Assignment 2

Smart bridge externship

Applied data science

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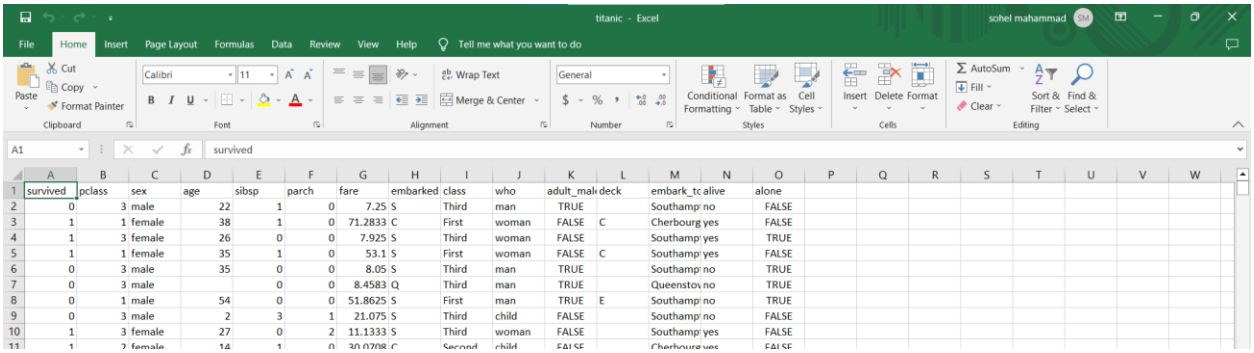
1. Download the dataset: Dataset



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	survived	pclass	sex	age	sibsp	parch	fare	embarked	class	who	adult_mal	deck	embark_tc	alive	alone								
2	0	3	male	22	1	0	7.25	S	Third	man	TRUE		Southamp	no	FALSE								
3	1	1	female	38	1	0	71.2833	C	First	woman	FALSE	C	Cherbourg	yes	FALSE								
4	1	3	female	26	0	0	7.925	S	Third	woman	FALSE		Southamp	yes	TRUE								
5	1	1	female	35	1	0	53.1	S	First	woman	FALSE	C	Southamp	yes	FALSE								
6	0	3	male	35	0	0	8.05	S	Third	man	TRUE		Southamp	no	TRUE								
7	0	3	male		0	0	8.4583	Q	Third	man	TRUE		Queenstov	no	TRUE								
8	0	1	male	54	0	0	51.8625	S	First	man	TRUE	E	Southamp	no	TRUE								
9	0	3	male	2	3	1	21.075	S	Third	child	FALSE		Southamp	no	FALSE								
10	1	3	female	27	0	2	11.1333	S	Third	woman	FALSE		Southamp	yes	FALSE								
11	1	2	female	14	1	0	30.0708	C	Second	child	FALSE		Cherbourg	yes	FALSE								

2Load the dataset

```
In [1]: import pandas as pd

        data=pd.read_csv('titanic.csv')
```

```
In [2]: print(data)
```

```
     survived  pclass     sex   age  sibsp  parch     fare embarked   class  \
0           0       3    male  22.0      1      0   7.2500        S   Third
1           1       1  female  38.0      1      0  71.2833        C   First
2           1       3  female  26.0      0      0   7.9250        S   Third
3           1       1  female  35.0      1      0  53.1000        S   First

      who  adult_male deck  embark_town alive  alone
0     man        True  NaN  Southampton    no  False
1   woman       False    C    Cherbourg   yes  False
```

2. Perform Below Visualizations. ● Univariate Analysis ● Bi - Variate Analysis ● Multi - Variate Analysis

1. Univariate Analysis: Univariate analysis involves examining individual variables in isolation to understand their distribution, central tendency, and variability. Here are some common visualizations for univariate analysis:

- Histogram: Displays the distribution of a continuous variable by dividing it into bins and showing the frequency or count in each bin.
- Bar Chart: Represents the distribution of a categorical variable using rectangular bars, where the height of each bar corresponds to the frequency or count.
- Box Plot: Illustrates the summary statistics of a numerical variable, such as the median, quartiles, and outliers.
- Kernel Density Plot: Shows the estimated probability density function of a continuous variable.

2. Bivariate Analysis: Bivariate analysis involves exploring the relationship between two variables. It helps to understand the correlation, association, or dependency between the variables. Here are some common visualizations for bivariate analysis:

- Scatter Plot: Displays the relationship between two continuous variables by plotting each data point on a two-dimensional plane.
- Line Chart: Shows the relationship between two continuous variables by connecting data points with lines.
- Bar Chart or Grouped Bar Chart: Compares the distribution of a categorical variable across different levels of another categorical variable.
- Heatmap: Represents the correlation or association between two numerical variables using a color-coded grid.

3. Multivariate Analysis: Multivariate analysis involves examining relationships between three or more variables. It helps to understand complex patterns, interactions, and dependencies between multiple variables. Here are some common visualizations for multivariate analysis:

- Scatter Plot Matrix: Displays pairwise scatter plots for multiple variables to visualize their relationships simultaneously.
- Parallel Coordinates Plot: Represents multiple variables as vertical axes and plots lines that connect data points based on their values on each variable, providing insights into patterns and clusters.
- 3D Scatter Plot: Extends the scatter plot to three dimensions, allowing the visualization of relationships between three continuous variables.
- Treemap: Hierarchically displays multiple categorical variables using nested rectangles, with the area of each rectangle representing a variable's proportion.

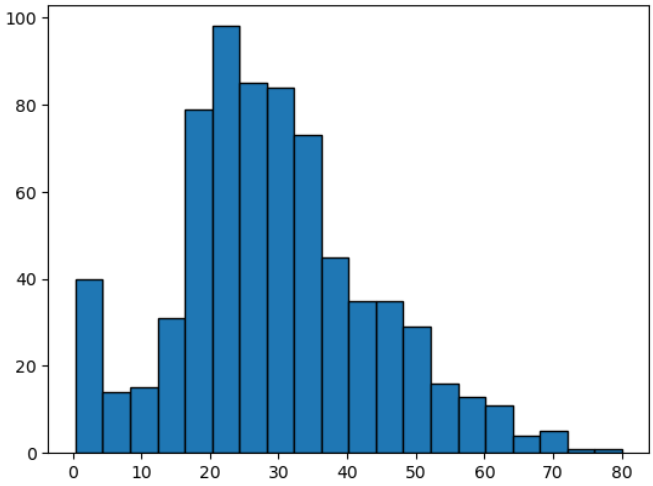
In [3]:
```
import matplotlib.pyplot as plt
```

In [4]:
```
age_column = data['age']
```

In [5]:
```
plt.hist(age_column, bins=20, edgecolor='black')
```

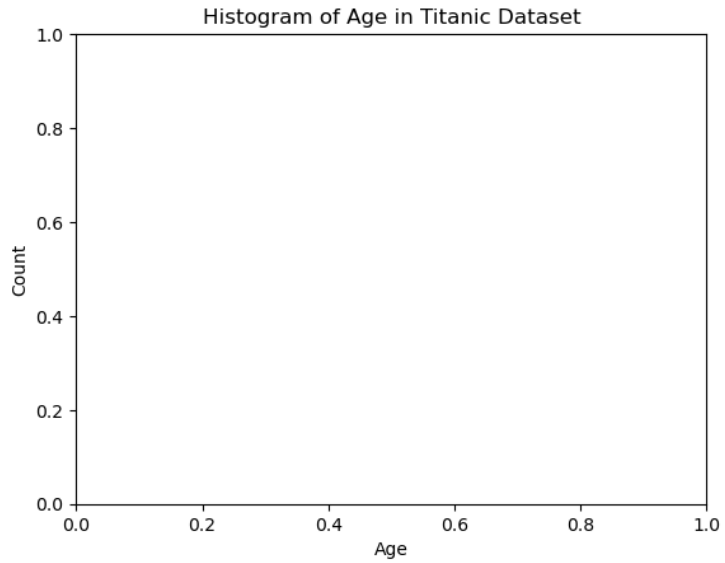
In [5]:
```
plt.hist(age_column, bins=20, edgecolor='black')
```

Out[5]:
```
(array([40., 14., 15., 31., 79., 98., 85., 84., 73., 45., 35., 35., 29.,
        16., 13., 11.,  4.,  5.,  1.,  1.]),
 array([ 0.42 ,  4.399,  8.378, 12.357, 16.336, 20.315, 24.294, 28.273,
        32.252, 36.231, 40.21 , 44.189, 48.168, 52.147, 56.126, 60.105,
        64.084, 68.063, 72.042, 76.021, 80.   ]),
 <BarContainer object of 20 artists>)
```



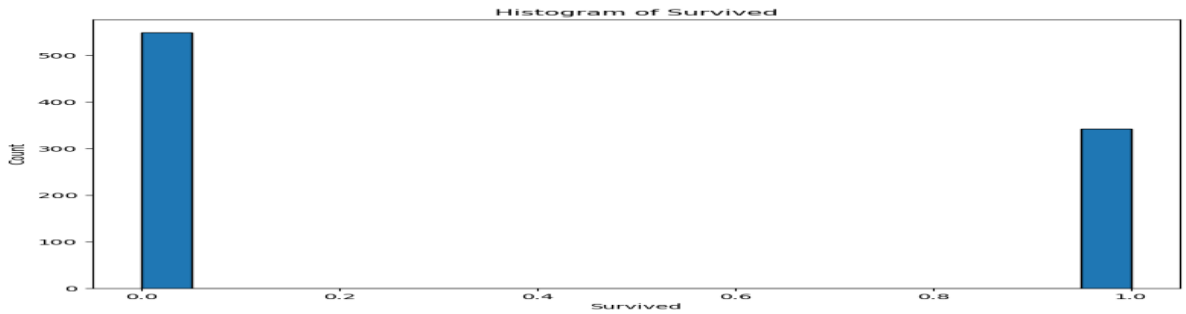
In [6]:
```
# Set the labels and title
plt.xlabel('Age')
plt.ylabel('Count')
plt.title('Histogram of Age in Titanic Dataset')
```

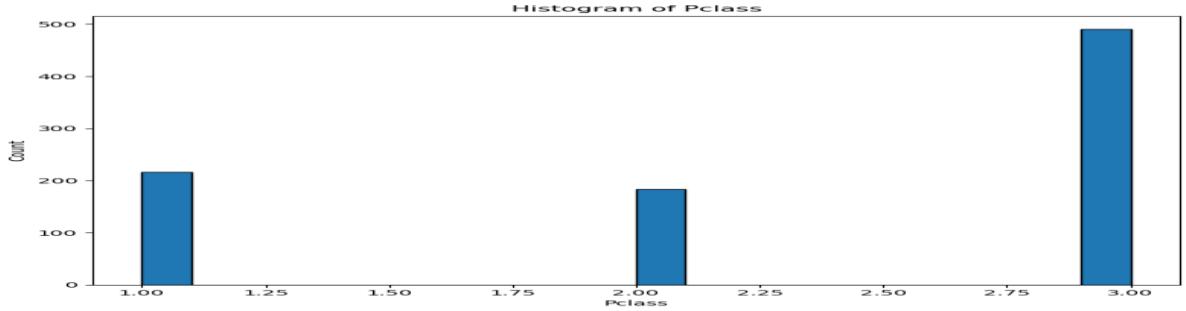
Out[6]:
```
Text(0.5, 1.0, 'Histogram of Age in Titanic Dataset')
```

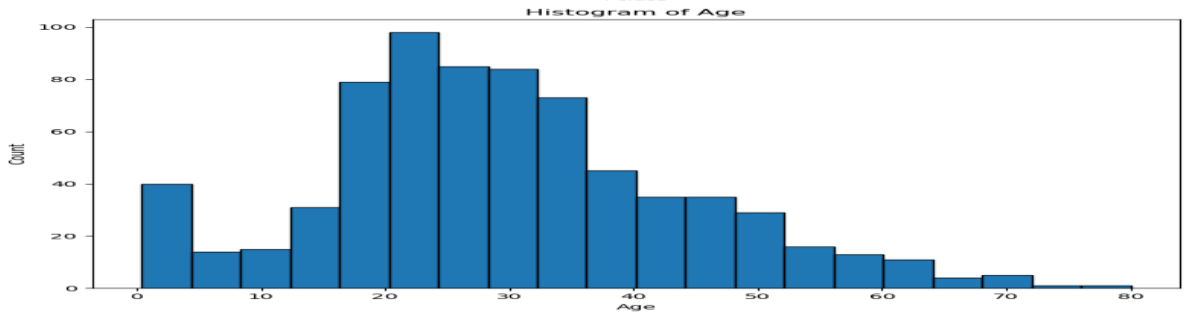


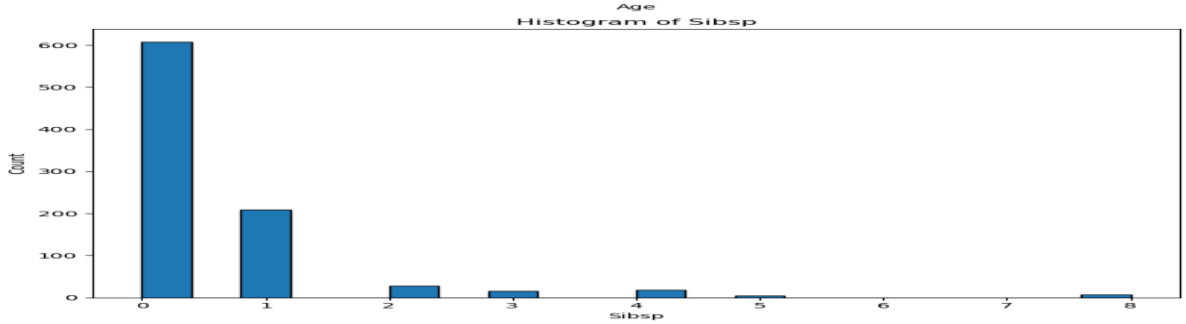
In [7]:
```
plt.show()
```

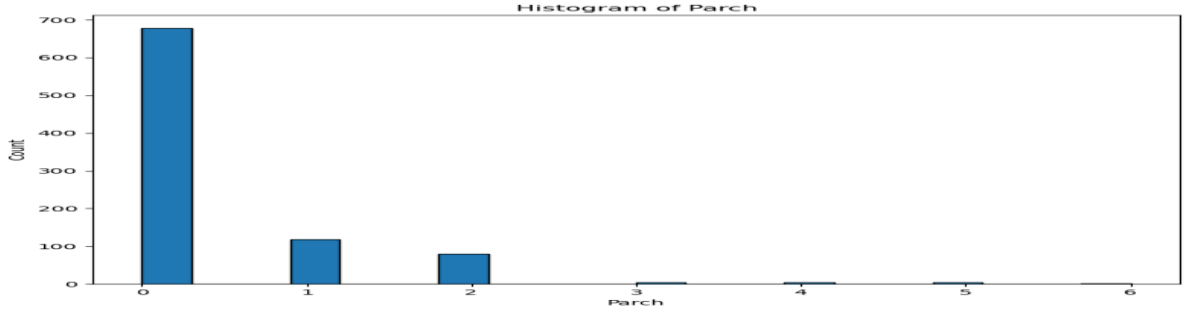
In [8]:
```
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# List of columns to create histograms for
columns = ['survived', 'pclass', 'age', 'sibsp', 'parch', 'fare']

# Set up the figure and subplots
fig, axes = plt.subplots(nrows=len(columns), ncols=1, figsize=(8, 6 * len(columns)))

# Create histograms for each column
for i, column in enumerate(columns):
    # Select the column
    data_column = data[column]

    # Create the histogram
    axes[i].hist(data_column, bins=20, edgecolor='black')

    # Set the labels and title for each subplot
    axes[i].set_xlabel(column.capitalize())
    axes[i].set_ylabel('Count')
    axes[i].set_title(f'Histogram of {column.capitalize()}')

# Adjust the spacing between subplots
plt.tight_layout()

# Display the histograms
plt.show()
```

