Lathvik Cherukuri - AI&ML- Assignment-3

Data Preprocessing

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

Perform Data preprocessing on Titanic dataset

Import the Libraries.

In [67]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

Importing the dataset.

In [68]:
```
df = pd.read_csv("Titanic.csv")
```

In [69]:
```
df.head()
```

Out[69]:

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

In [70]:
```
df.tail()
```

Out[70]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Emb
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.00	NaN	
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.00	B42	
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.45	NaN	
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.00	C148	
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.75	NaN	

In [71]:
```
df.shape
```

Out[71]:
```
(891, 12)
```

In [72]:
```
df.ndim
```

Out[72]:
```
2
```

In [73]:
```
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
```

In [74]:
```
df.describe()
```

Out[74]:

	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 [75]:
```
corr=df.corr()
corr
```

```
C:\Users\vishnu vardhan\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()
```

Out[75]:

	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 [76]:
```
ports=pd.get_dummies(df.Embarked,prefix='Embarked')
ports.head()
```

Out[76]:

	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

In [77]:
```
df=df.join(ports)
df.drop(['Embarked'],axis=1,inplace=True)
```

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

Out[78]:

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

In [ ]:

Checking for Null Values

In [80]:
```
df.isnull().any()
```

Out[80]:
```
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
```

In [81]:
```
df.isnull().sum()
```

Out[81]:
```
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
```

In [82]:
```
df['Age'].fillna(df['Age'].mean(),inplace=True)
```

In [83]:
```
df.isnull().sum()
```

Out[83]:
```
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
```

In [88]:
```
df.drop(['Cabin'],axis=1,inplace=True)
```

In [86]:
```
df.drop(['Embarked_C'],axis=1,inplace=True)
df.drop(['Embarked_Q'],axis=1,inplace=True)
df.drop(['Embarked_S'],axis=1,inplace=True)
```

In [87]:
```
df.head()
```

Out[87]:

