Assignment-3

September 20, 2023

1 Data Preprocessing on Titanic Dataset

1.1 Import the libraries

[2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

1.2 Import the Titanic Dataset

[3]:
```
df=pd.read_csv("Titanic-Dataset.csv")
```

[4]:
```
df.head()
```

[4]:
```
   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
```

[5]:
```
df.info
```

[5]:
```
<bound method DataFrame.info of 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]>
```

[6]:
```
df.describe
```

[6]:
```
<bound method NDFrame.describe of 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
 3 Futrelle, Mrs. Jacques Heath (Lily May Peel) female 35.0         1
 4 Allen, Mr. William Henry male 35.0 0.. … … … …                  1
 886 Montvila, Rev. Juozas male 27.0 0887 Graham, Miss. Margaret
 Edith female 19.0 0888 Johnston, Miss. Catherine Helen "Carrie"
 female NaN                                                        2

 2                          Heikkinen, Miss. Laina female 26.0    0
 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]>
```

[7]:
```
df.corr()
```

```
C:\Users\sbkom\AppData\Local\Temp\ipykernel_31760\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()
```

[7]:
```
             PassengerId Survived  Pclass      Age    SibSp    Parch \
PassengerId1.000000 -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
```

[8]:
```
df.corr().Fare.sort_values(ascending=False)
```

```
C:\Users\sbkom\AppData\Local\Temp\ipykernel_31760\60082530.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().Fare.sort_values(ascending=False)
```

[8]:
```
Fare        1.000000
Survived    0.257307
Parch       0.216225
SibSp       0.159651
Age         0.096067
PassengerId 0.012658
Pclass     -
           0.549500
Name: Fare, dtype: float64
```

1.3 Checking for Null Values

[9]:
```
df.isnull().any()
```

[9]:
```
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
```

[10]:
```
df.isnull().sum()
```

[10]:
```
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
```

[11]:
```
df["Age"].fillna(df["Age"].mean(),inplace=True)
```

[12]:
```
df["Cabin"].fillna(df["Cabin"].mode()[0],inplace=True)
```

[13]:
```
df["Embarked"].fillna(df["Embarked"].mode()[0],inplace=True)
```

[14]:
```
df.isnull().any()
```

[14]:
```
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
```

[15]:
```
df.isnull().sum()
```

[15]:
```
PassengerId  0
Survived     0
Pclass       0
Name         0
Sex          0
Age          0
SibSp        0
Parch        0
Ticket       0
Fare         0
Cabin        0
Embarked     0
dtype: int64
```

[16]:
```
df.Embarked.nunique()
```

[16]: 3

[17]:
```
df.Embarked.unique()
```

[17]: array(['S', 'C', 'Q'], dtype=object)

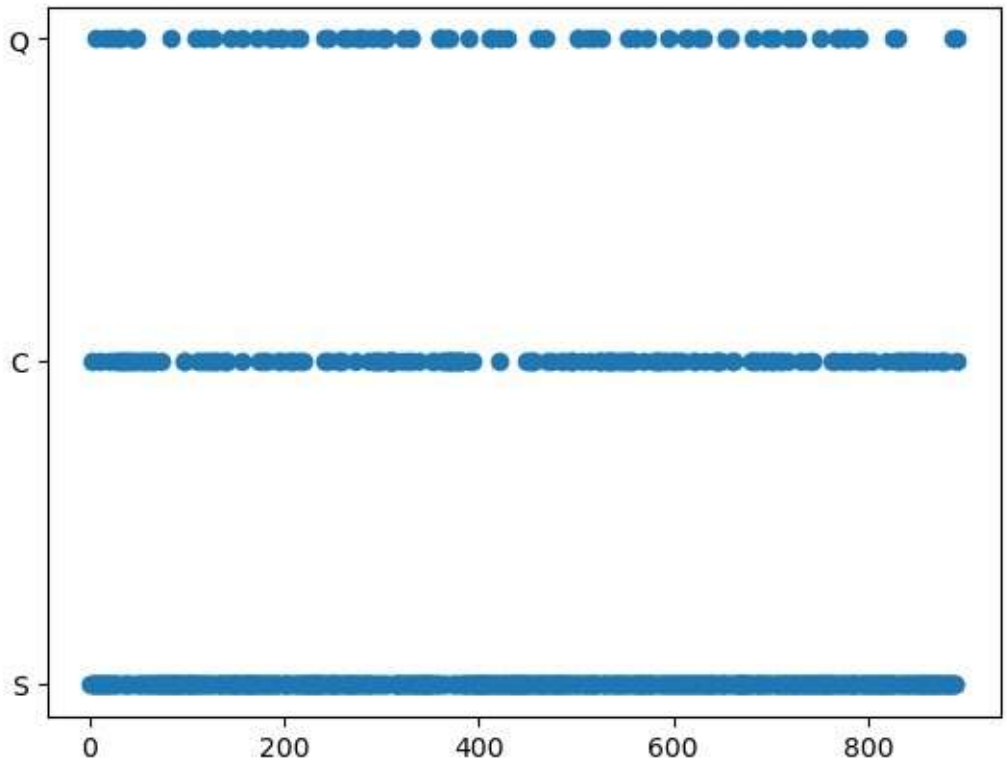
[18]:
```
df.Embarked.value_counts()
```

[18]:
```
S
646 C
168
Q    77
Name: Embarked, dtype: int64
```

2 Data Visualization

[19]:
```
plt.scatter(df["PassengerId"],df["Embarked"])
```

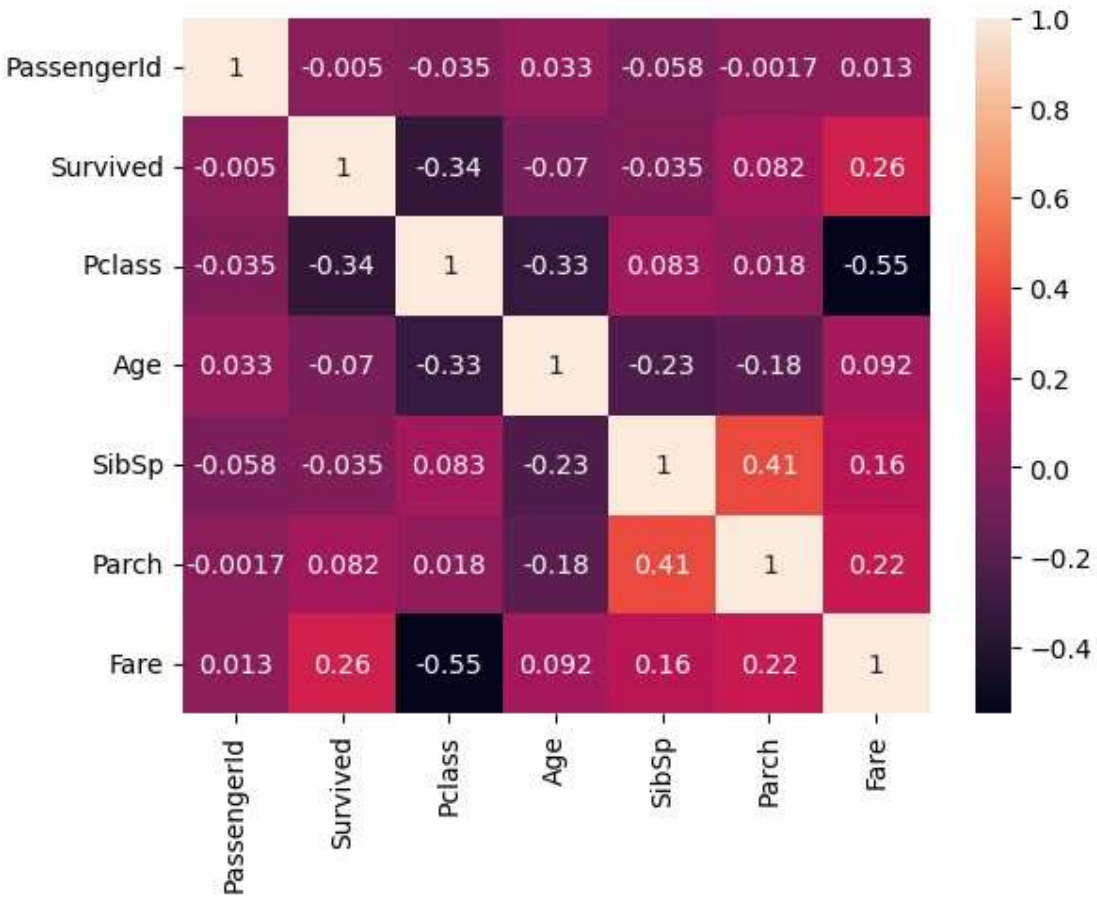
[19]: <matplotlib.collections.PathCollection at 0x2107ad5fe50>



[20]:
```
sns.heatmap(df.corr(), annot=True)
```

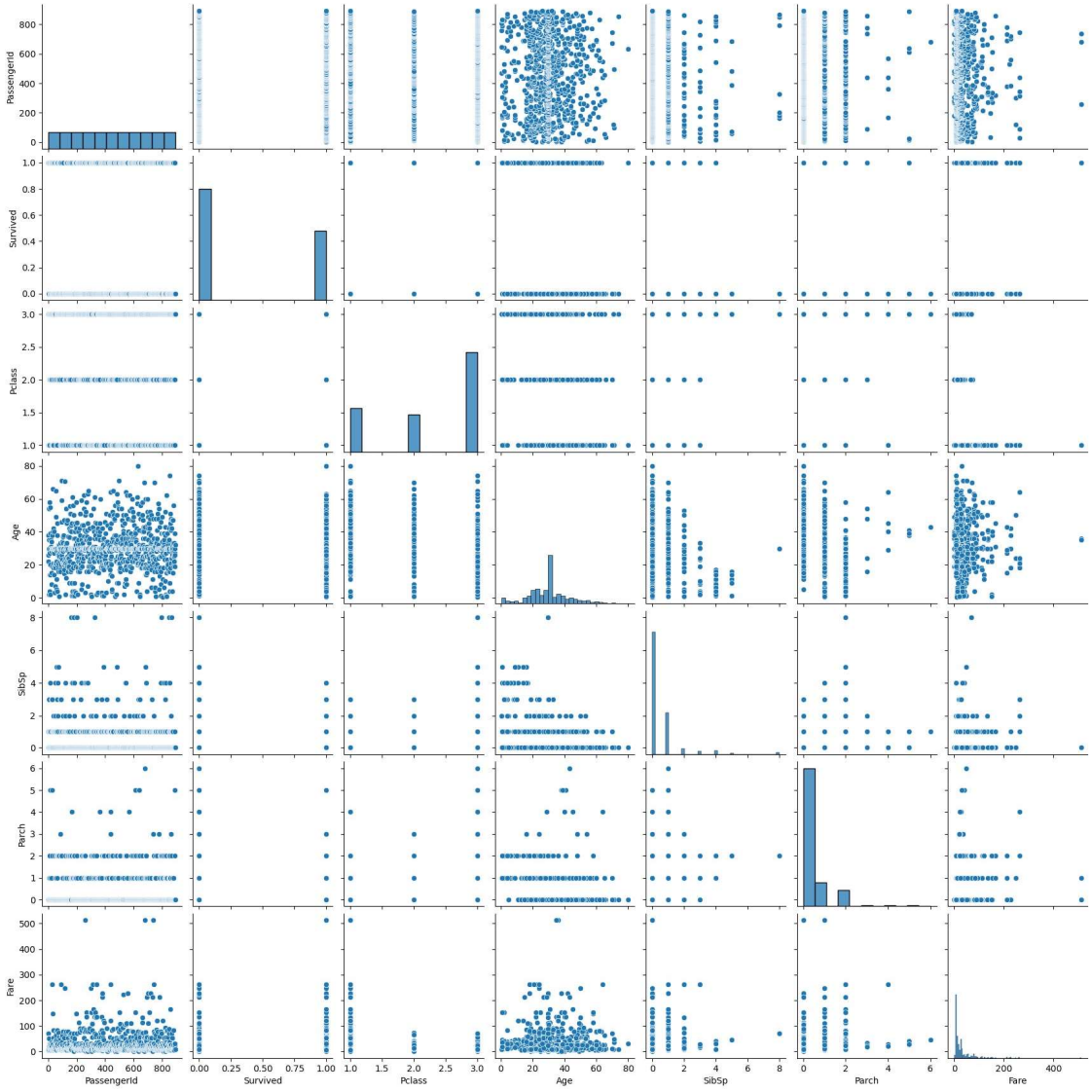
```
C:\Users\sbkom\AppData\Local\Temp\ipykernel_31760\621126171.py:1:
FutureWarning: The default value of numeric_only in DataFrame.corr
is deprecated. In a future version, it will default to False. Select
only valid columns or specify the value of numeric_only to silence
this warning. sns.heatmap(df.corr(), annot=True)
```

[20]: <Axes: >



[21]:
```
sns.pairplot(df)
```

[21]: <seaborn.axisgrid.PairGrid at 0x2107b7c39a0>



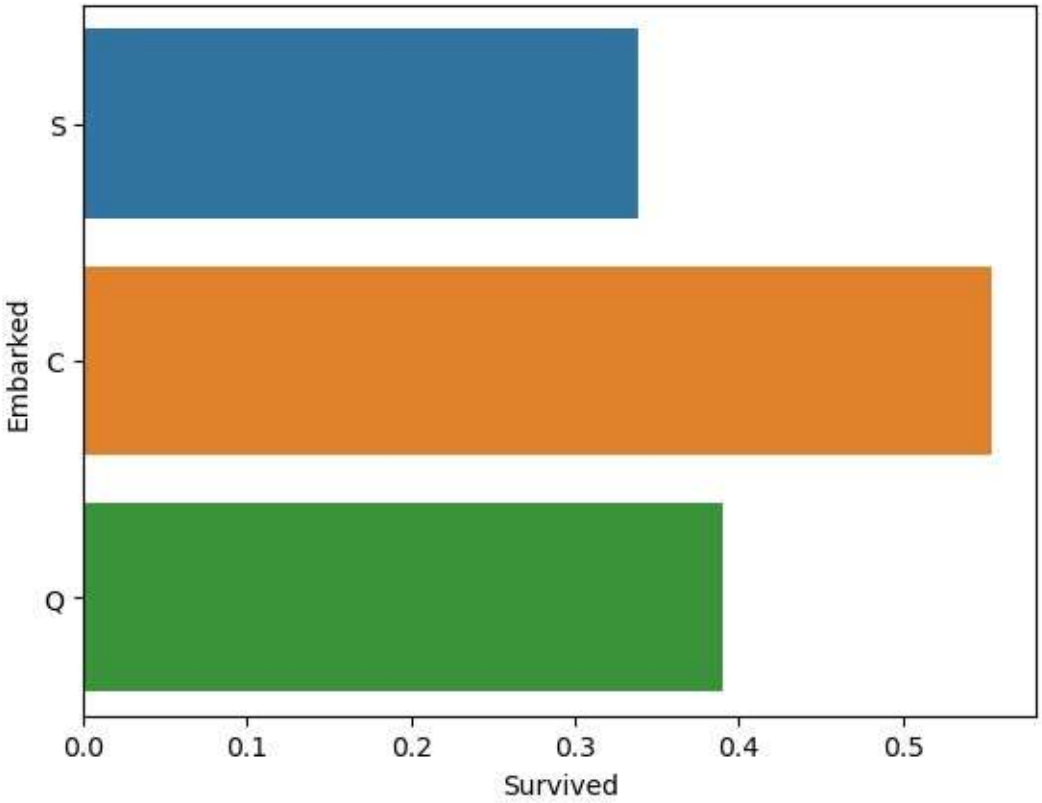
[22]:
```
sns.barplot(x=df["Survived"],y=df["Embarked"],ci=0)
```

```
C:\Users\sbkom\AppData\Local\Temp\ipykernel_31760\1646919353.py:1:
FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=('ci', 0)` for the same
                                                                effect.

  sns.barplot(x=df["Survived"],y=df["Embarked"],ci=0)
```

[22]: <Axes: xlabel='Survived', ylabel='Embarked'>



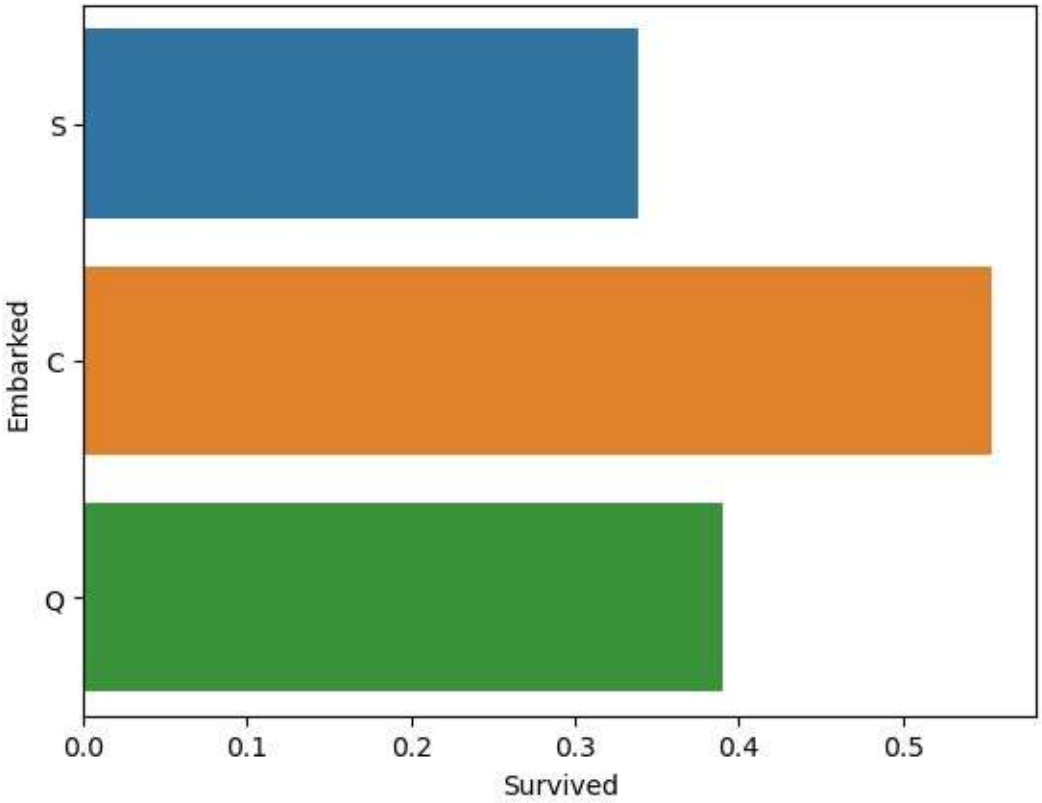
[23]:
```
sns.barplot(x=df["Survived"],y=df["Embarked"],ci=0)
```

```
C:\Users\sbkom\AppData\Local\Temp\ipykernel_31760\1646919353.py:1:
FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=('ci', 0)` for the same
                                                                effect.

  sns.barplot(x=df["Survived"],y=df["Embarked"],ci=0)
```

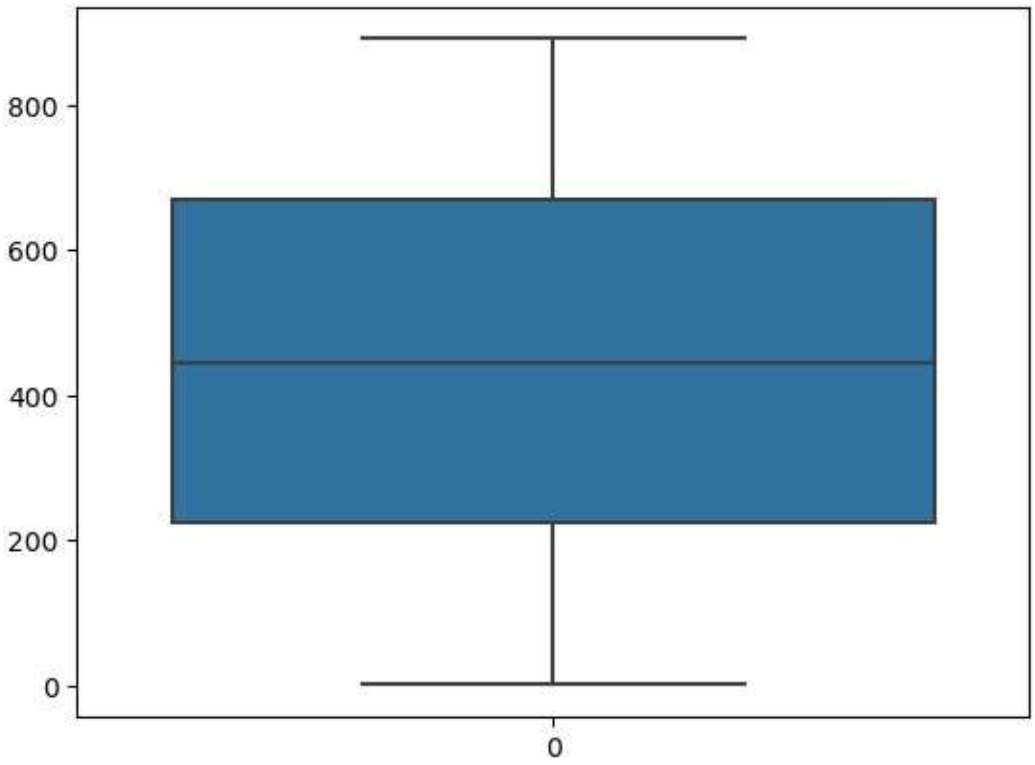
[23]: `<Axes: xlabel='Survived', ylabel='Embarked'>`



3 Outlier Detection

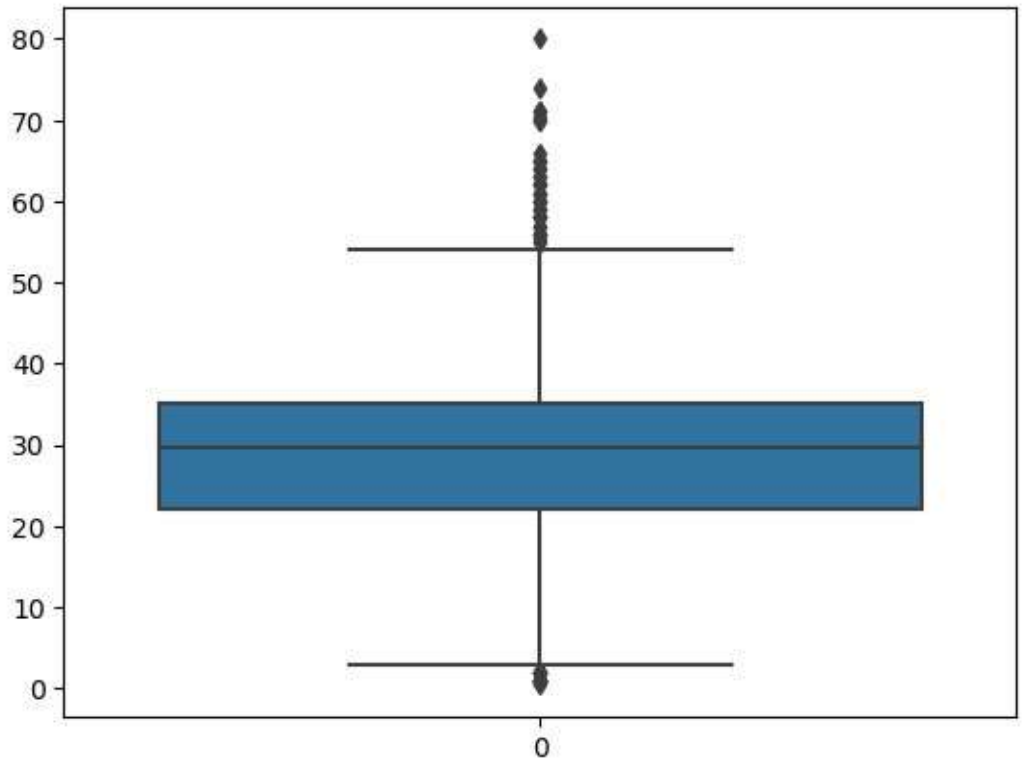
[52]:
```
sns.boxplot(df["PassengerId"])
```

[52]: <Axes: >



[24]:
```
sns.boxplot(df.Age)
```

[24]: <Axes: >



[25]:
```
q1 = df.Age.quantile(0.25) #qi mean 25 percentage of data
q3 = df.Age.quantile(0.75)
```

[26]:
```
IQR = q3-q1
print(IQR)
```

```
13.0
```

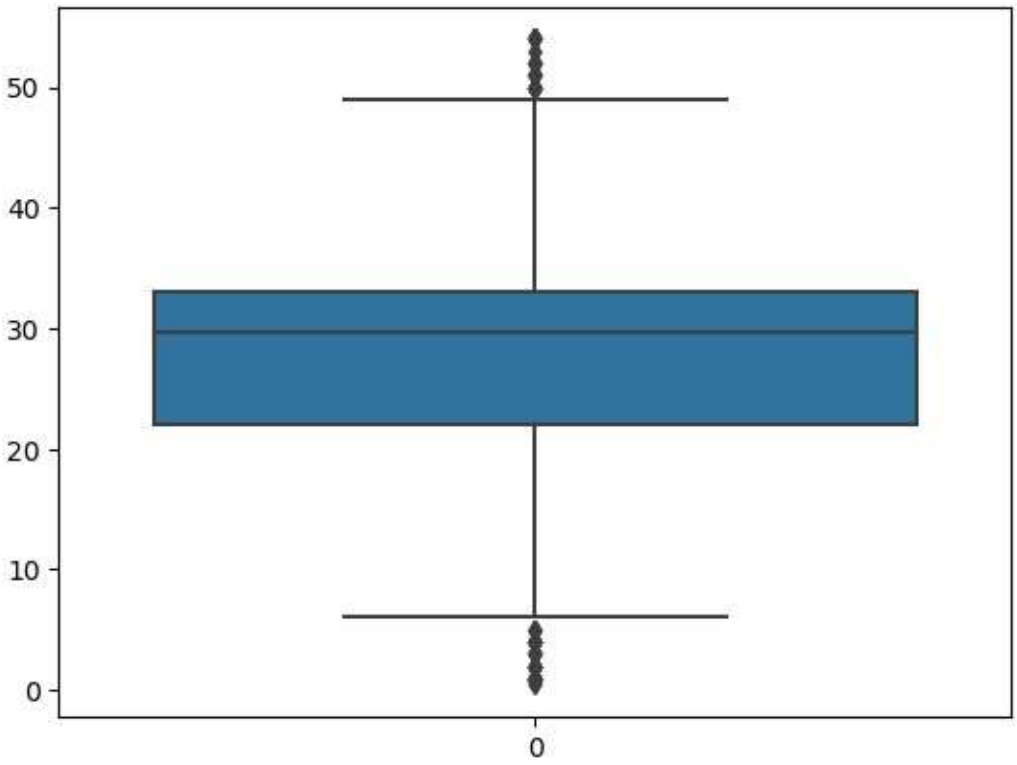
[27]:
```
upper_limit = q3+1.5*IQR
print(upper_limit)
```

```
54.5
```

[28]:
```
df = df[df.Age<upper_limit]
```

[29]:
```
sns.boxplot(df.Age)
```

[29]: <Axes: >



3.1 Splitting Dependent and Independent Variables

3.1.1 Method-I

[30]:
```
df.head()
```

[30]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th…	female	38.0	1
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1
4	5	0	3	Allen, Mr. William Henry	male	35.0	0

```
   Parch    Ticket     Fare  Cabin Embarked 0 0
  A/5 21171  7.2500 B96 B98   S
1      0    PC 17599 71.2833 C85   C
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
```

[31]:
```
X=df.drop(columns=["Survived"],axis=1)
X.head()
```

[31]:
```
   PassengerId Pclass                                               Name \
0            1      3                            Braund, Mr. Owen Harris
1            2      1 Cumings, Mrs. John Bradley (Florence Briggs Th…
2            3      3                             Heikkinen, Miss. Laina
3            4      1       Futrelle, Mrs. Jacques Heath (Lily May Peel)
4            5      3                           Allen, Mr. William Henry

      Sex Age SibSp Parch            Ticket    Fare  Cabin Embarked
0    male 22.0      1      0         A/5 21171  7.2500 B96 B98       S
1  female 38.0      1      0          PC 17599 71.2833     C85       C
2  female 26.0      0      0  STON/O2. 3101282 7.9250 B96 B98       S
3  female 35.0      1      0            113803 53.1000    C123       S
4    male 35.0      0      0            373450  8.0500 B96 B98       S
```

[32]:
```
X=df.drop(columns=["Pclass"],axis=1)
X.head()
```

[32]:
```
   PassengerId Survived                                             Name \
0            1        0                            Braund, Mr. Owen Harris
1            2        1 Cumings, Mrs. John Bradley (Florence Briggs Th…
2            3        1                             Heikkinen, Miss. Laina
3            4        1       Futrelle, Mrs. Jacques Heath (Lily May Peel)
4            5        0                           Allen, Mr. William Henry

      Sex Age SibSp Parch            Ticket    Fare  Cabin Embarked
0    male 22.0      1      0         A/5 21171  7.2500 B96 B98       S
1  female 38.0      1      0          PC 17599 71.2833     C85       C
2  female 26.0      0      0  STON/O2. 3101282 7.9250 B96 B98       S
3  female 35.0      1      0            113803 53.1000    C123       S
4    male 35.0      0      0            373450  8.0500 B96 B98       S
```

[33]:
```
X.shape
```

[33]:
```
(849, 11)
```

[34]:
```
type(X)
```

[34]: pandas.core.frame.DataFrame

[35]:
```
y=df["Embarked"]
y.head()
```

[35]:
```
0   S
1   C
2   S
3   S
4   S
Name: Embarked, dtype: object
```

3.1.2 Method-II

[36]:
```
x=df.iloc[:,3:13]
x
```

[36]:

	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
0	Braund, Mr. Owen Harris	male	22.000000	1	0	A/5 21171	7.2500	B96 B98	S
1	Cumings, Mrs. John Bradley (Florence Briggs Th…	female	38.000000	1	0	PC 17599	71.2833	C85	C
2	Heikkinen, Miss. Laina	female	26.000000	0	0	STON/O2. 3101282	7.9250	B96 B98	S
3	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.000000	1	0	113803	53.1000	C123	S
4	Allen, Mr. William Henry	male	35.000000	0	0	373450	8.0500	B96 B98	S
..	…	…	…	…	…	…	…	…	…
886	Montvila, Rev. Juozas	male	27.000000	0	0	211536	13.0000	B96 B98	S
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						

```
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

[849 rows x 9 columns]
```

[37]:
```
y=df.iloc[:,13:14]
y
```

[37]:
```
Empty DataFrame
Columns: []
Index: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18,
19, 20, 21,
22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37, 38, 39,
40, 41, 42,
43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60,
61, 62, 63,
64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80,
81, 82, 83,
84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 95, 97, 98, 99, 100, 101,
102, 103, 104, 105, …]

[849 rows x 0 columns]
```

[38]:
```
x.shape
```

[38]:
```
(849, 9)
```

[39]:
```
y.shape
```

[39]:
```
(849, 0)
```

4 Encoding

[40]:
```
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
```

[41]:
```
X["Sex"]=le.fit_transform(X["Sex"])
```

[42]:
```
X["Cabin"]=le.fit_transform(X["Cabin"])
```

[43]:
```
X.head()
```

[43]:
```
   PassengerId  Survived                                               Name  \
0            1         0                            Braund, Mr. Owen Harris
1            2         1 Cumings, Mrs. John Bradley (Florence Briggs Th…
```

```
2           3     1     Heikkinen, Miss. Laina
3           4     1     Futrelle, Mrs. Jacques Heath (Lily May Peel)
4           5     0     Allen, Mr. William Henry

   Sex Age SibSp Parch           Ticket    Fare Cabin Embarked
0    1 22.0 1     0     A/5 21171  7.2500     38    S
1    0 38.0 1     0     PC 17599 71.2833 69    C
2    0 26.0 0     0 STON/O2. 3101282    7.9250     38    S
3    0 35.0 1     0     113803 53.1000   45    S
4    1 35.0 0     0     373450     8.0500     38    S
```

[44]:
```
print(le.classes_)
```

```
['A10' 'A14' 'A16' 'A19' 'A20' 'A24' 'A31' 'A32' 'A34' 'A36' 'A6'
'B101'
'B102' 'B18' 'B20' 'B22' 'B28' 'B3' 'B35' 'B38' 'B39' 'B4' 'B42'
'B49'
'B5' 'B50' 'B51 B53 B55' 'B57 B59 B63 B66' 'B58 B60' 'B69' 'B71'
'B73'
'B77' 'B78' 'B79' 'B82 B84' 'B86' 'B94' 'B96 B98' 'C101' 'C104'
'C106'
'C110' 'C111' 'C118' 'C123' 'C124' 'C125' 'C126' 'C128' 'C148' 'C2'
'C22 C26' 'C23 C25 C27' 'C32' 'C45' 'C46' 'C47' 'C49' 'C52' 'C54'
'C62 C64' 'C65' 'C68' 'C7' 'C70' 'C78' 'C82' 'C83' 'C85' 'C86' 'C90'
'C91' 'C92' 'C93' 'C95' 'C99' 'D' 'D10 D12' 'D11' 'D15' 'D17' 'D19'
'D20'
'D21' 'D26' 'D28' 'D30' 'D33' 'D35' 'D36' 'D45' 'D46' 'D47' 'D49'
'D56'
'D6' 'D9' 'E10' 'E101' 'E12' 'E121' 'E17' 'E24' 'E25' 'E31' 'E33'
'E34'
'E36' 'E40' 'E44' 'E46' 'E49' 'E50' 'E58' 'E63' 'E67' 'E68' 'E8'
'F E69' 'F G63' 'F G73' 'F2' 'F33' 'F38' 'F4' 'G6' 'T']
```

[45]:
```
mapping=dict(zip(le.classes_,range(len(le.classes_))))
mapping
```

[45]:
```
{'A10': 0,
 'A14': 1,
 'A16': 2,
 'A19': 3,
 'A20': 4,
 'A24': 5,
 'A31': 6,
 'A32': 7,
 'A34': 8,
 'A36': 9,
 'A6': 10,
 'B101': 11,
```

```
'B102': 12,
'B18': 13,
'B20': 14,
'B22': 15,
'B28': 16,
'B3': 17,
'B35': 18,
'B38': 19,
'B39': 20,
'B4': 21,
'B42': 22,
'B49': 23,
'B5': 24,
'B50': 25,
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'B57 B59 B63 B66': 27,
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'B79': 34,
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'C148': 50,
'C2': 51,
'C22 C26': 52,
'C23 C25 C27': 53,
'C32': 54,
'C45': 55,
'C46': 56,
```

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'C49': 58,
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'C54': 60,
'C62 C64': 61,
'C65': 62,
'C68': 63,
'C7': 64,
'C70': 65,
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'C82': 67,
'C83': 68,
'C85': 69,
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'C92': 73,
'C93': 74,
'C95': 75,
'C99': 76,
'D': 77,
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'D11': 79,
'D15': 80,
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'D20': 83,
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 'E36': 108,
 'E40': 109,
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 'E49': 112,
 'E50': 113,
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 'F E69': 119,
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 'F G73': 121,
 'F2': 122,
 'F33': 123,
 'F38': 124, 'F4': 125,
 'G6': 126,
 'T': 127}
```

5 Feature Scaling

[46]:
```
from sklearn.preprocessing import MinMaxScaler
ms=MinMaxScaler()
```

[47]:
```
df.dtypes
```

[47]:
```
PassengerId      int64
Survived         int64
Pclass           int64
Name            object
Sex             object
Age            float64
SibSp            int64
Parch            int64
Ticket          object
Fare           float64
Cabin           object
```

```
Embarked     object
dtype:
object
```

[48]:
```
X.dtypes
```

[48]:
```
 PassengerId   int64
Survived       int64
 Name          object
 Sex            int32
 Age          float64
 SibSp          int64
 Parch          int64
 Ticket        object
 Fare         float64
 Cabin          int32
 Embarked      object
 dtype:
 object
```

6 Splitting Data into Train and Test Dataset

[49]:
```
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,rand
om_state=0)
```

[50]:
```
x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

[50]:
```
((594, 9), (255, 9), (594, 0), (255, 0))
```