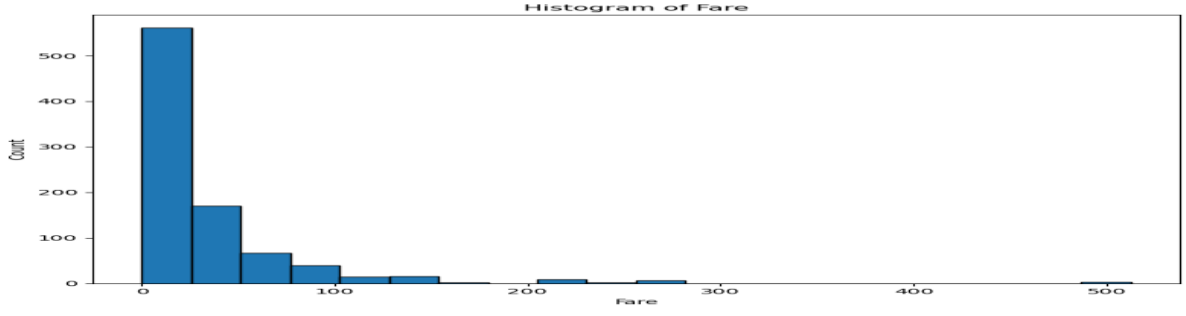

Histogram of Survived
Count
Survived


Histogram of Pclass
Count
Pclass


Histogram of Age
Count
Age


Histogram of Sibsp
Count
Sibsp

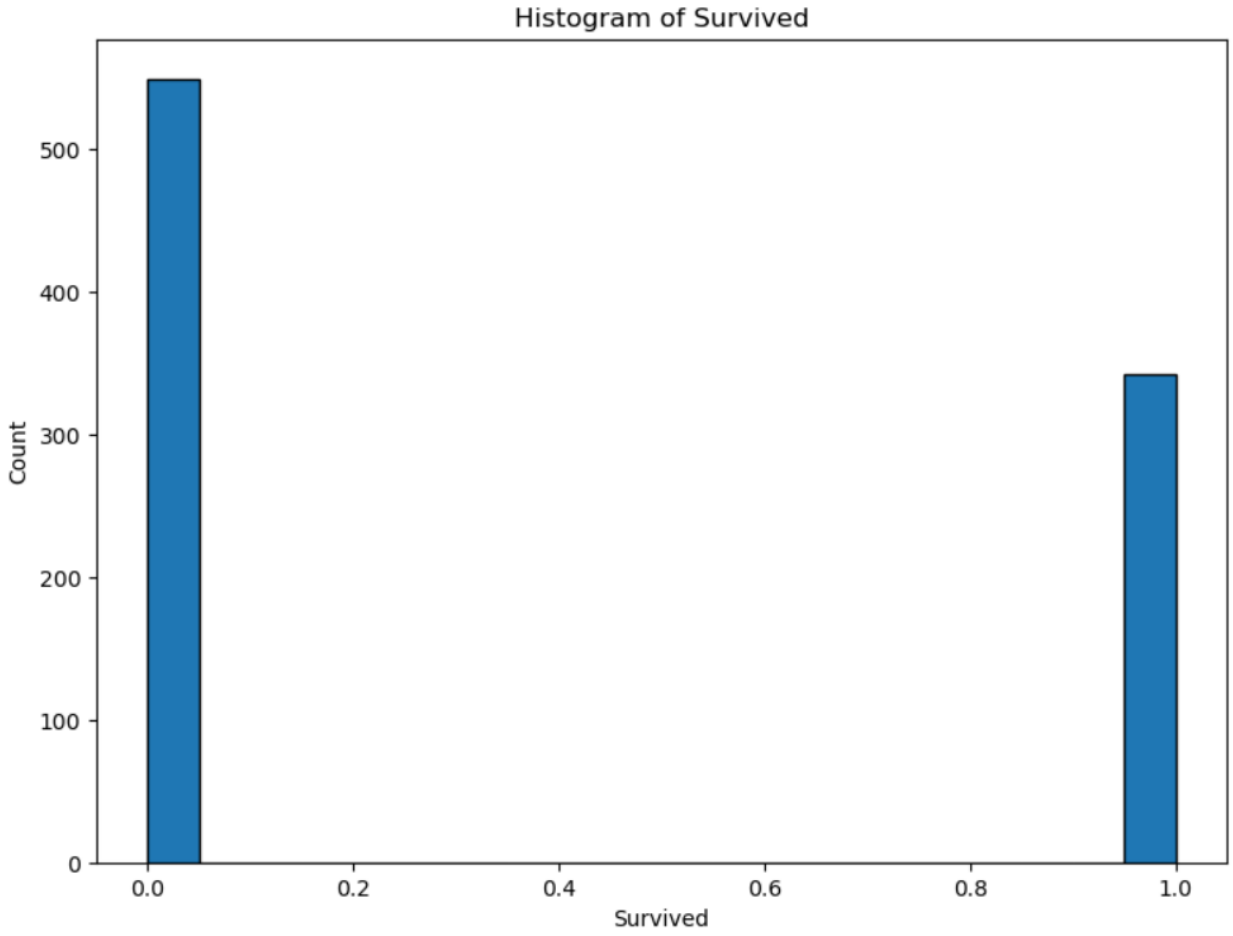

Histogram of Parch
Count
Parch

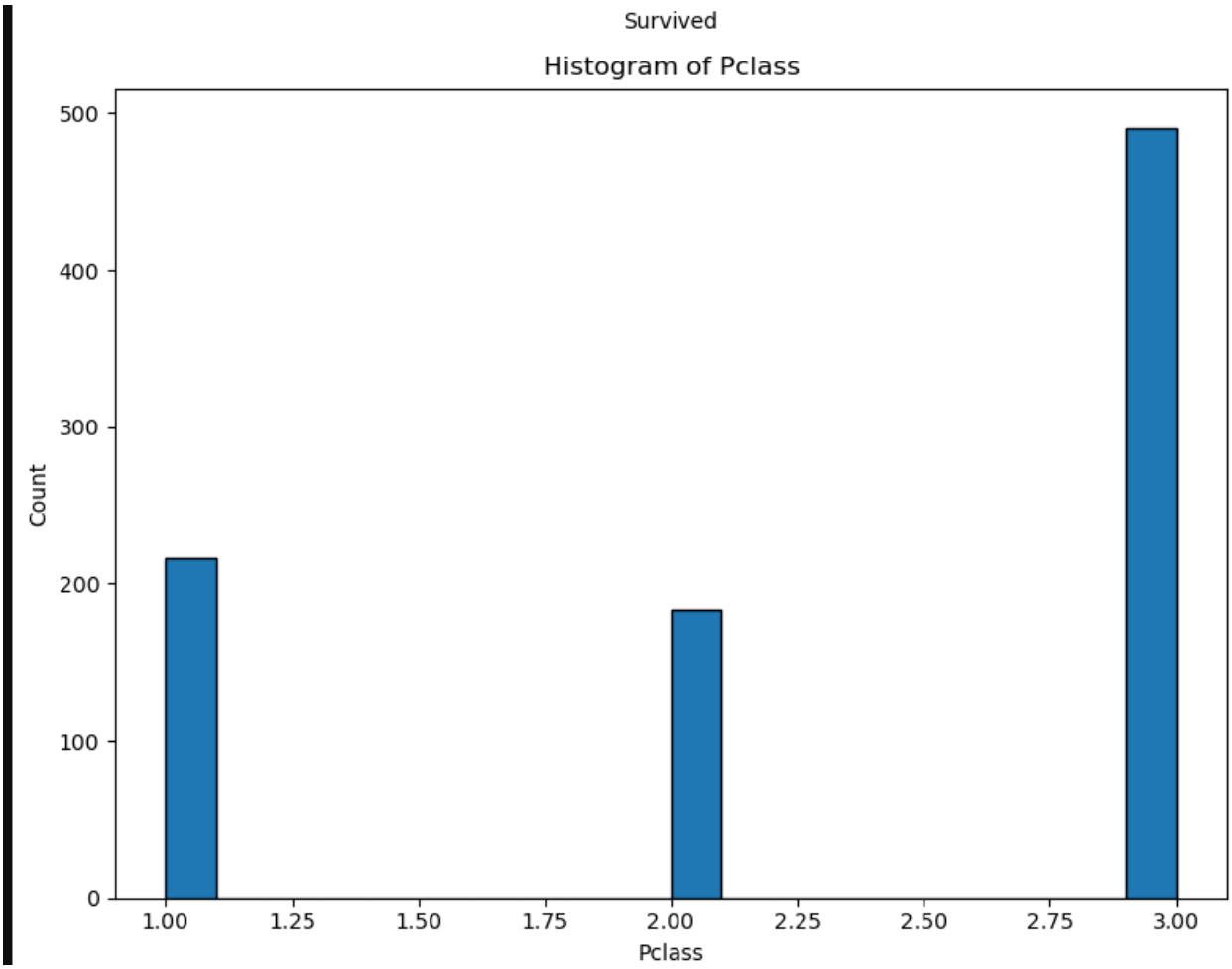

Histogram of Fare
Count
Fare

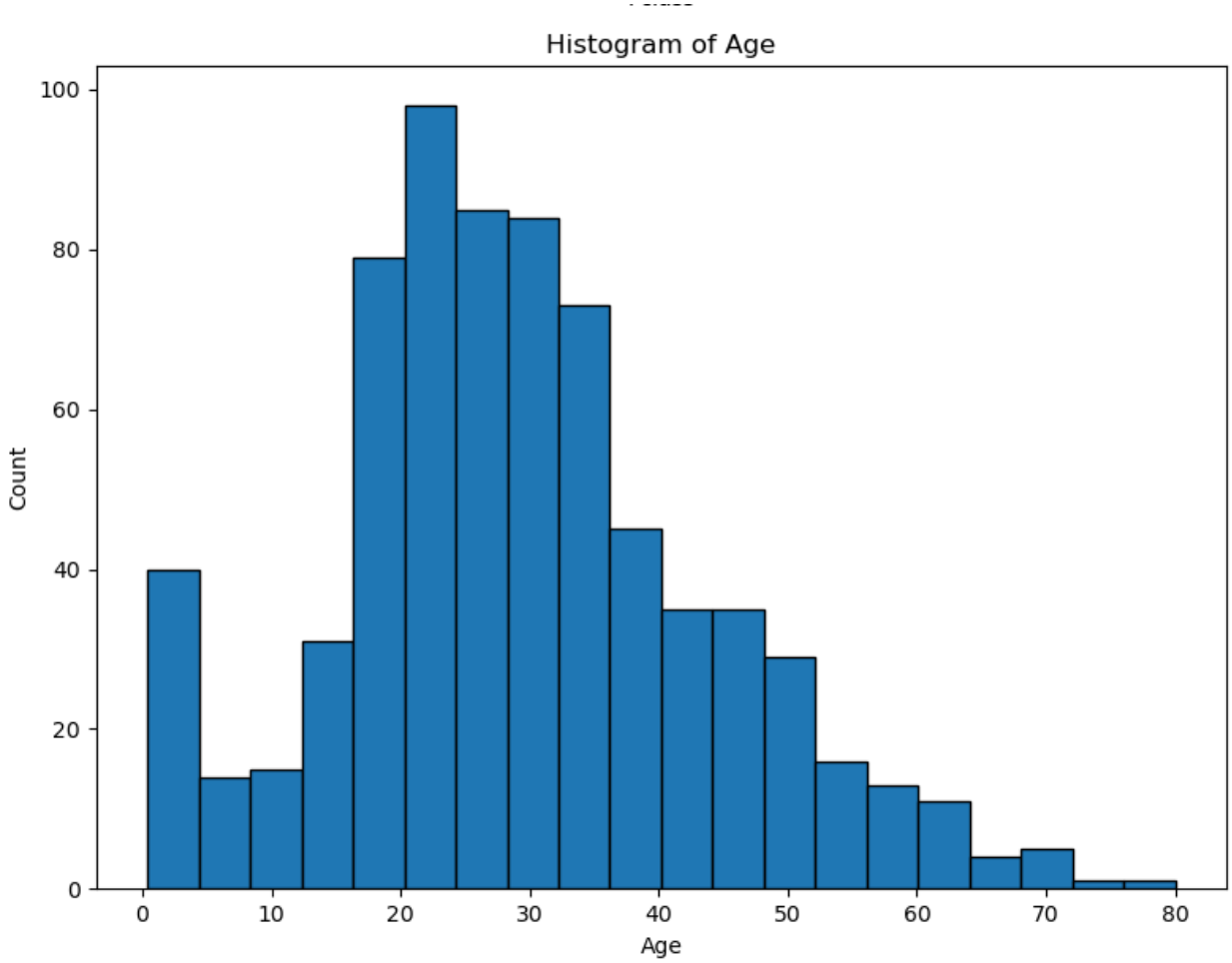
In [9]:

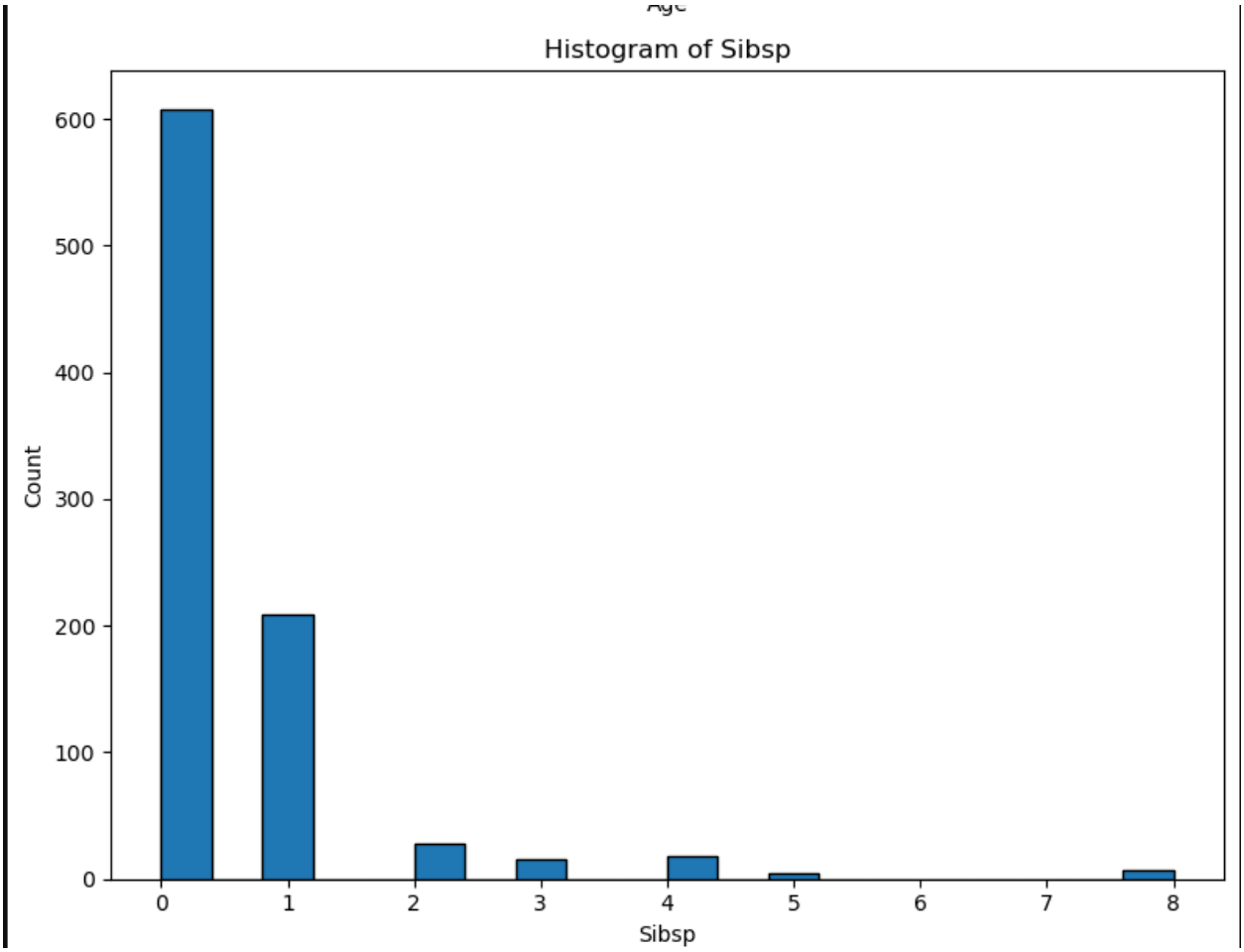
```
import pandas as pd
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# List of columns to create bar charts for
columns = ['survived', 'pclass', 'sex', 'age', 'sibsp', 'parch', 'fare', 'embarked', 'class', 'who', 'adult_male', 'deck', 'embar

# Set up the figure and subplots
fig, axes = plt.subplots(nrows=len(columns), ncols=1, figsize=(8, 6 * len(columns)))

# Create bar charts for each column
for i, column in enumerate(columns):
    # Select the column
    column_data = data[column]

    # Calculate the frequencies or counts
    counts = column_data.value_counts()

    # Create the bar chart
    axes[i].bar(counts.index, counts.values)

    # Set the labels and title for each subplot
    axes[i].set_xlabel(column.capitalize())
    axes[i].set_ylabel('Count')
    axes[i].set_title(f'Bar Chart of {column.capitalize()}')

# Adjust the spacing between subplots
plt.tight_layout()

# Display the bar charts
plt.show()
```

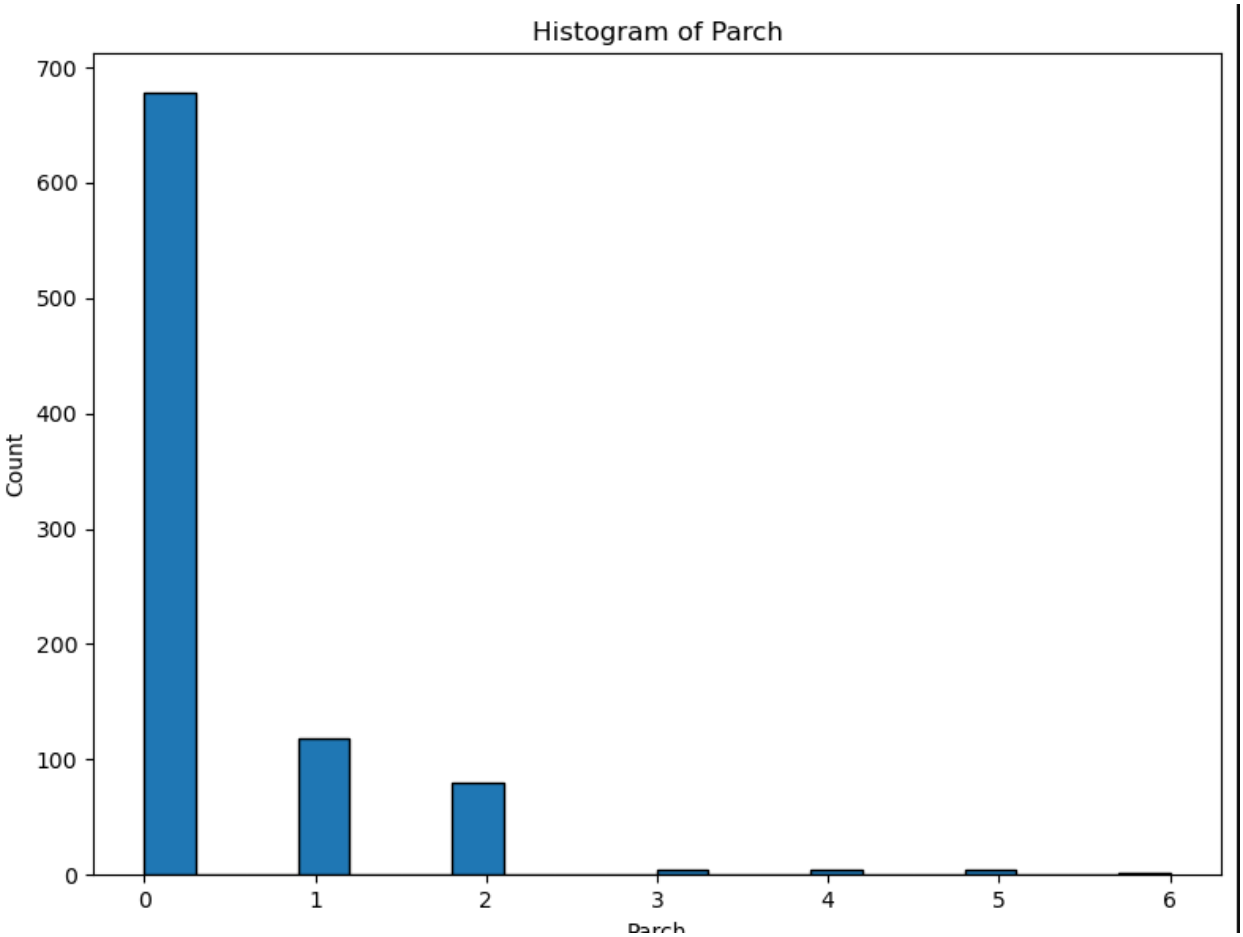

Bar Chart of Survived
Bar Chart of Pclass
Bar Chart of Sex
Bar Chart of Age
Bar Chart of Sibsp
Bar Chart of Parch
Bar Chart of Fare
Bar Chart of Embarked
Bar Chart of Class
Bar Chart of Who
Bar Chart of Adult_male
Bar Chart of Deck
Bar Chart of Embark_town
Bar Chart of Alive
Bar Chart of Alone

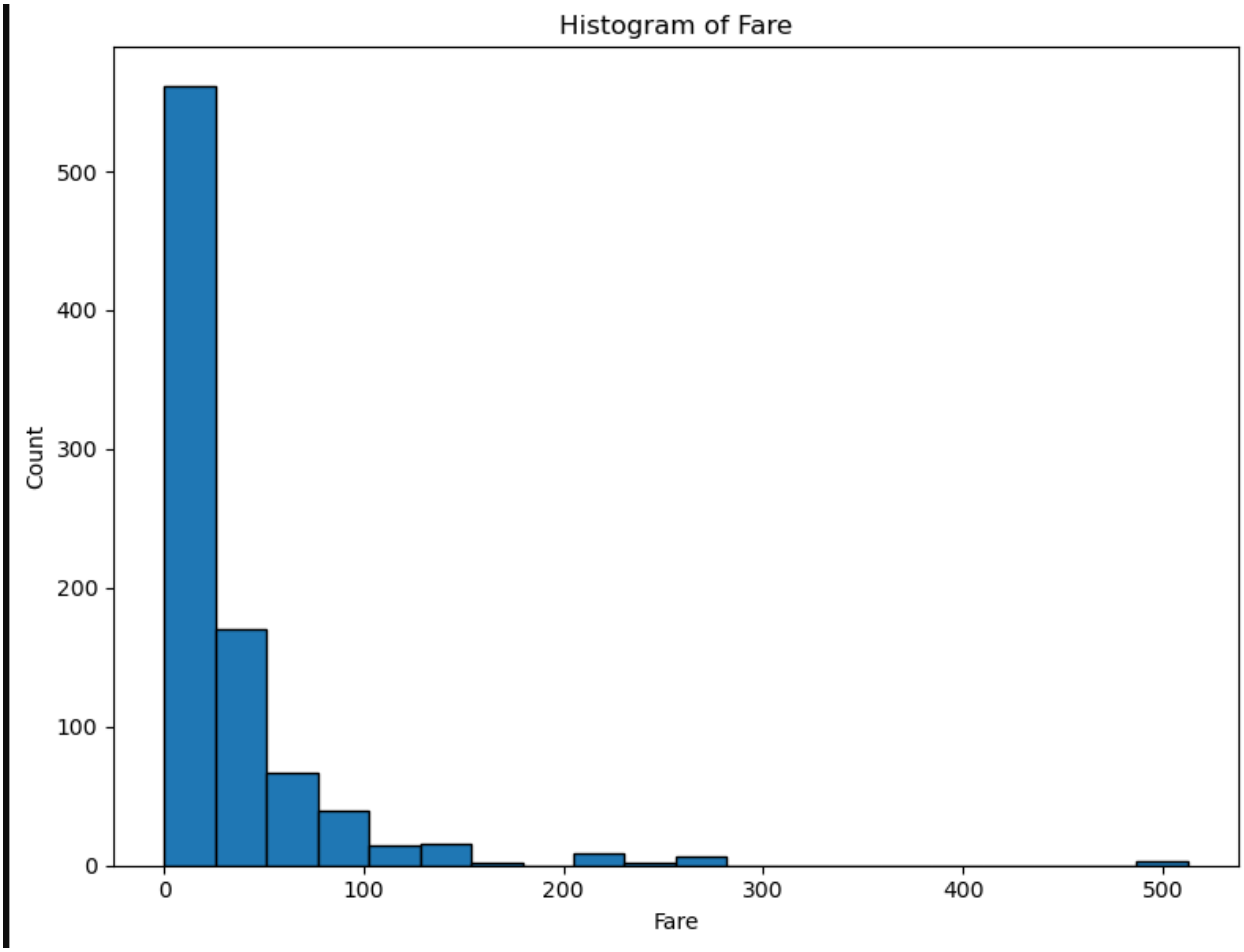

Histogram of Survived
Count
0
100
200
300
400
500
0.0
0.2
0.4
0.6
0.8
1.0
Survived


