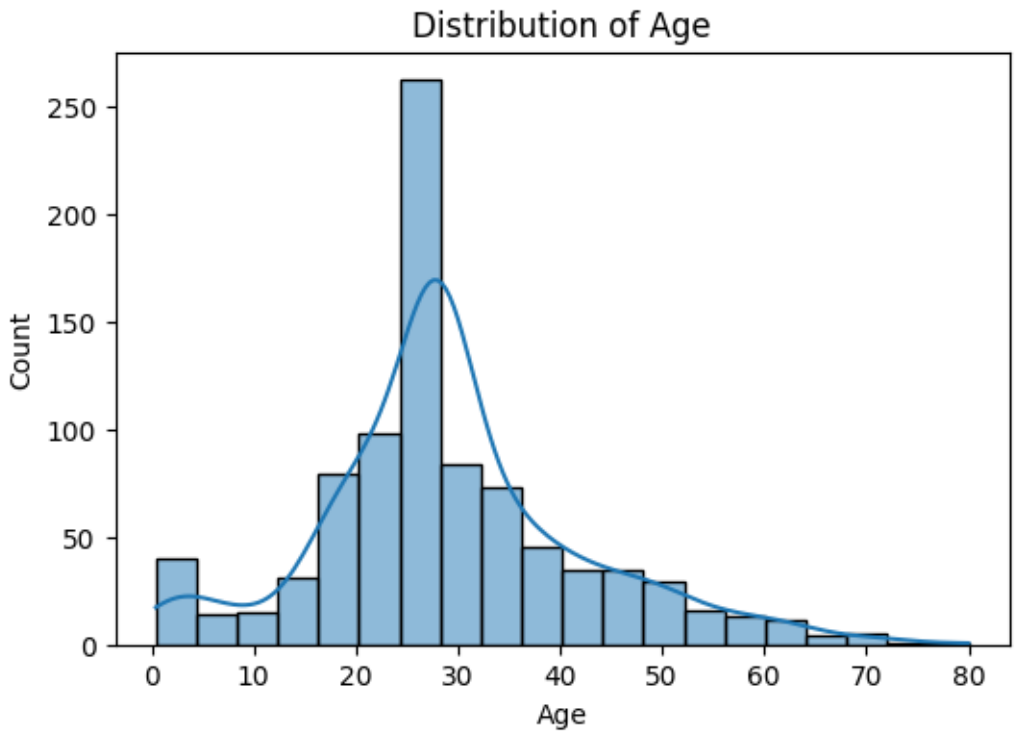


[25]:
```
# Visualization 7: Survival Rate by Family Size
plt.figure(figsize=(6, 4))
sns.barplot(x='family_size_group', y='survived', data=data, ci=None,␣
 ↪order=['Alone', 'Small', 'Large'])
plt.title('Survival Rate by Family Size')
plt.xlabel('Family Size')
plt.ylabel('Survival Rate')
plt.show()
```

