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

df = pd.read_csv('Titanic-Dataset.csv')
df
```

```
     PassengerId  Survived  Pclass  \
0              1         0       3
1              2         1       1
2              3         1       3
3              4         1       1
4              5         0       3
..           ...       ...     ...
886          887         0       2
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3

                                                  Name     Sex   Age
SibSp  \
0                              Braund, Mr. Owen Harris    male  22.0
1
1    Cumings, Mrs. John Bradley (Florence Briggs Th...  female  38.0
1
2                               Heikkinen, Miss. Laina  female  26.0
0
3         Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.0
1
4                             Allen, Mr. William Henry    male  35.0
0
..                                                 ...     ...   ...
...
886                              Montvila, Rev. Juozas    male  27.0
0
887                       Graham, Miss. Margaret Edith  female  19.0
0
888           Johnston, Miss. Catherine Helen "Carrie"  female   NaN
1
889                              Behr, Mr. Karl Howell    male  26.0
0
890                                Dooley, Mr. Patrick    male  32.0
0
```

```
     Parch            Ticket     Fare Cabin Embarked
0        0         A/5 21171   7.2500   NaN        S
1        0          PC 17599  71.2833   C85        C
2        0  STON/O2. 3101282   7.9250   NaN        S
3        0            113803  53.1000  C123        S
4        0            373450   8.0500   NaN        S
..     ...               ...      ...   ...      ...
886      0            211536  13.0000   NaN        S
887      0            112053  30.0000   B42        S
888      2        W./C. 6607  23.4500   NaN        S
889      0            111369  30.0000  C148        C
890      0            370376   7.7500   NaN        Q

[891 rows x 12 columns]
```

```
df.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
```

```
df.describe()
```

```
       PassengerId    Survived      Pclass         Age       SibSp  \
count   891.000000  891.000000  891.000000  714.000000  891.000000   
mean    446.000000    0.383838    2.308642   29.699118    0.523008   
std     257.353842    0.486592    0.836071   14.526497    1.102743   
min       1.000000    0.000000    1.000000    0.420000    0.000000   
25%     223.500000    0.000000    2.000000   20.125000    0.000000   
50%     446.000000    0.000000    3.000000   28.000000    0.000000   
75%     668.500000    1.000000    3.000000   38.000000    1.000000   
max     891.000000    1.000000    3.000000   80.000000    8.000000   

            Parch        Fare  
```

```
count  891.000000  891.000000
mean     0.381594   32.204208
std      0.806057   49.693429
min      0.000000    0.000000
25%      0.000000    7.910400
50%      0.000000   14.454200
75%      0.000000   31.000000
max      6.000000  512.329200
```

