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    Perform Encoding
o    Feature Scaling.
o    Splitting Data into Train and Test
```

Perform Data preprocessing on Titanic dataset

Import the Libraries.

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

Importing the dataset.

```
df = pd.read_csv("Titanic.csv")

df.head()
```

```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         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

   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
```

```
df.tail()
```

```
     PassengerId  Survived  Pclass
Name  \
886          887         0       2                     Montvila, Rev.
Juozas
887          888         1       1              Graham, Miss. Margaret
Edith
888          889         0       3  Johnston, Miss. Catherine Helen
"Carrie"
889          890         1       1                     Behr, Mr. Karl
Howell
890          891         0       3                       Dooley, Mr.
Patrick

        Sex   Age  SibSp  Parch      Ticket   Fare Cabin Embarked
886    male  27.0      0      0      211536  13.00   NaN        S
887  female  19.0      0      0      112053  30.00   B42        S
888  female   NaN      1      2  W./C. 6607  23.45   NaN        S
889    male  26.0      0      0      111369  30.00  C148        C
890    male  32.0      0      0      370376   7.75   NaN        Q
```

```
df.shape
```

```
(891, 12)
```

```
df.ndim
```

```
2
```

```
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
```

```
corr=df.corr()
corr
```

```
C:\Users\Love Chauhan\AppData\Local\Temp\
ipykernel_193160\3182140910.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.
  corr=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
```

```
ports=pd.get_dummies(df.Embarked,prefix='Embarked')
ports.head()
```

```
   Embarked_C  Embarked_Q  Embarked_S
0           0           0           1
1           1           0           0
2           0           0           1
3           0           0           1
4           0           0           1
```

```
df=df.join(ports)
df.drop(['Embarked'],axis=1,inplace=True)

df.head()
```

```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         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
```

```
   Parch            Ticket     Fare Cabin  Embarked_C  Embarked_Q
Embarked_S
```

```
0      0         A/5 21171   7.2500   NaN           0           0
1
1      0          PC 17599  71.2833   C85           1           0
0
2      0  STON/O2. 3101282   7.9250   NaN           0           0
1
3      0            113803  53.1000  C123           0           0
1
4      0            373450   8.0500   NaN           0           0
1
```

Checking for Null Values

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

```
PassengerId    False
Survived       False
Pclass         False
Name           False
Sex            False
Age            False
SibSp          False
Parch          False
Ticket         False
Fare           False
Embarked_C     False
Embarked_Q     False
Embarked_S     False
dtype: bool
```

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

```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked_C     0
Embarked_Q     0
Embarked_S     0
dtype: int64
```

```
df['Age'].fillna(df['Age'].mean(),inplace=True)
```

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

```
PassengerId    0
Survived       0
Pclass         0
Name           0
Sex            0
Age            0
SibSp          0
Parch          0
Ticket         0
Fare           0
Embarked_C     0
Embarked_Q     0
Embarked_S     0
dtype: int64
```

```
df.drop(['Cabin'],axis=1,inplace=True)
```

```
df.drop(['Embarked_C'],axis=1,inplace=True)
df.drop(['Embarked_Q'],axis=1,inplace=True)
df.drop(['Embarked_S'],axis=1,inplace=True)
```

```
df.head()
```

```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         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

   Parch            Ticket     Fare
0      0         A/5 21171   7.2500
1      0          PC 17599  71.2833
2      0  STON/O2. 3101282   7.9250
3      0            113803  53.1000
4      0            373450   8.0500
```

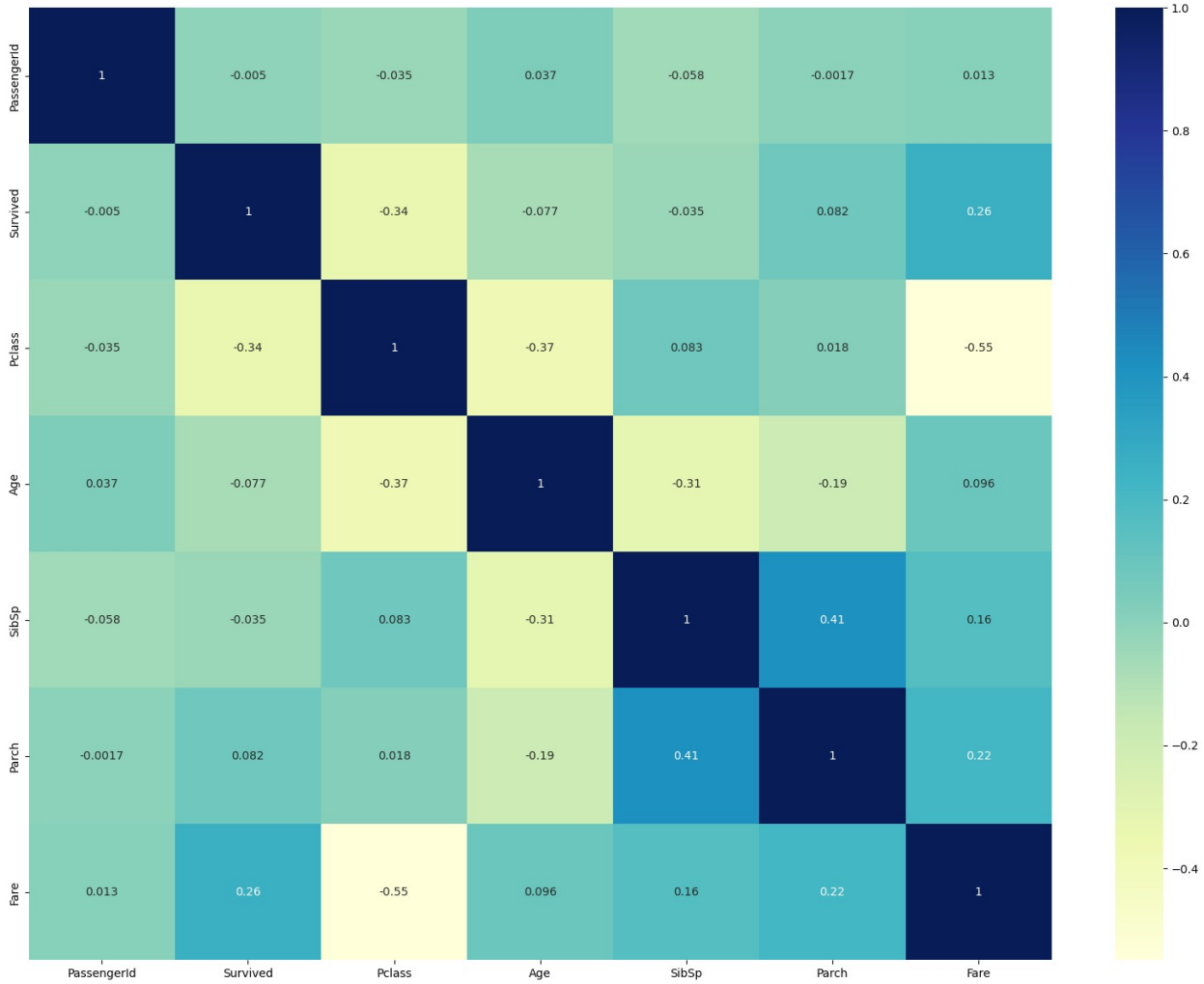
```
df.shape
```

