ASSIGNMENT-3(Perform Data preprocessing on Titanic dataset)

M.VYSHNAVI

21BCE7191

Data Preprocessing. o Import the Libraries. o Importing the dataset. o Checking for Null Values. o Data Visualization. o Outlier Detection o Splitting Dependent and Independent variables o Encoding o Feature Scaling. o Splitting Data into Train and Test.

Import the Libraries

In [5]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Importing the dataset

In [6]:
```
data = pd.read_csv('Titanic-Dataset.csv')
data
```

Out[6]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S
...	...	...	...	...	...	...	...	...	...	...	...	...
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	NaN	S
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	B42	S
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.4500	NaN	S
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C148	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	NaN	Q

891 rows × 12 columns

In [21]:
```
data.head()
```

Out[21]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

In [22]:
```
data.describe()
```

Out[22]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

In [23]:
```
data.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 [24]:
```
data.corr()
```

```
C:\Users\chatu\AppData\Local\Temp\ipykernel_13368\2627137660.py:1: 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.
  data.corr()
```

Out[24]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	1.000000	-0.005007	-0.035144	0.036847	-0.057527	-0.001652	0.012658
Survived	-0.005007	1.000000	-0.338481	-0.077221	-0.035322	0.081629	0.257307
Pclass	-0.035144	-0.338481	1.000000	-0.369226	0.083081	0.018443	-0.549500
Age	0.036847	-0.077221	-0.369226	1.000000	-0.308247	-0.189119	0.096067
SibSp	-0.057527	-0.035322	0.083081	-0.308247	1.000000	0.414838	0.159651
Parch	-0.001652	0.081629	0.018443	-0.189119	0.414838	1.000000	0.216225
Fare	0.012658	0.257307	-0.549500	0.096067	0.159651	0.216225	1.000000

In [25]:
```
data.corr().Age.sort_values(ascending=False)
```