```
df.isnull().any()
```

```
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
```

```
df.corr()
```

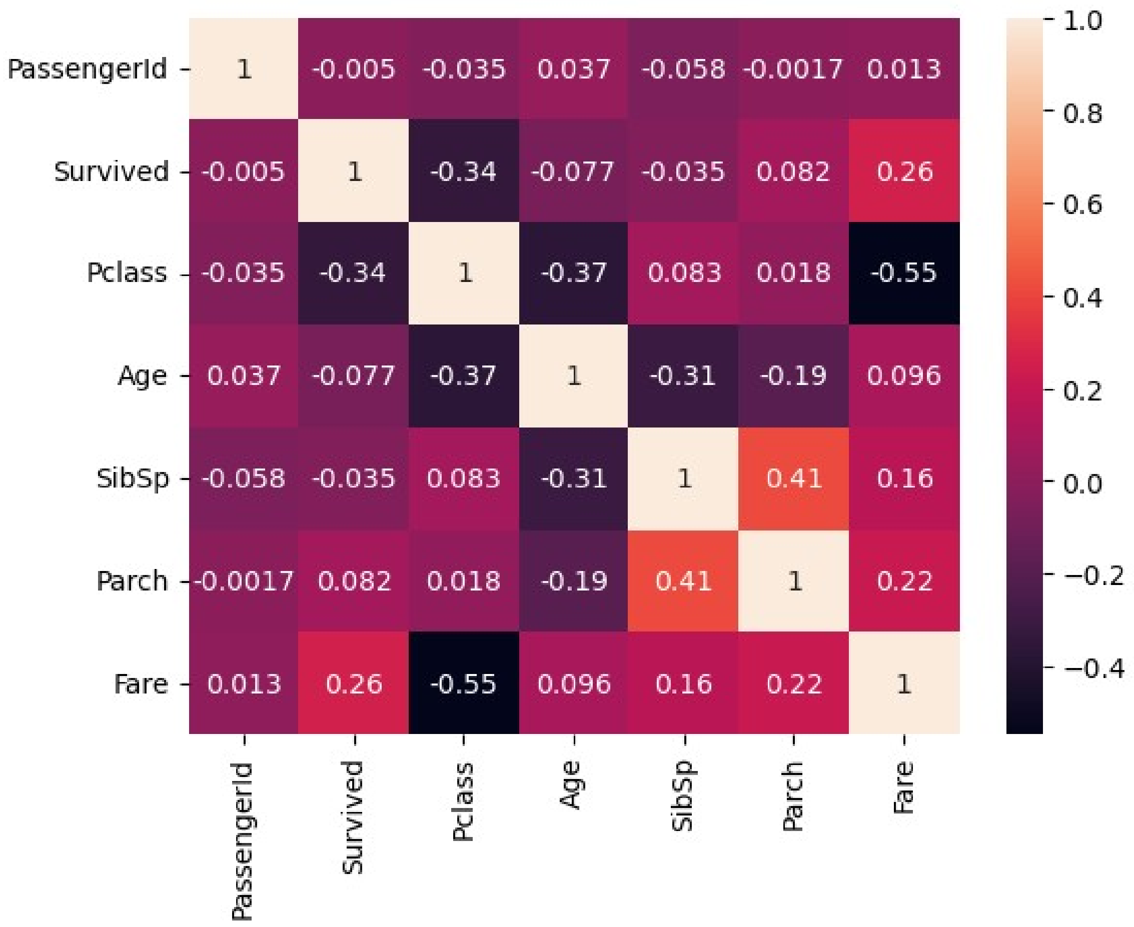
```
C:\Users\hp\AppData\Local\Temp\ipykernel_4088\1134722465.py:1:
FutureWarning: The default value of numeric_only in DataFrame.corr is
deprecated. In a future version, it will default to False. Select only
valid columns or specify the value of numeric_only to silence this
warning.
  df.corr()
```

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

```
                 Fare
PassengerId  0.012658
Survived     0.257307
Pclass      -0.549500
Age          0.096067
SibSp        0.159651
Parch        0.216225
Fare         1.000000
```

```
sns.heatmap(df.corr(),annot=True)
```

```
C:\Users\hp\AppData\Local\Temp\ipykernel_4088\4277794465.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.
  sns.heatmap(df.corr(),annot=True)

<Axes: >
```



	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
PassengerId	1	-0.005	-0.035	0.037	-0.058	-0.0017	0.013
Survived	-0.005	1	-0.34	-0.077	-0.035	0.082	0.26
Pclass	-0.035	-0.34	1	-0.37	0.083	0.018	-0.55
Age	0.037	-0.077	-0.37	1	-0.31	-0.19	0.096
SibSp	-0.058	-0.035	0.083	-0.31	1	0.41	0.16
Parch	-0.0017	0.082	0.018	-0.19	0.41	1	0.22
Fare	0.013	0.26	-0.55	0.096	0.16	0.22	1

```
df.isnull().sum()
```

```
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
```

```
df['Age'].mean()
```

```
29.69911764705882
```

```
df["Age"]=df["Age"].fillna(df["Age"].mean())
```

```
df
```

```
     PassengerId  Survived  Pclass  \
0              1         0       3
1              2         1       1
2              3         1       3
3              4         1       1
4              5         0       3
..           ...       ...     ...
886          887         0       2
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3

                                                  Name     Sex
Age  \
0                              Braund, Mr. Owen Harris    male
22.000000
1    Cumings, Mrs. John Bradley (Florence Briggs Th...  female
38.000000
2                               Heikkinen, Miss. Laina  female
26.000000
3         Futrelle, Mrs. Jacques Heath (Lily May Peel)  female
35.000000
4                             Allen, Mr. William Henry    male
35.000000
..                                                 ...     ...
...
```