```
(891, 10)
```

Data Visualization

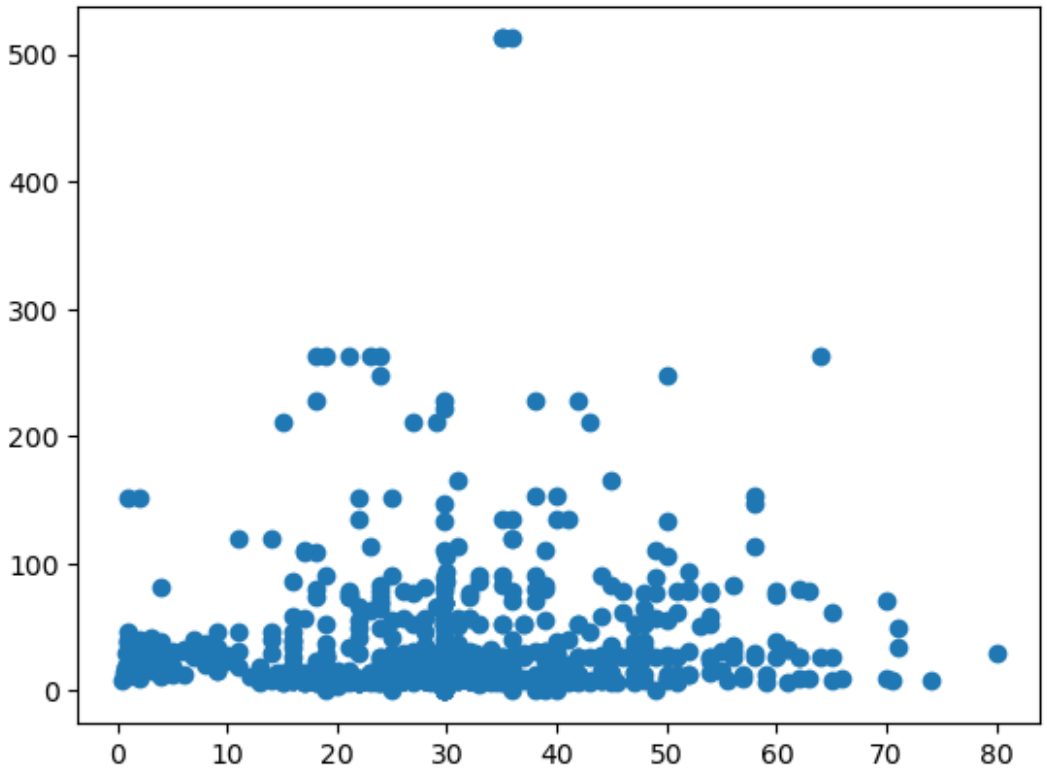
```
plt.subplots(figsize=(20,15))
sns.heatmap(corr,annot=True,cmap='YlGnBu')
```