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

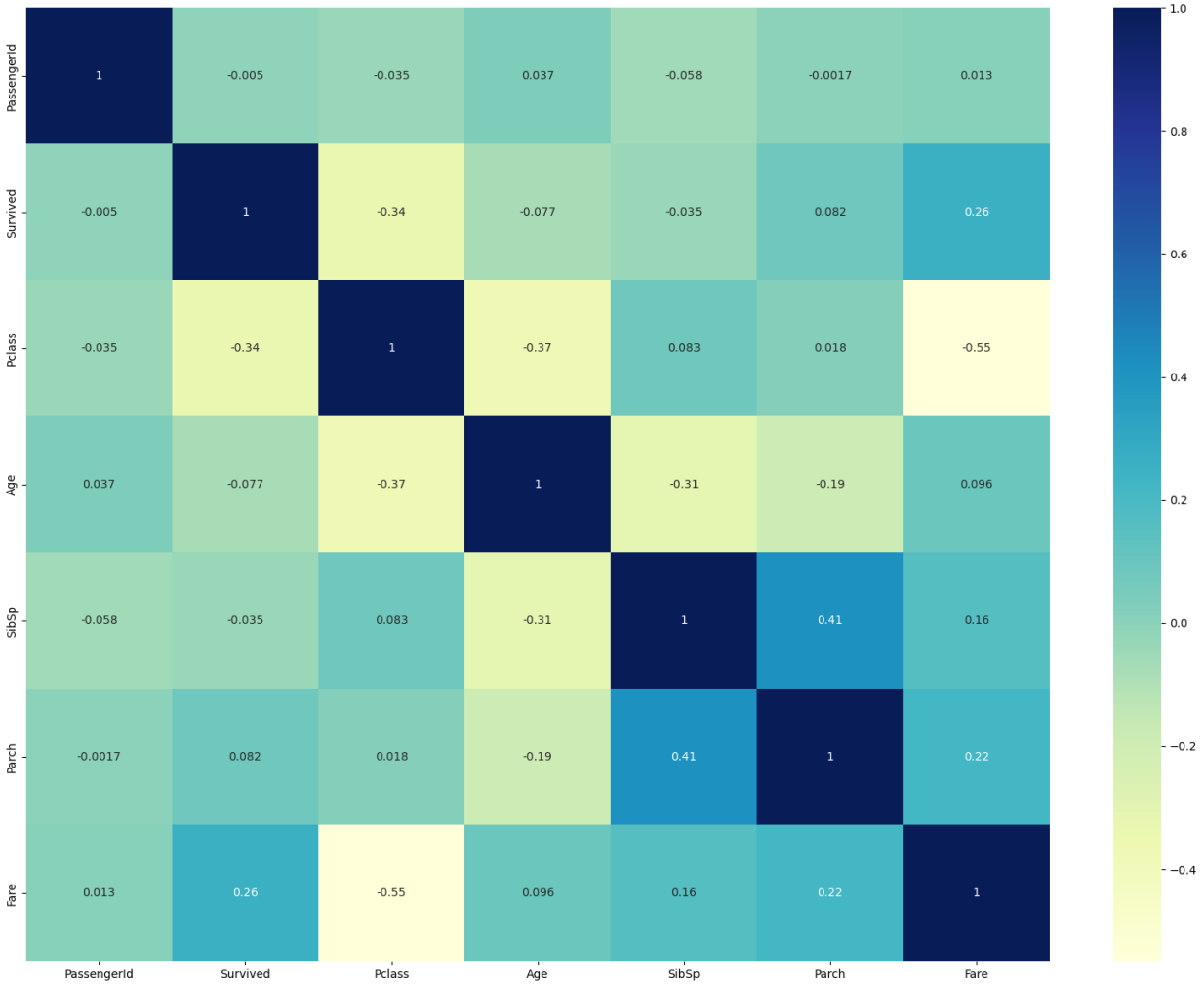
In [21]:
```
df.shape
```

Out[21]:
```
(891, 10)
```

Data Visualization

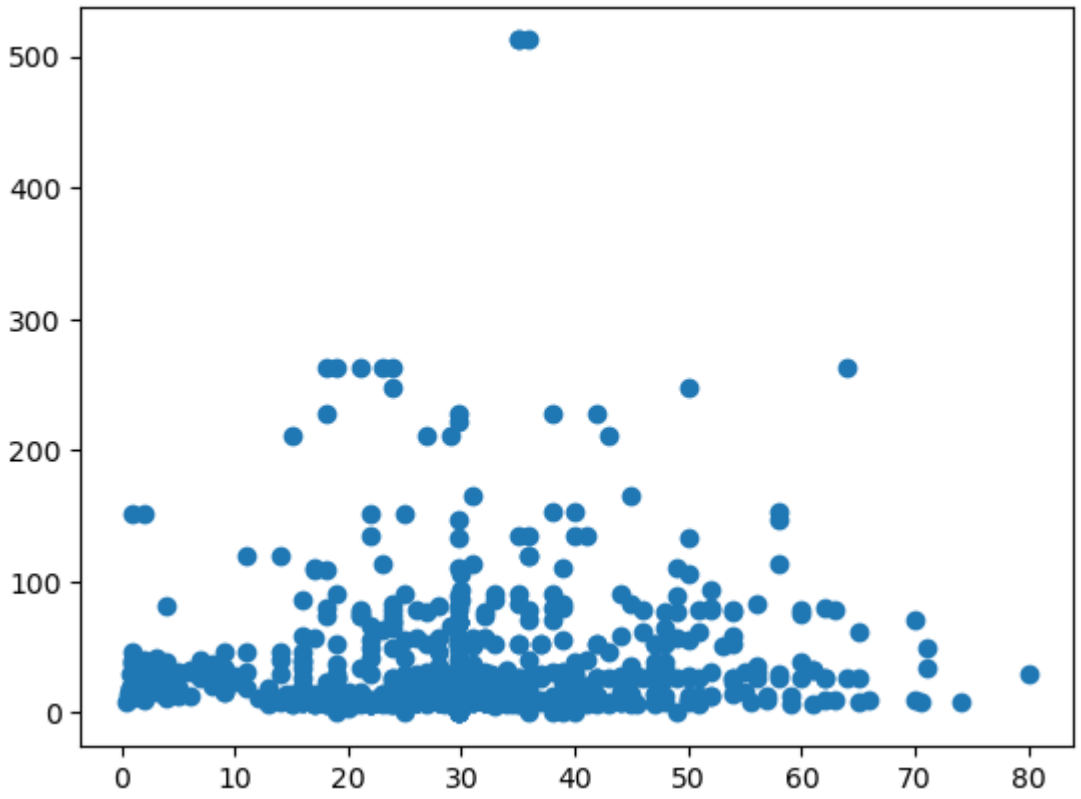
In [89]:
```
plt.subplots(figsize=(20,15))
sns.heatmap(corr,annot=True,cmap='YlGnBu')
```