```
886                              Montvila, Rev. Juozas    male
27.000000
887                       Graham, Miss. Margaret Edith  female
19.000000
888           Johnston, Miss. Catherine Helen "Carrie"  female
29.699118
889                              Behr, Mr. Karl Howell    male
26.000000
890                                Dooley, Mr. Patrick    male
32.000000

     SibSp  Parch            Ticket     Fare Cabin Embarked
0        1      0         A/5 21171   7.2500   NaN        S
1        1      0          PC 17599  71.2833   C85        C
2        0      0  STON/O2. 3101282   7.9250   NaN        S
3        1      0            113803  53.1000  C123        S
4        0      0            373450   8.0500   NaN        S
..     ...    ...               ...      ...   ...      ...
886      0      0            211536  13.0000   NaN        S
887      0      0            112053  30.0000   B42        S
888      1      2        W./C. 6607  23.4500   NaN        S
889      0      0            111369  30.0000  C148        C
890      0      0            370376   7.7500   NaN        Q

[891 rows x 12 columns]
```

```
df["Cabin"]=df["Cabin"].fillna(df["Cabin"].mode()[0])
```

```
df
```

```
     PassengerId  Survived  Pclass  \
0              1         0       3
1              2         1       1
2              3         1       3
3              4         1       1
4              5         0       3
..           ...       ...     ...
886          887         0       2
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3

                                                  Name     Sex
Age  \
0                              Braund, Mr. Owen Harris    male
22.000000
1    Cumings, Mrs. John Bradley (Florence Briggs Th...  female
38.000000
2                               Heikkinen, Miss. Laina  female
```

```
26.000000
3         Futrelle, Mrs. Jacques Heath (Lily May Peel)  female
35.000000
4                                 Allen, Mr. William Henry    male
35.000000
..                                                     ...     ...
...
886                                  Montvila, Rev. Juozas    male
27.000000
887                           Graham, Miss. Margaret Edith  female
19.000000
888               Johnston, Miss. Catherine Helen "Carrie"  female
29.699118
889                                  Behr, Mr. Karl Howell    male
26.000000
890                                    Dooley, Mr. Patrick    male
32.000000

     SibSp  Parch            Ticket     Fare    Cabin Embarked
0        1      0         A/5 21171   7.2500  B96 B98        S
1        1      0          PC 17599  71.2833      C85        C
2        0      0  STON/O2. 3101282   7.9250  B96 B98        S
3        1      0            113803  53.1000     C123        S
4        0      0            373450   8.0500  B96 B98        S
..     ...    ...               ...      ...      ...      ...
886      0      0            211536  13.0000  B96 B98        S
887      0      0            112053  30.0000      B42        S
888      1      2        W./C. 6607  23.4500  B96 B98        S
889      0      0            111369  30.0000     C148        C
890      0      0            370376   7.7500  B96 B98        Q

[891 rows x 12 columns]
```

```
df["Embarked"]=df["Embarked"].fillna(df["Embarked"].mode()[0])

df
```

```
     PassengerId  Survived  Pclass  \
0              1         0       3
1              2         1       1
2              3         1       3
3              4         1       1
4              5         0       3
..           ...       ...     ...
886          887         0       2
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3
```

```
                                                   Name     Sex
Age  \
0                               Braund, Mr. Owen Harris    male
22.000000
1     Cumings, Mrs. John Bradley (Florence Briggs Th...  female
38.000000
2                                Heikkinen, Miss. Laina  female
26.000000
3          Futrelle, Mrs. Jacques Heath (Lily May Peel)  female
35.000000
4                              Allen, Mr. William Henry    male
35.000000
..                                                  ...     ...
...
886                               Montvila, Rev. Juozas    male
27.000000
887                        Graham, Miss. Margaret Edith  female
19.000000
888            Johnston, Miss. Catherine Helen "Carrie"  female
29.699118
889                               Behr, Mr. Karl Howell    male
26.000000
890                                 Dooley, Mr. Patrick    male
32.000000

     SibSp  Parch            Ticket     Fare    Cabin Embarked
0        1      0         A/5 21171   7.2500  B96 B98        S
1        1      0          PC 17599  71.2833      C85        C
2        0      0  STON/O2. 3101282   7.9250  B96 B98        S
3        1      0            113803  53.1000     C123        S
4        0      0            373450   8.0500  B96 B98        S
..     ...    ...               ...      ...      ...      ...
886      0      0            211536  13.0000  B96 B98        S
887      0      0            112053  30.0000      B42        S
888      1      2        W./C. 6607  23.4500  B96 B98        S
889      0      0            111369  30.0000     C148        C
890      0      0            370376   7.7500  B96 B98        Q

[891 rows x 12 columns]
```

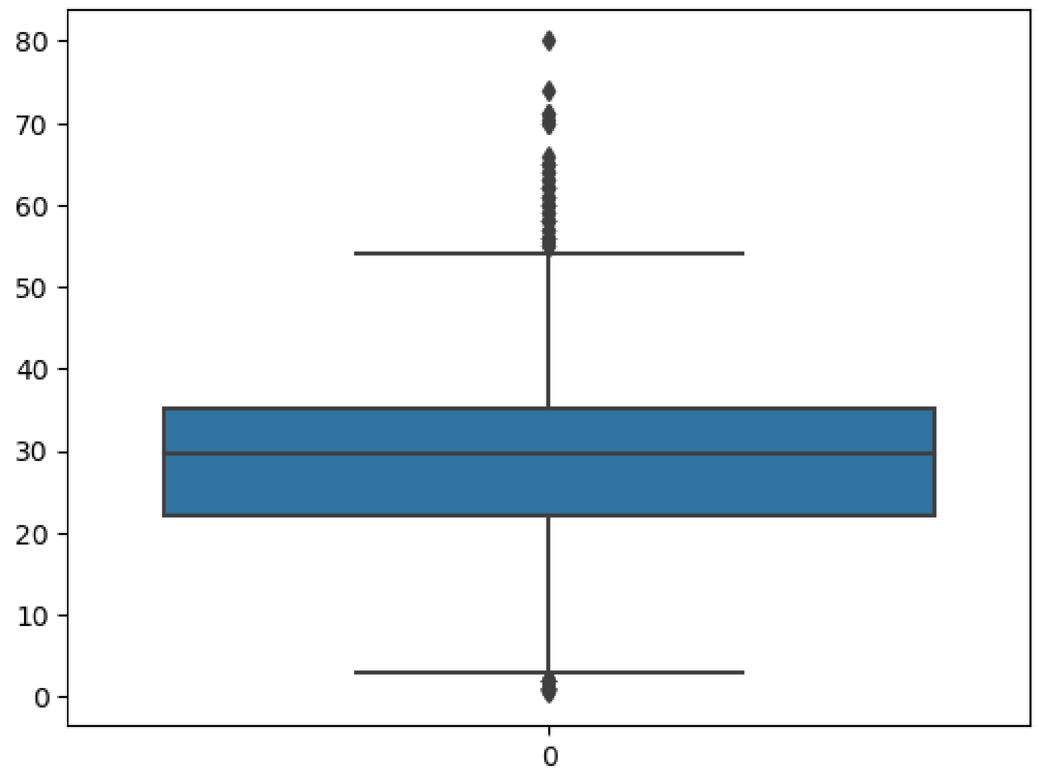
```
df.isnull().any()
```

```
PassengerId    False
Survived       False
Pclass         False
Name           False
Sex            False
Age            False
SibSp          False
Parch          False
```

```
Ticket          False
Fare            False
Cabin           False
Embarked        False
dtype: bool
```

```
sns.boxplot(df.Age)
```

```
<Axes: >
```



```
q1 = df.Age.quantile(0.25)
```

```
q3 = df.Age.quantile(0.75)
```

```
print(q1)
```

```
22.0
```

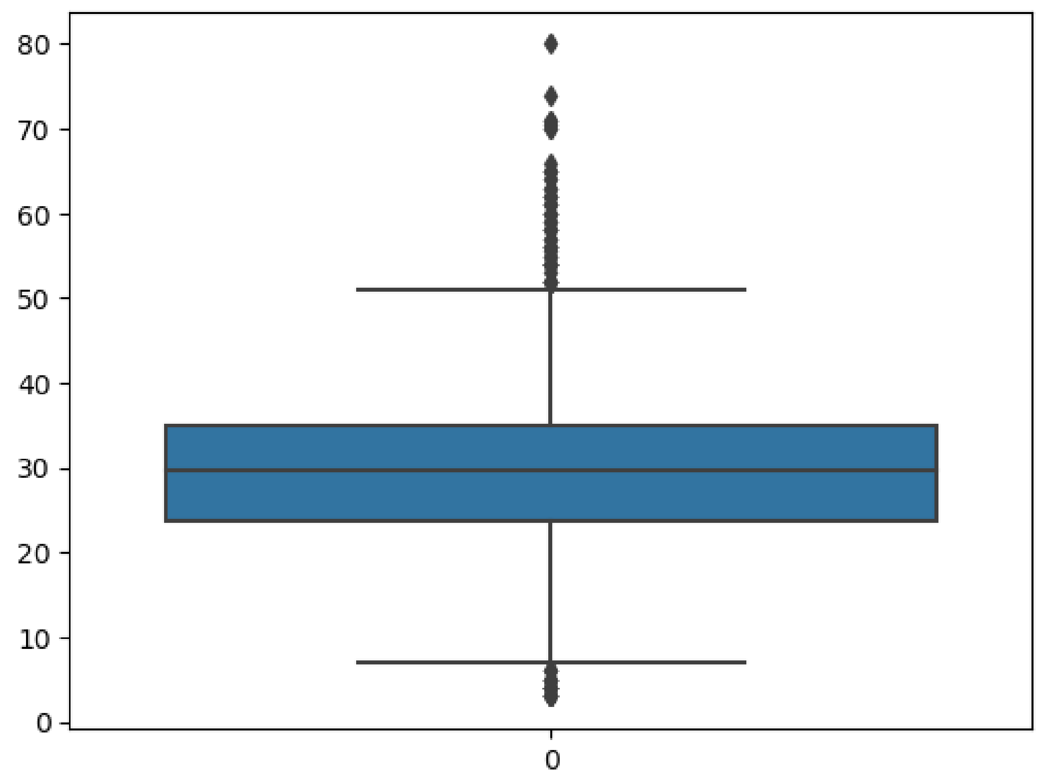
```
print(q3)
```

```
35.0
```

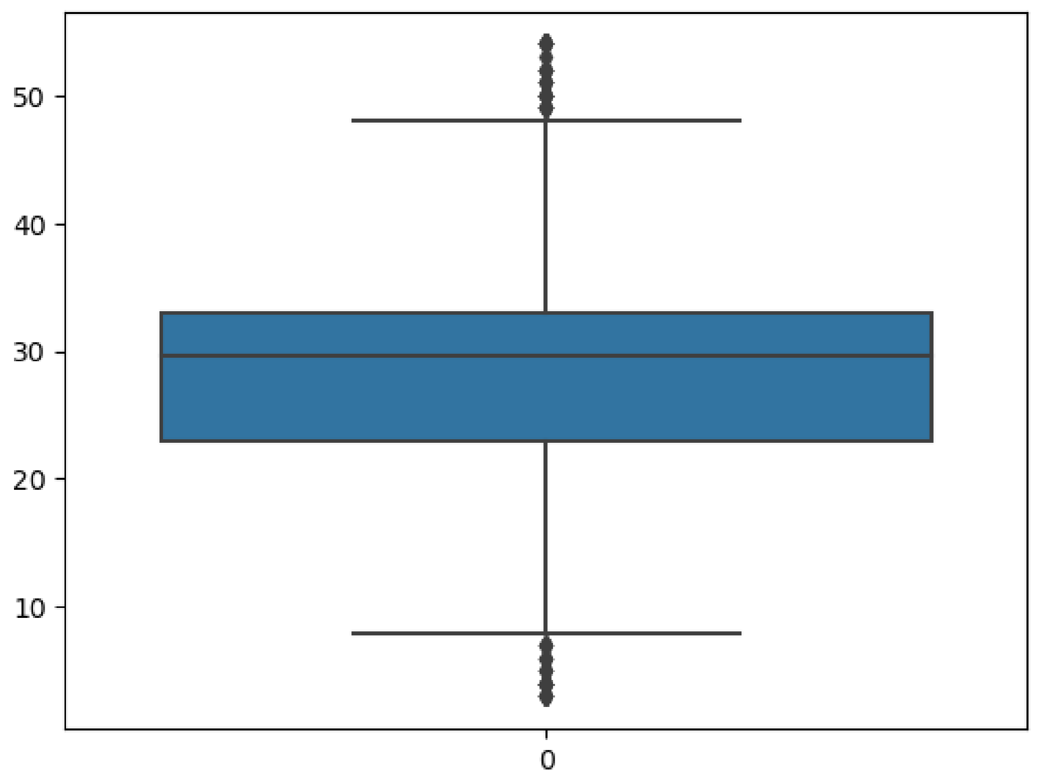
```
IQR = q3-q1
IQR
```

```
13.0
```

```
upper_limit = q3+1.5*IQR
upper_limit

54.5

lower_limit = q1-1.5*IQR
lower_limit

2.5

df.median()

C:\Users\hp\AppData\Local\Temp\ipykernel_4088\530051474.py:1:
FutureWarning: The default value of numeric_only in DataFrame.median
is deprecated. In a future version, it will default to False. In
addition, specifying 'numeric_only=None' is deprecated. Select only
valid columns or specify the value of numeric_only to silence this
warning.
  df.median()

PassengerId    446.000000
Survived         0.000000
Pclass           3.000000
Age             29.699118
SibSp            0.000000
Parch            0.000000
Fare            14.454200
dtype: float64

df['Age'] = np.where(df['Age']<lower_limit,29.69,df['Age'])

sns.boxplot(df.Age)

<Axes: >
```



```
df = df[df.Age<upper_limit]

sns.boxplot(df.Age)

<Axes: >
```



```
from scipy import stats
z_scores = np.abs(stats.zscore(df['Age']))
max_threshold=3
outliers = df['Age'][z_scores > max_threshold]

# Print and visualize the outliers
print("Outliers detected using Z-Score:")
print(outliers)
```

```
Outliers detected using Z-Score:
Series([], Name: Age, dtype: float64)
```

```
from scipy import stats
z_scores = np.abs(stats.zscore(df['Fare']))
max_threshold=3
outliers = df['Fare'][z_scores > max_threshold]

# Print and visualize the outliers
print("Outliers detected using Z-Score:")
print(outliers)
```

```
Outliers detected using Z-Score:
27     263.0000
88     263.0000
118    247.5208
258    512.3292
```

```
299    247.5208
311    262.3750
341    263.0000
377    211.5000
380    227.5250
527    221.7792
557    227.5250
679    512.3292
689    211.3375
700    227.5250
716    227.5250
730    211.3375
737    512.3292
742    262.3750
779    211.3375
Name: Fare, dtype: float64
```

```
column_name = 'Fare'

# Calculate the first quartile (Q1) and third quartile (Q3)
Q1 = df[column_name].quantile(0.25)
Q3 = df[column_name].quantile(0.75)

# Calculate the IQR
IQR = Q3 - Q1

# Define the lower and upper bounds for outliers
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR

# Filter rows with values outside the IQR bounds
df_cleaned = df[(df[column_name] > lower_bound) & (df[column_name]
<upper_bound)]

# Display the original and cleaned DataFrame sizes
print(f"Original DataFrame size: {df.shape}")
print(f"Cleaned DataFrame size: {df_cleaned.shape}")
df_cleaned
```

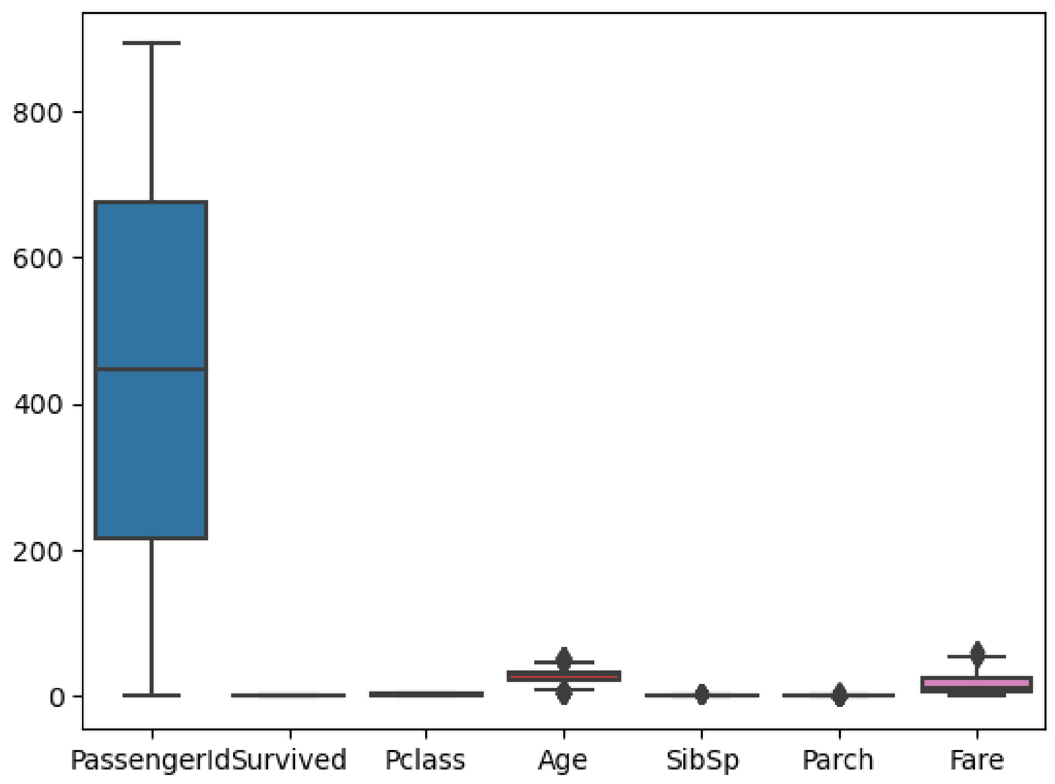
```
Original DataFrame size: (849, 12)
Cleaned DataFrame size: (741, 12)
```

```
     PassengerId  Survived  Pclass  \
0              1         0       3
2              3         1       3
3              4         1       1
4              5         0       3
5              6         0       3
..           ...       ...     ...
886          887         0       2
```

```
887          888         1       1
888          889         0       3
889          890         1       1
890          891         0       3

                                                  Name     Sex        Age  
SibSp  \
0                              Braund, Mr. Owen Harris    male  22.000000  
1
2                               Heikkinen, Miss. Laina  female  26.000000  
0
3         Futrelle, Mrs. Jacques Heath (Lily May Peel)  female  35.000000  
1
4                             Allen, Mr. William Henry    male  35.000000  
0
5                                     Moran, Mr. James    male  29.699118  
0
..                                                 ...     ...        ...  
...
886                              Montvila, Rev. Juozas    male  27.000000  
0
887                       Graham, Miss. Margaret Edith  female  19.000000  
0
888           Johnston, Miss. Catherine Helen "Carrie"  female  29.699118  
1
889                              Behr, Mr. Karl Howell    male  26.000000  
0
890                                Dooley, Mr. Patrick    male  32.000000  
0

     Parch            Ticket     Fare    Cabin Embarked  
0        0         A/5 21171   7.2500  B96 B98        S  
2        0  STON/O2. 3101282   7.9250  B96 B98        S  
3        0            113803  53.1000     C123        S  
4        0            373450   8.0500  B96 B98        S  
5        0            330877   8.4583  B96 B98        Q  
..     ...               ...      ...      ...      ...  
886      0            211536  13.0000  B96 B98        S  
887      0            112053  30.0000      B42        S  
888      2        W./C. 6607  23.4500  B96 B98        S  
889      0            111369  30.0000     C148        C  
890      0            370376   7.7500  B96 B98        Q  

[741 rows x 12 columns]
```

```
sns.boxplot(df_cleaned)
```

```
<Axes: >
```



Separating dependent and independent variables

```
x = df.iloc[:, [2, 4, 5, 6, 7, 9, 11]]
y = df.iloc[:, 1]

x.head()

   Pclass     Sex   Age  SibSp  Parch     Fare Embarked
0       3    male  22.0      1      0   7.2500        S
1       1  female  38.0      1      0  71.2833        C
2       3  female  26.0      0      0   7.9250        S
3       1  female  35.0      1      0  53.1000        S
4       3    male  35.0      0      0   8.0500        S

y.head()

0    0
1    1
2    1
3    1
4    0
Name: Survived, dtype: int64

df.shape

(849, 12)
```

```
x.shape
```

```
(849, 7)
```

```
y.shape
```

```
(849,)
```

One hot encoding on Embarked column

```
x.Embarked.value_counts()
```

```
S    618
C    157
Q     74
Name: Embarked, dtype: int64
```

```
embarked=pd.get_dummies(x["Embarked"],drop_first=True)
```

```
embarked
```

```
     Q  S
0    0  1
1    0  0
2    0  1
3    0  1
4    0  1
..  .. ..
886  0  1
887  0  1
888  0  1
889  0  0
890  1  0

[849 rows x 2 columns]
```

```
x=pd.concat([x,embarked],axis=1)
```

```
x.head()
```

```
   Pclass     Sex   Age  SibSp  Parch     Fare Embarked  Q  S
0       3    male  22.0      1      0   7.2500        S  0  1
1       1  female  38.0      1      0  71.2833        C  0  0
2       3  female  26.0      0      0   7.9250        S  0  1
3       1  female  35.0      1      0  53.1000        S  0  1
4       3    male  35.0      0      0   8.0500        S  0  1
```

```
x.drop(["Embarked"],axis=1,inplace=True)
```

```
x.head(10)
```

```
   Pclass     Sex        Age  SibSp  Parch     Fare  Q  S
0       3    male  22.000000      1      0   7.2500  0  1
1       1  female  38.000000      1      0  71.2833  0  0
2       3  female  26.000000      0      0   7.9250  0  1
3       1  female  35.000000      1      0  53.1000  0  1
4       3    male  35.000000      0      0   8.0500  0  1
5       3    male  29.699118      0      0   8.4583  1  0
6       1    male  54.000000      0      0  51.8625  0  1
7       3    male  29.690000      3      1  21.0750  0  1
8       3  female  27.000000      0      2  11.1333  0  1
9       2  female  14.000000      1      0  30.0708  0  0
```

```
x.shape
```

```
(849, 8)
```

Label Encoding on sex column

```
from sklearn.preprocessing import LabelEncoder
```

```
le=LabelEncoder()
```

```
x["Sex"]=le.fit_transform(x["Sex"])
```

```
x["Sex"]
```

```
0      1
1      0
2      0
3      0
4      1
      ..
886    1
887    0
888    0
889    1
890    1
Name: Sex, Length: 849, dtype: int32
```

```
x["Sex"].value_counts()
```

```
1    545
0    304
Name: Sex, dtype: int64
```

```
x["Sex"].nunique()
```

```
2
```

```
x.head()
```

```
   Pclass  Sex   Age  SibSp  Parch     Fare  Q  S
0       3    1  22.0      1      0   7.2500  0  1
1       1    0  38.0      1      0  71.2833  0  0
2       3    0  26.0      0      0   7.9250  0  1
3       1    0  35.0      1      0  53.1000  0  1
4       3    1  35.0      0      0   8.0500  0  1
```

```
x.Sex.value_counts()
```

```
1    545
0    304
Name: Sex, dtype: int64
```

Splitting into training and testing set

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,rando
m_state=0)
```

```
x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

```
((594, 8), (255, 8), (594,), (255,))
```

Feature Scaling

```
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
```

```
x_train=sc.fit_transform(x_train)
x_test=sc.fit_transform(x_test)
```

```
x_train
```

```
array([[-0.41834557, -1.31330524,  1.17453394, ..., -0.24582194,
        -0.32262861,  0.62017367],
       [ 0.79383622, -1.31330524,  0.0443624 , ..., -0.49093682,
        -0.32262861, -1.61245155],
       [ 0.79383622,  0.76143761,  0.0443624 , ..., -0.48045329,
         3.09953914, -1.61245155],
       ...,
       [ 0.79383622,  0.76143761,  0.67449708, ..., -0.48552931,
        -0.32262861,  0.62017367],
       [ 0.79383622,  0.76143761, -0.72560612, ..., -0.4744627 ,
        -0.32262861,  0.62017367],
       [ 0.79383622,  0.76143761, -1.22564298, ..., -0.49434746,
        -0.32262861,  0.62017367]])
```