```
<Axes: >
```

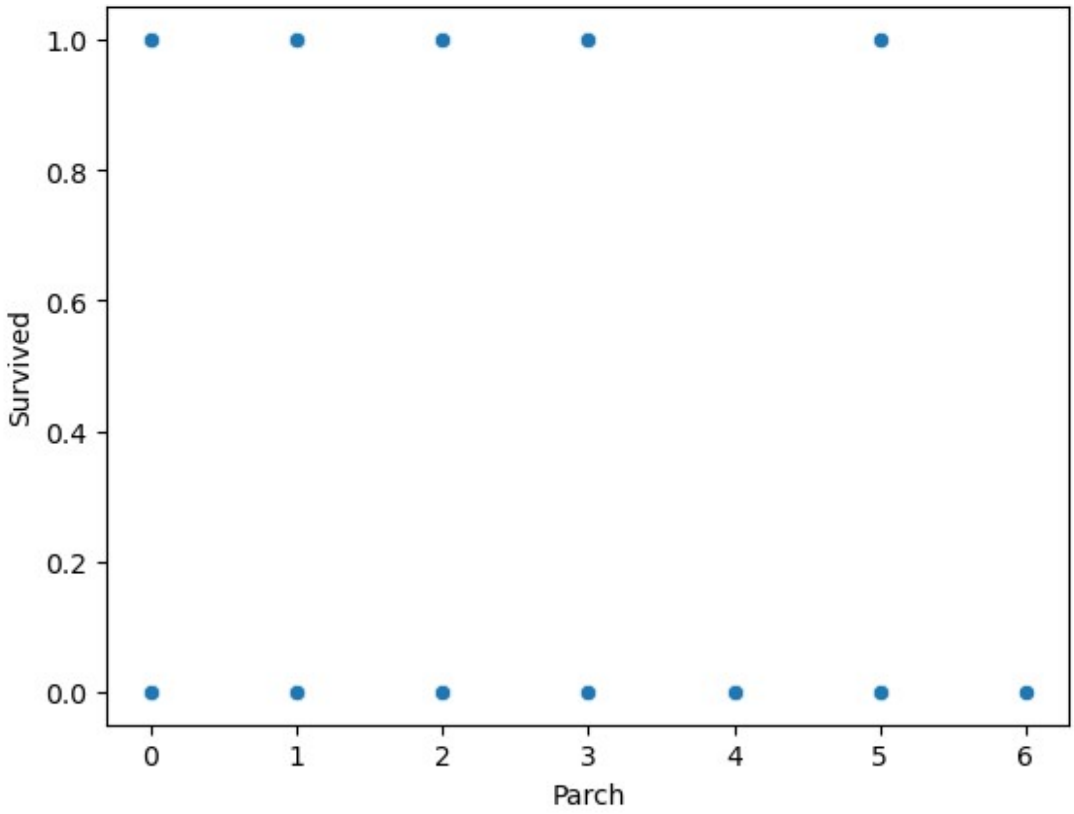



```
plt.scatter(df["Age"],df["Fare"])
```

```
<matplotlib.collections.PathCollection at 0x298f4e4f850>
```

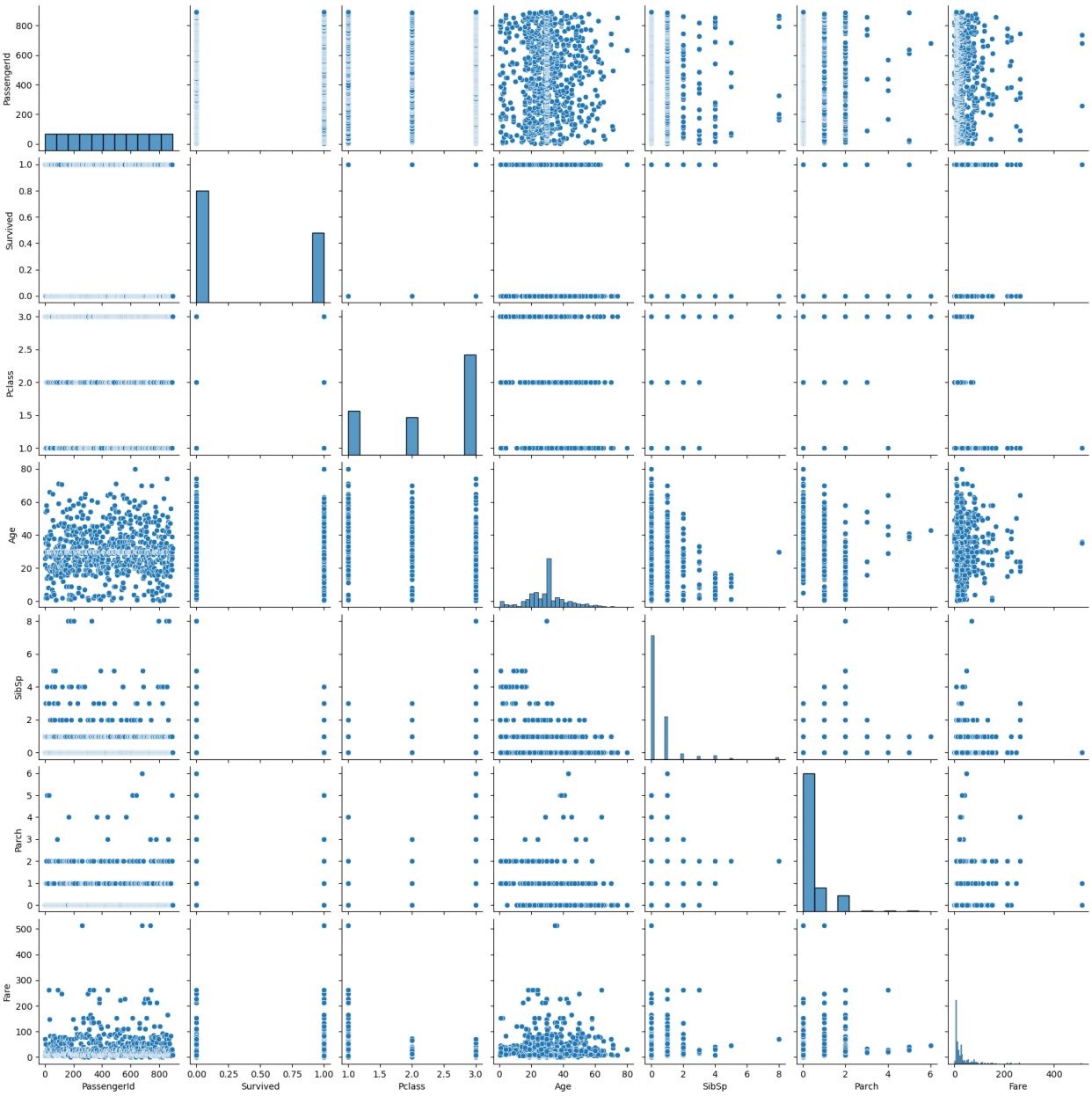



```
sns.scatterplot(x="Parch",y="Survived",data=df)
plt.show()
```



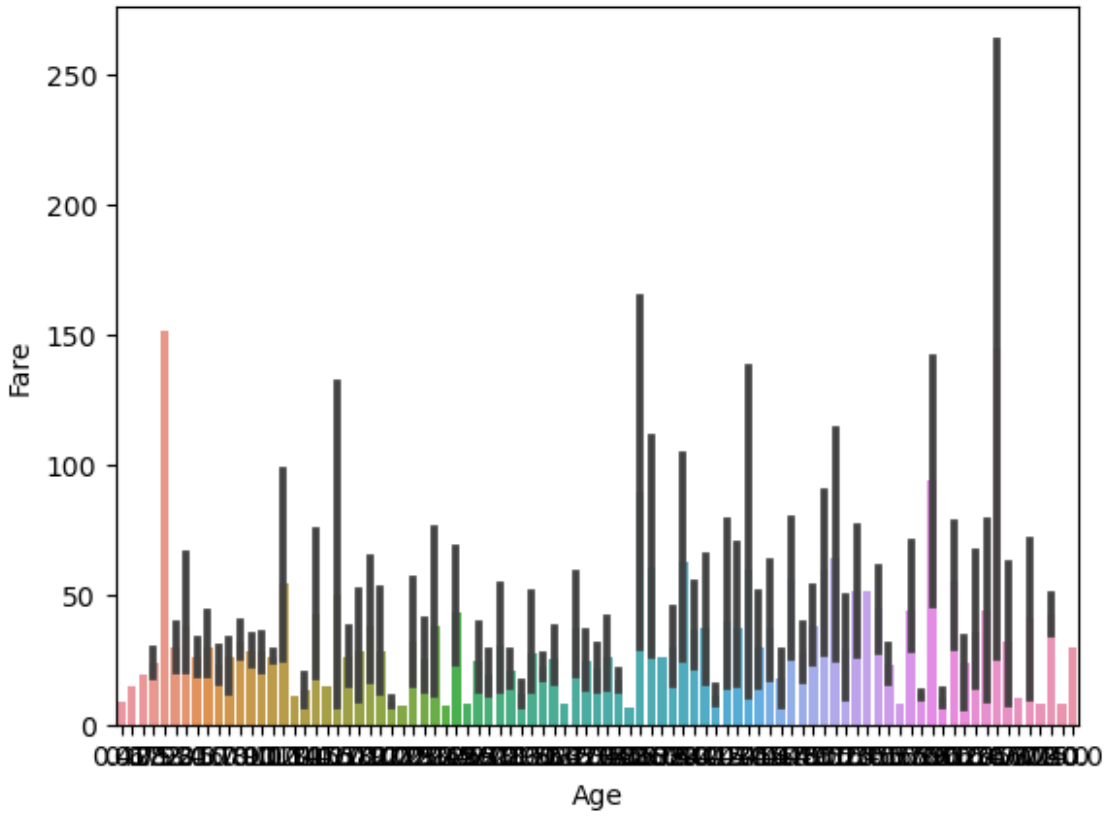