```
C:\Users\chatu\AppData\Local\Temp\ipykernel_13368\1767978217.py:1: 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.
  data.corr().Age.sort_values(ascending=False)
```

Out[25]:
```
Age            1.000000
Fare           0.096067
PassengerId    0.036847
Survived      -0.077221
Parch         -0.189119
SibSp         -0.308247
Pclass        -0.369226
Name: Age, dtype: float64
```

Checking for Null Values

In [26]:
```
data.isnull().any()
```

Out[26]:
```
PassengerId    False
Survived       False
Pclass         False
Name           False
Sex            False
Age             True
SibSp          False
Parch          False
Ticket         False
Fare           False
Cabin           True
Embarked        True
dtype: bool
```

In [27]:
```
data.isnull().sum()
```

Out[27]:
```
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
```

In [28]:
```
data.Cabin.value_counts()
```

Out[28]:
```
B96 B98        4
G6             4
C23 C25 C27    4
C22 C26        3
F33            3
              ..
E34            1
C7             1
C54            1
E36            1
C148           1
Name: Cabin, Length: 147, dtype: int64
```

In [35]:
```
data.drop('Cabin', axis=1, inplace=True)
```

In [39]:
```
data
```

Out[39]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	S
...	...	...	...	...	...	...	...	...	...	...	...
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	S
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	S
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.4500	S
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	Q

891 rows × 11 columns

In [40]:
```
data.Ticket.nunique()