Out[89]:
```
<Axes: >
```

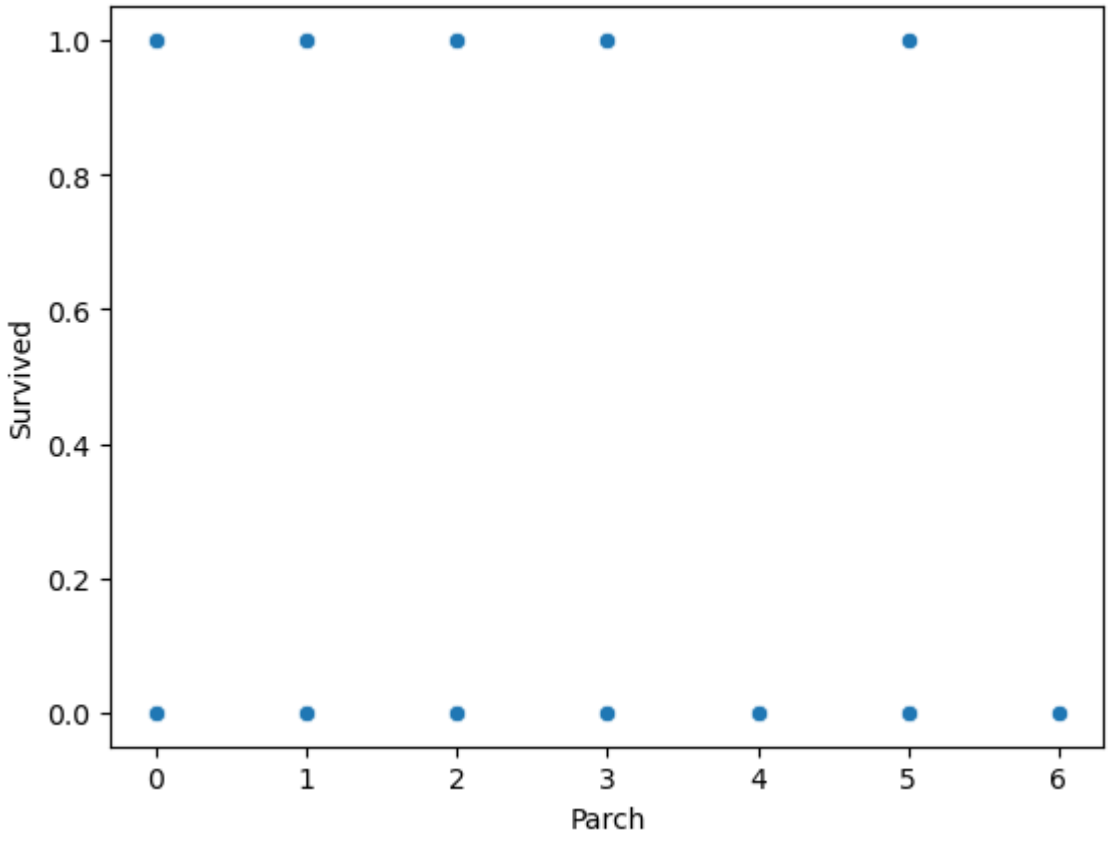


In [90]:
```
plt.scatter(df["Age"],df["Fare"])
```

Out[90]:
```
<matplotlib.collections.PathCollection at 0x298f4e4f850>
```

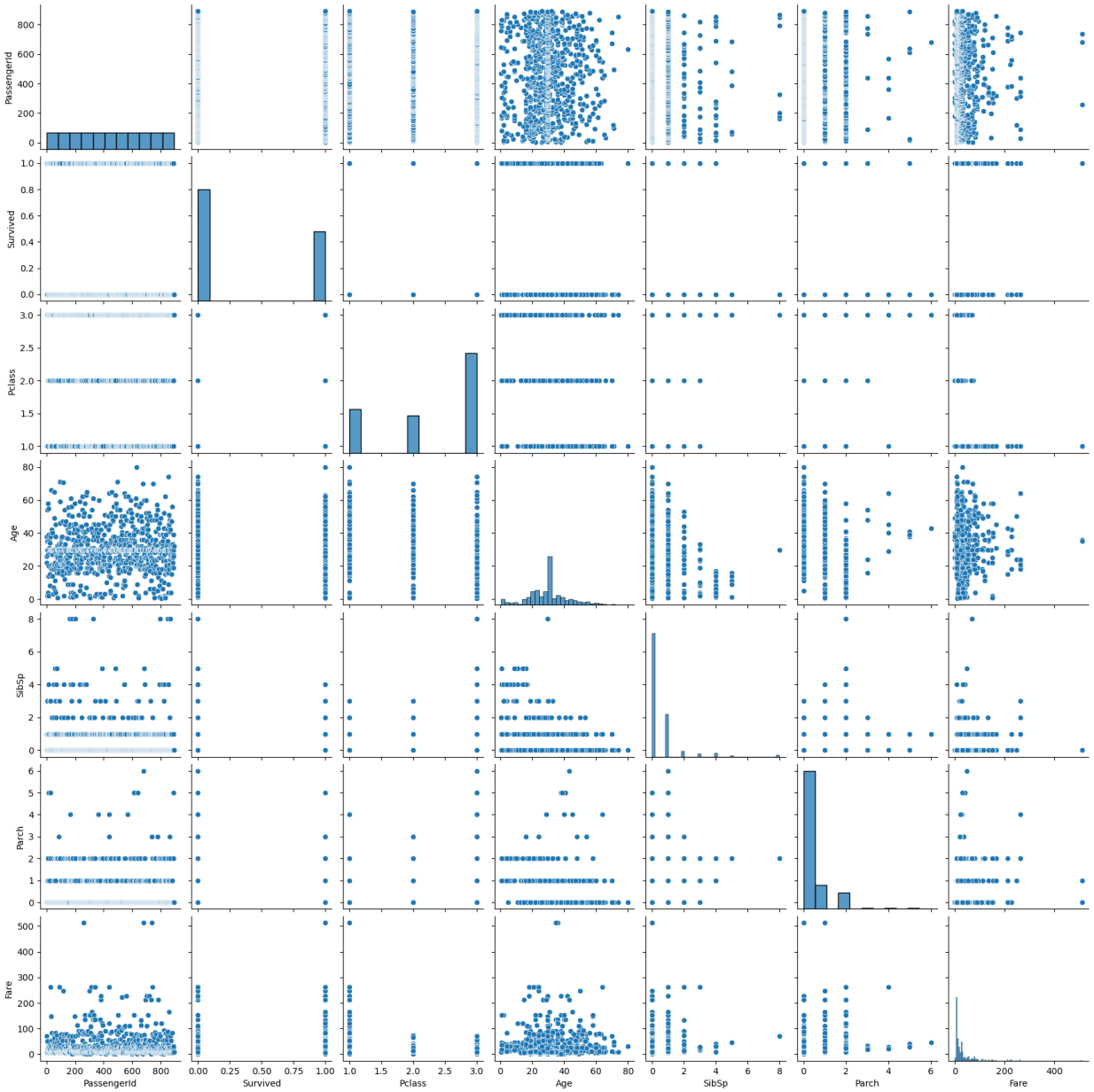


In [91]:
```
sns.scatterplot(x="Parch",y="Survived",data=df)
plt.show()
```



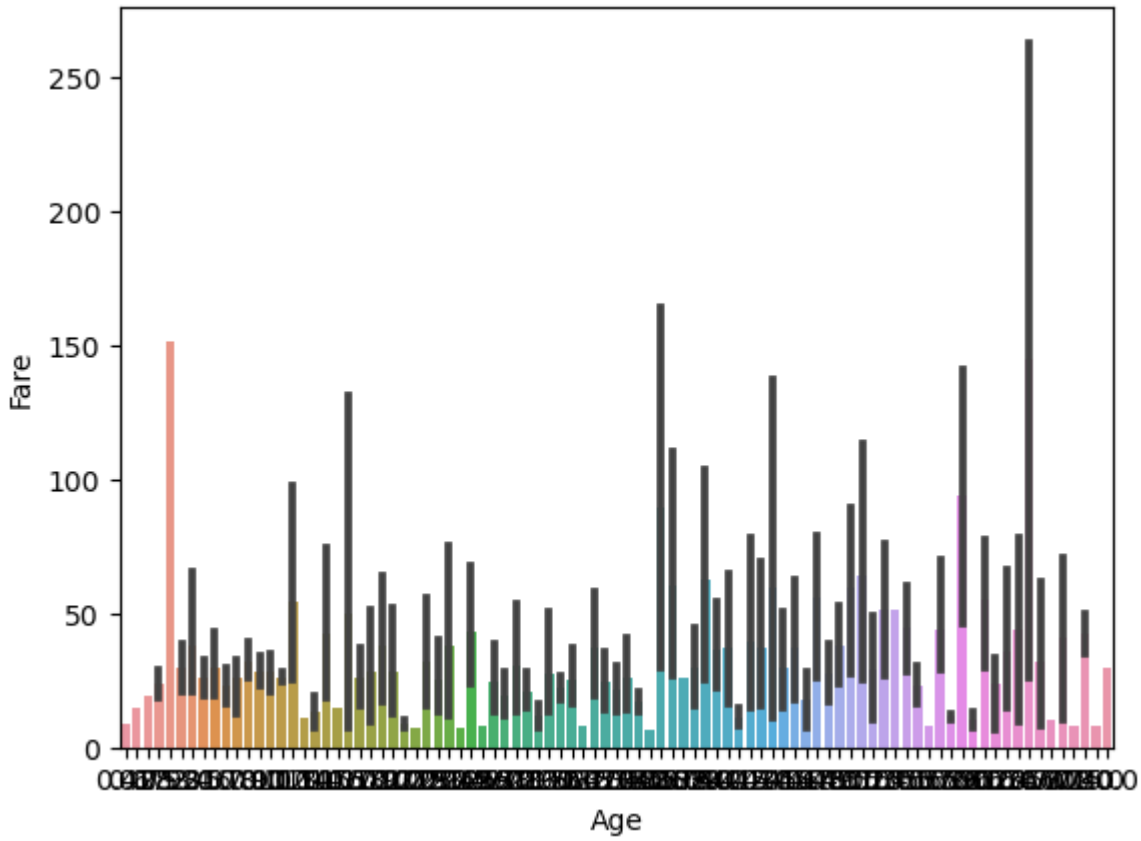
In [92]:
```
sns.pairplot(df)
```

Out[92]: <seaborn.axisgrid.PairGrid at 0x298f4cd2c10>