```
sns.pairplot(df)
```

```
<seaborn.axisgrid.PairGrid at 0x298f4cd2c10>
```



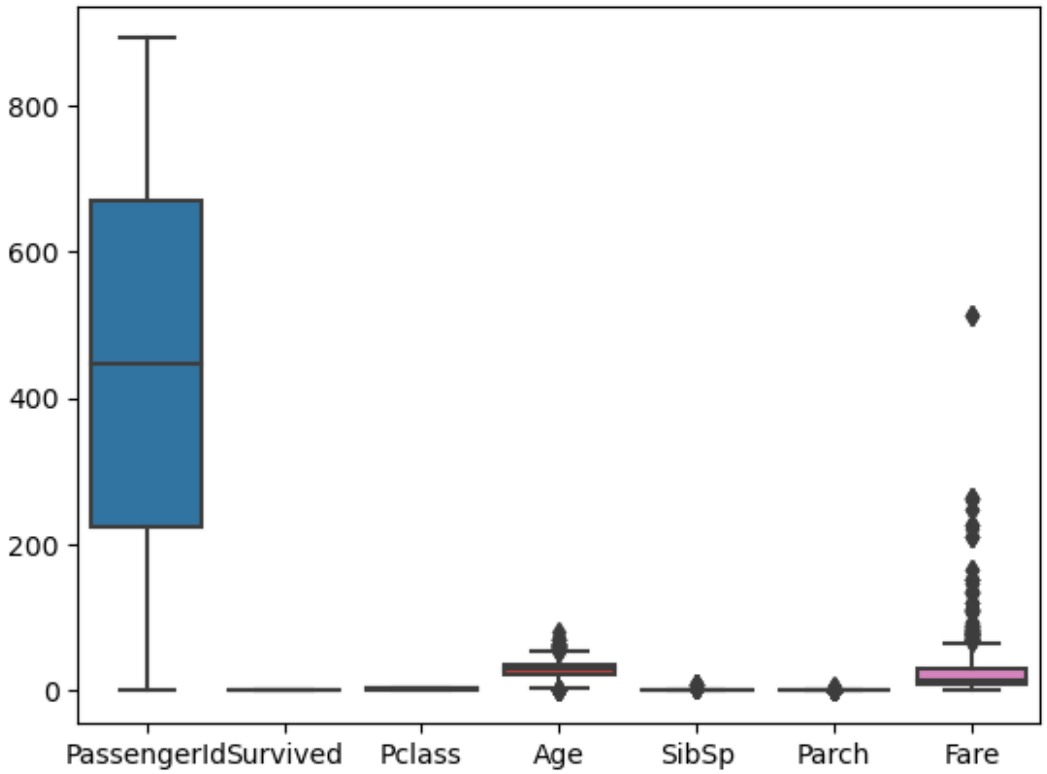

```
sns.barplot(x=df["Age"],y=df["Fare"])
```

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




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

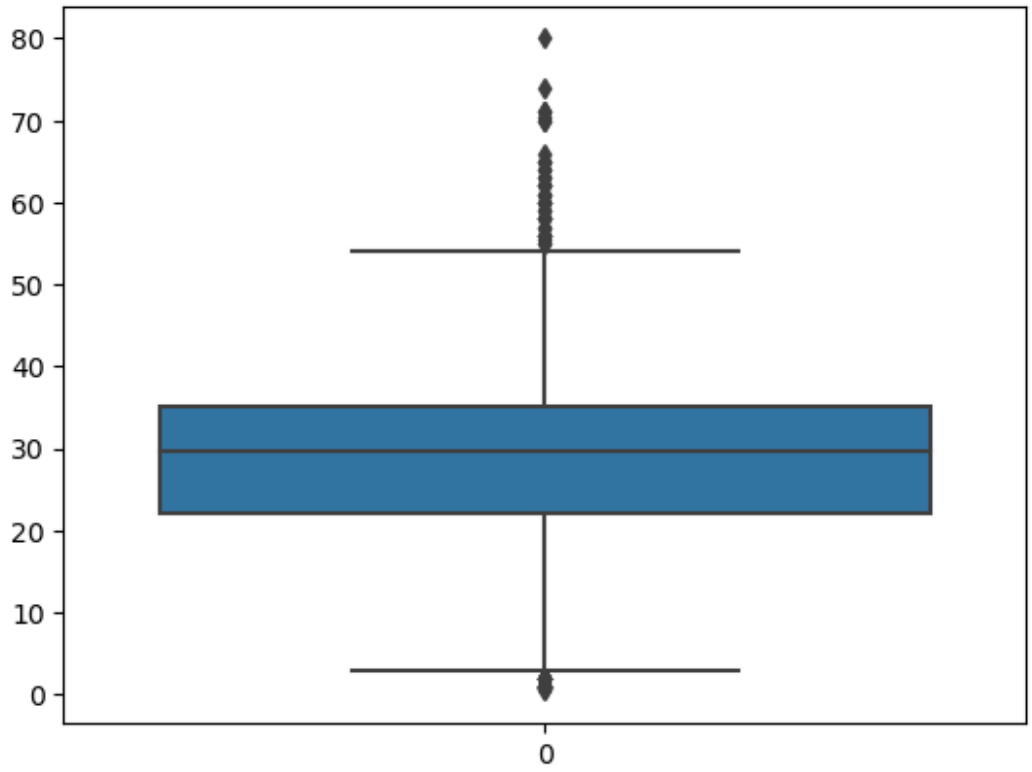
```
<Axes: >
```



Outlier Detection

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

```
<Axes: >
```




```
q1=df.Age.quantile(0.25)
q3=df.Age.quantile(0.75)
q2=df.Age.quantile(0.50)

q1

30.0

q2

30.0

q3

30.0

IQR=q3-q1
IQR

0.0

upper_limit=q3+1.5*IQR
lower_limit=q1-1.5*IQR

upper_limit

30.0
```

```
lower_limit
```

```
30.0
```

```
df.median()
```

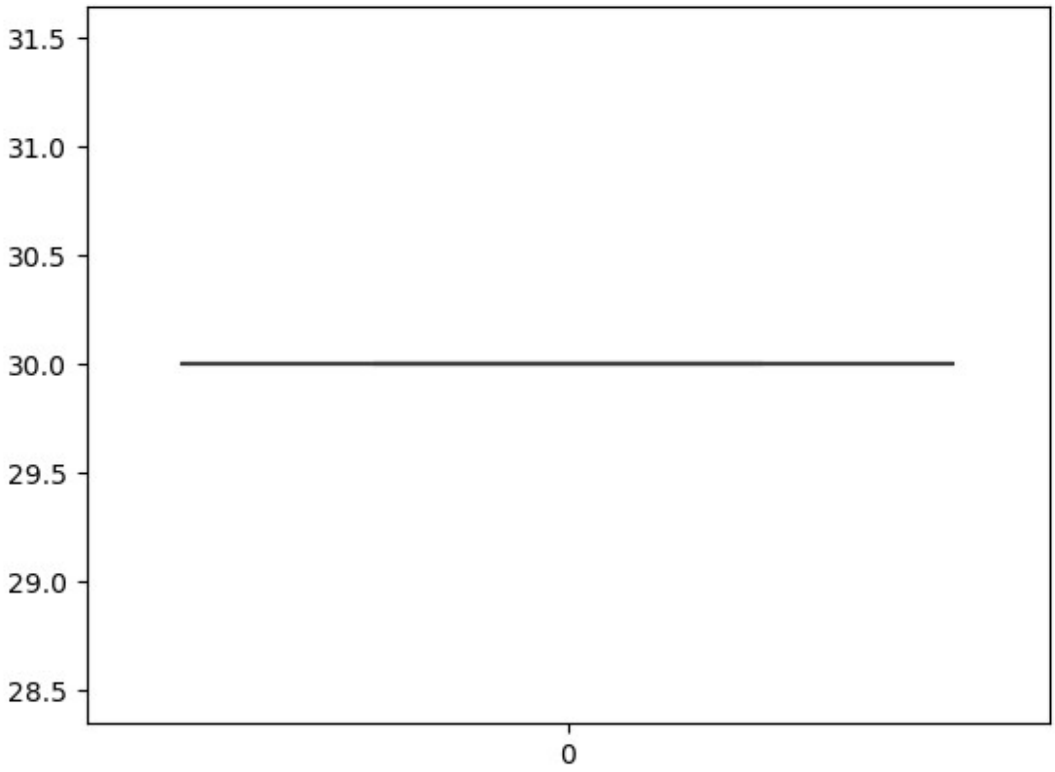
```
C:\Users\Love Chauhan\AppData\Local\Temp\
ipykernel_193160\530051474.py:1: FutureWarning: The default value of
numeric_only in DataFrame.median is deprecated. In a future version,
it will default to False. In addition, specifying 'numeric_only=None'
is deprecated. Select only valid columns or specify the value of
numeric_only to silence this warning.
  df.median()
```

```
PassengerId    446.00
Survived         0.00
Pclass           3.00
Age             30.00
SibSp            0.00
Parch            0.00
Fare            14.45
dtype: float64
```

```
df['Age']=np.where(df['Age']>upper_limit,30,df['Age'])
df['Age']=np.where(df['Age']<lower_limit,30,df['Age'])
#df=df[(df.Age<lower_limit)&(df.Age>upper_limit)]
```

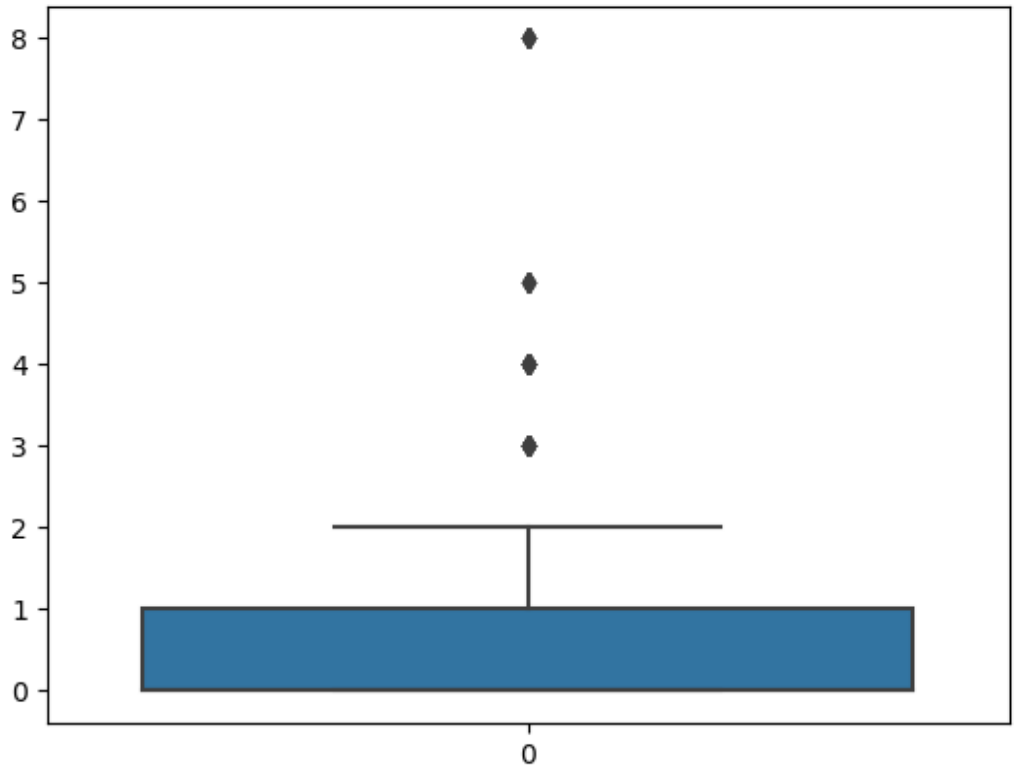
```
sns.boxplot(df.Age)
```

```
<Axes: >
```




```
sns.boxplot(df.SibSp)
```

```
<Axes: >
```




```
q1=df.SibSp.quantile(0.25)
q3=df.SibSp.quantile(0.75)
q2=df.SibSp.quantile(0.50)
```

```
q1
```

```
0.0
```

```
q2
```

```
0.0
```

```
q3
```

```
1.0
```

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

```
1.0
```

```
upper_limit=q3+1.5*IQR
upper_limit
```

```
2.5
```

```
lower_limit=q1-1.5*IQR
lower_limit
```

```
-1.5
```

```
df.median()
```

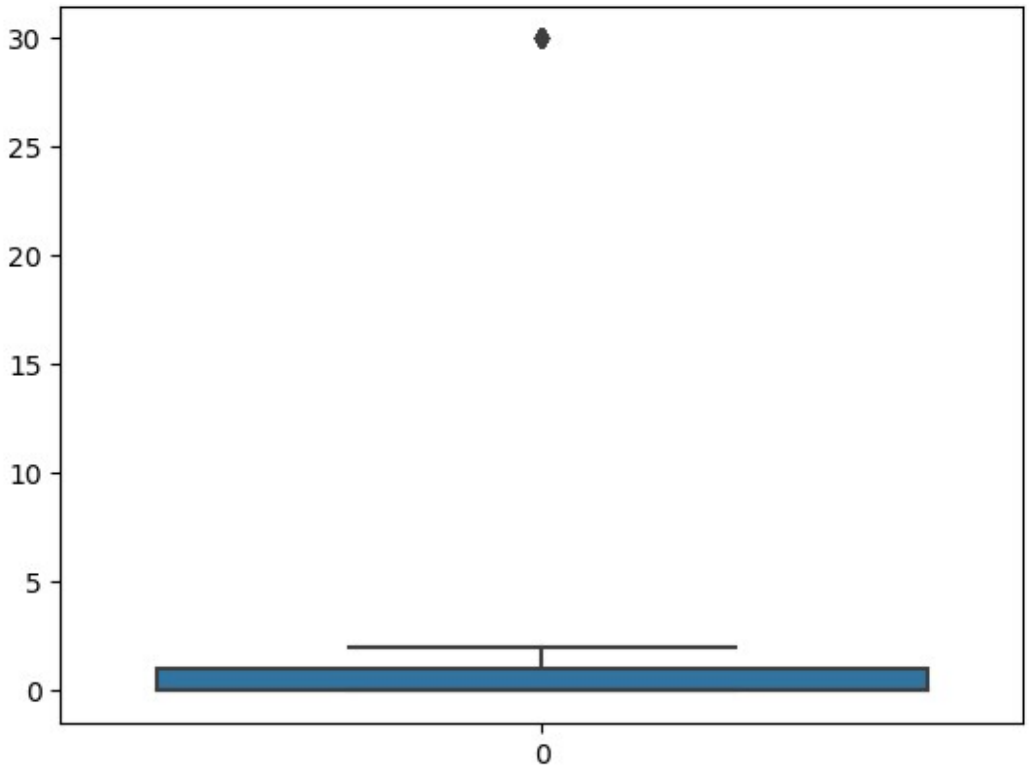
```
C:\Users\Love Chauhan\AppData\Local\Temp\
ipykernel_193160\530051474.py:1: FutureWarning: The default value of
numeric_only in DataFrame.median is deprecated. In a future version,
it will default to False. In addition, specifying 'numeric_only=None'
is deprecated. Select only valid columns or specify 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['SibSp']=np.where(df['SibSp']>upper_limit,30,df['SibSp'])
```

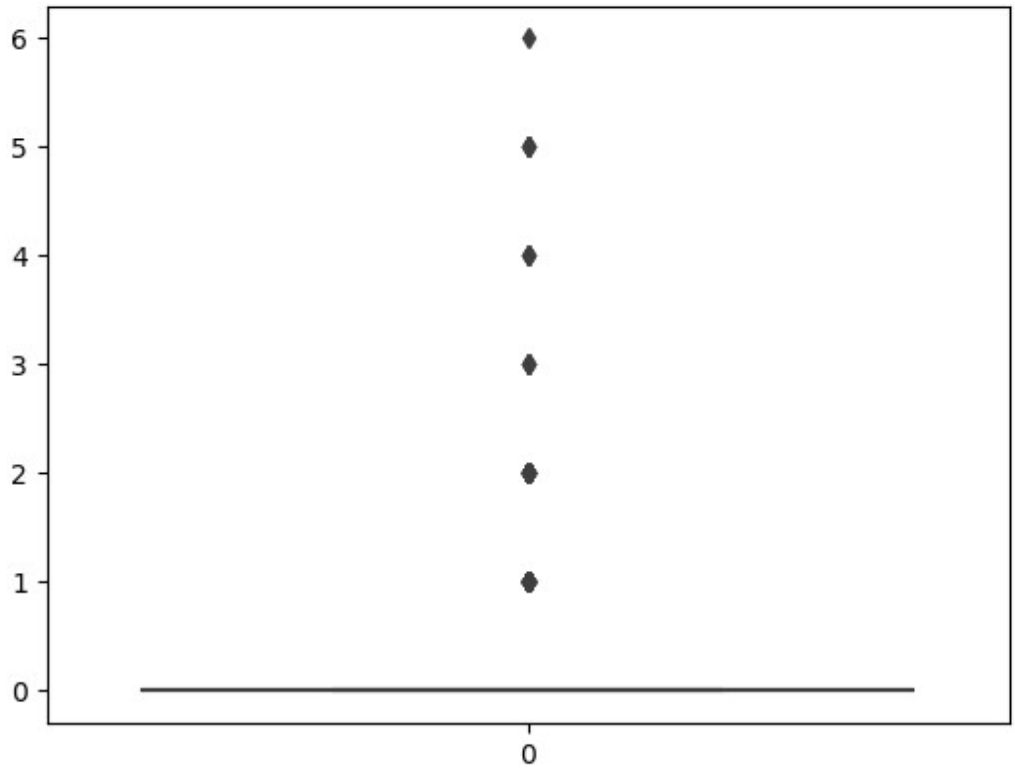
```
sns.boxplot(df.SibSp)
```

```
<Axes: >
```



```
sns.boxplot(df.Parch)
```

```
<Axes: >
```




```
q1=df.Parch.quantile(0.25)
q3=df.Parch.quantile(0.75)
q2=df.Parch.quantile(0.50)

q1
```

```
0.0
```

```
q2
```

```
0.0
```

```
q3
```

```
0.0
```

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

```
0.0
```

```
upper_limit=q3+1.5*IQR
upper_limit
```

```
0.0
```

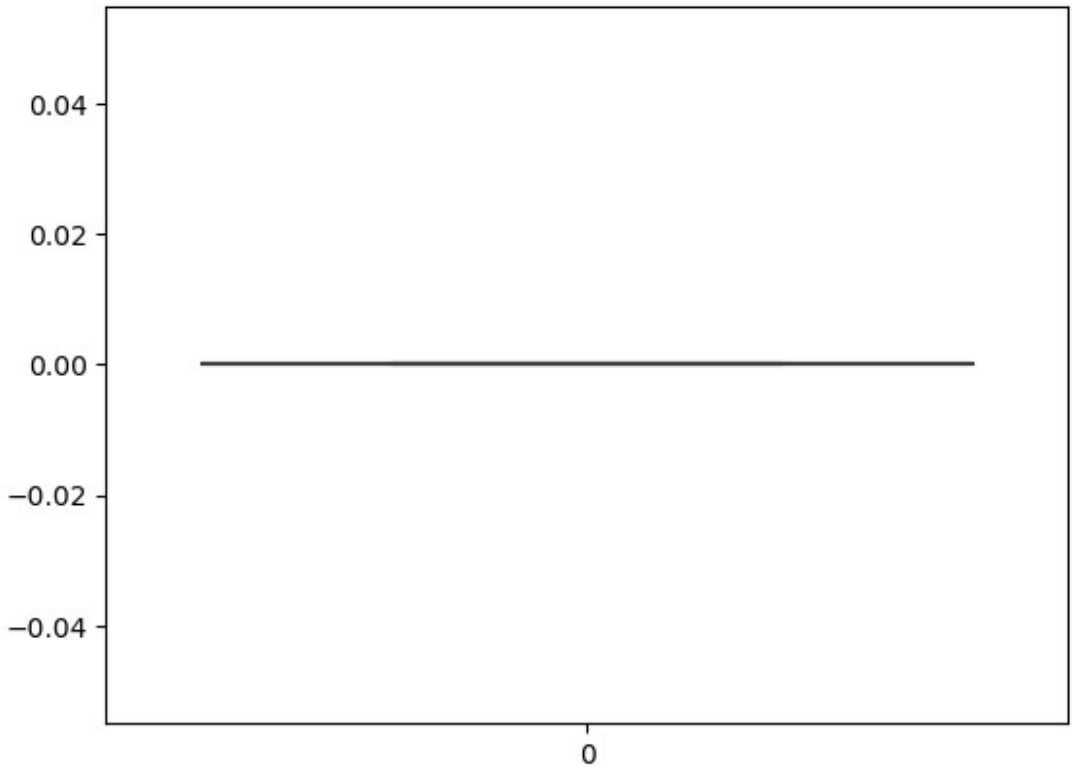
```
lower_limit=q1-1.5*IQR
lower_limit
```

```
0.0
```

```
df['Parch']=np.where(df['Parch']>upper_limit,0,df['Parch'])
```

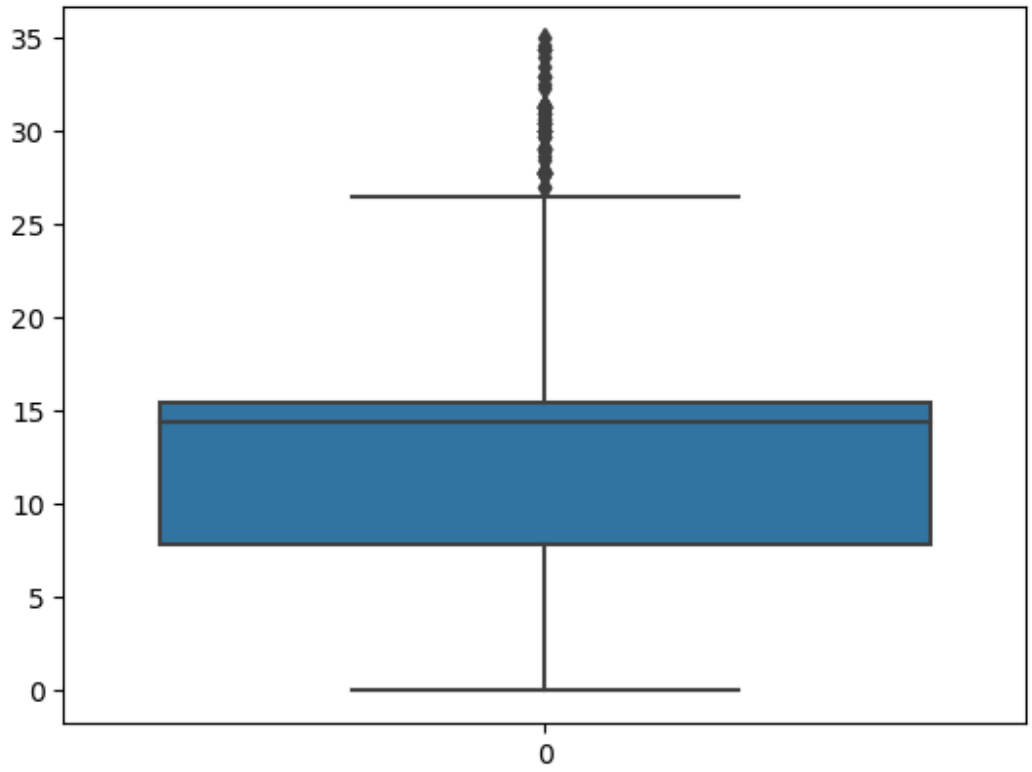
```
sns.boxplot(df.Parch)
```

```
<Axes: >
```




```
sns.boxplot(df.Fare)
```

```
<Axes: >
```




```
q1=df.Fare.quantile(0.25)
q3=df.Fare.quantile(0.75)
q2=df.Fare.quantile(0.50)

q1
```

```
7.9104
```

```
q2
```

```
14.45
```

```
q3
```

```
14.45
```

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

```
6.539599999999999
```

```
upper_limit=q3+1.5*IQR
upper_limit
```

```
24.2594
```

```
lower_limit=q1-1.5*IQR
lower_limit
```

```
-1.8989999999999982
```

```
df.median()
```

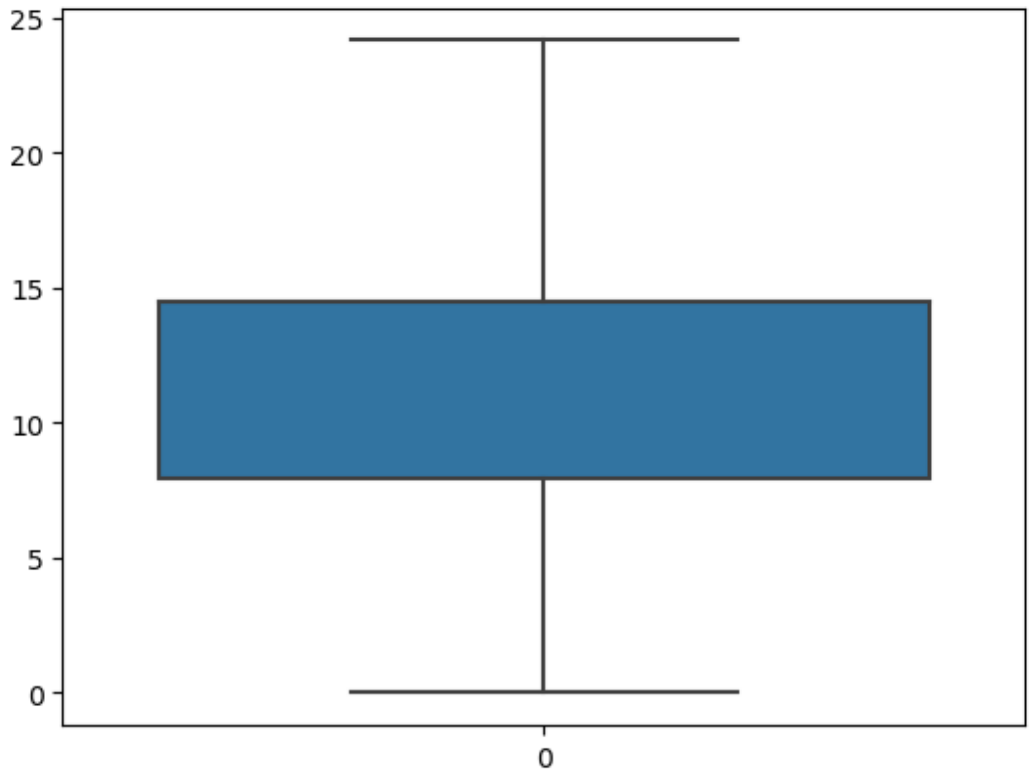
```
C:\Users\Love Chauhan\AppData\Local\Temp\
ipykernel_193160\530051474.py:1: FutureWarning: The default value of
numeric_only in DataFrame.median is deprecated. In a future version,
it will default to False. In addition, specifying 'numeric_only=None'
is deprecated. Select only valid columns or specify the value of
numeric_only to silence this warning.
  df.median()
```

```
PassengerId    446.00
Survived         0.00
Pclass           3.00
Age             30.00
SibSp            0.00
Parch            0.00
Fare            14.45
dtype: float64
```

```
df['Fare']=np.where(df['Fare']>upper_limit,14.45,df['Fare'])
```

```
sns.boxplot(df.Fare)
```

```
<Axes: >
```



Splitting Dependent and Independent variables

```
df.head(10)
```

```
   PassengerId  Survived  Pclass  \
0            1         0       3
1            2         1       1
2            3         1       3
3            4         1       1
4            5         0       3
5            6         0       3
6            7         0       1
7            8         0       3
8            9         1       3
9           10         1       2

                                                 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
5                                    Moran, Mr. James    male
29.699118
6                             McCarthy, Mr. Timothy J    male
54.000000
7                      Palsson, Master. Gosta Leonard    male
2.000000
8  Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)  female
27.000000
9                Nasser, Mrs. Nicholas (Adele Achem)  female
14.000000

   SibSp  Parch            Ticket     Fare
0      1      0         A/5 21171   7.2500
1      1      0          PC 17599  14.4500
2      0      0  STON/O2. 3101282   7.9250
3      1      0            113803  14.4500
4      0      0            373450   8.0500
5      0      0            330877   8.4583
6      0      0             17463  14.4500
7     30      0            349909  21.0750
8      0      0            347742  11.1333
9      1      0            237736  14.4500
```

```
x=df.iloc[:,2:]
y=df.iloc[:,1:2]

x
```

```
     Pclass                                                Name     Sex
\
0         3                             Braund, Mr. Owen Harris    male

1         1  Cumings, Mrs. John Bradley (Florence Briggs Th...  female

2         3                              Heikkinen, Miss. Laina  female

3         1       Futrelle, Mrs. Jacques Heath (Lily May Peel)  female

4         3                            Allen, Mr. William Henry    male

..      ...                                                ...     ...