```

Out[40]:
```
681
```

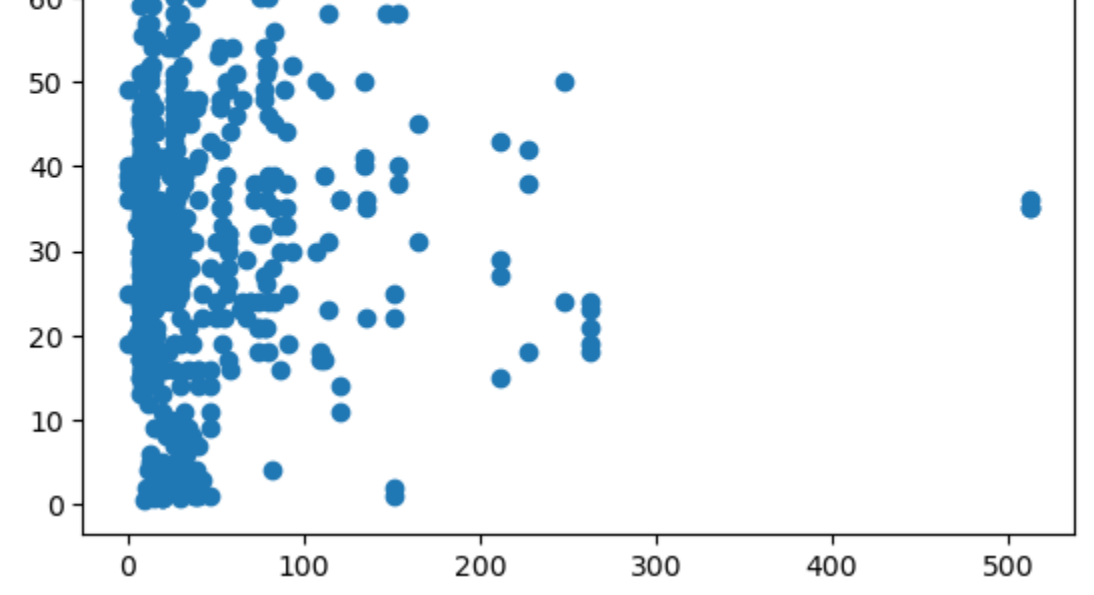
In [42]:
```
data.Embarked.unique()
```

Out[42]:
```
array(['S', 'C', 'Q', nan], dtype=object)
```

Data Visualization

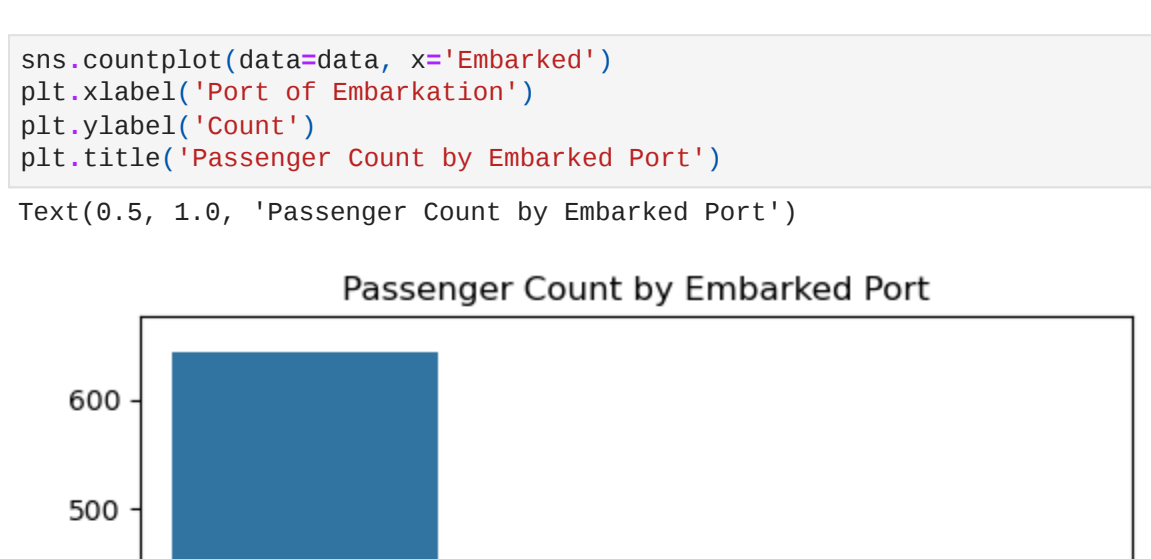
In [46]:
```
plt.scatter(data["Fare"],data["Age"])
```

Out[46]:
```
<matplotlib.collections.PathCollection at 0x28b11605350>
```



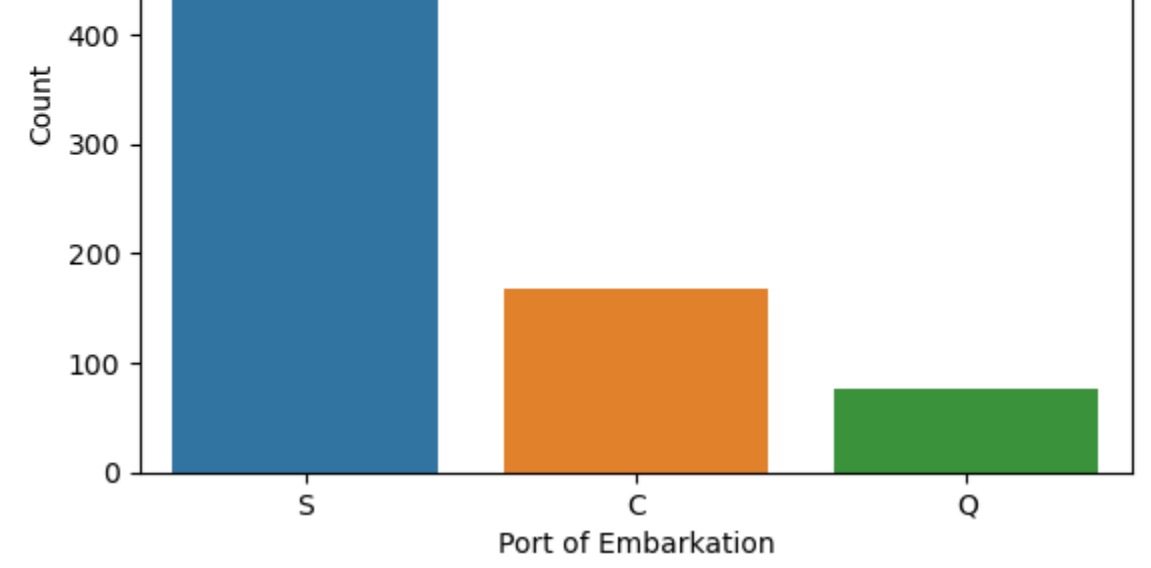
Inference:There are a few outliers where passengers paid significantly higher fares relative to their age, indicating potential variability in ticket pricing or unique circumstances for certain individuals.

In [47]:
```
# Example: Histogram of age distribution
sns.histplot(data['Age'], bins=20, kde=True)
plt.xlabel('Age')
plt.ylabel('Count')
plt.title('Age Distribution')
plt.show()
```