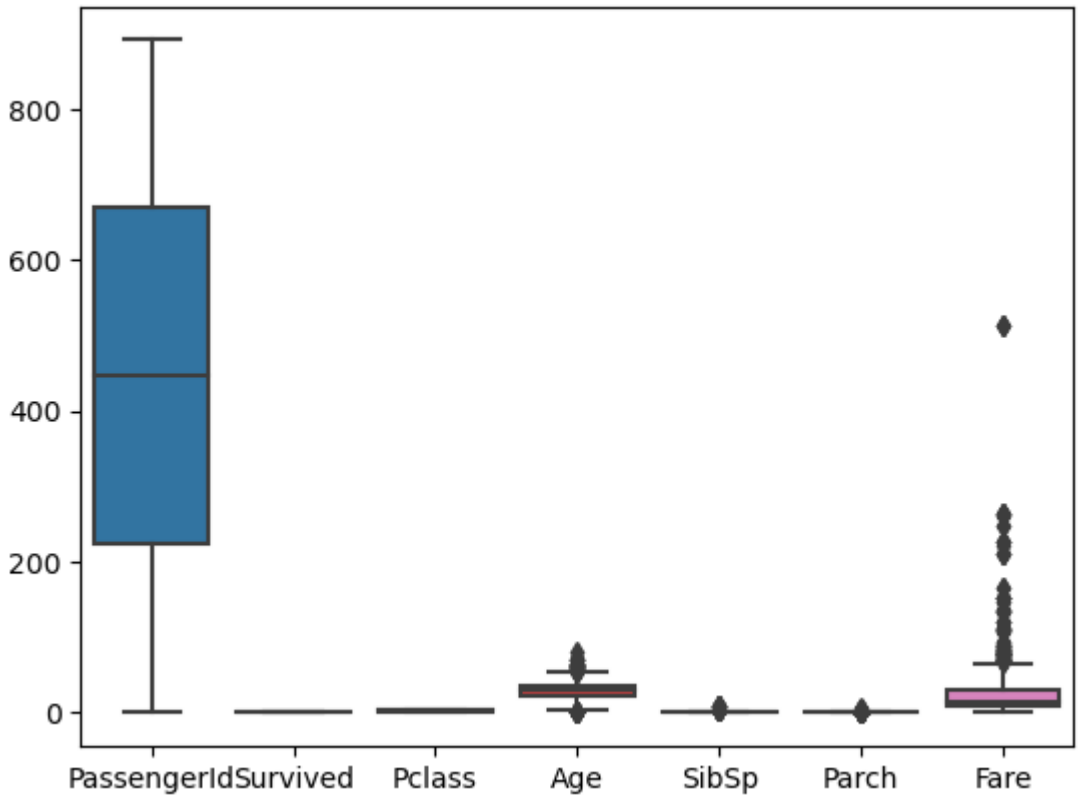
In [93]:
```
sns.barplot(x=df["Age"],y=df["Fare"])
```

Out[93]: <Axes: xlabel='Age', ylabel='Fare'>



In [32]:
```
sns.boxplot(df)
```

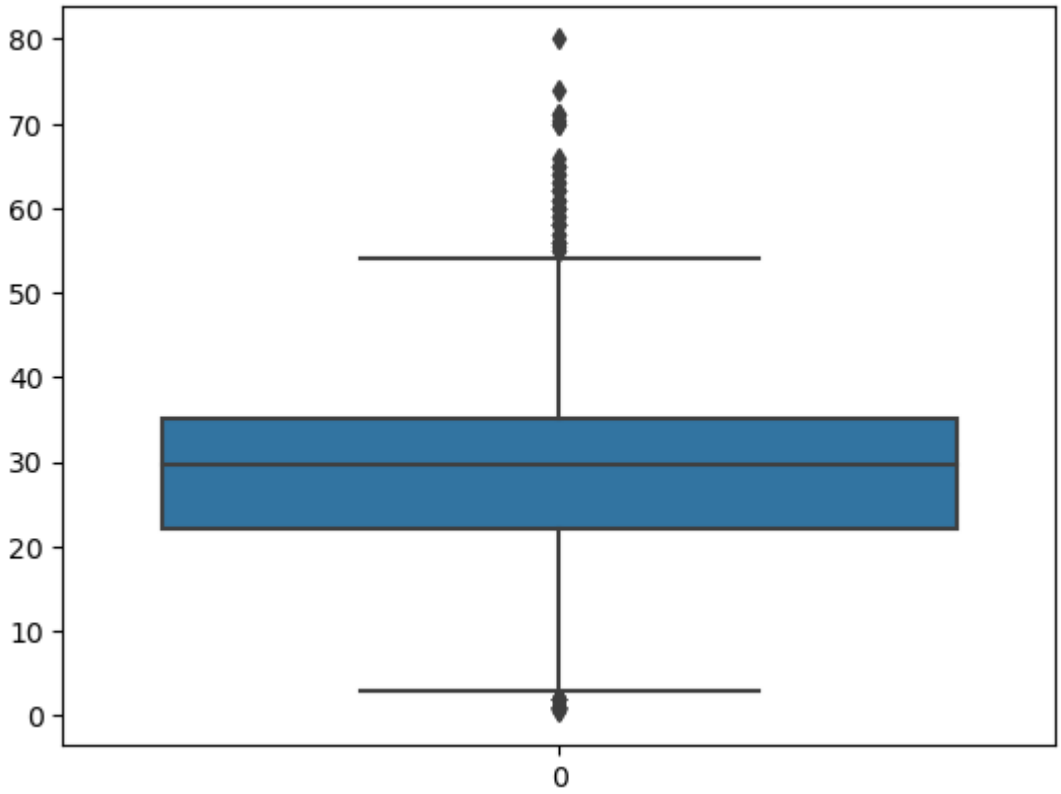
Out[32]: <Axes: >



Outlier Detection

In [94]:
```
sns.boxplot(df.Age)
```

Out[94]:
```
<Axes: >
```



In [248…
```
q1=df.Age.quantile(0.25)
q3=df.Age.quantile(0.75)
q2=df.Age.quantile(0.50)
```

In [249…
```
q1
```

Out[249]:
```
30.0
```

In [250…
```
q2
```

Out[250]:
```
30.0
```

In [251…
```
q3
```

Out[251]:
```
30.0
```

In [252…
```
IQR=q3-q1
IQR
```

Out[252]:
```
0.0
```

In [253…
```
upper_limit=q3+1.5*IQR
lower_limit=q1-1.5*IQR
```

In [254…
```
upper_limit
```

Out[254]:
```
30.0
```

In [255…
```
lower_limit
```

Out[255]:
```
30.0
```

In [256…
```
df.median()
```

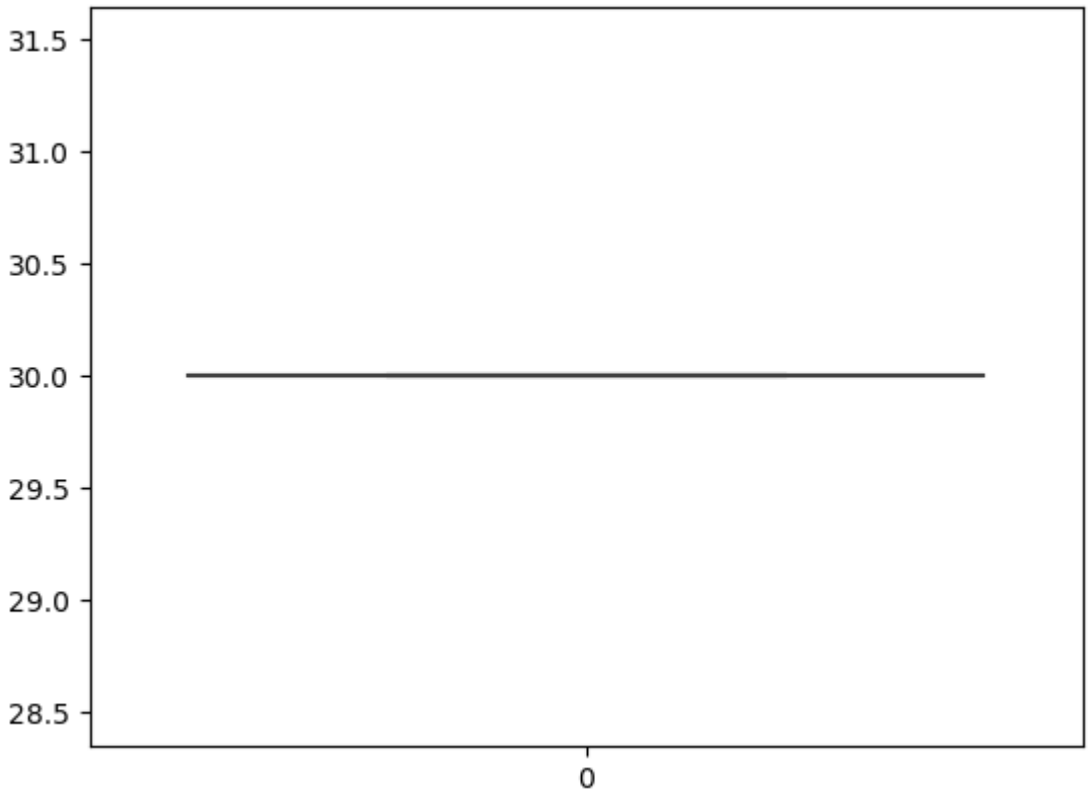
```
C:\Users\vishnu vardhan\AppData\Local\Temp\ipykernel_193160\530051474.py:1: FutureWarning: The default value of numeric_only in DataFrame.median is deprecated. In a future version, it will default to False. In addition, specifying 'numeric_only=None' is deprecated. Select only valid columns or specify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

Out[256]:
```
PassengerId    446.00
Survived         0.00
Pclass           3.00
Age             30.00
SibSp            0.00
Parch            0.00
Fare            14.45
dtype: float64
```

In [257…
```
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)]
```

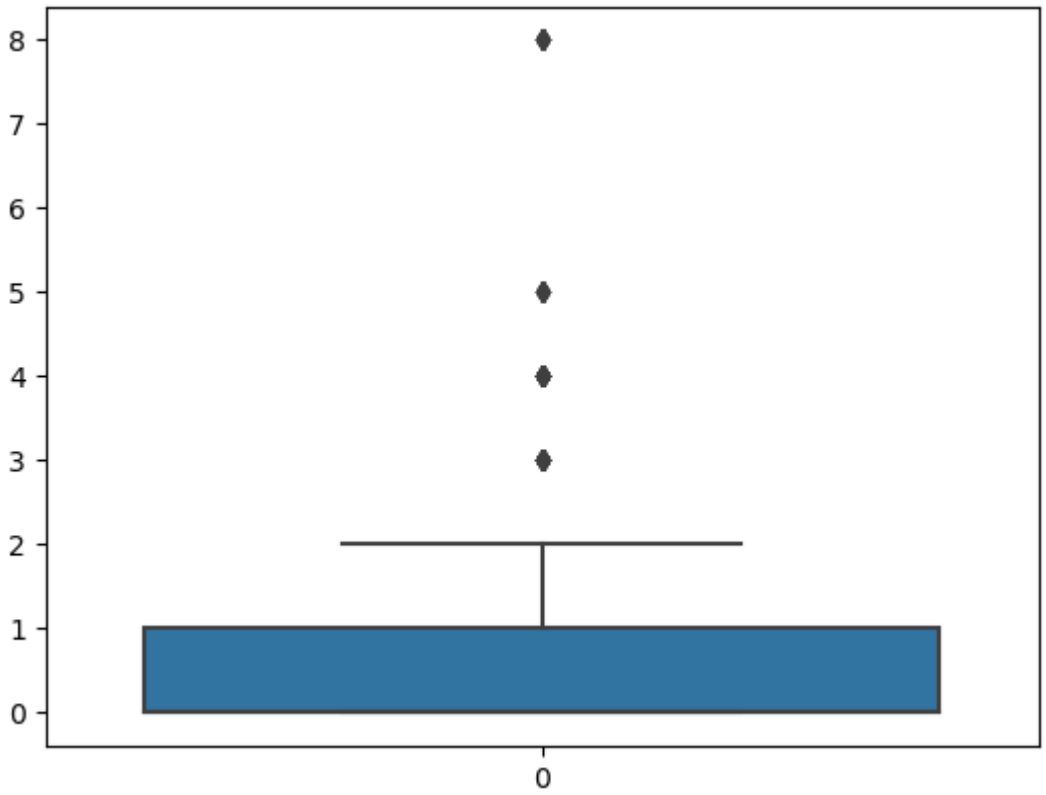
In [258…
```
sns.boxplot(df.Age)
```

Out[258]:
```
<Axes: >
```



In [106…
```
sns.boxplot(df.SibSp)
```

Out[106]: <Axes: >



In [107…
```
q1=df.SibSp.quantile(0.25)
q3=df.SibSp.quantile(0.75)
q2=df.SibSp.quantile(0.50)
```

In [108…
```
q1
```

Out[108]:
```
0.0
```

In [109…
```
q2
```

Out[109]:
```
0.0
```

In [110…
```
q3
```

Out[110]:
```
1.0
```

In [111…
```
IQR=q3-q1
IQR
```

Out[111]:
```
1.0
```

In [112…
```
upper_limit=q3+1.5*IQR
upper_limit
```

Out[112]:
```
2.5
```

In [113…
```
lower_limit=q1-1.5*IQR
lower_limit
```

Out[113]:
```
-1.5
```

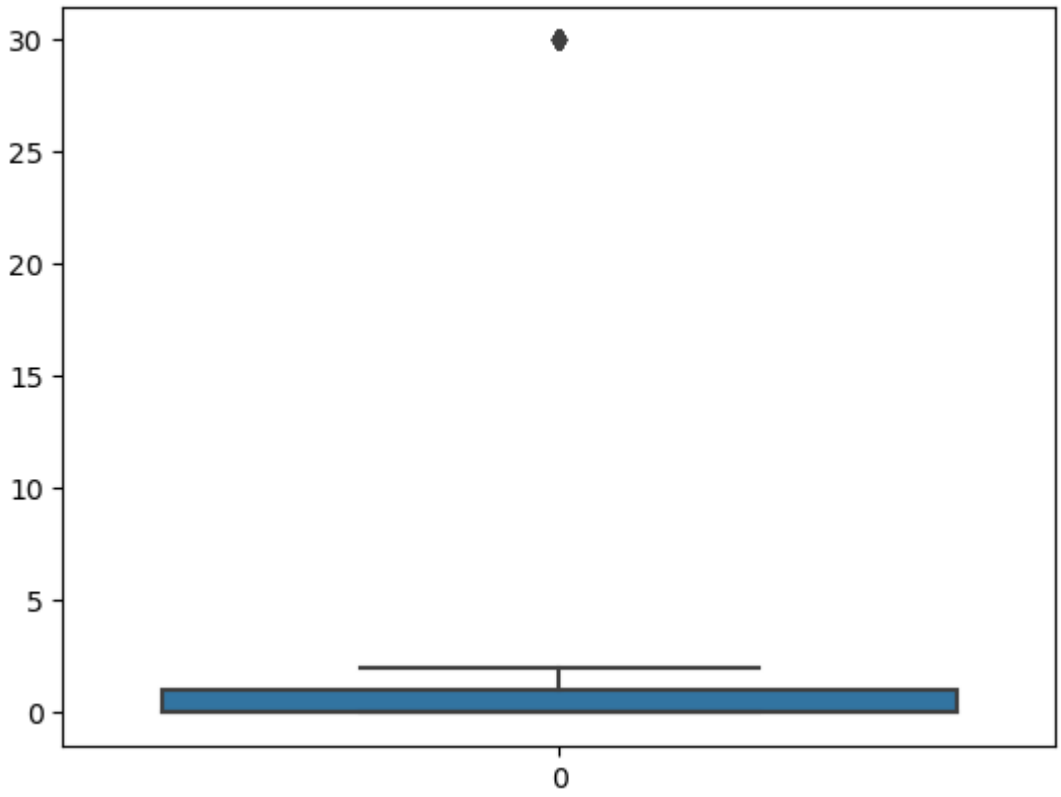
In [114…
```
df.median()
```

Out[114]:
```
C:\Users\vishnu vardhan\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
```

In [115…
```
df['SibSp']=np.where(df['SibSp']>upper_limit,30,df['SibSp'])
```

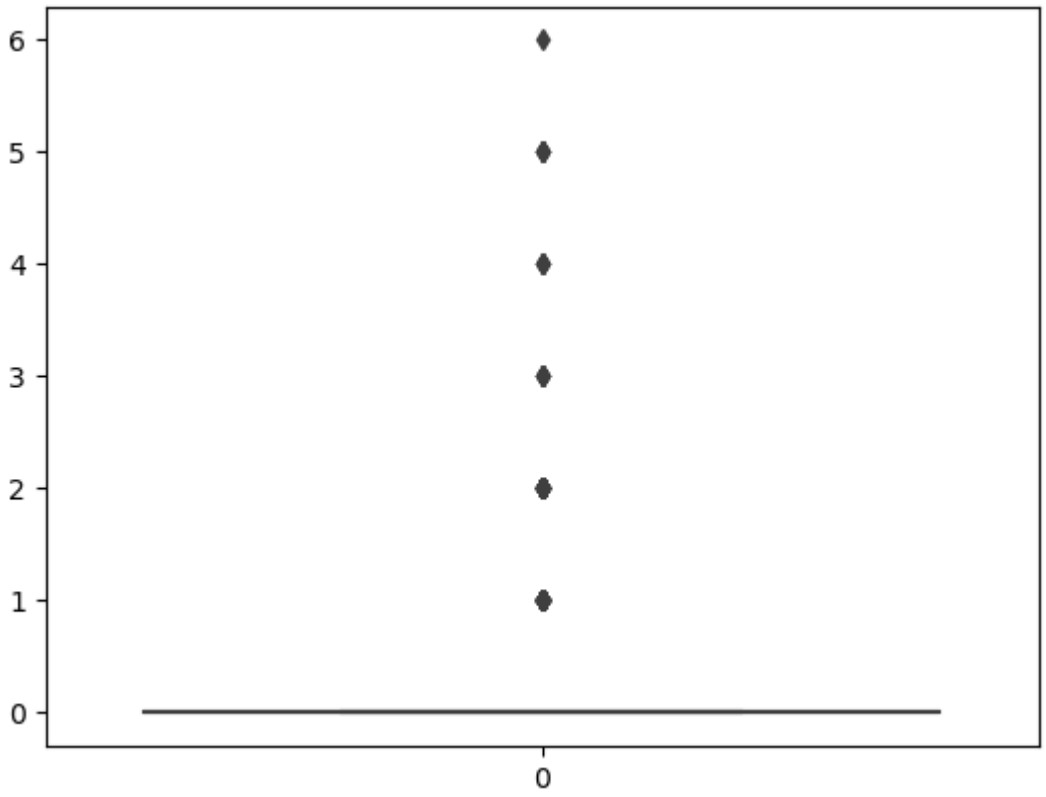
In [116…
```
sns.boxplot(df.SibSp)
```

Out[116]:
```
<Axes: >
```



In [117…
```
sns.boxplot(df.Parch)
```

Out[117]: <Axes: >



In [118…
```
q1=df.Parch.quantile(0.25)
q3=df.Parch.quantile(0.75)
q2=df.Parch.quantile(0.50)
```

In [119…
```
q1
```

Out[119]:
```
0.0
```

In [120…
```
q2
```

Out[120]:
```
0.0
```

In [121…
```
q3
```

Out[121]:
```
0.0
```

In [122…
```
IQR=q3-q1
IQR
```

Out[122]:
```
0.0
```

In [123…
```
upper_limit=q3+1.5*IQR
upper_limit
```

Out[123]:
```
0.0
```

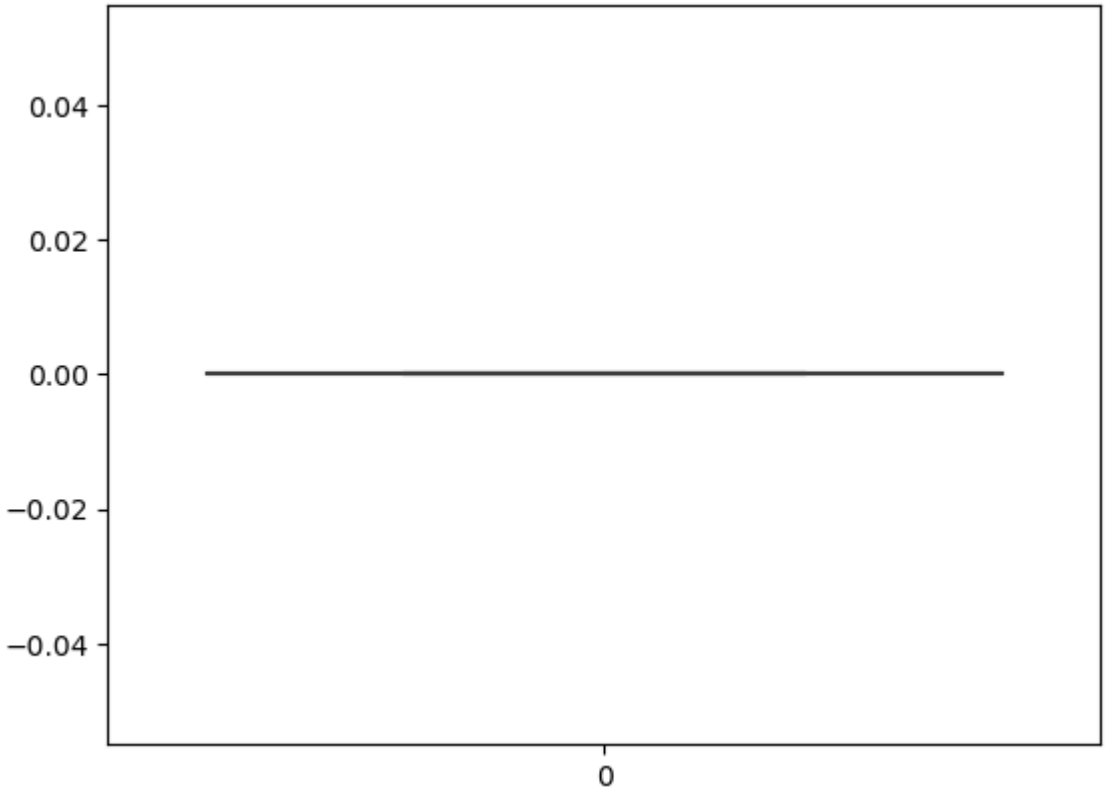
In [124…
```
lower_limit=q1-1.5*IQR
lower_limit
```

Out[124]:
```
0.0
```

In [125…
```
df['Parch']=np.where(df['Parch']>upper_limit,0,df['Parch'])
```

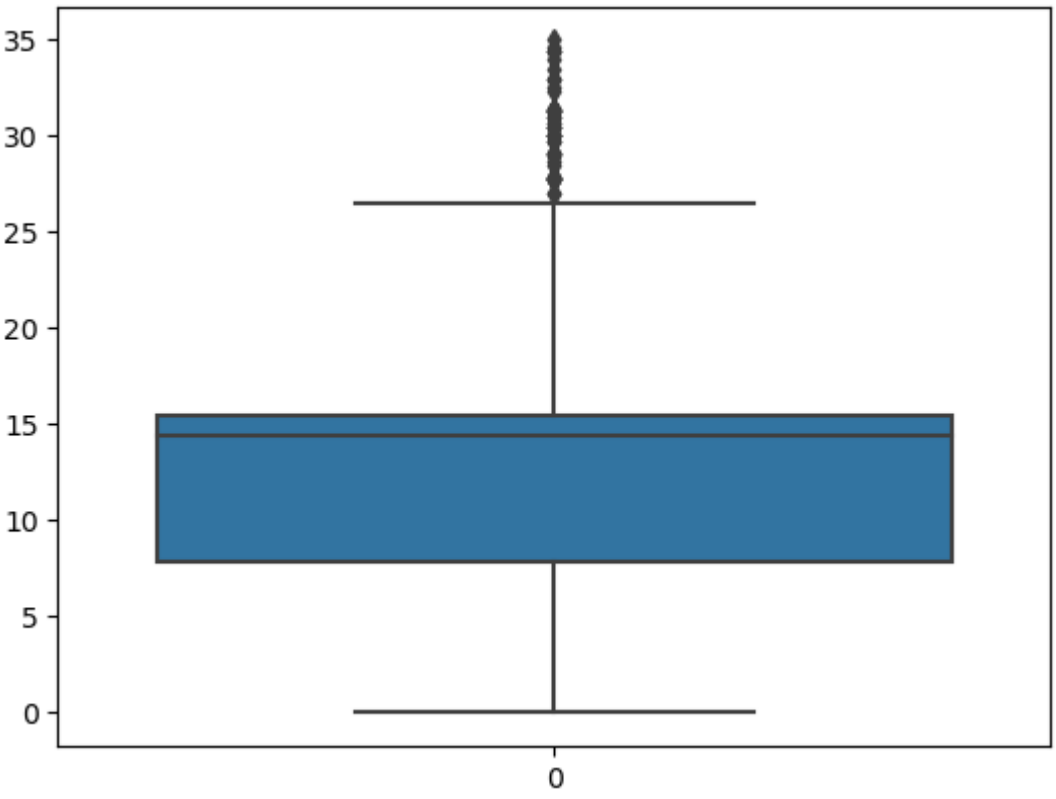
In [164…
```
sns.boxplot(df.Parch)
```

Out[164]:
```
<Axes: >
```



In [165…
```
sns.boxplot(df.Fare)
```

Out[165]: <Axes: >



In [259…
```
q1=df.Fare.quantile(0.25)
q3=df.Fare.quantile(0.75)
q2=df.Fare.quantile(0.50)
```

In [260…
```
q1
```

Out[260]:
```
7.9104
```

In [261…
```
q2
```

Out[261]:
```
14.45
```

In [262…
```
q3
```

Out[262]:
```
14.45
```

In [263…
```
IQR=q3-q1
IQR
```

Out[263]:
```
6.539599999999999
```

In [264…
```
upper_limit=q3+1.5*IQR
upper_limit
```

Out[264]:
```
24.2594
```

In [265…
```
lower_limit=q1-1.5*IQR
lower_limit
```

Out[265]:
```
-1.8989999999999982
```

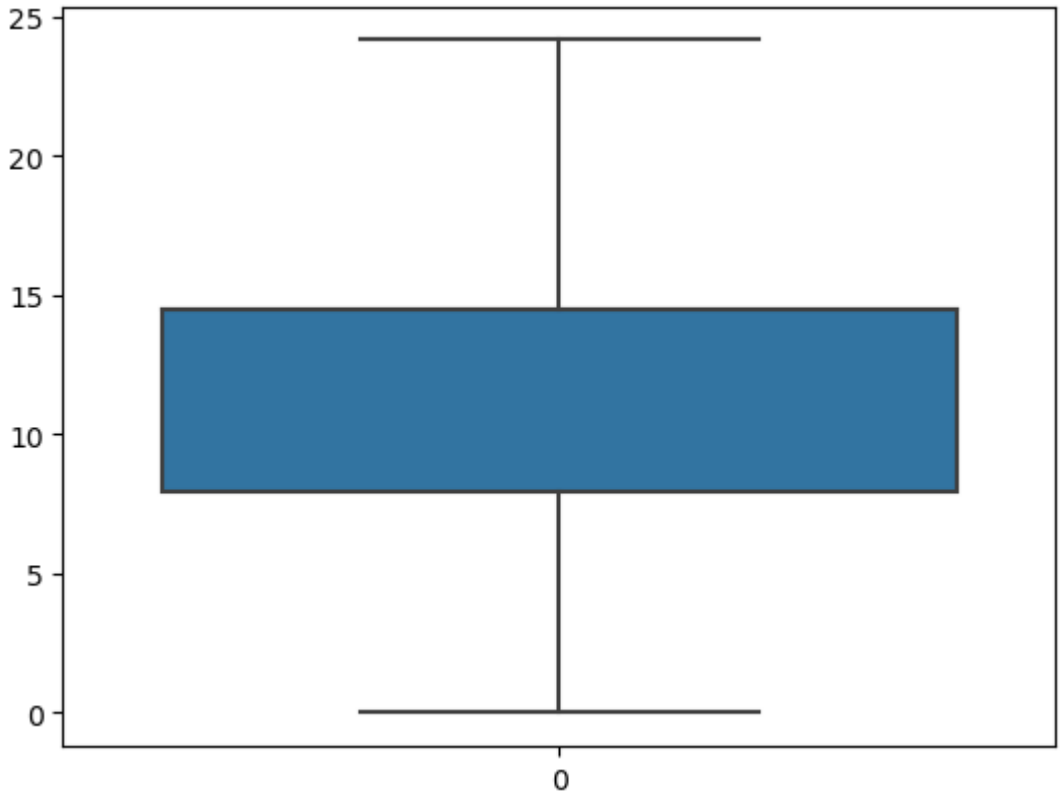
In [266…
```
df.median()
```

Out[266]:
```
C:\Users\vishnu vardhan\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
```

In [267…
```
df['Fare']=np.where(df['Fare']>upper_limit,14.45,df['Fare'])
```

In [268…
```
sns.boxplot(df.Fare)
```

Out[268]:
```
<Axes: >
```



Splitting Dependent and Independent variables

In [177…

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

Out[177]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	1	0	3	Braund, Mr. Owen Harris	male	22.000000	1	0	A/5 21171	7.2500
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.000000	1	0	PC 17599	14.4500
2	3	1	3	Heikkinen, Miss. Laina	female	26.000000	0	0	STON/O2. 3101282	7.9250
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.000000	1	0	113803	14.4500
4	5	0	3	Allen, Mr. William Henry	male	35.000000	0	0	373450	8.0500
5	6	0	3	Moran, Mr. James	male	29.699118	0	0	330877	8.4583
6	7	0	1	McCarthy, Mr. Timothy J	male	54.000000	0	0	17463	14.4500
7	8	0	3	Palsson, Master. Gosta Leonard	male	2.000000	30	0	349909	21.0750
8	9	1	3	Johnson, Mrs. Oscar W (Elisabeth Vilhelmina Berg)	female	27.000000	0	0	347742	11.1333
9	10	1	2	Nasser, Mrs. Nicholas (Adele Achem)	female	14.000000	1	0	237736	14.4500

In [178...

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

In [179...