886       2                              Montvila, Rev. Juozas    male

887       1                       Graham, Miss. Margaret Edith  female

888       3           Johnston, Miss. Catherine Helen "Carrie"  female

889       1                              Behr, Mr. Karl Howell    male

890       3                                Dooley, Mr. Patrick    male


            Age  SibSp  Parch            Ticket    Fare
0    22.000000      1      0         A/5 21171   7.250
1    38.000000      1      0          PC 17599  14.450
2    26.000000      0      0  STON/O2. 3101282   7.925
3    35.000000      1      0            113803  14.450
4    35.000000      0      0            373450   8.050
..         ...    ...    ...               ...     ...
886  27.000000      0      0            211536  13.000
887  19.000000      0      0            112053  14.450
888  29.699118      1      0        W./C. 6607  23.450
889  26.000000      0      0            111369  14.450
890  32.000000      0      0            370376   7.750

[891 rows x 8 columns]

y
```

```
     Survived
0           0
1           1
2           1
```

```
3           1
4           0
..        ...
886         0
887         1
888         0
889         1
890         0

[891 rows x 1 columns]
```

```
x.shape
```

```
(891, 8)
```

Perform Encoding

```
from sklearn.preprocessing import LabelEncoder

le=LabelEncoder()

x["Name"]=le.fit_transform(x["Name"])

x.head()
```

	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	3	108	male	22.0	1	0	A/5 21171	7.250
1	1	190	female	38.0	1	0	PC 17599	14.450
2	3	353	female	26.0	0	0	STON/O2. 3101282	7.925
3	1	272	female	35.0	1	0	113803	14.450
4	3	15	male	35.0	0	0	373450	8.050

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

```
108    1
98     1
267    1
284    1
566    1
      ..
431    1
518    1
411    1
428    1
220    1
Name: Name, Length: 891, dtype: int64
```

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

x.head()
```

```
   Pclass  Name  Sex   Age  SibSp  Parch            Ticket    Fare
0       3   108    1  22.0      1      0         A/5 21171   7.250
1       1   190    0  38.0      1      0          PC 17599  14.450
2       3   353    0  26.0      0      0  STON/O2. 3101282   7.925
3       1   272    0  35.0      1      0            113803  14.450
4       3    15    1  35.0      0      0            373450   8.050
```

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

```
1    577
0    314
Name: Sex, dtype: int64
```

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

```
x.head()
```

```
   Pclass  Name  Sex   Age  SibSp  Parch  Ticket    Fare
0       3   108    1  22.0      1      0     523   7.250
1       1   190    0  38.0      1      0     596  14.450
2       3   353    0  26.0      0      0     669   7.925
3       1   272    0  35.0      1      0      49  14.450
4       3    15    1  35.0      0      0     472   8.050
```

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

```
333    7
568    7
80     7
249    6
566    6
      ..
513    1
98     1
212    1
606    1
466    1
Name: Ticket, Length: 681, dtype: int64
```

Feature Scaling.

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

x_scaled=sc.fit_transform(x)
x_scaled
```

```
array([[ 0.82737724, -1.31021659,  0.73769513, ...,  0.        ,
         0.91896631, -1.0191909 ],
       [-1.56610693, -0.99141018, -1.35557354, ...,  0.        ,
         1.28262456,  0.27123506],
```

```
       [ 0.82737724, -0.35768524, -1.35557354, ...,  0.        ,
         1.64628282, -0.89821347],
       ...,
       [ 0.82737724, -0.12441226, -1.35557354, ...,  0.        ,
         1.67617254,  1.88426751],
       [-1.56610693, -1.41518943,  0.73769513, ...,  0.        ,
        -1.64656796,  0.27123506],
       [ 0.82737724, -0.87477369,  0.73769513, ...,  0.        ,
         0.63501397, -0.92957799]])
```

Splitting Data into Train and Test

```
from sklearn.model_selection import train_test_split

tts=train_test_split

x_train,x_test,y_train,y_test=tts(x_scaled,y,test_size=0.2,random_stat
e=0)

print(x_train.shape,x_test.shape,y_train.shape,y_test.shape)
```

```
(712, 8) (179, 8) (712, 1) (179, 1)
```

```
x_train
```

```
array([[ 0.82737724, -1.34520754, -1.35557354, ...,  0.        ,
        -0.67515207,  0.41386297],
       [-0.36936484,  0.00777577,  0.73769513, ...,  0.        ,
         1.03852519, -0.43670696],
       [-0.36936484,  0.2293851 ,  0.73769513, ...,  0.        ,
         1.3922202 ,  0.27123506],
       ...,
       [ 0.82737724,  0.61039764,  0.73769513, ...,  0.        ,
        -0.26167762, -0.93257106],
       [ 0.82737724,  1.71066854, -1.35557354, ...,  0.        ,
        -0.19193494,  0.79995125],
       [-0.36936484, -1.29466506,  0.73769513, ...,  0.        ,
        -0.49083214,  0.27123506]])
```

```
x_test
```

```
array([[ 0.82737724,  1.69122913,  0.73769513, ...,  0.        ,
        -0.80965581,  0.27272263],
       [ 0.82737724,  1.63291088,  0.73769513, ...,  0.        ,
         1.40218344, -0.96542316],
       [ 0.82737724,  0.9175404 ,  0.73769513, ...,  0.        ,
         0.70475665,  0.27123506],
       ...,
       [-1.56610693,  0.53263998, -1.35557354, ...,  0.        ,
         0.38593297,  0.27123506],
       [ 0.82737724, -1.53960169,  0.73769513, ...,  0.        ,
```

```
         0.0172931 , -0.91090266],
       [ 0.82737724, -1.43851673,  0.73769513, ...,  0.        ,
        -0.32643868, -0.87581024]])
```

y_train

```
     Survived
140         0
439         0
817         0
378         0
491         0
..        ...
835         1
192         1
629         0
559         1
684         0

[712 rows x 1 columns]
```

y_test

```
     Survived
495         0
648         0
278         0
31          1
255         1
..        ...
780         1
837         0
215         1
833         0
372         0

[179 rows x 1 columns]
```