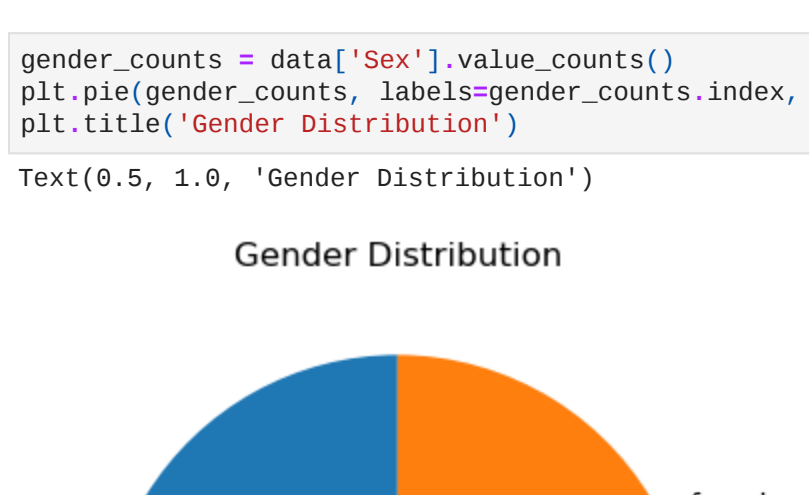
In [48]:
```
sns.countplot(data=data, x='Embarked')
plt.xlabel('Port of Embarkation')
plt.ylabel('Count')
plt.title('Passenger Count by Embarked Port')
```

Out[48]:
```
Text(0.5, 1.0, 'Passenger Count by Embarked Port')
```



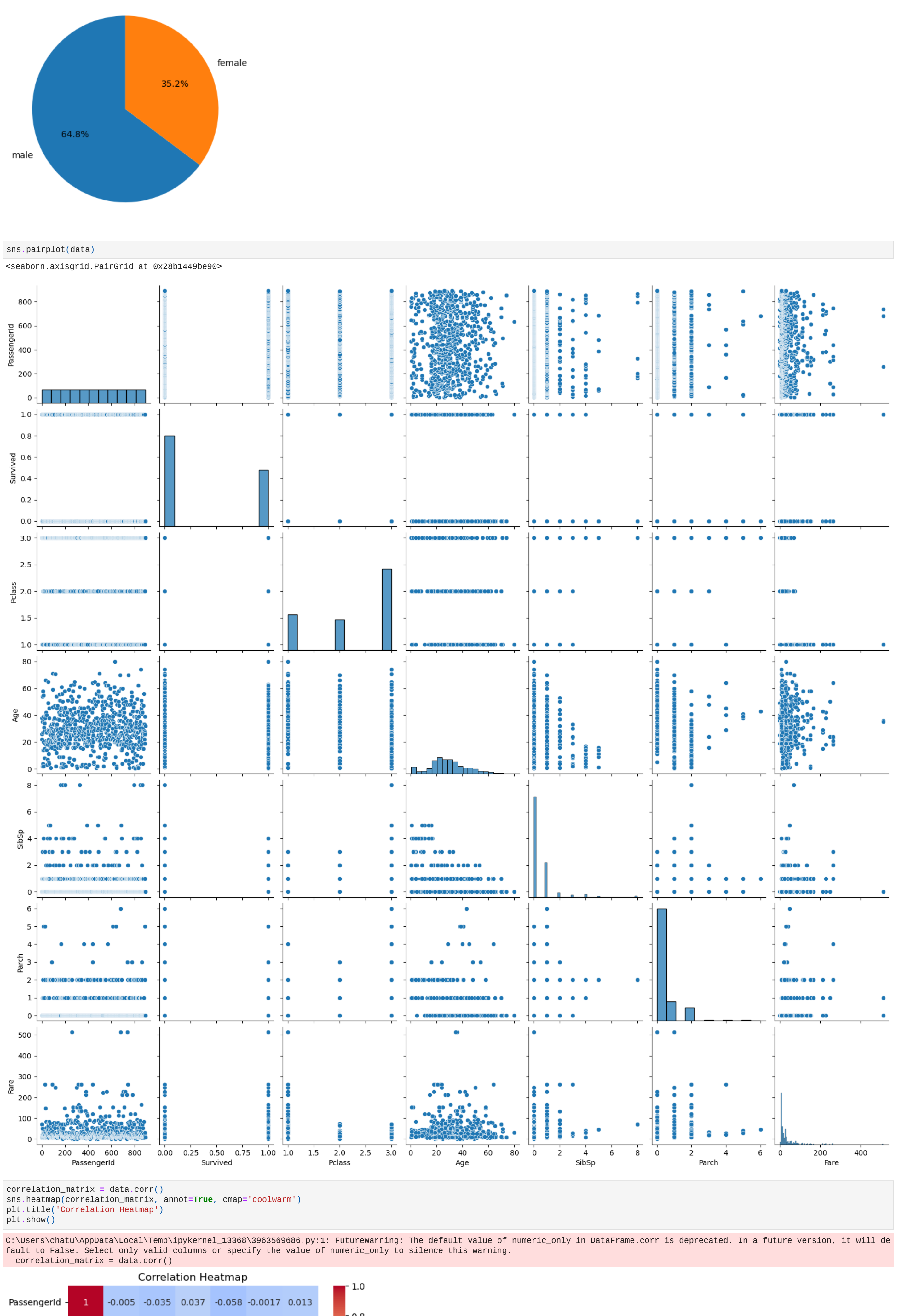
In [49]:
```
gender_counts = data['Sex'].value_counts()
plt.pie(gender_counts, labels=gender_counts.index, autopct='%1.1f%%', startangle=90)
plt.title('Gender Distribution')
```

Out[49]:
```
Text(0.5, 1.0, 'Gender Distribution')
```



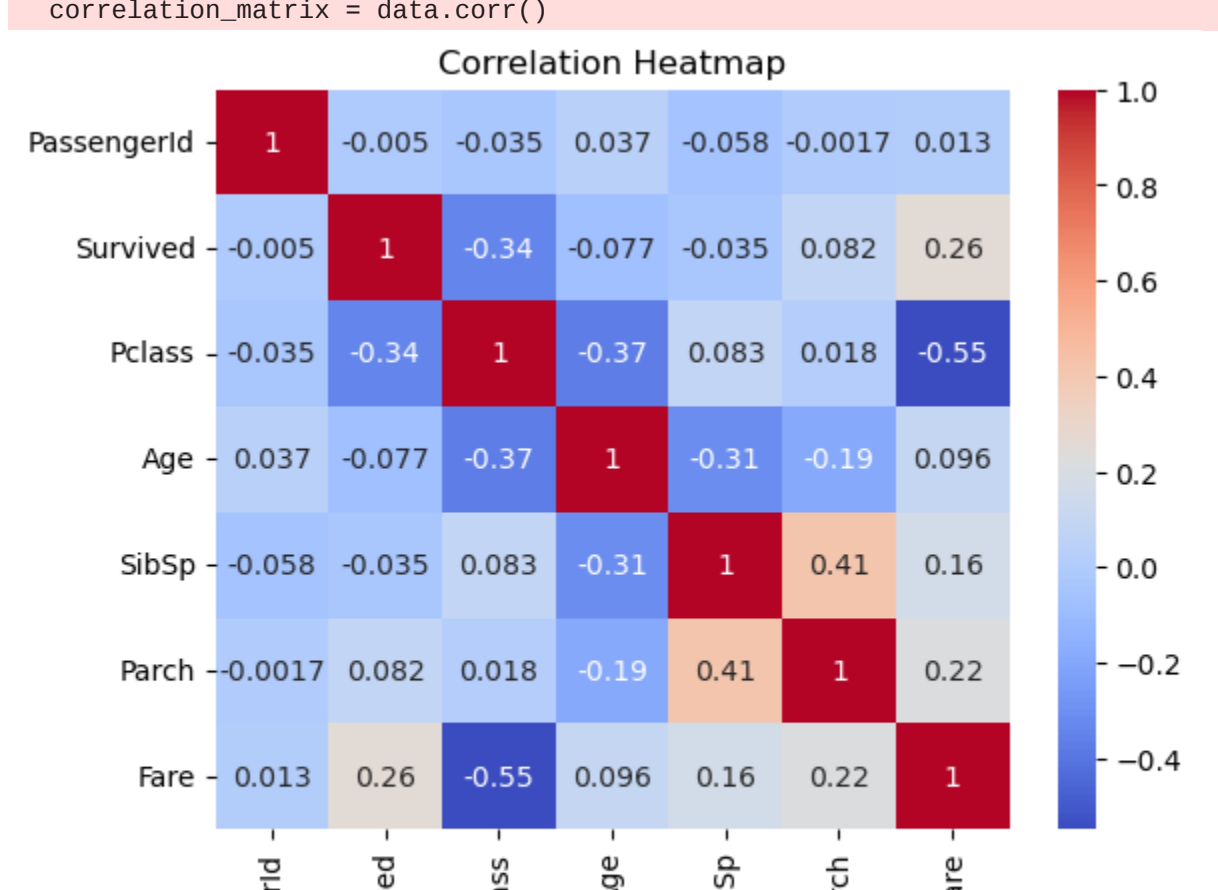
In [52]:
```
sns.pairplot(data)
```

Out[52]:
```
<seaborn.axisgrid.PairGrid at 0x28b1449be90>
```



In [50]:
```
correlation_matrix = data.corr()
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Heatmap')
plt.show()
```

