DATA SCIENCE

Lab-4

In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

In [2]:
```
DS = pd.read_csv("Titanic_Dataset.csv")
DS.head(5)
```

Out[2]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabi
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	Na
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C8
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	Na
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C12
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	Na

In [3]:
```
DS.shape
```

Out[3]:
```
(891, 12)
```

In [4]:
```
DS.describe()
```

Out[4]:

	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

Handling of Missing Values

In [5]:
```
Missing_values_count=print(DS.isnull().sum())
Missing_values_count

print("\n")
null_values=[features for features in DS.columns if DS[features].isnull().sum()>1
for feature in null_values:
    print(feature)
```

```
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


Age
Cabin
Embarked
```

1. For Numerical Variables

In [6]:
```
# numerical variables containing missing values

num_null_values=[feature for feature in DS.columns if DS[feature].isnull().sum():

## We will print the numerical nan variables and percentage of missing values

for feature in num_null_values:
    print("{}: {}% missing value".format(feature,np.around(DS[feature].isnull().
```

```
Age: 0.199% missing value
```

In [7]:
```
# Replacing num_null_values

for feature in num_null_values:
    median_value=DS[feature].median()

    DS[feature]=np.where(DS[feature].isnull(),1,0)
    DS[feature].fillna(median_value,inplace=True)

DS[num_null_values].isnull().sum()
```

Out[7]:
```
Age    0
dtype: int64
```

In [8]:
```
DS.head()
```

Out[8]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabi
0	1	0	3	Braund, Mr. Owen Harris	male	0	1	0	A/5 21171	7.2500	Na
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	0	1	0	PC 17599	71.2833	C8
2	3	1	3	Heikkinen, Miss. Laina	female	0	0	0	STON/O2. 3101282	7.9250	Na
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	0	1	0	113803	53.1000	C12
4	5	0	3	Allen, Mr. William Henry	male	0	0	0	373450	8.0500	Na

2. For Categorical Variables

In [9]:
```
# categorical variables containing missing values
cat_null_values=[feature for feature in DS.columns if DS[feature].isnull().sum()>

for feature in cat_null_values:
    print("{}: {}% missing values".format(feature,np.round(DS[feature].isnull().m
```

```
Cabin: 0.771% missing values
Embarked: 0.002% missing values
```

In [10]:
```
# Replace missing value with a new label

def replace_cat_values(DS,cat_null_values):
    data=DS.copy()
    data[cat_null_values]=data[cat_null_values].fillna('NULL')
    return data

DS=replace_cat_values(DS,cat_null_values)

DS[cat_null_values].isnull().sum()
```

Out[10]:
```
Cabin       0
Embarked    0
dtype: int64
```

In [11]:
```
DS.head()
```

Out[11]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabi
0	1	0	3	Braund, Mr. Owen Harris	male	0	1	0	A/5 21171	7.2500	NUL
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	0	1	0	PC 17599	71.2833	C8
2	3	1	3	Heikkinen, Miss. Laina	female	0	0	0	STON/O2. 3101282	7.9250	NUL
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	0	1	0	113803	53.1000	C12
4	5	0	3	Allen, Mr. William Henry	male	0	0	0	373450	8.0500	NUL

we can observe the missing values in the data set present in the columns where Age is numerical variable, Cabin and Embarked are categorical variable. We have handle the missing values and replace it with some other values in place of null value.

Handling of Outliers at least for 1 variable.

In [12]:

```
numerical_variables = [feature for feature in DS.columns if DS[feature].dtypes !=
print('Number of Numerical Variables: ', len(numerical_variables))
discrete_variables=[feature for feature in numerical_variables if len(DS[feature]
print("Discrete Variables Count: {}".format(len(discrete_variables)))
continuous_variables=[feature for feature in numerical_variables if feature not i
print("Continuous Variables Count: {}".format(len(continuous_variables)))
```

```
Number of Numerical Variables:  7
Discrete Variables Count: 5
Continuous Variables Count: 2
```

In [13]:

```
print(continuous_variables)
DS[continuous_variables].head()
```

```
['PassengerId', 'Fare']
```

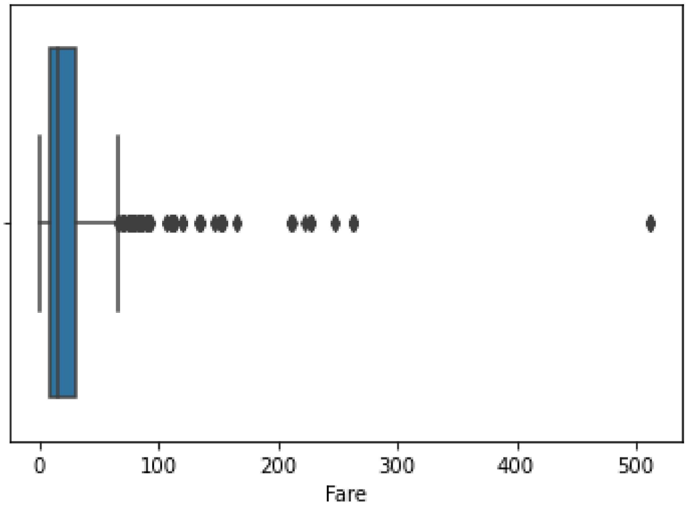
Out[13]:

	PassengerId	Fare
0	1	7.2500
1	2	71.2833
2	3	7.9250
3	4	53.1000
4	5	8.0500

In [14]:
```
sns.boxplot(DS['Fare'])
```

```
C:\Users\Rishab\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWa
rning: Pass the following variable as a keyword arg: x. From version 0.12, the
only valid positional argument will be `data`, and passing other arguments with
out an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

Out[14]:
```
<AxesSubplot:xlabel='Fare'>
```



In [15]:
```
outlier=np.where(DS['Age']>66)
print(outlier)
```

```
(array([], dtype=int64),)
```

In [16]:
```
import numpy as np
Q1 = np.quantile(DS['Fare'],0.25)
print("Q1 = ",Q1)
Q3 = np.quantile(DS['Fare'],0.75)
print("Q3 = ",Q3)
IQR = Q3 - Q1
print("IQR = ",IQR)

# For finding out the Outlier using IQR we have to define a multiplier which is 1

print("\nRange of Outliers:")
Q1=Q1 - 1.5*IQR
print("Min_Value = ",Q1)
Q3=Q3 + 1.5*IQR
print("Max_Value = ",Q3)
```

```
Q1 =  7.9104
Q3 =  31.0
IQR =  23.0896

Range of Outliers:
Min_Value =  -26.724
Max_Value =  65.6344
```

Hence, any value below Min_Value or Max_Value will be considered as an Outlier

Handling of Rare Variables

In [17]:

```
cat_rare_variables=[feature for feature in DS.columns if DS[feature].dtype=='O']
cat_rare_variables
```

Out[17]:

```
['Name', 'Sex', 'Ticket', 'Cabin', 'Embarked']
```

In [18]:

```
DS.head()
```

Out[18]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabi
0	1	0	3	Braund, Mr. Owen Harris	male	0	1	0	A/5 21171	7.2500	NUL
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	0	1	0	PC 17599	71.2833	C8
2	3	1	3	Heikkinen, Miss. Laina	female	0	0	0	STON/O2. 3101282	7.9250	NUL
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	0	1	0	113803	53.1000	C12
4	5	0	3	Allen, Mr. William Henry	male	0	0	0	373450	8.0500	NUL

In [19]:

```

for feature in cat_rare_variables:
    temp=DS.groupby(feature)['Fare'].count()/len(DS)
    temp_df=temp[temp>0.01].index
    DS[feature]=np.where(DS[feature].isin(temp_df),DS[feature],'Rare_var')
```

In [20]:
```
DS.head()
```

Out[20]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cab
0	1	0	3	Rare_var	male	0	1	0	Rare_var	7.2500	NUL
1	2	1	1	Rare_var	female	0	1	0	Rare_var	71.2833	Rare_v
2	3	1	3	Rare_var	female	0	0	0	Rare_var	7.9250	NUL
3	4	1	1	Rare_var	female	0	1	0	Rare_var	53.1000	Rare_v
4	5	0	3	Rare_var	male	0	0	0	Rare_var	8.0500	NUL

In [21]:
```
for feature in cat_rare_variables:
    labels_ordered=DS.groupby([feature])['Fare'].mean().sort_values().index
    labels_ordered={k:i for i,k in enumerate(labels_ordered,0)}
    DS[feature]=DS[feature].map(labels_ordered)
```

In [22]:
```
DS.head()
```

Out[22]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarl
0	1	0	3	0	0	0	1	0	0	7.2500	0	
1	2	1	1	0	1	0	1	0	0	71.2833	1	
2	3	1	3	0	1	0	0	0	0	7.9250	0	
3	4	1	1	0	1	0	1	0	0	53.1000	1	
4	5	0	3	0	0	0	0	0	0	8.0500	0	

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NAME: **Rishab Jha**

PRN: **20190802072**