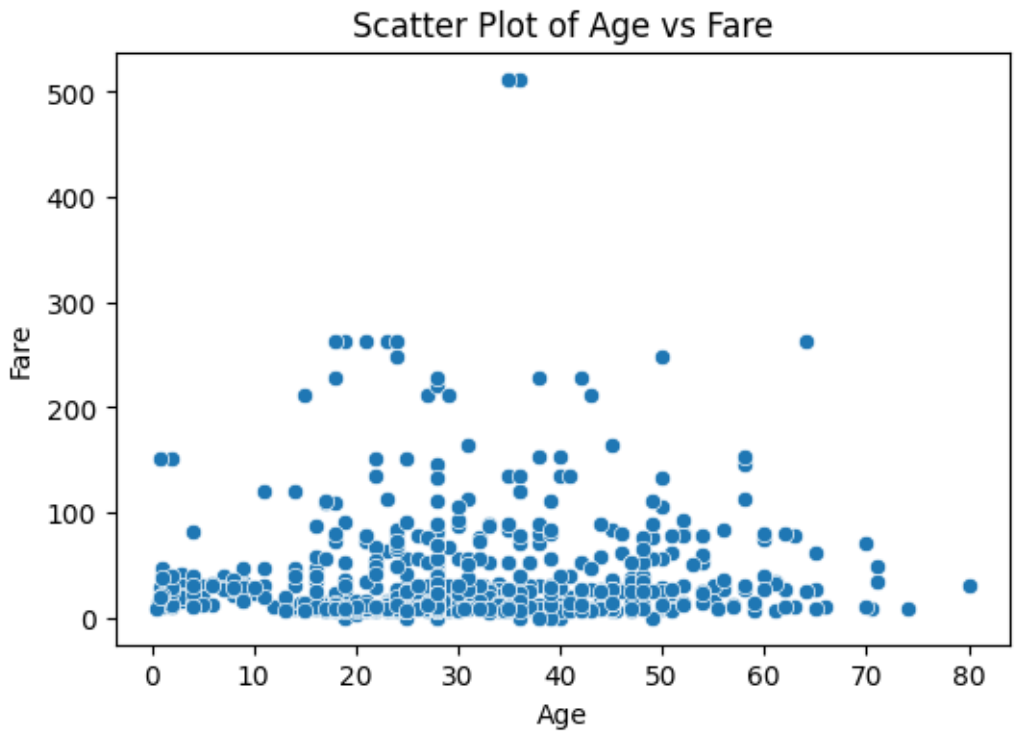
```
<ipython-input-25-1a02e147f81a>:3: FutureWarning:

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

  sns.barplot(x='family_size_group', y='survived', data=data, ci=None,
order=['Alone', 'Small', 'Large'])
```



[26]:
```
# Visualization 8: Explore the distribution of 'age' variable
plt.figure(figsize=(6, 4))
sns.histplot(data['age'].dropna(), bins=20, kde=True)
plt.title('Distribution of Age')
plt.xlabel('Age')
plt.ylabel('Count')
plt.show()
```

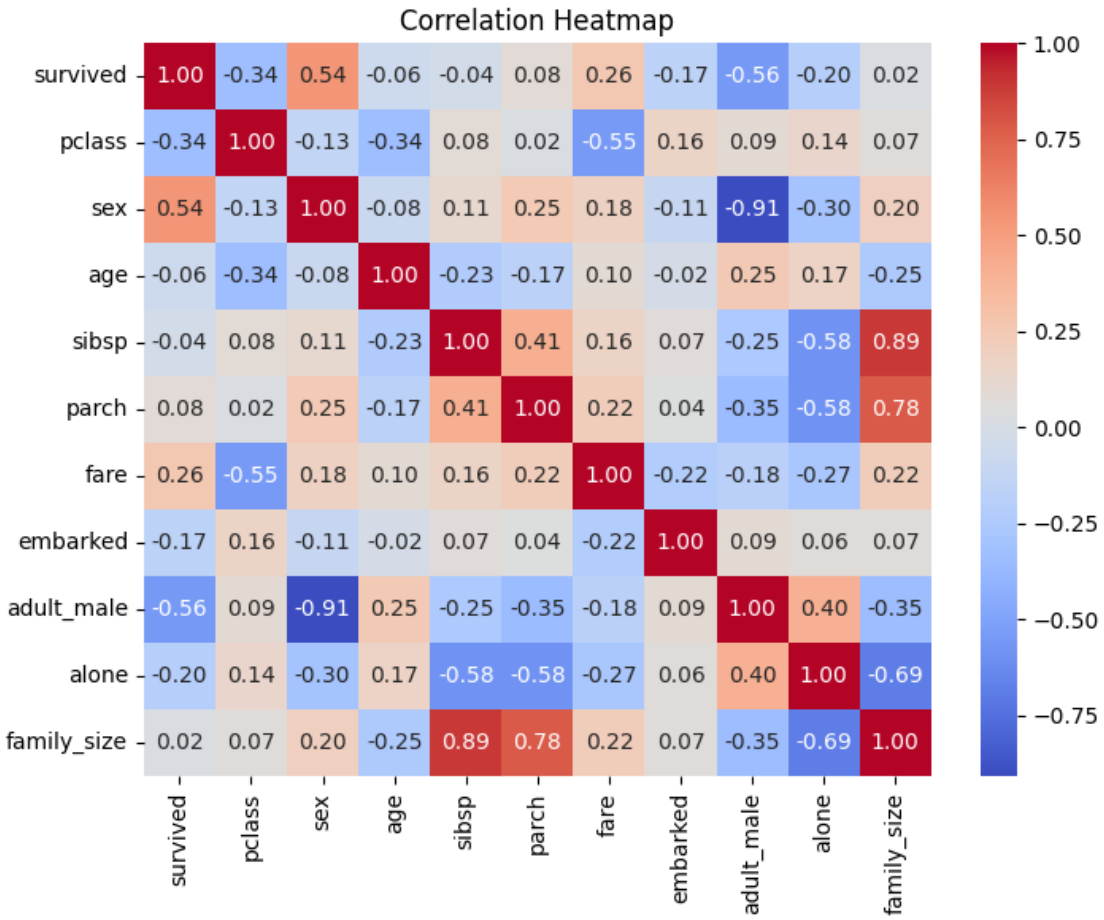


[27]:
```
# Visualization 9: Explore the relationship between 'age' and 'fare' variables
plt.figure(figsize=(6, 4))
sns.scatterplot(x='age', y='fare', data=data)
plt.title('Scatter Plot of Age vs Fare')
plt.xlabel('Age')
plt.ylabel('Fare')
plt.show()
```



[28]:
```
# Visualization 10: Correlation Heatmap
plt.figure(figsize=(8, 6))
sns.heatmap(data.corr(), annot=True, cmap='coolwarm', fmt=".2f",␣
 ↪annot_kws={"size": 10})
plt.title('Correlation Heatmap')
plt.show()
```

```
<ipython-input-28-2818870677d0>:3: FutureWarning: The default value of
numeric_only in DataFrame.corr is deprecated. In a future version, it will
default to False. Select only valid columns or specify the value of numeric_only
to silence this warning.
  sns.heatmap(data.corr(), annot=True, cmap='coolwarm', fmt=".2f",
annot_kws={"size": 10})
```


Correlation Heatmap
survived 1.00 -0.34 0.54 -0.06 -0.04 0.08 0.26 -0.17 -0.56 -0.20 0.02
pclass -0.34 1.00 -0.13 -0.34 0.08 0.02 -0.55 0.16 0.09 0.14 0.07
sex 0.54 -0.13 1.00 -0.08 0.11 0.25 0.18 -0.11 -0.91 -0.30 0.20
age -0.06 -0.34 -0.08 1.00 -0.23 -0.17 0.10 -0.02 0.25 0.17 -0.25
sibsp -0.04 0.08 0.11 -0.23 1.00 0.41 0.16 0.07 -0.25 -0.58 0.89
parch 0.08 0.02 0.25 -0.17 0.41 1.00 0.22 0.04 -0.35 -0.58 0.78
fare 0.26 -0.55 0.18 0.10 0.16 0.22 1.00 -0.22 -0.18 -0.27 0.22
embarked -0.17 0.16 -0.11 -0.02 0.07 0.04 -0.22 1.00 0.09 0.06 0.07
adult_male -0.56 0.09 -0.91 0.25 -0.25 -0.35 -0.18 0.09 1.00 0.40 -0.35
alone -0.20 0.14 -0.30 0.17 -0.58 -0.58 -0.27 0.06 0.40 1.00 -0.69
family_size 0.02 0.07 0.20 -0.25 0.89 0.78 0.22 0.07 -0.35 -0.69 1.00
survived pclass sex age sibsp parch fare embarked adult_male alone family_size
1.00 0.75 0.50 0.25 0.00 −0.25 −0.50 −0.75