```
C:\Users\chatu\AppData\Local\Temp\ipykernel_13368\3963569686.py:1: 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.
  correlation_matrix = data.corr()
```



Outlier Detection

In [63]:
```
col='Fare'
Q1 = data[col].quantile(0.25)
Q3 = data[col].quantile(0.75)
IQR = Q3 - Q1
IQR
```

Out[63]:
```
23.0896
```

In [64]:
```
# Determine outlier boundaries
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR

# Identify outliers
outliers = data[(data[col] < lower_bound) | (data[col] > upper_bound)]
outliers
```

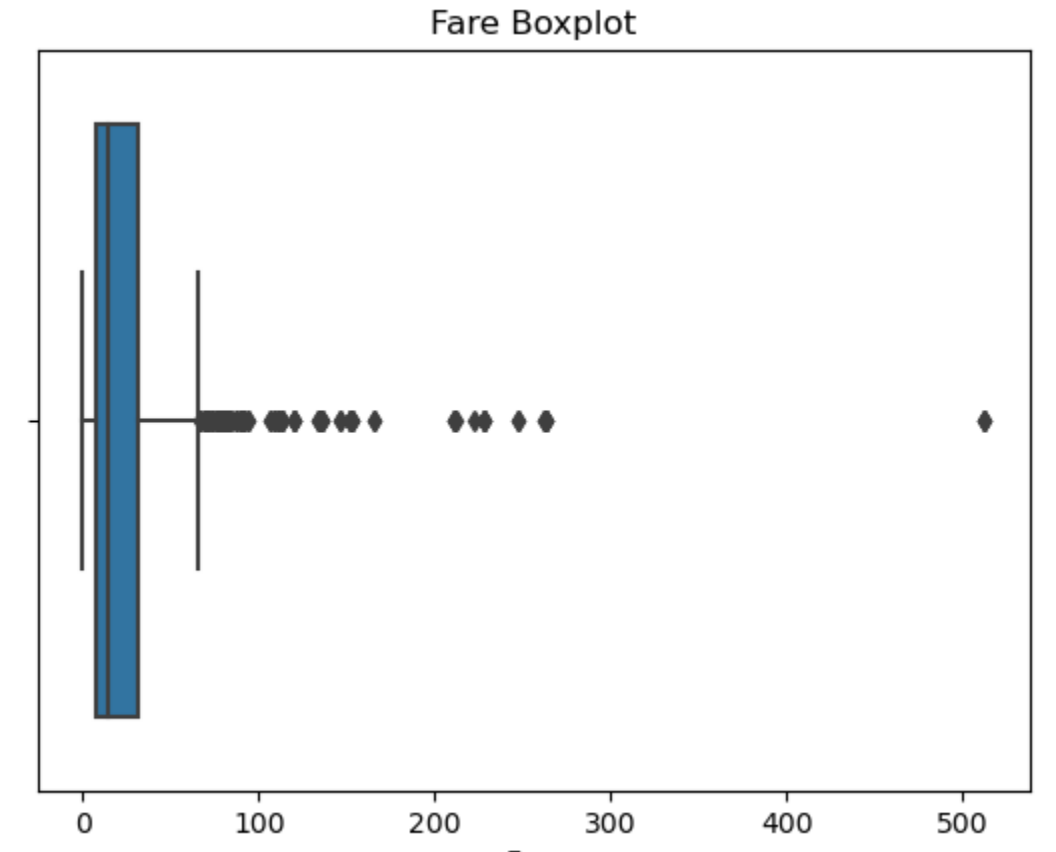
Out[64]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
27	28	0	1	Fortune, Mr. Charles Alexander	male	19.0	3	2	19950	263.0000	C23 C25 C27	S
31	32	1	1	Spencer, Mrs. William Augustus (Marie Eugenie)	female	NaN	1	0	PC 17569	146.5208	B78	C
34	35	0	1	Meyer, Mr. Edgar Joseph	male	28.0	1	0	PC 17604	82.1708	NaN	C
52	53	1	1	Harper, Mrs. Henry Sleeper (Myna Haxtun)	female	49.0	1	0	PC 17572	76.7292	D33	C
...	...	...	...	...	...	...	...	...	...	...	...	...
846	847	0	3	Sage, Mr. Douglas Bullen	male	NaN	8	2	CA. 2343	69.5500	NaN	S
849	850	1	1	Goldenberg, Mrs. Samuel L (Edwiga Grabowska)	female	NaN	1	0	17453	89.1042	C92	C
856	857	1	1	Wick, Mrs. George Dennick (Mary Hitchcock)	female	45.0	1	1	36928	164.8667	NaN	S
863	864	0	3	Sage, Miss. Dorothy Edith "Dolly"	female	NaN	8	2	CA. 2343	69.5500	NaN	S
879	880	1	1	Potter, Mrs. Thomas Jr (Lily Alexenia Wilson)	female	56.0	0	1	11767	83.1583	C50	C

116 rows × 12 columns

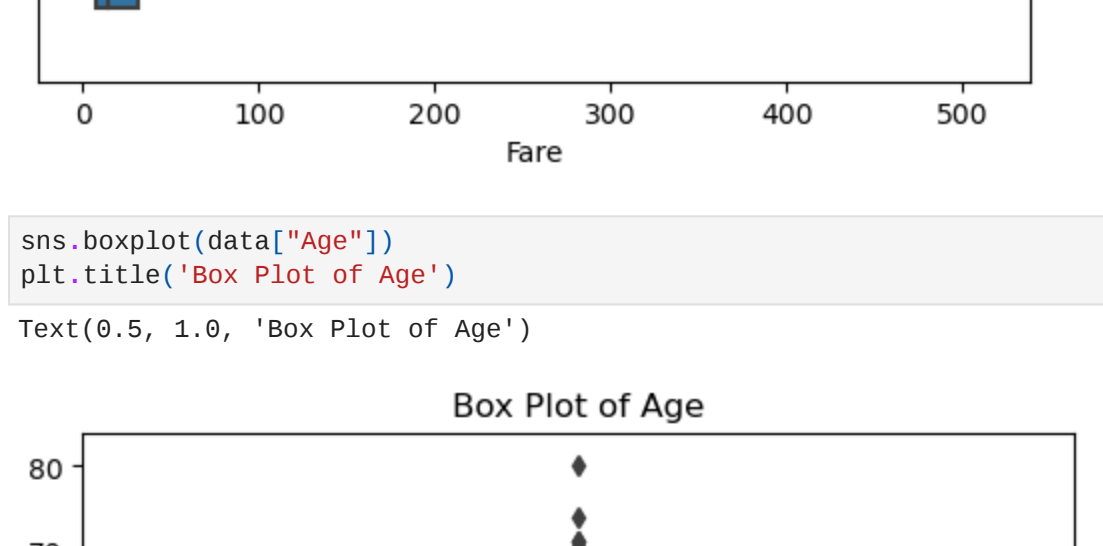
In [12]:
```
sns.boxplot(x=data['Fare'])
plt.xlabel('Fare')
plt.title('Fare Boxplot')
plt.show()