Survived
Histogram of Pclass
Count
Pclass
0
100
200
300
400
500
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00


Histogram of Age
Count
Age
0
20
40
60
80
100
0
10
20
30
40
50
60
70
80

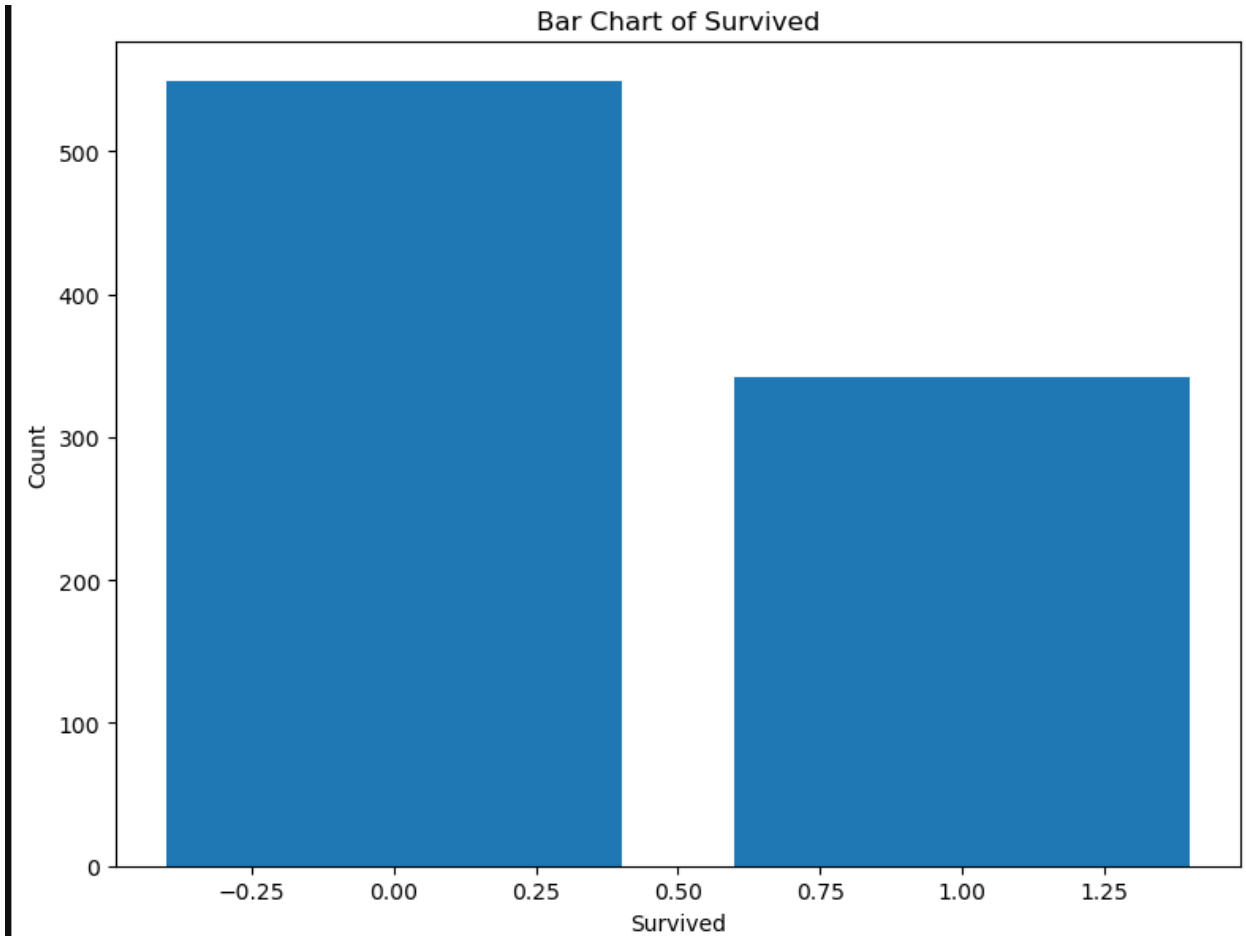

Histogram of Sibsp
Count
Sibsp
0
100
200
300
400
500
600
0
1
2
3
4
5
6
7
8

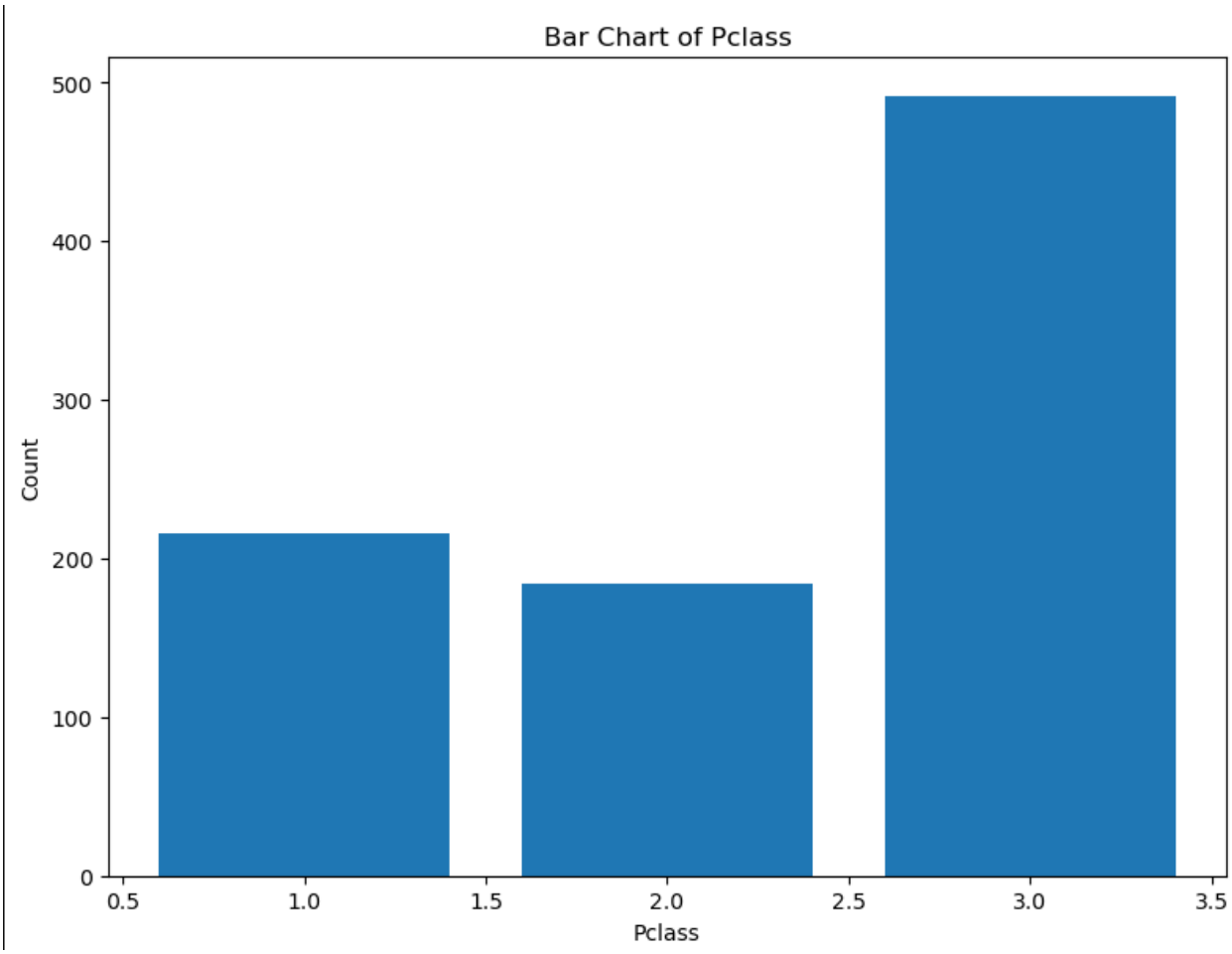

Histogram of Parch
Count
700
600
500
400
300
200
100
0
0
1
2
3
4
5
6
Parch

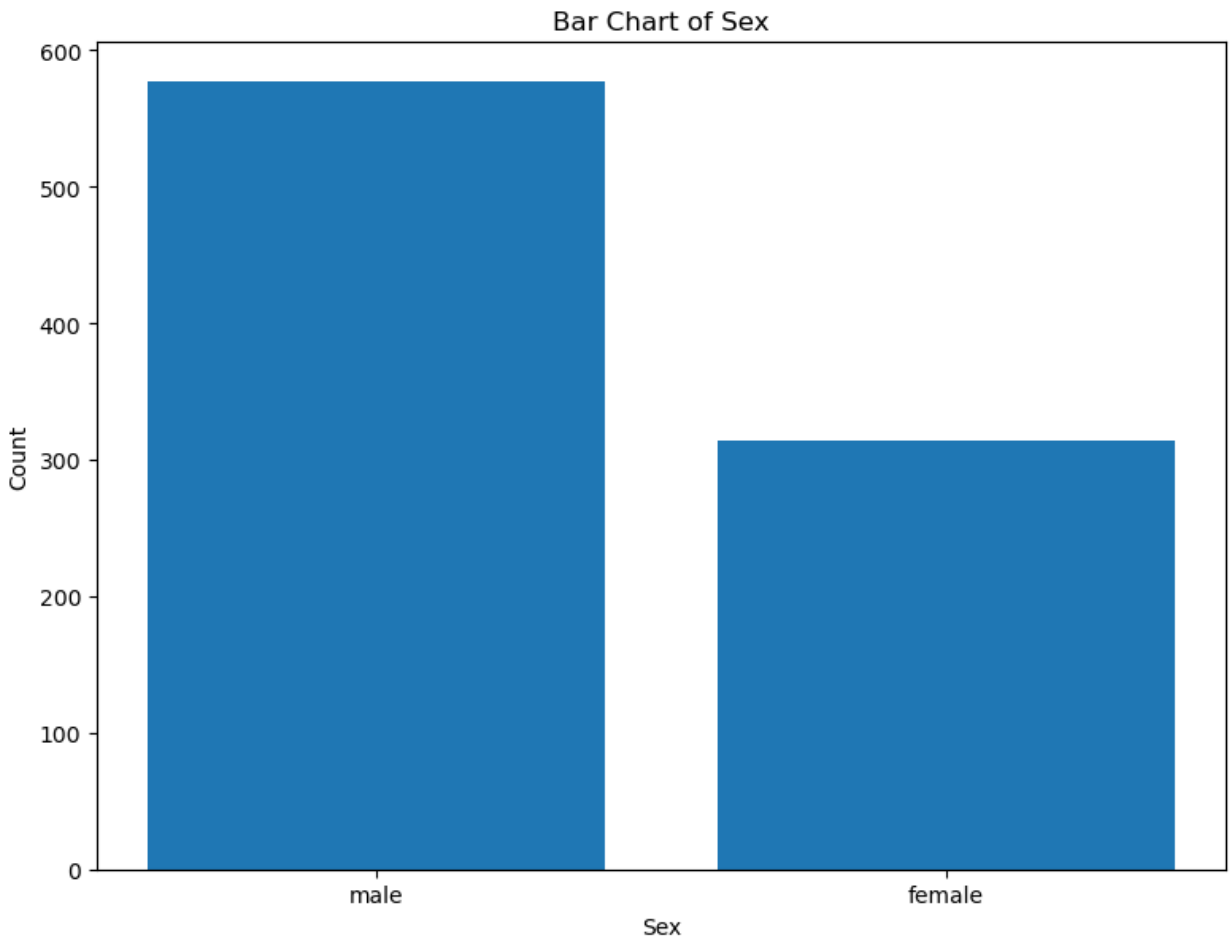

Histogram of Fare
Count
Fare
0
100
200
300
400
500

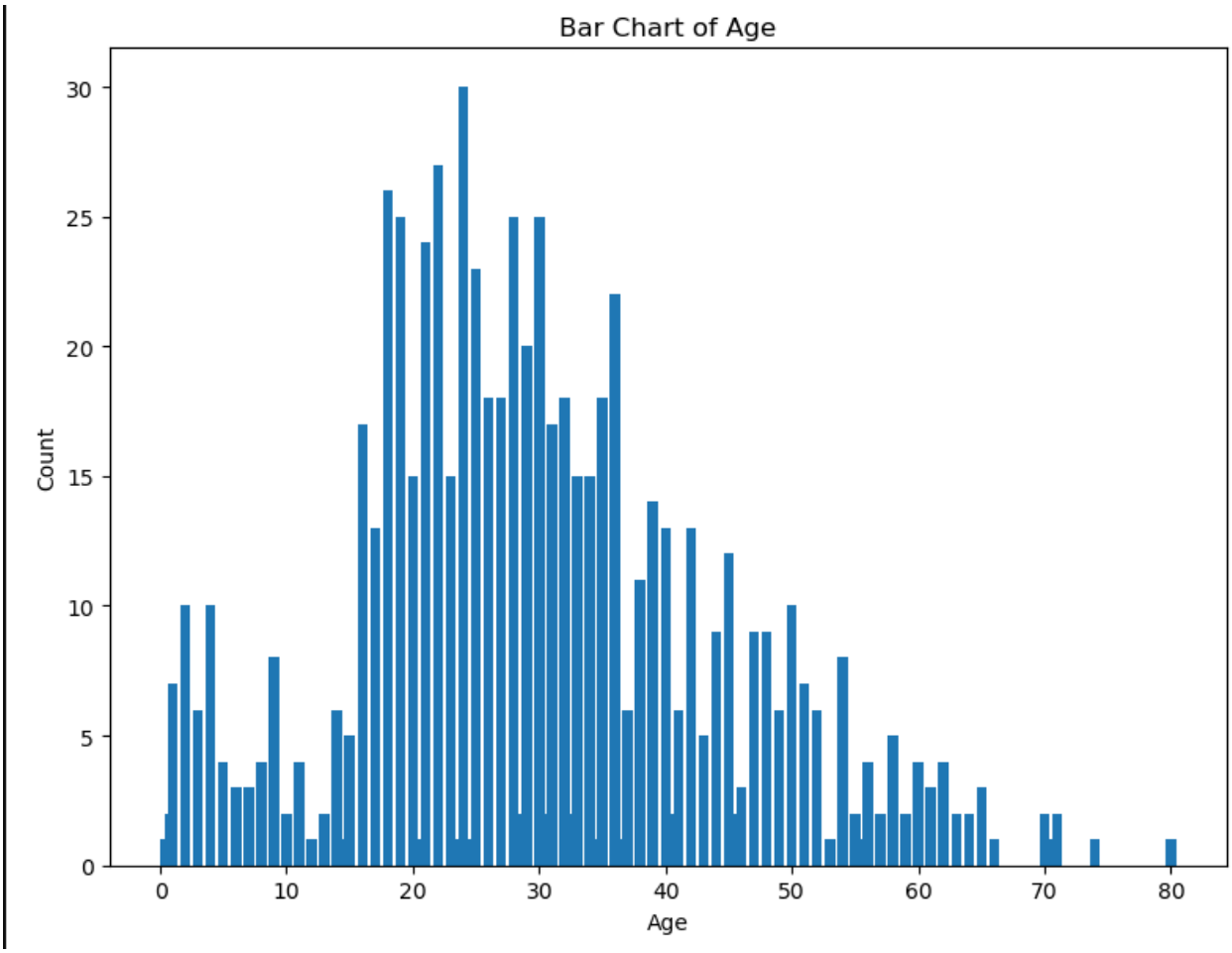
In [9]:

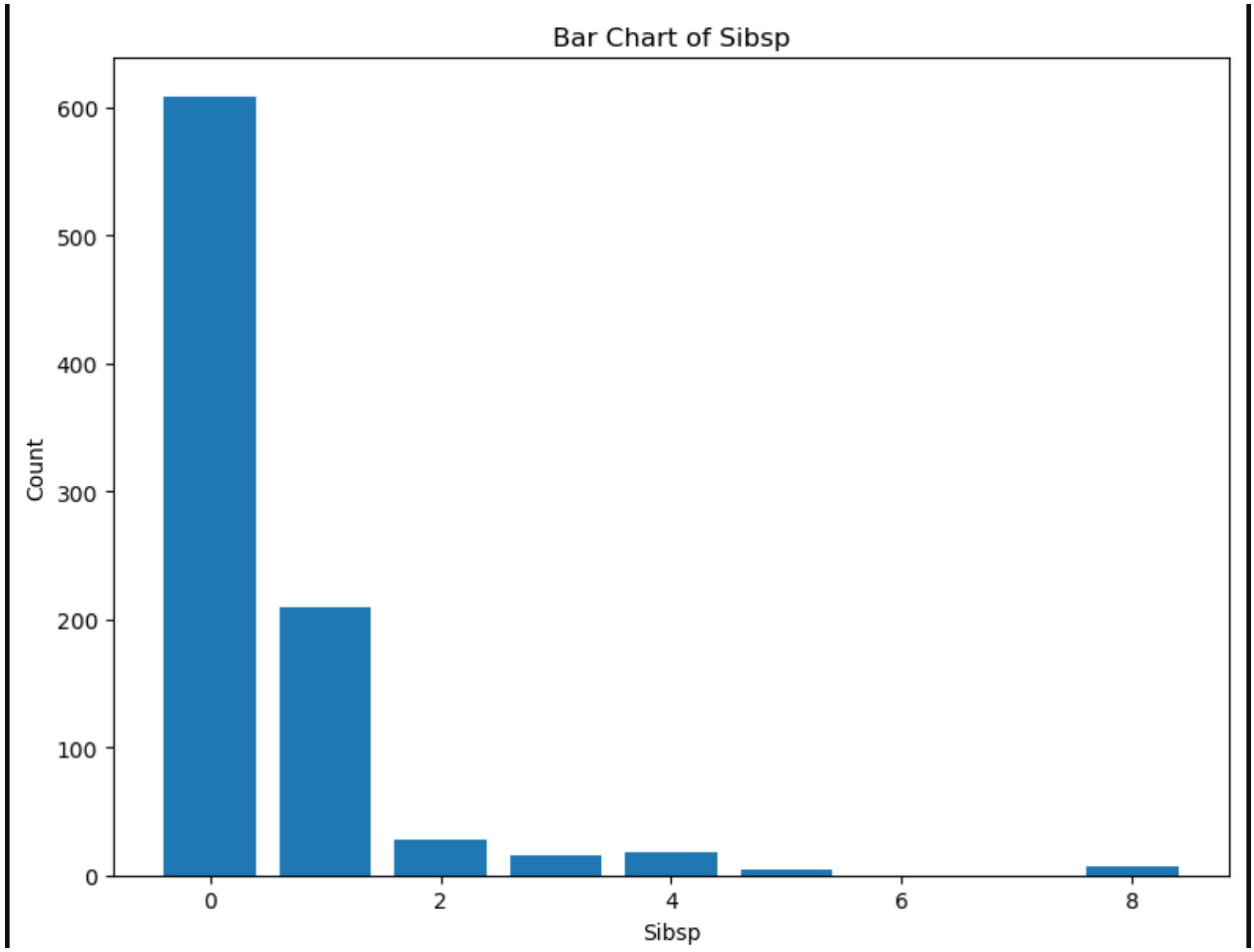
```
import pandas as pd
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# List of columns to create bar charts for
columns = ['survived', 'pclass', 'sex', 'age', 'sibsp', 'parch', 'fare', 'embarked', 'class', 'who', 'a

# Set up the figure and subplots
fig, axes = plt.subplots(nrows=len(columns), ncols=1, figsize=(8, 6 * len(columns)))

# Create bar charts for each column
for i, column in enumerate(columns):
    # Select the column
    column_data = data[column]

    # Calculate the frequencies or counts
    counts = column_data.value_counts()

    # Create the bar chart
    axes[i].bar(counts.index, counts.values)

    # Set the labels and title for each subplot
    axes[i].set_xlabel(column.capitalize())
    axes[i].set_ylabel('Count')
    axes[i].set_title(f'Bar Chart of {column.capitalize()}')

# Adjust the spacing between subplots
plt.tight_layout()

# Display the bar charts
plt.show()
```

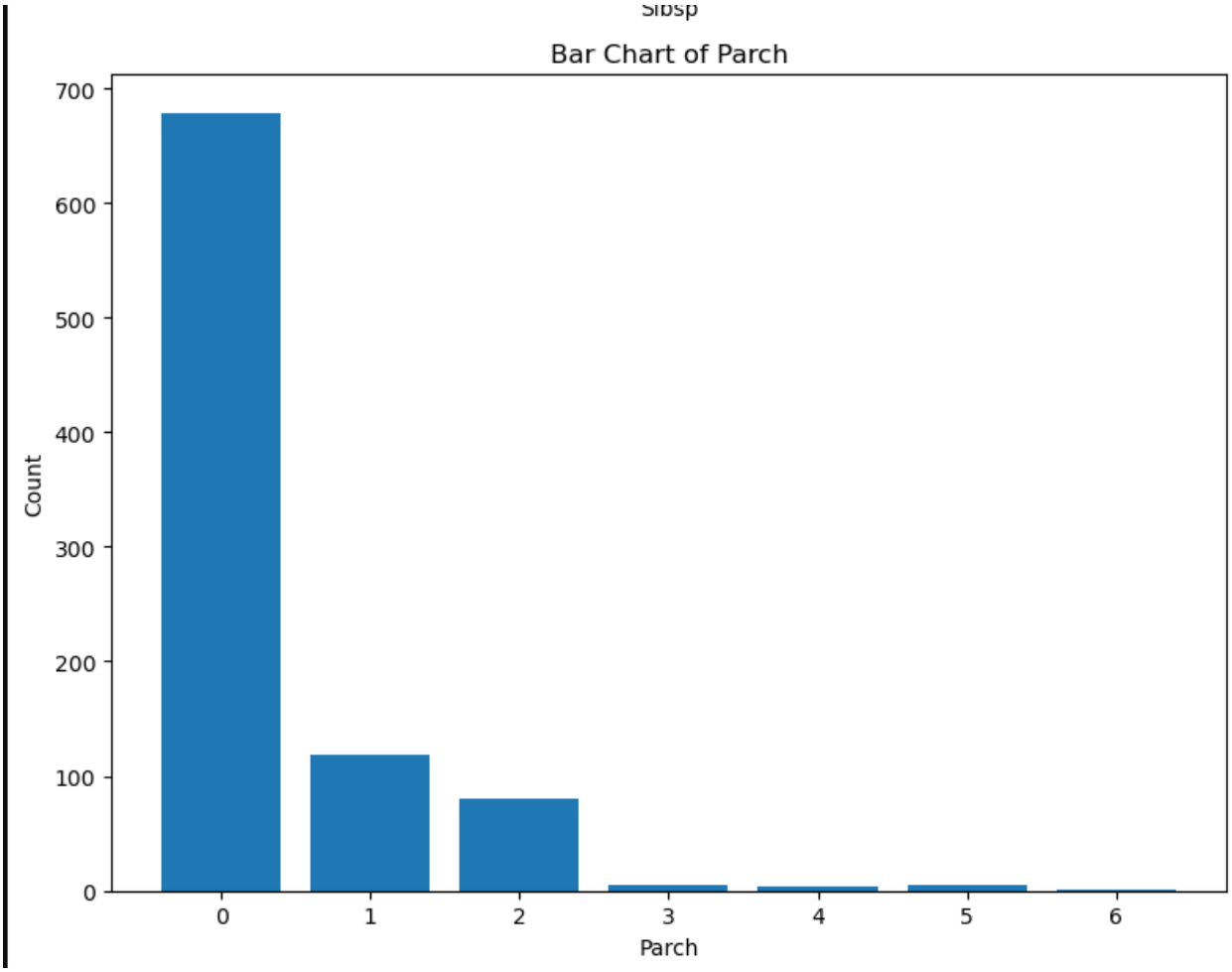

Bar Chart of Survived
Count
0
100
200
300
400
500
−0.25
0.00
0.25
0.50
0.75
1.00
1.25
Survived

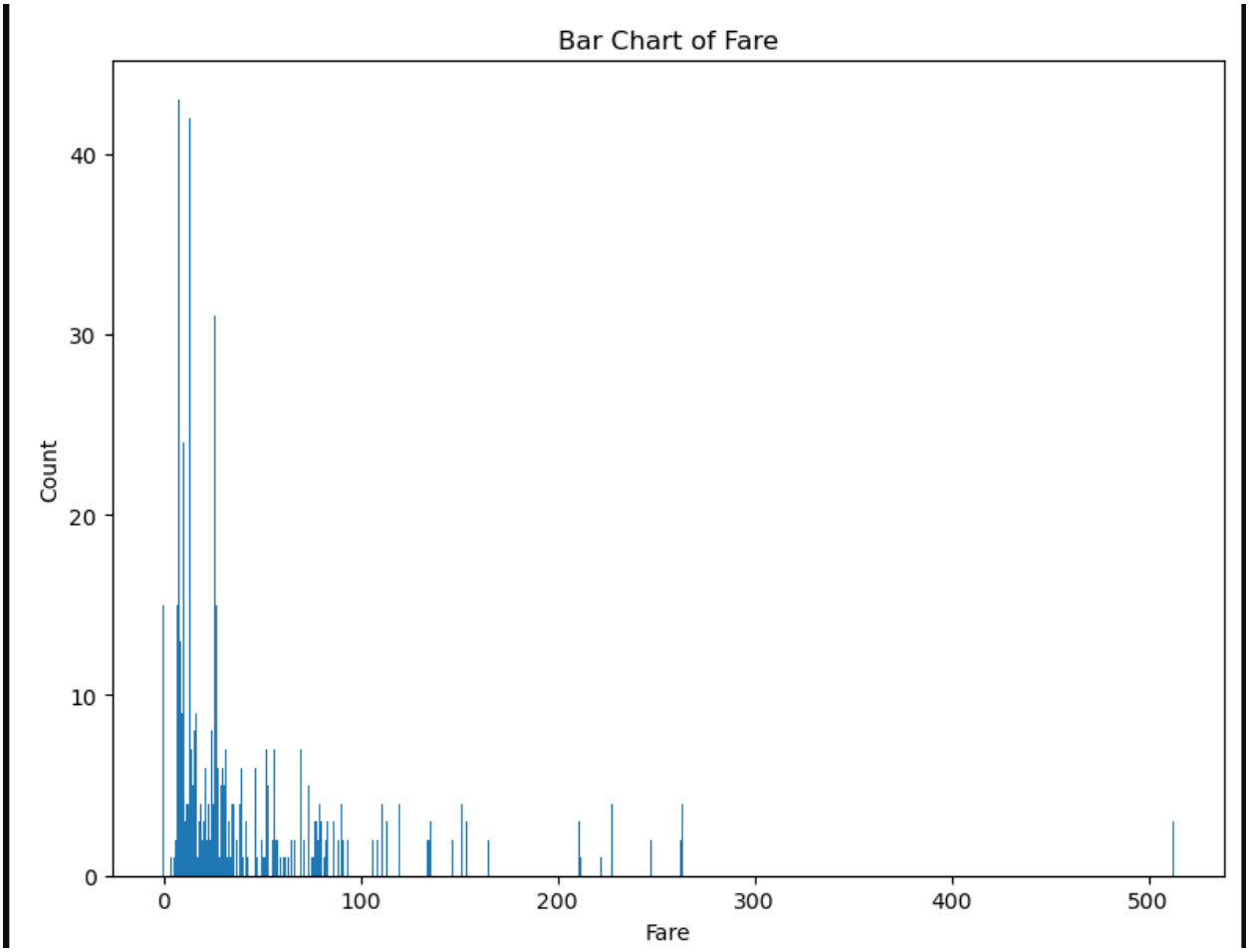

Bar Chart of Pclass
Count
Pclass
0
100
200
300
400
500
0.5
1.0
1.5
2.0
2.5
3.0
3.5

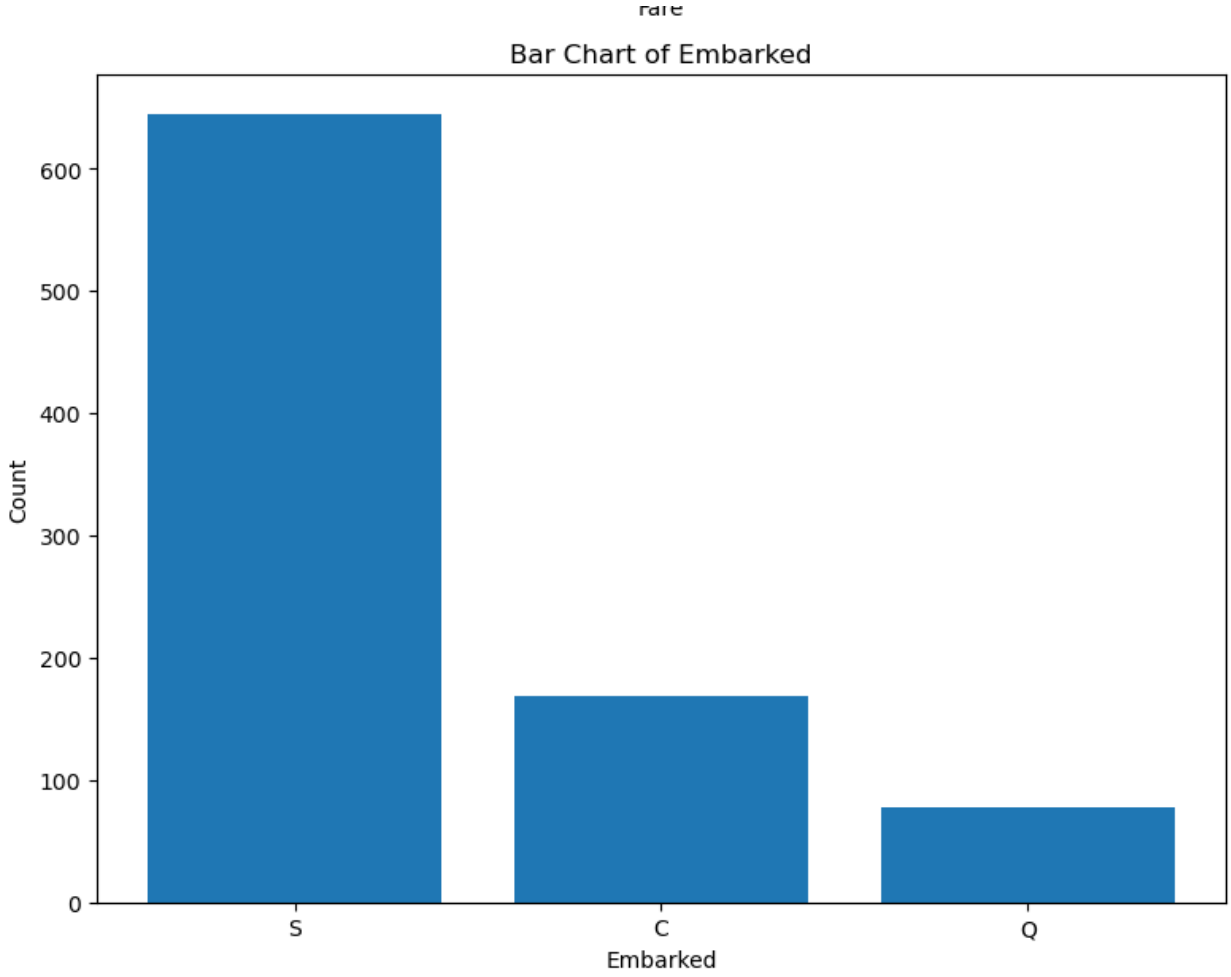

Bar Chart of Sex
600
500
400
300
200
100
0
Count
male
female
Sex

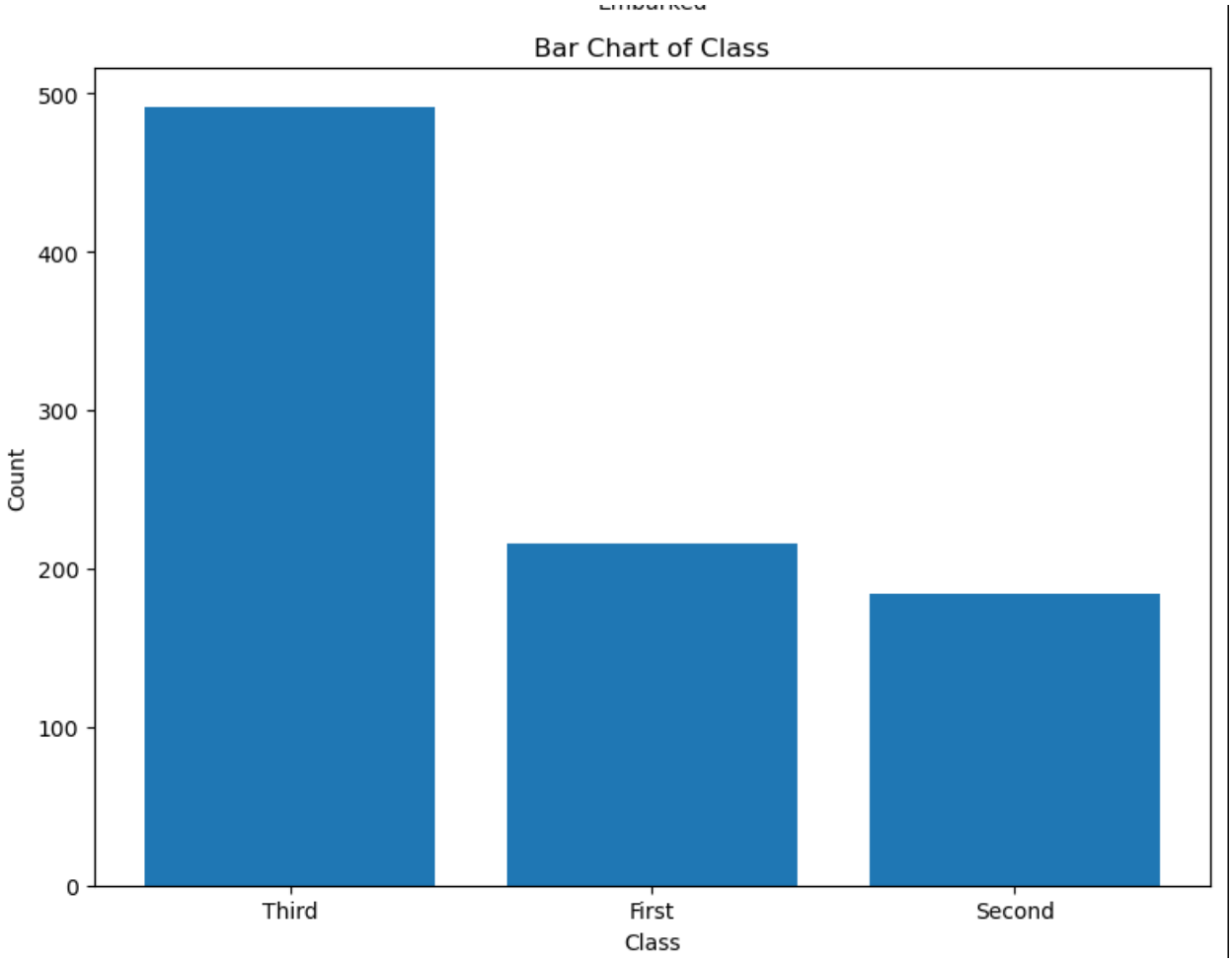

Bar Chart of Age
Count
Age
0
5
10
15
20
25
30
0
10
20
30
40
50
60
70
80

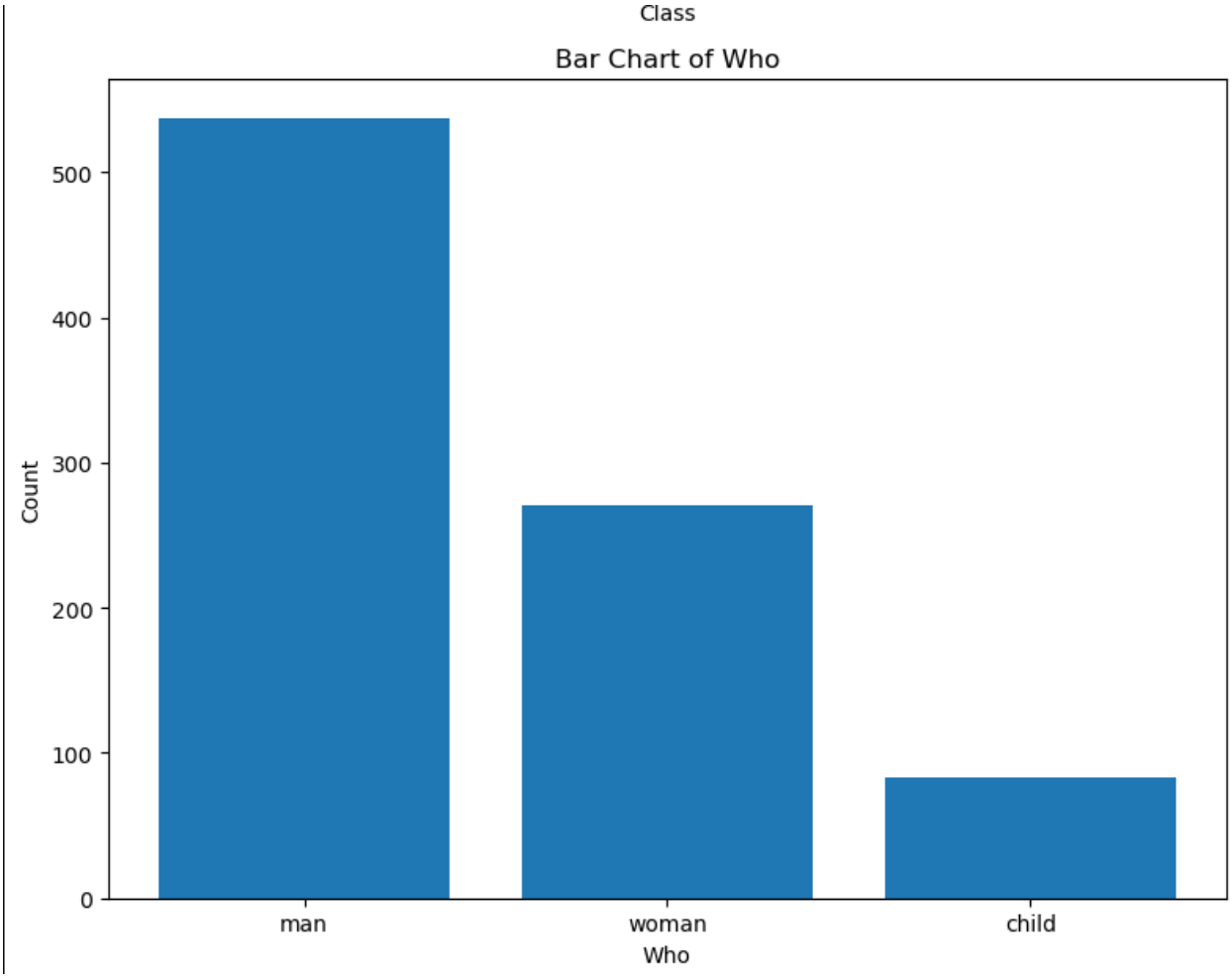

Bar Chart of Sibsp
Count
Sibsp
0
100
200
300
400
500
600
0
2
4
6
8

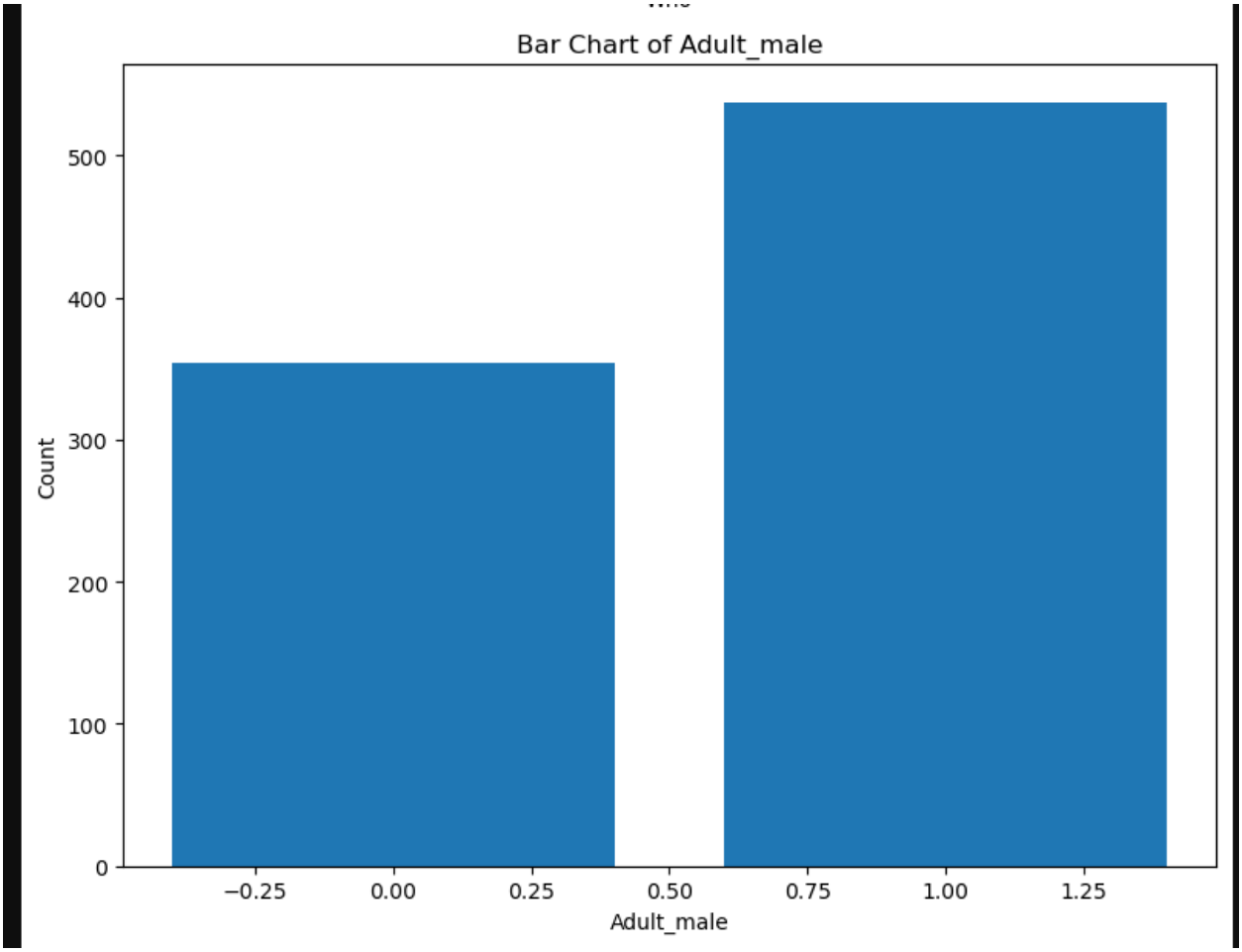

Sibsp
Bar Chart of Parch
700
600
500
400
300
200
100
0
Count
0
1
2
3
4
5
6
Parch

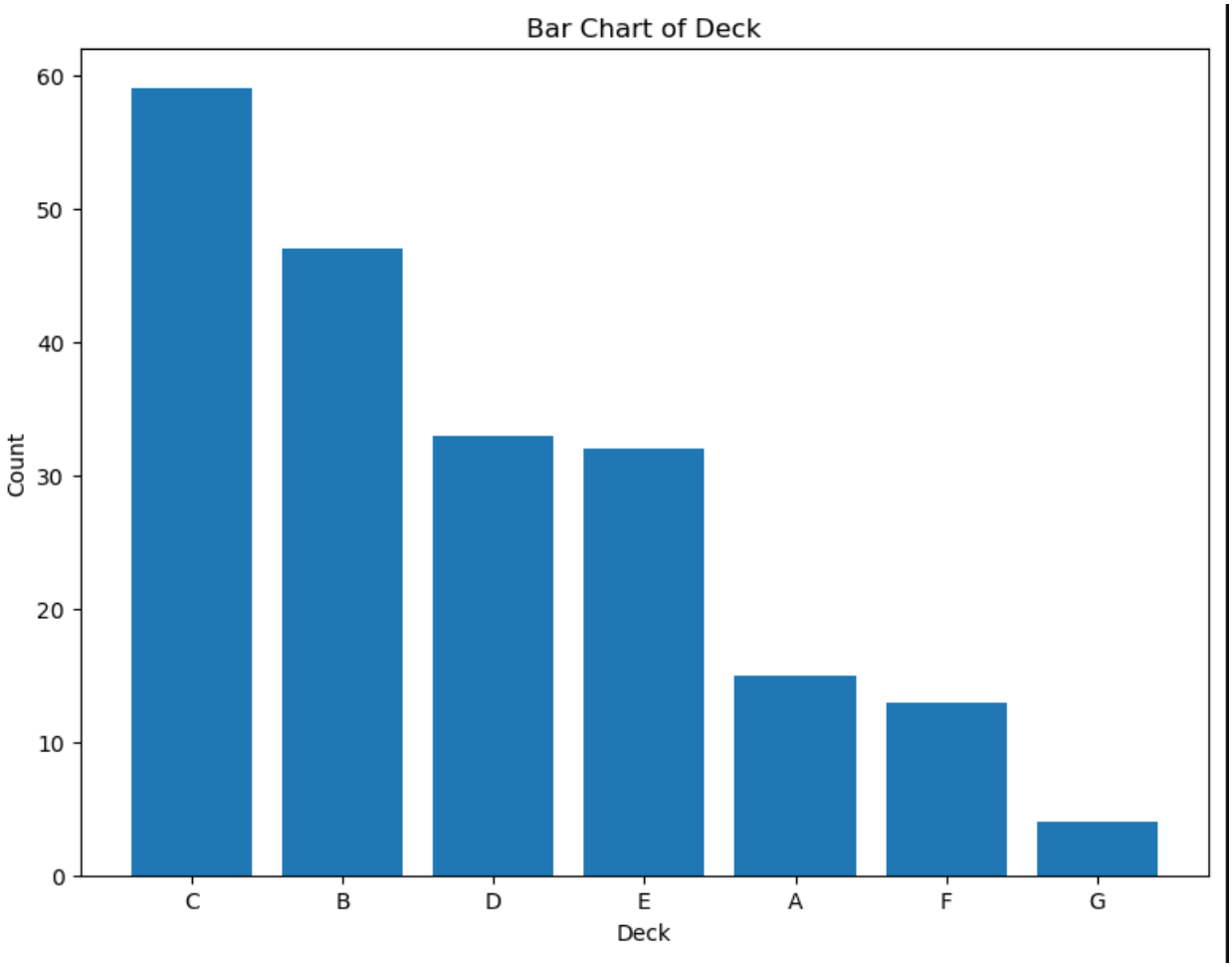

Bar Chart of Fare
Count
Fare
0
10
20
30
40
0
100
200
300
400
500


Fare
Bar Chart of Embarked
600
500
400
300
200
100
0
Count
S
C
Q
Embarked


Bar Chart of Class
500
400
300
200
100
0
Count
Third
First
Second
Class

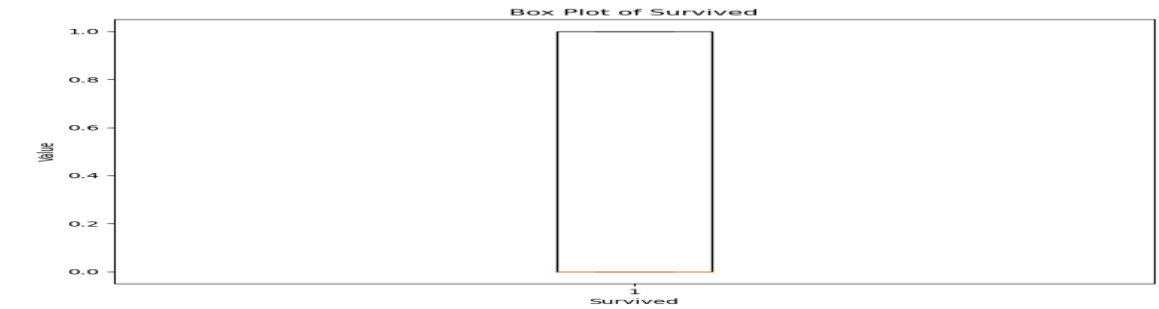

Class
Bar Chart of Who
500
400
300
200
100
0
Count
man
woman
child
Who

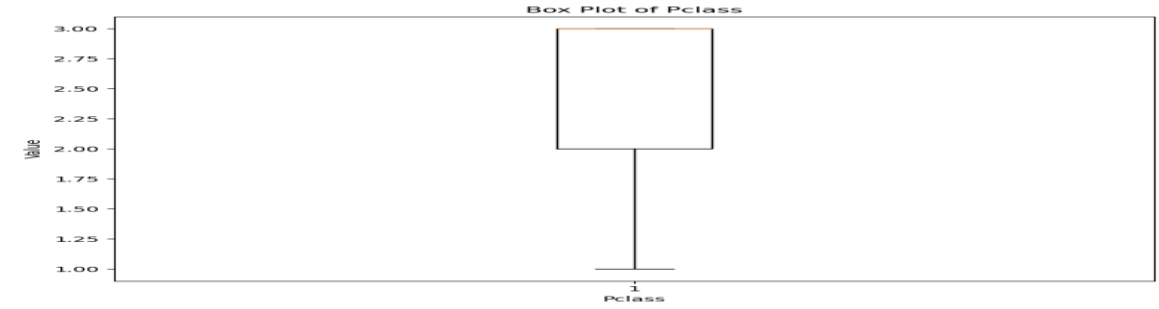

Bar Chart of Adult_male
Count
Adult_male
0
100
200
300
400
500
−0.25
0.00
0.25
0.50
0.75
1.00
1.25

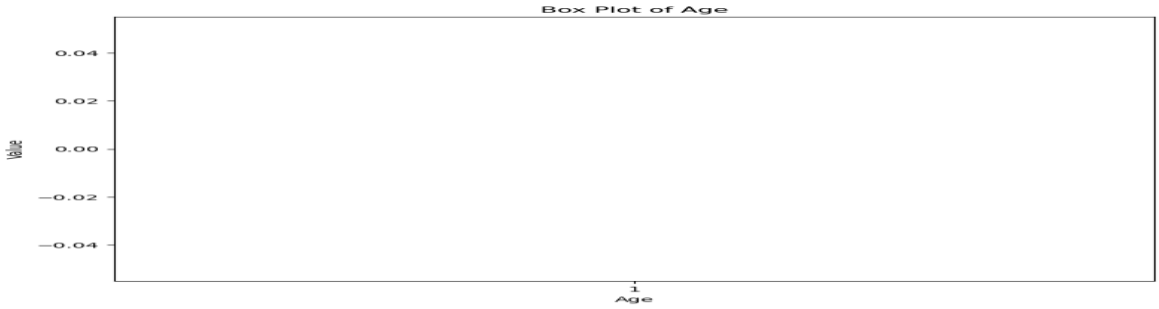


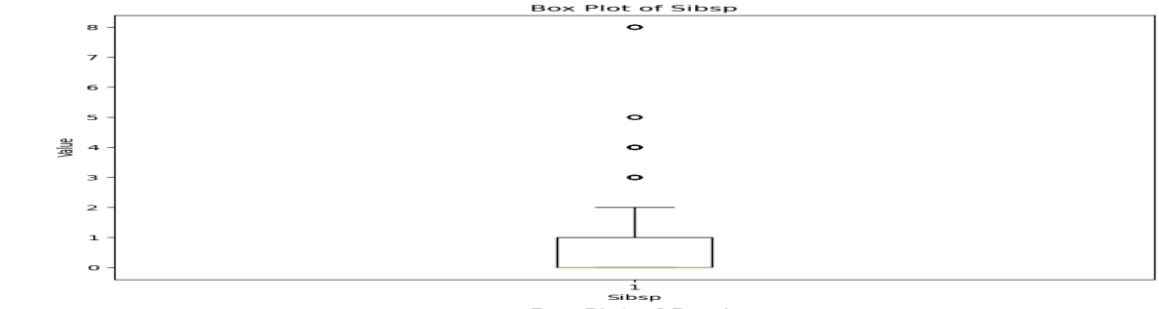
In [11]:

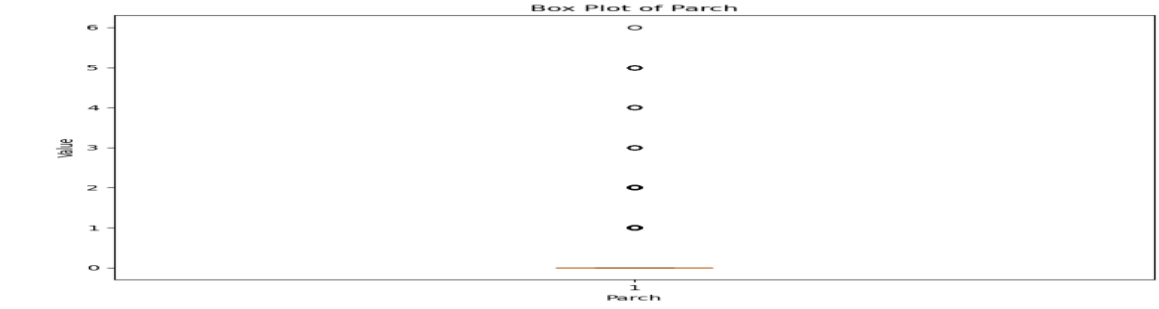
```python
import pandas as pd
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# List of columns to create box plots for
columns = ['survived', 'pclass', 'age', 'sibsp', 'parch', 'fare']

# Set up the figure and subplots
fig, axes = plt.subplots(nrows=len(columns), ncols=1, figsize=(8, 6 * len(columns)))

# Create box plots for each column
for i, column in enumerate(columns):
    # Select the column
    column_data = data[column]

    # Create the box plot
    axes[i].boxplot(column_data)

    # Set the labels and title for each subplot
    axes[i].set_xlabel(column.capitalize())
    axes[i].set_ylabel('Value')
    axes[i].set_title(f'Box Plot of {column.capitalize()}')

# Adjust the spacing between subplots
plt.tight_layout()

# Display the box plots
plt.show()
```

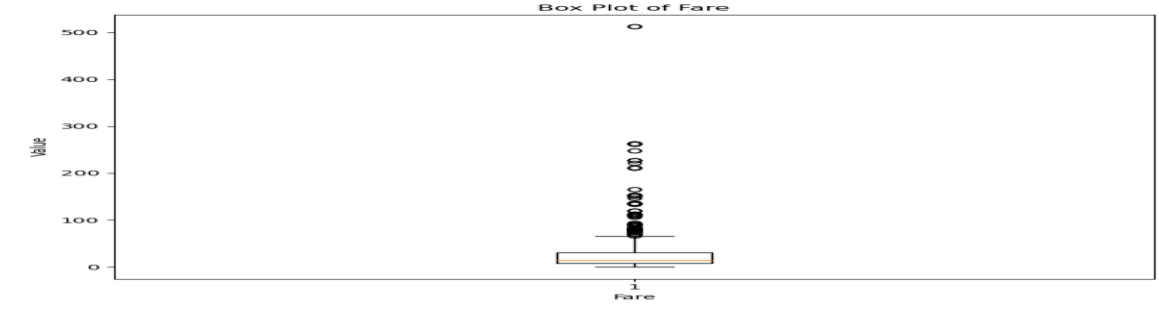

Box Plot of Survived
Value
1.0
0.8
0.6
0.4
0.2
0.0
1
Survived


Box Plot of Pclass
Value
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
1
Pclass


Box Plot of Age
Value
0.04
0.02
0.00
−0.02
−0.04
1
Age

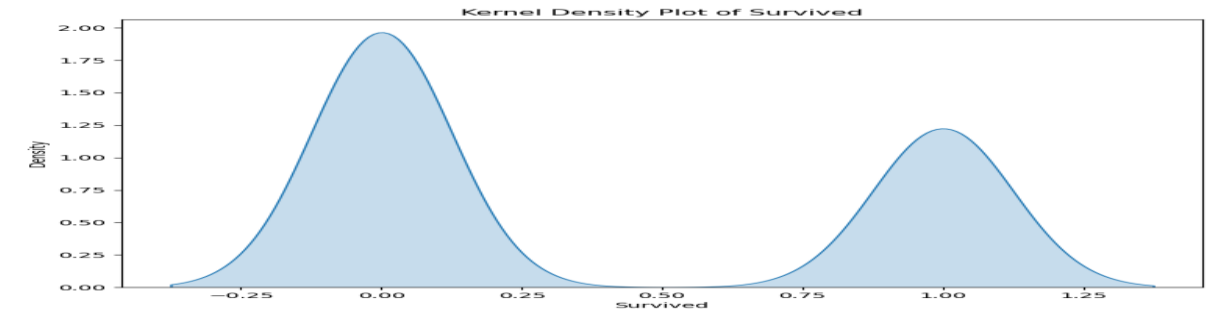

Box Plot of Sibsp
Value
8
7
6
5
4
3
2
1
0
1
Sibsp

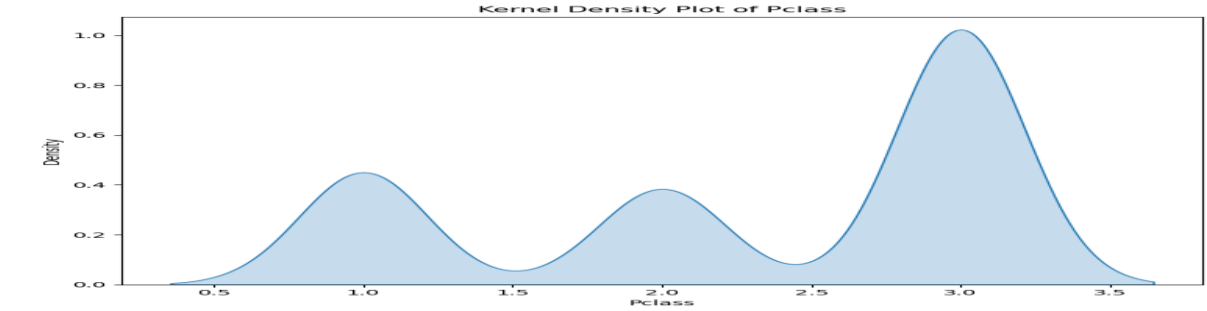

Box Plot of Parch
Value
6
5
4
3
2
1
0
1
Parch

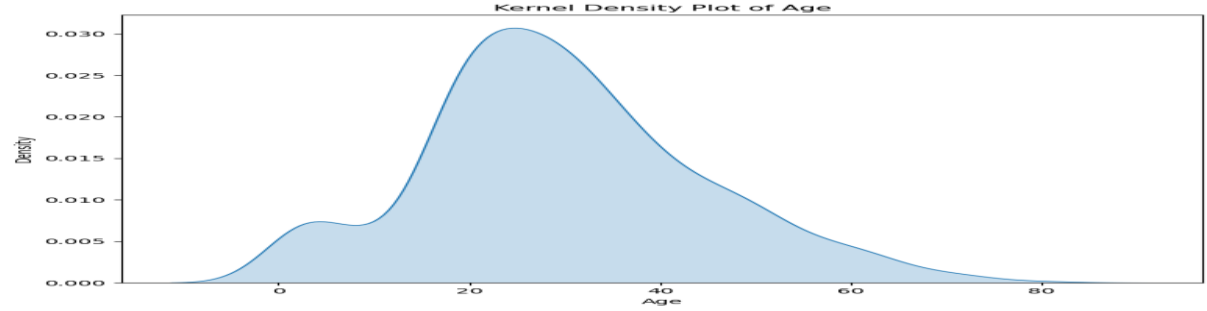

Box Plot of Fare
Value
500
400
300
200
100
0
1
Fare

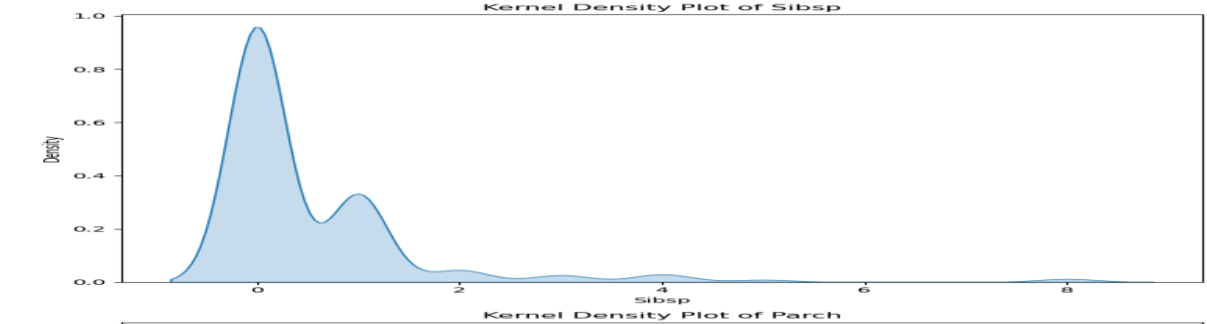
In [14]:

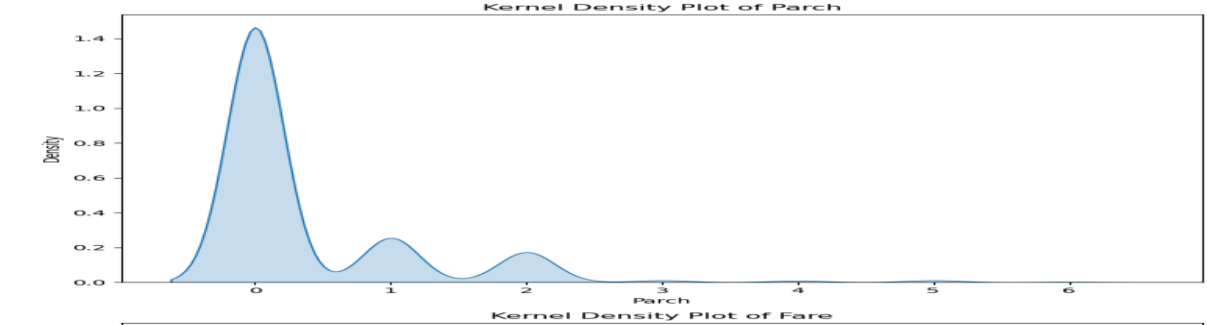
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# List of columns to create KDE plots for
columns = ['survived', 'pclass', 'age', 'sibsp', 'parch', 'fare']

# Set up the figure and subplots
fig, axes = plt.subplots(nrows=len(columns), ncols=1, figsize=(8, 6 * len(columns)))

# Create KDE plots for each column
for i, column in enumerate(columns):
    # Select the column
    column_data = data[column]

    # Create the KDE plot
    sns.kdeplot(column_data, ax=axes[i], fill=True)

    # Set the labels and title for each subplot
    axes[i].set_xlabel(column.capitalize())
    axes[i].set_ylabel('Density')
    axes[i].set_title(f'Kernel Density Plot of {column.capitalize()}')

# Adjust the spacing between subplots
plt.tight_layout()

# Display the KDE plots
plt.show()
```

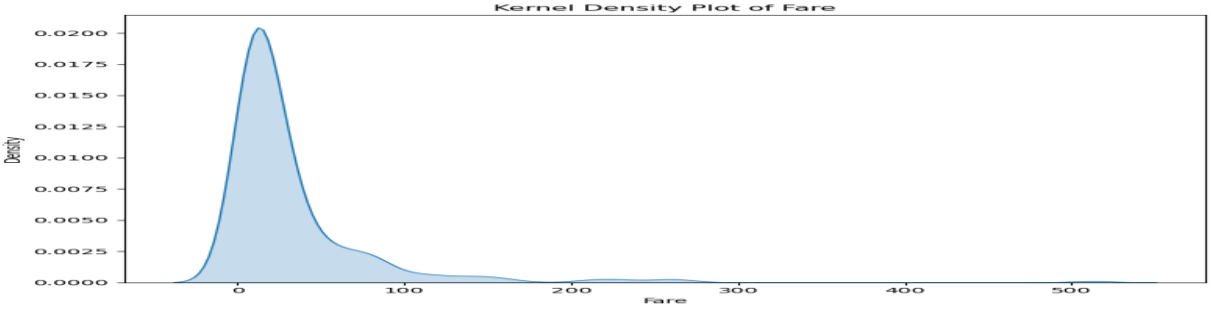

Kernel Density Plot of Survived
Density
Survived


Kernel Density Plot of Pclass
Density
Pclass


Kernel Density Plot of Age
Density
Age

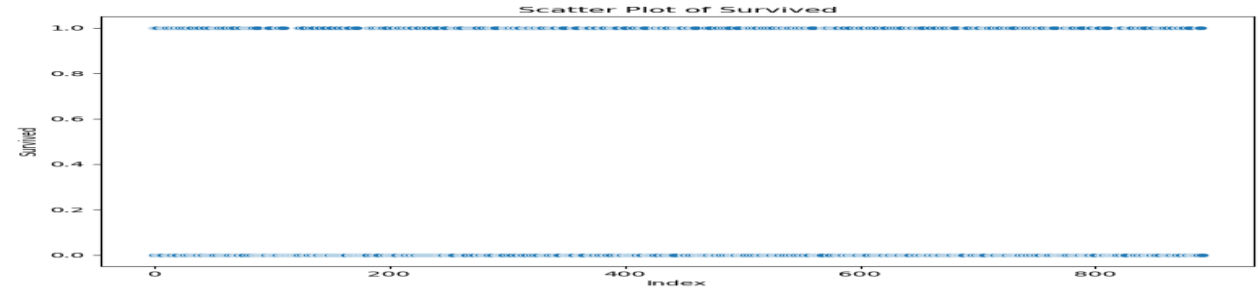

Kernel Density Plot of Sibsp
Density
Sibsp

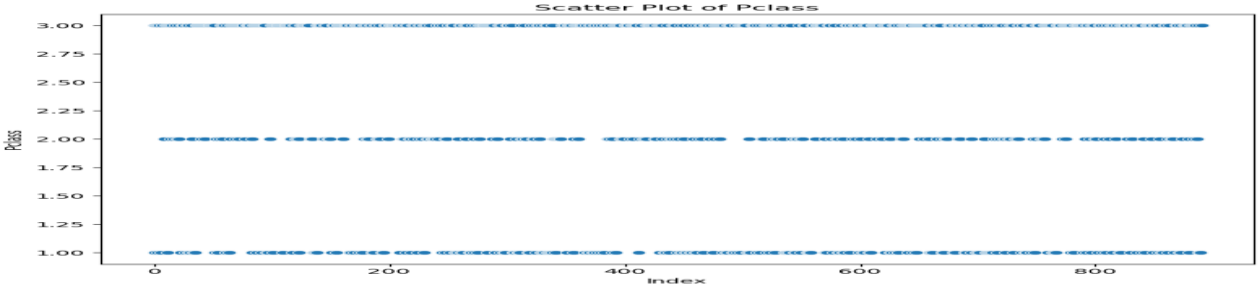

Kernel Density Plot of Parch
Density
Parch

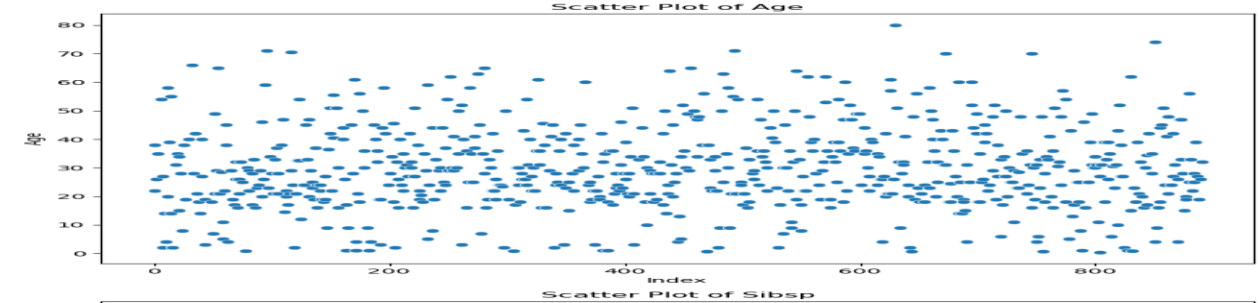

Kernel Density Plot of Fare
Density
Fare

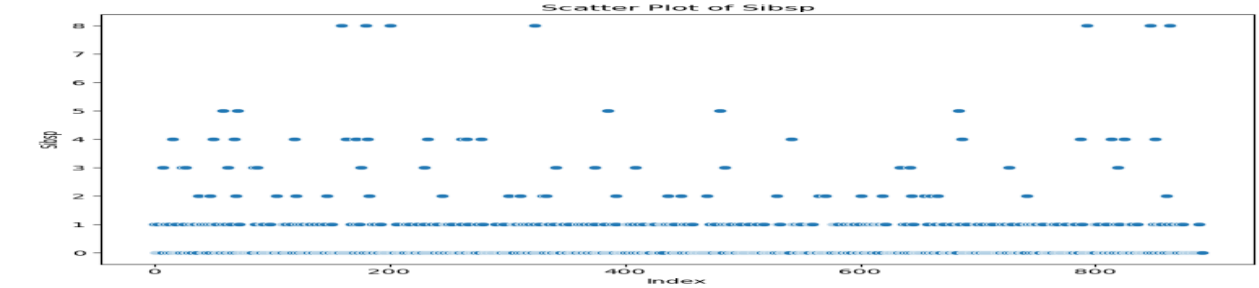
In [15]:

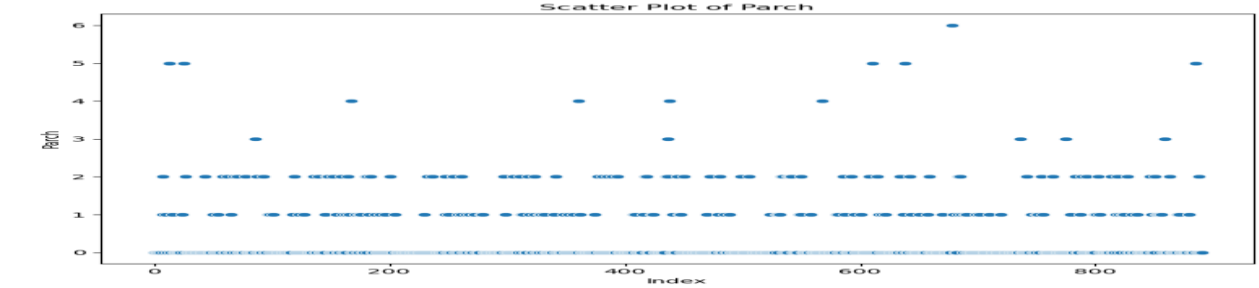
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# List of columns to create scatter plots for
columns = ['survived', 'pclass', 'age', 'sibsp', 'parch', 'fare']

# Set up the figure and subplots
fig, axes = plt.subplots(nrows=len(columns), ncols=1, figsize=(8, 6 * len(columns)))

# Create scatter plots for each column
for i, column in enumerate(columns):
    # Select the column
    column_data = data[column]

    # Generate x-coordinates for scatter plot
    x = range(len(column_data))

    # Create the scatter plot
    sns.scatterplot(x=x, y=column_data, ax=axes[i])

    # Set the labels and title for each subplot
    axes[i].set_xlabel('Index')
    axes[i].set_ylabel(column.capitalize())
    axes[i].set_title(f'Scatter Plot of {column.capitalize()}')

# Adjust the spacing between subplots
plt.tight_layout()

# Display the scatter plots
plt.show()
```

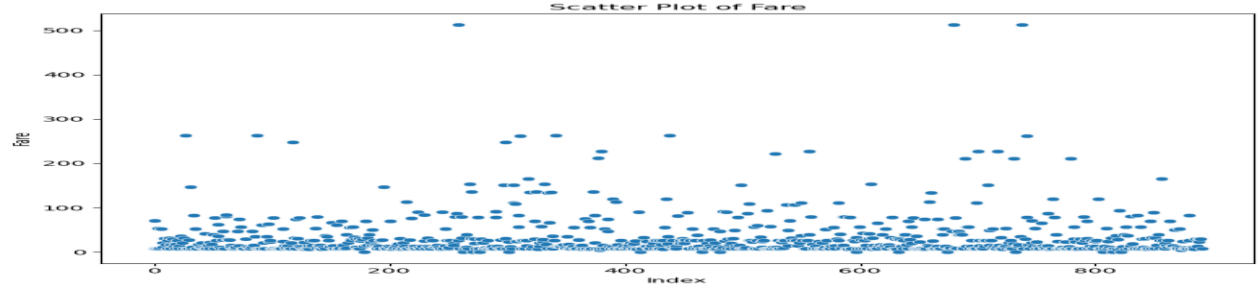

Scatter Plot of Survived
Survived
Index


Scatter Plot of Pclass
Pclass
Index


Scatter Plot of Age
Age
Index

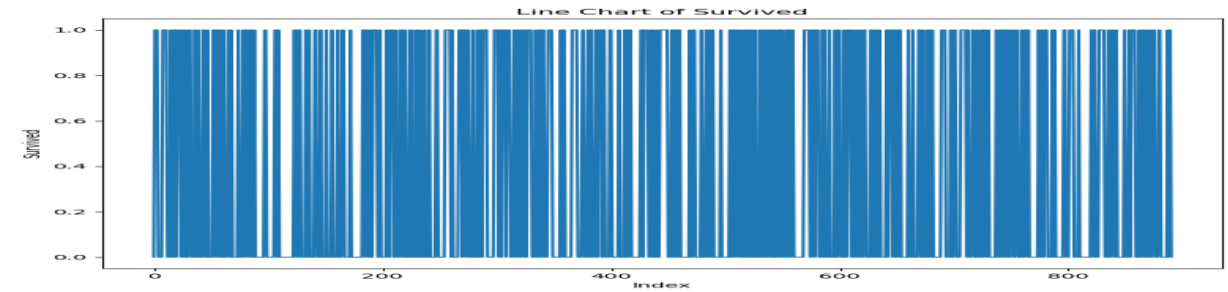

Scatter Plot of Sibsp
Sibsp
Index

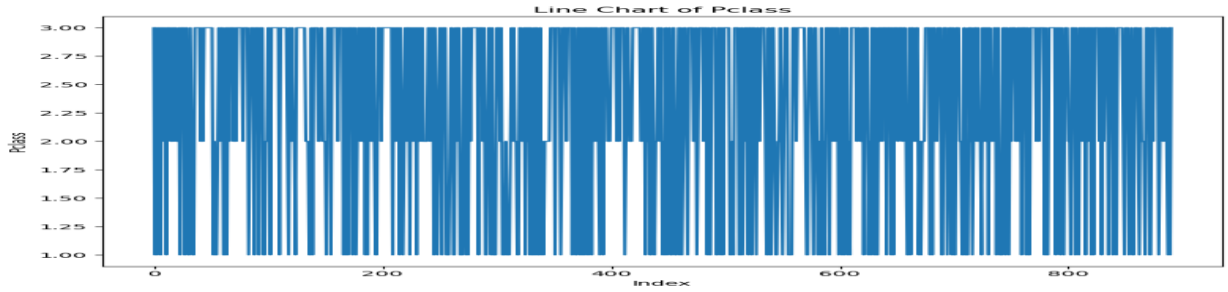

Scatter Plot of Parch
Parch
Index

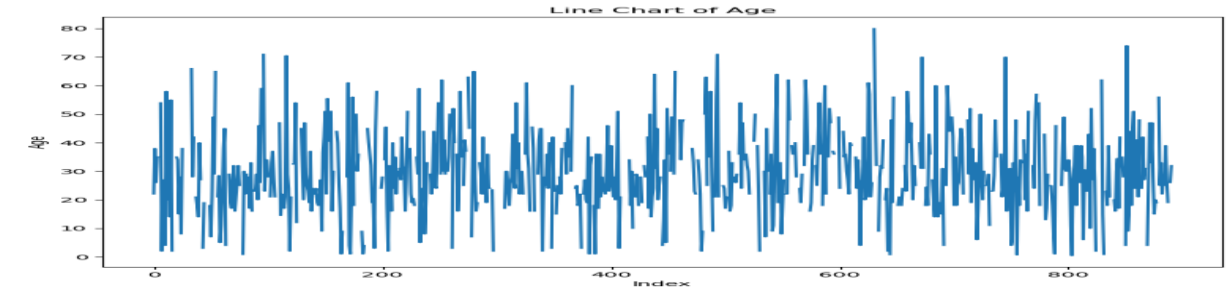

Scatter Plot of Fare
Fare
Index

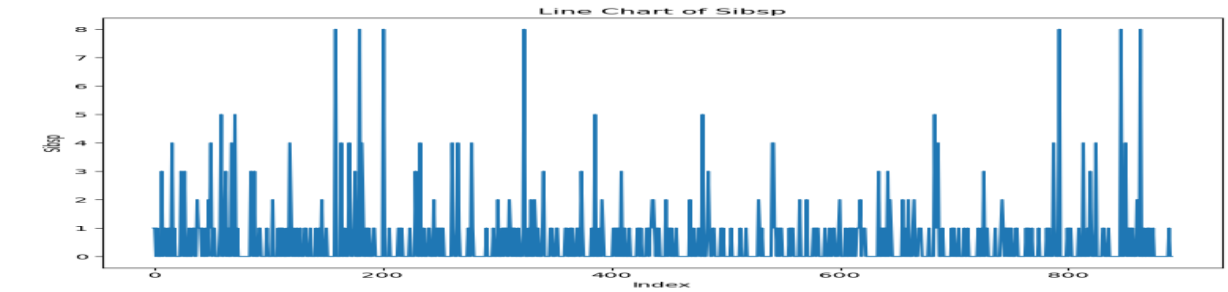
In [16]:

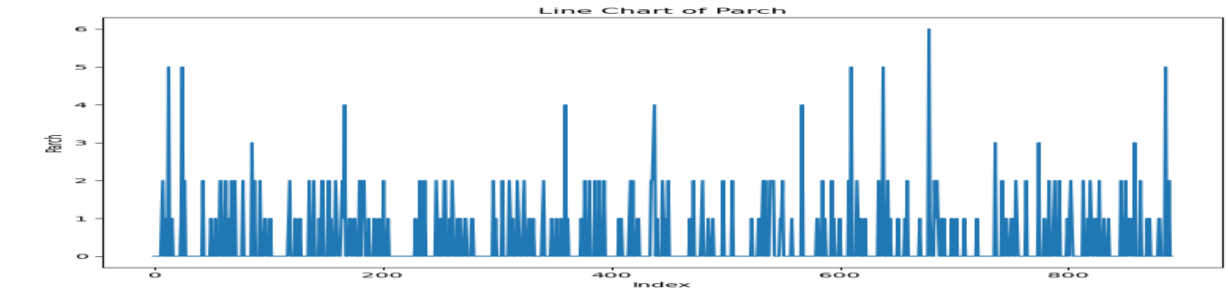
```
import pandas as pd
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# List of columns to create line charts for
columns = ['survived', 'pclass', 'age', 'sibsp', 'parch', 'fare']

# Set up the figure and subplots
fig, axes = plt.subplots(nrows=len(columns), ncols=1, figsize=(8, 6 * len(columns)))

# Create line charts for each column
for i, column in enumerate(columns):
    # Select the column
    column_data = data[column]

    # Generate x-coordinates for line chart
    x = range(len(column_data))

    # Create the line chart
    axes[i].plot(x, column_data)

    # Set the labels and title for each subplot
    axes[i].set_xlabel('Index')
    axes[i].set_ylabel(column.capitalize())
    axes[i].set_title(f'Line Chart of {column.capitalize()}')

# Adjust the spacing between subplots
plt.tight_layout()

# Display the line charts
plt.show()
```

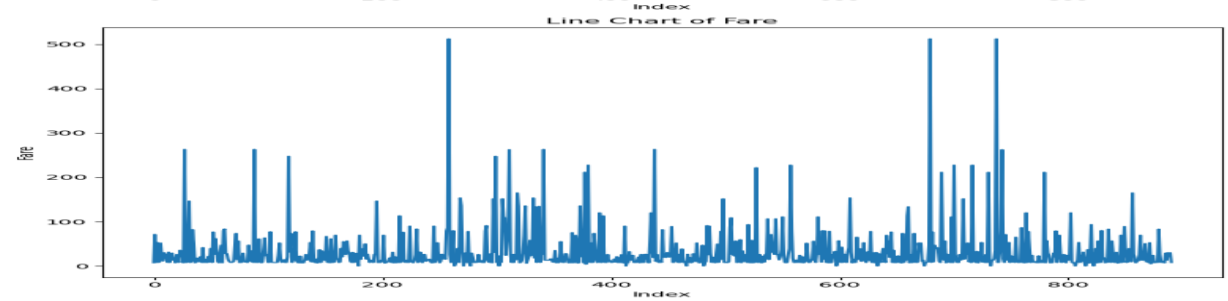

Line Chart of Survived
Survived
1.0
0.8
0.6
0.4
0.2
0.0
0
200
400
600
800
Index


Line Chart of Pclass
Pclass
3.00
2.75
2.50
2.25
2.00
1.75
1.50
1.25
1.00
0
200
400
600
800
Index


Line Chart of Age
Age
80
70
60
50
40
30
20
10
0
0
200
400
600
800
Index

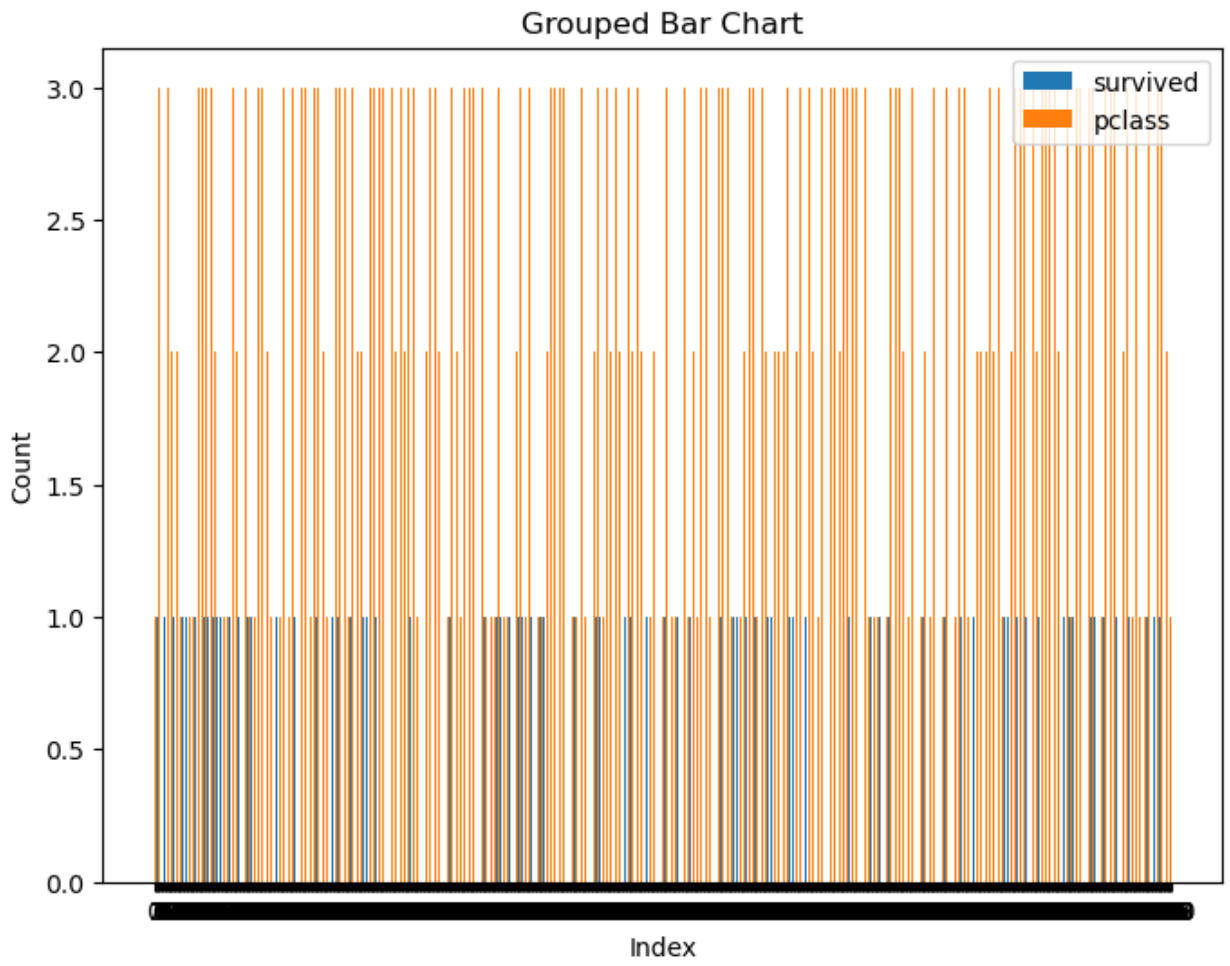

Line Chart of Sibsp
Sibsp
8
7
6
5
4
3
2
1
0
0
200
400
600
800
Index


Line Chart of Parch
Parch
6
5
4
3
2
1
0
0
200
400
600
800
Index

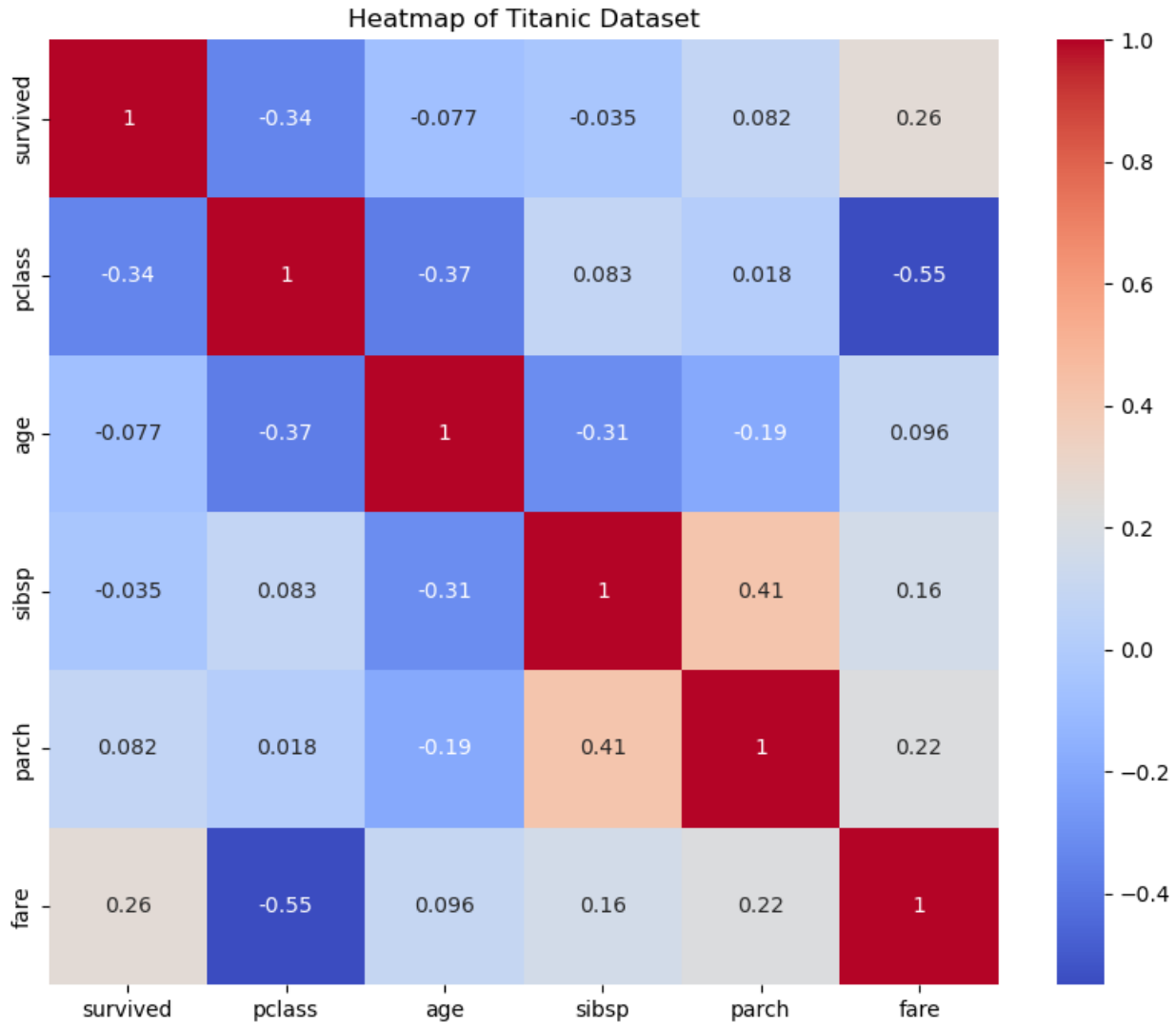

Line Chart of Fare
Fare
500
400
300
200
100
0
0
200
400
600
800
Index

In [17]:

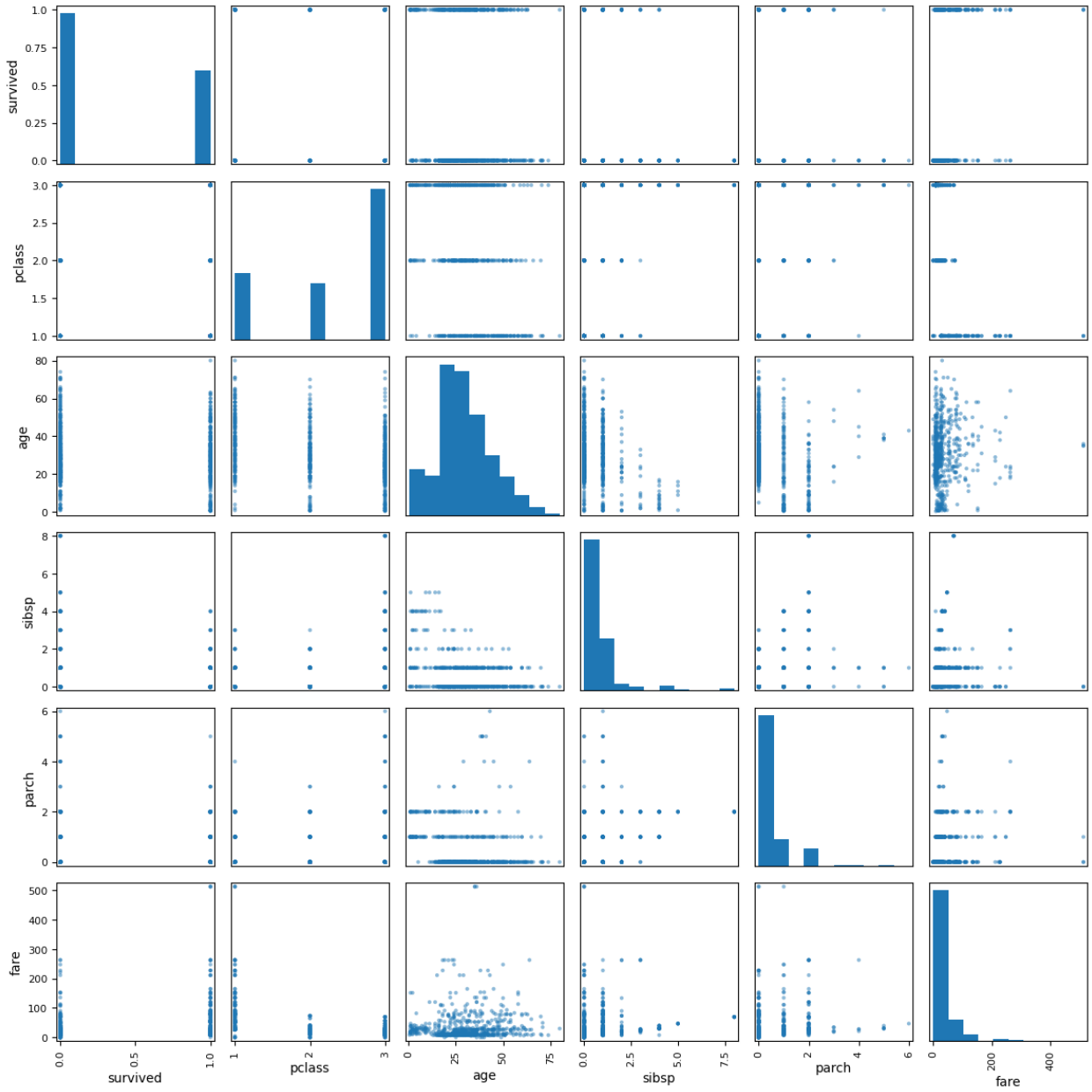
```
import pandas as pd
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# List of columns for the bar chart
columns = ['survived', 'pclass']

# Set up the figure and subplots
fig, ax = plt.subplots(figsize=(8, 6))

# Set the positions and width for the bars
positions = range(len(data))
width = 0.35

# Create the bar chart
for i, column in enumerate(columns):
    # Select the column
    column_data = data[column]

    # Generate the x-coordinates for the bars
    x = [pos + width * i for pos in positions]

    # Create the bars
    ax.bar(x, column_data, width, label=column)

# Set the labels and title
ax.set_xlabel('Index')
ax.set_ylabel('Count')
ax.set_title('Grouped Bar Chart')

# Set the x-axis ticks and labels
ax.set_xticks([pos + width for pos in positions])
ax.set_xticklabels(data.index)

# Add a legend
ax.legend()

# Display the bar chart
plt.show()
```



In [19]:
```python
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# Select numeric columns for correlation calculation
numeric_columns = data.select_dtypes(include='number')

# Compute the correlation matrix
correlation_matrix = numeric_columns.corr()

# Set up the figure and axes
fig, ax = plt.subplots(figsize=(10, 8))

# Create the heatmap
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', ax=ax)

# Set the title
ax.set_title('Heatmap of Titanic Dataset')

# Display the heatmap
plt.show()
```

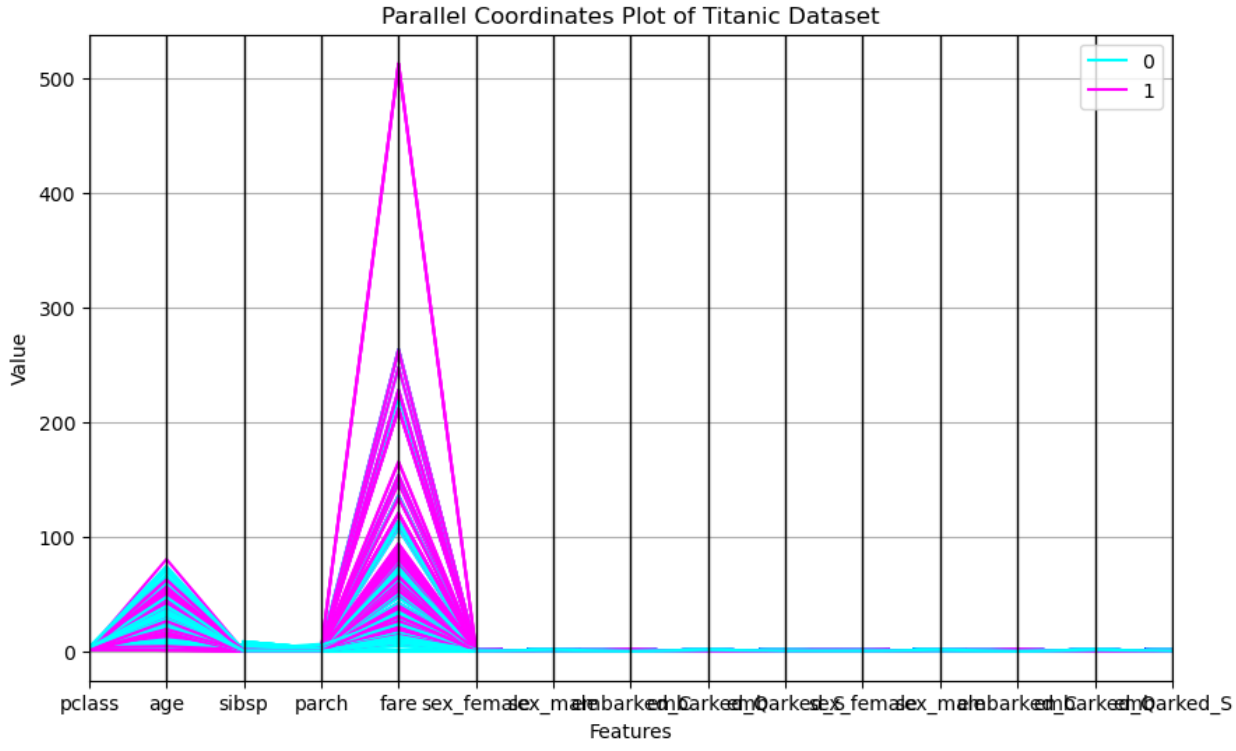


In [20]:
```python
import pandas as pd
import matplotlib.pyplot as plt

# Assuming 'data' is your DataFrame

# Select the columns for the scatter plot matrix
columns = ['survived', 'pclass', 'age', 'sibsp', 'parch', 'fare']

# Create the scatter plot matrix
scatter_matrix = pd.plotting.scatter_matrix(data[columns], figsize=(12, 12))

# Adjust the spacing between subplots
plt.tight_layout()

# Display the scatter plot matrix
plt.show()
```


survived
pclass
age
sibsp
parch
fare
survived
pclass
age
sibsp
parch
fare

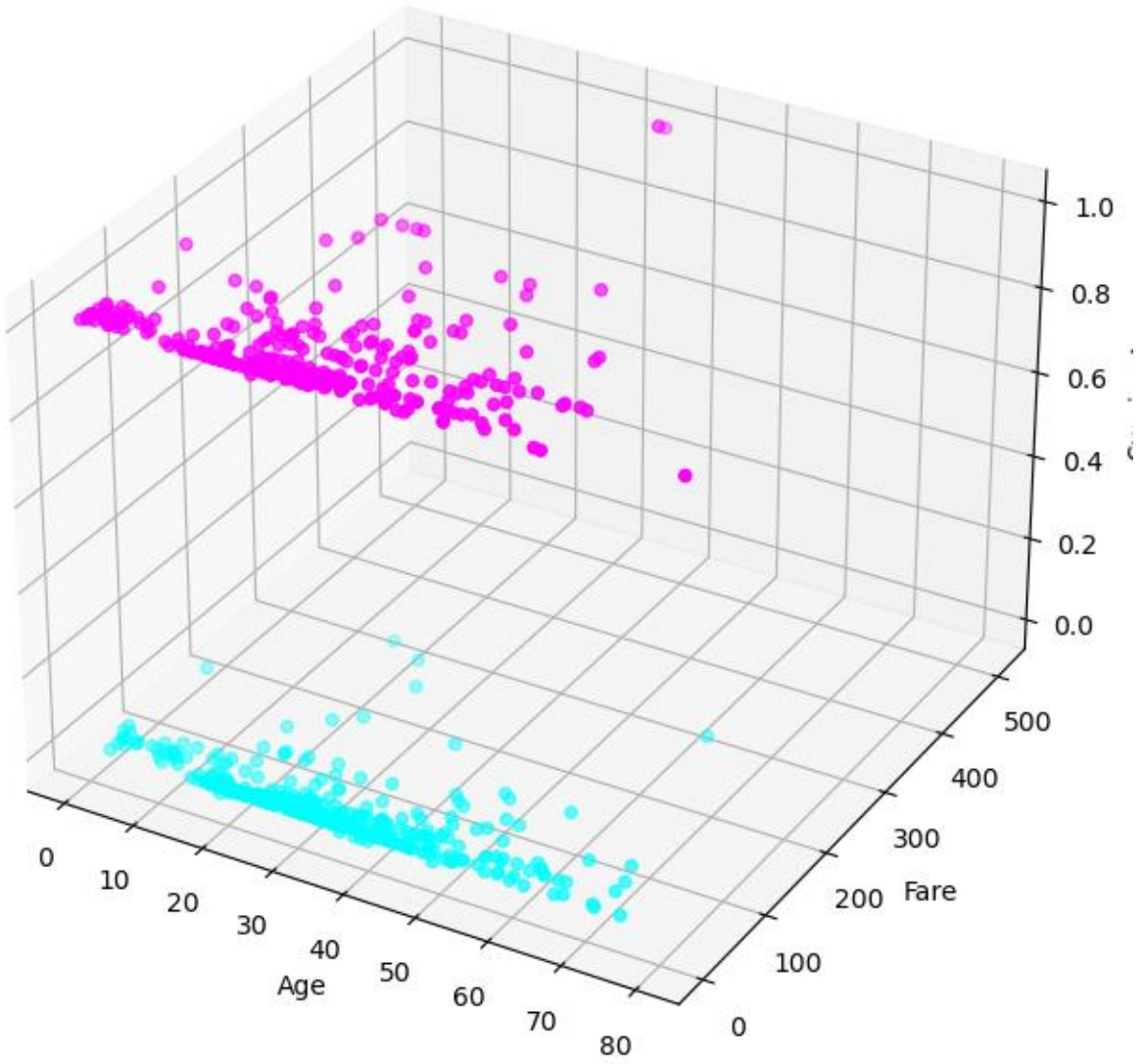
In [26]:

```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder

# Assuming 'data' is your DataFrame

# Select the columns for the Parallel Coordinates Plot
columns = ['pclass', 'sex', 'age', 'sibsp', 'parch', 'fare', 'embarked']

# Encode the 'survived' column
label_encoder = LabelEncoder()
data['survived_encoded'] = label_encoder.fit_transform(data['survived'])

# Encode categorical columns using one-hot encoding
categorical_columns = ['sex', 'embarked']
data_encoded = pd.get_dummies(data[columns + categorical_columns])

# Merge the encoded columns with the target column
data_final = pd.concat([data_encoded, data['survived_encoded']], axis=1)

# Create the Parallel Coordinates Plot using pandas.plotting
plt.figure(figsize=(10, 6))
pd.plotting.parallel_coordinates(data_final, 'survived_encoded', colormap='cool')
plt.title('Parallel Coordinates Plot of Titanic Dataset')
plt.xlabel('Features')
plt.ylabel('Value')
plt.legend()

# Display the Parallel Coordinates Plot
plt.show()
```



In [28]:

```
import pandas as pd
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D

# Assuming 'data' is your DataFrame

# Select the columns for the 3D scatter plot
columns = ['age', 'fare', 'survived']

# Create a subset of the data with the selected columns
subset = data[columns]

# Remove rows with missing values
subset = subset.dropna()

# Create a 3D scatter plot
fig = plt.figure(figsize=(10, 8))
ax = fig.add_subplot(111, projection='3d')
ax.scatter(subset['age'], subset['fare'], subset['survived'], c=subset['survived'], cmap='cool')

# Set labels for each axis
ax.set_xlabel('Age')A
ax.set_ylabel('Fare')
ax.set_zlabel('Survived')

# Set the title of the plot
plt.title('3D Scatter Plot of Titanic Dataset')

# Show the plot
plt.show()
```


3D Scatter Plot of Titanic Dataset
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
50
60
70
80
Age
0
100
200
300
400
500
Fare

In [29]:

```
import pandas as pd
import plotly.express as px

# Assuming 'data' is your DataFrame

# Select the columns for the treemap
columns = ['survived', 'pclass', 'sex', 'age', 'sibsp', 'parch', 'fare', 'embark

# Create a subset of the data with the selected columns
subset = data[columns]

# Remove rows with missing values
subset = subset.dropna()

# Create the treemap
fig = px.treemap(subset, path=columns)

# Set the title of the treemap
fig.update_layout(title='Treemap of Titanic Dataset')

# Show the treemap
fig.show()
```

4. Perform descriptive statistics on the dataset

In [30]:
```
import pandas as pd

# Assuming 'data' is your DataFrame

# Perform descriptive statistics on the dataset
statistics = data.describe(include='all')

# Print the descriptive statistics
print(statistics)
```

```
          survived      pclass   sex         age       sibsp       parch  \
count   891.000000  891.000000   891  714.000000  891.000000  891.000000
unique         NaN         NaN     2         NaN         NaN         NaN
top            NaN         NaN  male         NaN         NaN         NaN
freq           NaN         NaN   577         NaN         NaN         NaN
mean      0.383838    2.308642   NaN   29.699118    0.523008    0.381594
std       0.486592    0.836071   NaN   14.526497    1.102743    0.806057
min       0.000000    1.000000   NaN    0.420000    0.000000    0.000000
25%       0.000000    2.000000   NaN   20.125000    0.000000    0.000000
50%       0.000000    3.000000   NaN   28.000000    0.000000    0.000000
75%       1.000000    3.000000   NaN   38.000000    1.000000    0.000000
max       1.000000    3.000000   NaN   80.000000    8.000000    6.000000

             fare embarked  class  who adult_male deck  embark_town alive  \
count   891.000000      889    891  891        891  203          889   891
unique         NaN        3      3    3          2    7            3     2
top            NaN        S  Third  man       True    C  Southampton    no
freq           NaN      644    491  537        537   59          644   549
mean     32.204208      NaN    NaN  NaN        NaN  NaN          NaN   NaN
std      49.693429      NaN    NaN  NaN        NaN  NaN          NaN   NaN
min       0.000000      NaN    NaN  NaN        NaN  NaN          NaN   NaN
25%       7.910400      NaN    NaN  NaN        NaN  NaN          NaN   NaN
50%      14.454200      NaN    NaN  NaN        NaN  NaN          NaN   NaN
75%      31.000000      NaN    NaN  NaN        NaN  NaN          NaN   NaN
max     512.329200      NaN    NaN  NaN        NaN  NaN          NaN   NaN

       alone  sex_encoded  survived_encoded
count    891   891.000000        891.000000
unique     2          NaN               NaN
```

5. Handle the Missing values

In [31]:
```
import pandas as pd

# Load the Titanic dataset
data = pd.read_csv('titanic.csv')

# Check for missing values
print(data.isnull().sum())

# Drop rows with missing values
data = data.dropna()

# Fill missing values with a specific value
data['age'] = data['age'].fillna(data['age'].mean())
data['embarked'] = data['embarked'].fillna(data['embarked'].mode()[0])

# Perform linear interpolation to fill missing fare values
data['fare'] = data['fare'].interpolate(method='linear')

# Drop columns with a high percentage of missing values
data = data.drop('deck', axis=1)

# Check for missing values again to confirm
print(data.isnull().sum())
```

```
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
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
```

6. Find the outliers and replace the outliers

In [33]:
```
import pandas as pd
import numpy as np
from scipy import stats

# Load the Titanic dataset
data = pd.read_csv('titanic.csv')

# Identify outliers using z-score
z_scores = np.abs(stats.zscore(data['fare']))
threshold = 3
outliers = np.where(z_scores > threshold)

# Replace outliers with the median value
median_fare = data['fare'].median()
data.loc[outliers[0], 'fare'] = median_fare

# Check for outliers again to confirm
z_scores_after = np.abs(stats.zscore(data['fare']))
new_outliers = np.where(z_scores_after > threshold)
print("Number of outliers after replacement:", len(new_outliers[0]))
```

```
Number of outliers after replacement: 22
```

In [34]:
```
import pandas as pd
import numpy as np
from scipy import stats

# Load the Titanic dataset
data = pd.read_csv('titanic.csv')

# Calculate z-scores for the 'fare' column
z_scores = np.abs(stats.zscore(data['fare']))

# Set the threshold for identifying outliers
threshold = 3

# Find the outliers based on the z-scores
outliers = data[z_scores > threshold]

# Print the outliers
print("Outliers in the 'fare' column:")
print(outliers)
```

```
Outliers in the 'fare' column:
     survived  pclass     sex   age  sibsp  parch      fare embarked  class  \
27          0       1    male  19.0      3      2  263.0000        S  First
88          1       1  female  23.0      3      2  263.0000        S  First
118         0       1    male  24.0      0      1  247.5208        C  First
258         1       1  female  35.0      0      0  512.3292        C  First
299         1       1  female  50.0      0      1  247.5208        C  First
311         1       1  female  18.0      2      2  262.3750        C  First
341         1       1  female  24.0      3      2  263.0000        S  First
377         0       1    male  27.0      0      2  211.5000        C  First
380         1       1  female  42.0      0      0  227.5250        C  First
438         0       1    male  64.0      1      4  263.0000        S  First
527         0       1    male   NaN      0      0  221.7792        S  First
557         0       1    male   NaN      0      0  227.5250        C  First
679         1       1    male  36.0      0      1  512.3292        C  First
689         1       1  female  15.0      0      1  211.3375        S  First
700         1       1  female  18.0      1      0  227.5250        C  First
716         1       1  female  38.0      0      0  227.5250        C  First
730         1       1  female  29.0      0      0  211.3375        S  First
737         1       1    male  35.0      0      0  512.3292        C  First
742         1       1  female  21.0      2      2  262.3750        C  First
779         1       1  female  43.0      0      1  211.3375        S  First
```

```
        who  adult_male deck  embark_town alive  alone
27      man        True    C  Southampton    no  False
88    woman       False    C  Southampton   yes  False
118     man        True    B    Cherbourg    no  False
258   woman       False  NaN    Cherbourg   yes   True
299   woman       False    B    Cherbourg   yes  False
311   woman       False    B    Cherbourg   yes  False
341   woman       False    C  Southampton   yes  False
377     man        True    C    Cherbourg    no  False
380   woman       False  NaN    Cherbourg   yes   True
438     man        True    C  Southampton    no  False
527     man        True    C  Southampton    no   True
557     man        True  NaN    Cherbourg    no   True
679     man        True    B    Cherbourg   yes  False
689   child       False    B  Southampton   yes  False
700   woman       False    C    Cherbourg   yes  False
716   woman       False    C    Cherbourg   yes   True
730   woman       False    B  Southampton   yes   True
737     man        True    B    Cherbourg   yes   True
742   woman       False    B    Cherbourg   yes  False
779   woman       False    B  Southampton   yes  False
```

7. Check for Categorical columns and perform encoding

In [35]:
```
import pandas as pd

# Load the Titanic dataset
data = pd.read_csv('titanic.csv')

# Check for categorical columns
categorical_columns = data.select_dtypes(include=['object']).columns

# Perform encoding for categorical columns
data_encoded = pd.get_dummies(data, columns=categorical_columns)

# Print the encoded dataset
print("Encoded dataset:")
print(data_encoded.head())
```

```
Encoded dataset:
   survived  pclass   age  sibsp  parch     fare  adult_male  alone  \
0         0       3  22.0      1      0   7.2500        True  False
1         1       1  38.0      1      0  71.2833       False  False
2         1       3  26.0      0      0   7.9250       False   True
3         1       1  35.0      1      0  53.1000       False  False
4         0       3  35.0      0      0   8.0500        True   True

   sex_female  sex_male  ...  deck_C  deck_D  deck_E  deck_F  deck_G  \
0           0         1  ...       0       0       0       0       0
1           1         0  ...       1       0       0       0       0
2           1         0  ...       0       0       0       0       0
3           1         0  ...       1       0       0       0       0
4           0         1  ...       0       0       0       0       0

   embark_town_Cherbourg  embark_town_Queenstown  embark_town_Southampton  \
0                      0                       0                        1
1                      1                       0                        0
2                      0                       0                        1
3                      0                       0                        1
4                      0                       0                        1

   alive_no  alive_yes
0         1          0
1         0          1
2         0          1
3         0          1
4         1          0

[5 rows x 31 columns]
```

8. Split the data into dependent and independent variables.

In [36]:
```
import pandas as pd

# Load the Titanic dataset
data = pd.read_csv('titanic.csv')

# Split into dependent and independent variables
X = data.drop('survived', axis=1)  # Independent variables (features)
y = data['survived']  # Dependent variable (target)

# Print the shapes of the variables
print("Independent variables shape:", X.shape)
print("Dependent variable shape:", y.shape)
```

```
Independent variables shape: (891, 14)
Dependent variable shape: (891,)
```

In [37]:
```
print(X)
```

```
     pclass     sex   age  sibsp  parch     fare embarked   class    who  \
0         3    male  22.0      1      0   7.2500        S   Third    man
1         1  female  38.0      1      0  71.2833        C   First  woman
2         3  female  26.0      0      0   7.9250        S   Third  woman
3         1  female  35.0      1      0  53.1000        S   First  woman
4         3    male  35.0      0      0   8.0500        S   Third    man
..      ...     ...   ...    ...    ...      ...      ...     ...    ...
886       2    male  27.0      0      0  13.0000        S  Second    man
887       1  female  19.0      0      0  30.0000        S   First  woman
888       3  female   NaN      1      2  23.4500        S   Third  woman
889       1    male  26.0      0      0  30.0000        C   First    man
890       3    male  32.0      0      0   7.7500        Q   Third    man

     adult_male deck  embark_town alive  alone
0          True  NaN  Southampton    no  False
1         False    C    Cherbourg   yes  False
2         False  NaN  Southampton   yes   True
3         False    C  Southampton   yes  False
4          True  NaN  Southampton    no   True
..          ...  ...          ...   ...    ...
886        True  NaN  Southampton    no   True
887       False    B  Southampton   yes   True
888       False  NaN  Southampton    no  False
889        True    C    Cherbourg   yes   True
890        True  NaN   Queenstown    no   True

[891 rows x 14 columns]
```

In [39]:
```
print(y)
```

```
0      0
1      1
2      1
3      1
4      0
      ..
886    0
887    1
888    0
889    1
890    0
Name: survived, Length: 891, dtype: int64
```

9. Scale the independent variables

In [43]:
```
from sklearn.preprocessing import StandardScaler, OneHotEncoder
from sklearn.compose import ColumnTransformer

# Load the Titanic dataset
data = pd.read_csv('titanic.csv')

# Split into dependent and independent variables
X = data.drop('survived', axis=1)  # Independent variables (features)
y = data['survived']  # Dependent variable (target)

# Identify the categorical columns
categorical_cols = X.select_dtypes(include=['object']).columns

# Perform one-hot encoding on categorical columns
encoder = OneHotEncoder(drop='first')
X_encoded = encoder.fit_transform(X[categorical_cols]).toarray()
encoded_cols = encoder.get_feature_names_out(categorical_cols)
X_encoded = pd.DataFrame(X_encoded, columns=encoded_cols)

# Concatenate encoded columns with remaining columns
X_encoded = pd.concat([X_encoded, X.drop(categorical_cols, axis=1)], axis=1)

# Scale the independent variables
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X_encoded)

# Print the scaled independent variables
print(X_scaled)
```

```
[[ 0.73769513 -0.30756234  0.61930636 ... -0.50244517  0.81192233
  -1.2316449 ]
 [-1.35557354 -0.30756234 -1.61470971 ...  0.78684529 -1.2316449
  -1.2316449 ]
 [-1.35557354 -0.30756234  0.61930636 ... -0.48885426 -1.2316449
   0.81192233]
 ...
 [-1.35557354 -0.30756234  0.61930636 ... -0.17626324 -1.2316449
  -1.2316449 ]
 [ 0.73769513 -0.30756234 -1.61470971 ... -0.04438104  0.81192233
   0.81192233]
 [ 0.73769513  3.25137334 -1.61470971 ... -0.49237783  0.81192233
   0.81192233]]
```

10. Split the data into training and testing

In [44]:
```
from sklearn.model_selection import train_test_split

# Split the data into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.2, random_state=42)

# Print the shapes of the training and testing sets
print("Training set shape:", X_train.shape, y_train.shape)
print("Testing set shape:", X_test.shape, y_test.shape)
```

```
Training set shape: (712, 26) (712,)
Testing set shape: (179, 26) (179,)
```

In [45]:
```
print("Training set:")
print(X_train)
print(y_train)

print("Testing set:")
print(X_test)
print(y_test)
```

```
Training set:
[[ 0.73769513 -0.30756234  0.61930636 ... -0.07458307  0.81192233
   0.81192233]
 [ 0.73769513 -0.30756234  0.61930636 ... -0.38667072  0.81192233
   0.81192233]
 [ 0.73769513 -0.30756234  0.61930636 ... -0.48885426  0.81192233
   0.81192233]
 ...
 [ 0.73769513 -0.30756234  0.61930636 ... -0.36435545  0.81192233
  -1.2316449 ]
 [-1.35557354 -0.30756234  0.61930636 ...  1.76774081 -1.2316449
  -1.2316449 ]
 [ 0.73769513 -0.30756234  0.61930636 ...  0.90773798  0.81192233
  -1.2316449 ]]
331    0
733    0
382    0
704    0
813    0
      ..
106    1
270    0
860    0
435    1
102    0
Name: survived, Length: 712, dtype: int64
Testing set:
[[ 0.73769513 -0.30756234 -1.61470971 ... -0.34145224  0.81192233
  -1.2316449 ]
 [ 0.73769513 -0.30756234  0.61930636 ... -0.43700744  0.81192233
   0.81192233]
 [ 0.73769513 -0.30756234  0.61930636 ... -0.48885426  0.81192233
```