```
x
```

Out[179]:

	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	3	Braund, Mr. Owen Harris	male	22.000000	1	0	A/5 21171	7.250
1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.000000	1	0	PC 17599	14.450
2	3	Heikkinen, Miss. Laina	female	26.000000	0	0	STON/O2. 3101282	7.925
3	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.000000	1	0	113803	14.450
4	3	Allen, Mr. William Henry	male	35.000000	0	0	373450	8.050
...	...	...	...	...	...	...	...	...
886	2	Montvila, Rev. Juozas	male	27.000000	0	0	211536	13.000
887	1	Graham, Miss. Margaret Edith	female	19.000000	0	0	112053	14.450
888	3	Johnston, Miss. Catherine Helen "Carrie"	female	29.699118	1	0	W./C. 6607	23.450
889	1	Behr, Mr. Karl Howell	male	26.000000	0	0	111369	14.450
890	3	Dooley, Mr. Patrick	male	32.000000	0	0	370376	7.750

891 rows × 8 columns

In [180…
```
y
```

Out[180]:

	Survived
0	0
1	1
2	1
3	1
4	0
...	...
886	0
887	1
888	0
889	1
890	0

891 rows × 1 columns

In [181…
```
x.shape
```

Out[181]:
```
(891, 8)
```

Perform Encoding

In [182…
```
from sklearn.preprocessing import LabelEncoder
```

In [185…
```
le=LabelEncoder()
```

In [186…
```
x["Name"]=le.fit_transform(x["Name"])
```

In [187…
```
x.head()
```

Out[187]:

	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

In [196…
```
x["Name"].value_counts()
```

Out[196]:
```
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
```

In [188…
```
x["Sex"]=le.fit_transform(x["Sex"])
```

In [189…
```
x.head()
```

Out[189]:

	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

In [194…
```
x["Sex"].value_counts()
```

Out[194]:
```
1    577
0    314
Name: Sex, dtype: int64
```

In [190…
```
x["Ticket"]=le.fit_transform(x["Ticket"])
```

In [191…
```
x.head()
```

Out[191]:

	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

In [195…
```
x["Ticket"].value_counts()
```

Out[195]:
```
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.

In [197…
```
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
```

In [198…
```
x_scaled=sc.fit_transform(x)
x_scaled
```

Out[198]:
```
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

In [201…
```
from sklearn.model_selection import train_test_split
```

In [203…
```
tts=train_test_split
```

In [204…
```
x_train,x_test,y_train,y_test=tts(x_scaled,y,test_size=0.2,random_state=0)
```

In [206…
```
print(x_train.shape,x_test.shape,y_train.shape,y_test.shape)
```

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

In [270…
```
x_train
```

Out[270]:
```
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]])
```

In [271…
```
x_test
```

Out[271]:
```
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]])
```

In [207…
```
y_train
```

Out[207]:

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

712 rows × 1 columns

In [269…

```
y_test
```

Out[269]:

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

179 rows × 1 columns

In [ ]:

```

```