# Handle outliers (example: capping extreme fare values)
data['Fare'] = np.where(data['Fare'] > data['Fare'].quantile(0.95), data['Fare'].quantile(0.95), data['Fare'])
```



In [67]:
```
sns.boxplot(data["Age"])
plt.title('Box Plot of Age')
```

Out[67]:
```
Text(0.5, 1.0, 'Box Plot of Age')
```



Splitting Dependent and independent Variables

In [73]:
```
X=data.drop(columns=["Survived"],axis=1)
X.head()
```

Out[73]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

In [74]:
```
X.shape
```

Out[74]:
```
(891, 11)
```

In [75]:
```
type(X)
```

Out[75]:
```
pandas.core.frame.DataFrame
```

In [76]:
```
y=data["Survived"]
y.head()
```

Out[76]:
```
0    0
1    1
2    1
3    1
4    0
Name: Survived, dtype: int64
```

Perform Encoding

In [78]:
```
X.head()
```

Out[78]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	NaN	S
1	2	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C
2	3	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	NaN	S
3	4	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S
4	5	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	NaN	S

In [79]:
```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
```

In [89]:
```
X["Embarked"]=le.fit_transform(X["Embarked"])
```

In [90]:
```
X.head()
```

Out[90]:

	PassengerId	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	1	3	Braund, Mr. Owen Harris	1	28	1	0	523	7.2500	NaN	2
1	2	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	0	51	1	0	596	71.2833	C85	0
2	3	3	Heikkinen, Miss. Laina	0	34	0	0	669	7.9250	NaN	2
3	4	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	0	47	1	0	49	53.1000	C123	2
4	5	3	Allen, Mr. William Henry	1	47	0	0	472	8.0500	NaN	2

In [91]:
```
print(le.classes_)
```

```
['C' 'Q' 'S' nan]
```

In [92]:
```
mapping=dict(zip(le.classes_,range(len(le.classes_))))
mapping
```

Out[92]:
```
{'C': 0, 'Q': 1, 'S': 2, nan: 3}
```

Feature Scaling

In [101…
```
from sklearn.preprocessing import MinMaxScaler
cols = ['Age', 'Fare']
# Initialize the MinMaxScaler
scaler = MinMaxScaler()
X = data[cols]
# Fit the scaler to the data and transform the selected columns
Xscale = scaler.fit_transform(X)
```

In [103…
```
Xscale=pd.DataFrame(scaler.fit_transform(X),columns=cols)
```

In [104…
```
Xscale.head()
```

Out[104]:

	Age	Fare
0	0.271174	0.014151
1	0.472229	0.139136
2	0.321438	0.015469
3	0.434531	0.103644
4	0.434531	0.015713

Splitting Data into Train and Test

In [107…
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(Xscale, y, test_size=0.2, random_state=42)
print(X_train.shape,X_test.shape,y_train.shape,y_test.shape)
```

```
(712, 2) (179, 2) (712,) (179,)
```

In [7]:
```
data= data.drop(['PassengerId', 'Name', 'Ticket'], axis=1)
```

In [8]:
```
data
```

Out[8]:

	Survived	Pclass	Sex	Age	SibSp	Parch	Fare	Cabin	Embarked
0	0	3	male	22.0	1	0	7.2500	NaN	S
1	1	1	female	38.0	1	0	71.2833	C85	C
2	1	3	female	26.0	0	0	7.9250	NaN	S
3	1	1	female	35.0	1	0	53.1000	C123	S
4	0	3	male	35.0	0	0	8.0500	NaN	S
...	...	...	...	...	...	...	...	...	...
886	0	2	male	27.0	0	0	13.0000	NaN	S
887	1	1	female	19.0	0	0	30.0000	B42	S
888	0	3	female	NaN	1	2	23.4500	NaN	S
889	1	1	male	26.0	0	0	30.0000	C148	C
890	0	3	male	32.0	0	0	7.7500	NaN	Q

891 rows × 9 columns

In [ ]: