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SUB: Data Science

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Laboratory Experiment No. 4

AIM: Perform Feature Engineering on the “TITANIC” dataset shared

1. Handling of Missing Values

In [84]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
pd. pandas.set_option('display.max_columns', None)
```

In [85]:

```
dataset=pd.read_csv('Titanic_Dataset.csv')
print(dataset.shape)
dataset.head()
```

```
(891, 12)
```

Out[85]:

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

In [86]:

```
## Let us capture all the nan values
## First lets handle Categorical features which are missing
features_nan=[feature for feature in dataset.columns if dataset[feature].isnull().sum()>1
              and dataset[feature].dtypes=='O']

for feature in features_nan:
    print("{}: {}% missing values".format(feature,np.round(dataset[feature].isnull().mean(),4)))
```

```
Cabin: 0.771% missing values
Embarked: 0.0022% missing values
```

In [87]:

```
## Replace missing value with a new label
def replace_cat_feature(dataset,features_nan):
    data=dataset.copy()
    data[features_nan]=data[features_nan].fillna('Missing')
    return data

dataset=replace_cat_feature(dataset,features_nan)

dataset[features_nan].isnull().sum()
```

Out[87]:

```
Cabin       0
Embarked    0
dtype: int64
```

In [88]:

```
dataset.head()
```

Out[88]:

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

In [89]:

```
## Now lets check for numerical variables the contains missing values
numerical_with_nan=[feature for feature in dataset.columns if dataset[feature].isnull().sum()>1
                    and dataset[feature].dtypes!='O']

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

for feature in numerical_with_nan:
    print("{}: {}% missing value".format(feature,np.around(dataset[feature].isnull().mean(),4)))
```

```
Age: 0.1987% missing value
```

In [90]:

```
## Replacing the numerical Missing Values

for feature in numerical_with_nan:
    ## We will replace by using median since there are outliers
    median_value=dataset[feature].median()

    ## create a new feature to capture nan values
    dataset[feature+'nan']=np.where(dataset[feature].isnull(),1,0)
    dataset[feature].fillna(median_value,inplace=True)

dataset[numerical_with_nan].isnull().sum()
```

Out[90]:

```
Age      0
dtype: int64
```

In [91]:

```
dataset.head(50)
```

Out[91]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Agenan
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	Missing	S	0
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C	0
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	Missing	S	0
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S	0
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	Missing	S	0
5	6	0	3	Moran, Mr.	male	28.0	0	0	330877	8.4583	Missing	Q	1

Here we have succefully cleaned the data and filled the missing values with the required parameters.

2. Handling The Outliers

In [92]:

```
max_thresold = dataset['Age'].quantile(0.95)
max_thresold
```

Out[92]:

```
54.0
```

In [93]:

```
dataset[dataset['Age']>max_thresold]
```

Out[93]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Agenan
11	12	1	1	Bonnell, Miss. Elizabeth	female	58.0	0	0	113783	26.5500	C103	S	0
15	16	1	2	Hewlett, Mrs. (Mary D Kingcome)	female	55.0	0	0	248706	16.0000	Missing	S	0
33	34	0	2	Wheadon, Mr. Edward H	male	66.0	0	0	C.A. 24579	10.5000	Missing	S	0
54	55	0	1	Ostby, Mr. Engelhart Cornelius	male	65.0	0	1	113509	61.9792	B30	C	0
94	95	0	3	Coxon, Mr. Daniel	male	59.0	0	0	364500	7.2500	Missing	S	0
96	97	0	1	Goldschmidt, Mr. George B	male	71.0	0	0	PC 17754	34.6542	A5	C	0
116	117	0	3	Connors, Mr.	male	70.5	0	0	370369	7.7500	Missing	Q	0

In [94]:

```
min_thresold = dataset['Age'].quantile(0.05)
min_thresold
```

Out[94]:

```
6.0
```

In [95]:

```
dataset[dataset['Age']<min_thresold]
```

Out[95]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Agenan
7	8	0	3	Palsson, Master. Gosta Leonard	male	2.00	3	1	349909	21.0750	Missing	S	0
10	11	1	3	Sandstrom, Miss. Marguerite Rut	female	4.00	1	1	PP 9549	16.7000	G6	S	0
16	17	0	3	Rice, Master. Eugene	male	2.00	4	1	382652	29.1250	Missing	Q	0
43	44	1	2	Laroche, Miss. Simonne Marie Anne Andree	female	3.00	1	2	SC/Paris 2123	41.5792	Missing	C	0

In [96]:

```
dataset[(dataset['Age']<max_thresold) & (dataset['Age']>min_thresold)]
```

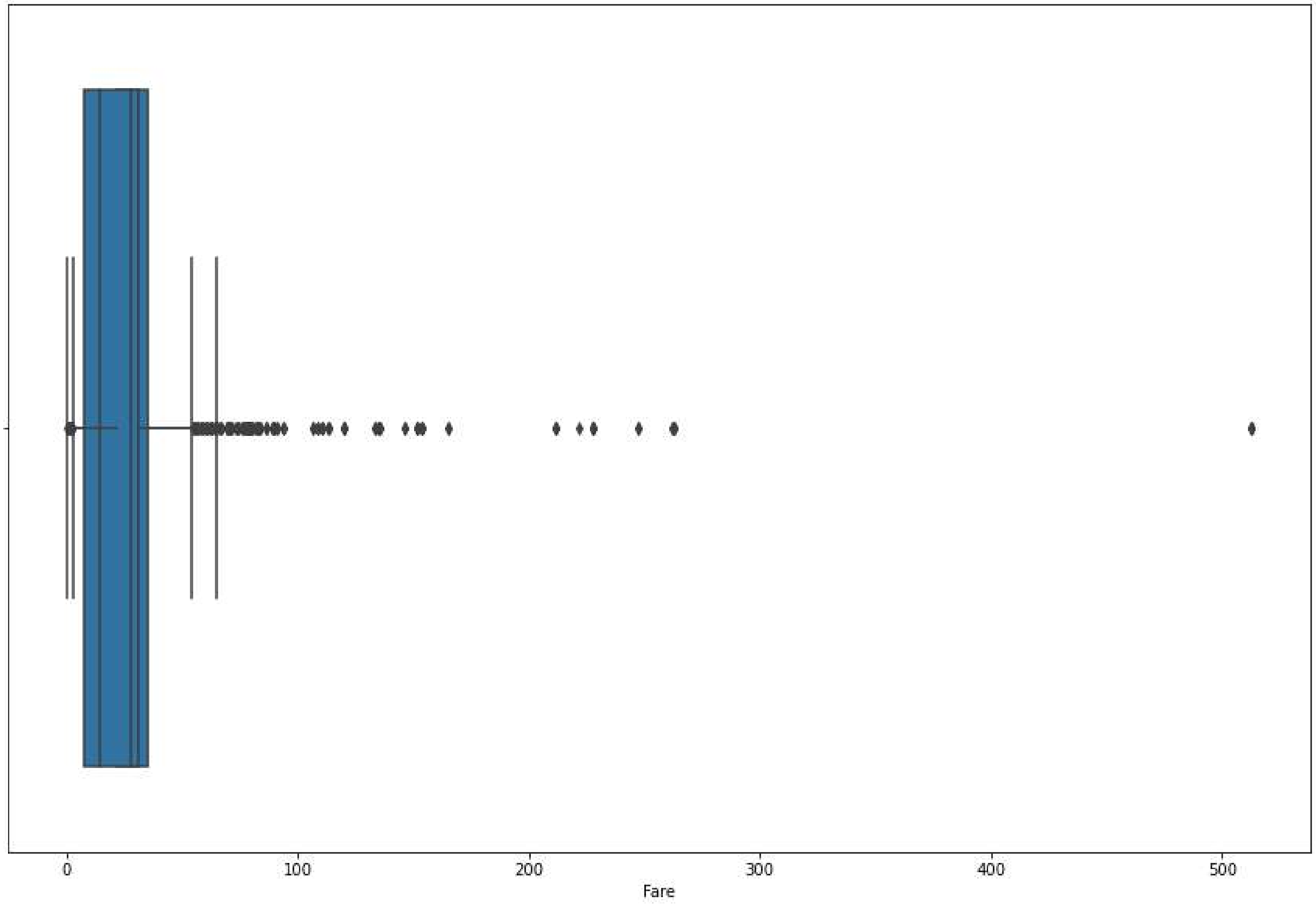
Out[96]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Agenan
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	Missing	S	0
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C	0
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	Missing	S	0
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S	0
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	Missing	S	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	Missing	S	0
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	B42	S	0
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	28.0	1	2	W./C. 6607	23.4500	Missing	S	1
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C148	C	0
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	Missing	Q	0

794 rows × 13 columns

In [97]:

```
num_fig = dataset.select_dtypes(include=['float64'])
plt.figure(figsize = (15,10), facecolor='white')
for column in num_fig:
    sns.boxplot(x=dataset[column])
plt.show()
```



We can identify the outliers by considering the Min and Max values of the range for Age and Fare respectively and we are able to recognize the Outliers by finding the values below Min value and above max value respectively

In [98]:

```
#Handling rare type of categorical variables
```

In [99]:

```
categorical_features=[feature for feature in dataset.columns if dataset[feature].dtype=='O']
```

In [100]:

```
categorical_features
```

Out[100]:

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

In [101]:

```
for feature in categorical_features:
    temp=dataset.groupby(feature)['Fare'].count()/len(dataset)
    temp_df=temp[temp>0.001].index
    dataset[feature]=np.where(dataset[feature].isin(temp_df),dataset[feature],'Rare_var')
```

In [102]:

```
dataset.head(50)
```

Out[102]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Agenan
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	Missing	S	0
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C85	C	0
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	Missing	S	0
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	C123	S	0
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	Missing	S	0
5	6	0	3	Moran, Mr.	male	28.0	0	0	330877	8.4583	Missing	Q	1

In [103]:

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

In [104]:

```
dataset.head(10)
```

Out[104]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Agenan
0	1	0	3	74	0	22.0	1	0	66	7.2500	14	1	0
1	2	1	1	788	1	38.0	1	0	636	71.2833	90	2	0
2	3	1	3	223	1	26.0	0	0	235	7.9250	14	1	0
3	4	1	1	749	1	35.0	1	0	617	53.1000	75	1	0
4	5	0	3	245	0	35.0	0	0	250	8.0500	14	1	0
5	6	0	3	292	0	28.0	0	0	287	8.4583	14	0	1
6	7	0	1	734	0	54.0	0	0	609	51.8625	66	1	0
7	8	0	3	530	0	2.0	3	1	480	21.0750	14	1	0
8	9	1	3	364	1	27.0	0	2	356	11.1333	14	1	0
9	10	1	2	657	1	14.0	1	0	564	30.0708	14	2	0

In [105]:

```
scaling_feature=[feature for feature in dataset.columns if feature not in ['PassengerId','Embarked'] ]
len(scaling_feature)
```

Out[105]:

```
11
```

In [106]:

```
scaling_feature
```

Out[106]:

```
['Survived',
 'Pclass',
 'Name',
 'Sex',
 'Age',
 'SibSp',
 'Parch',
 'Ticket',
 'Fare',
 'Cabin',
 'Agenan']
```

In [107]:

```
dataset.head()
```

Out[107]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked	Agenan
0	1	0	3	74	0	22.0	1	0	66	7.2500	14	1	0
1	2	1	1	788	1	38.0	1	0	636	71.2833	90	2	0
2	3	1	3	223	1	26.0	0	0	235	7.9250	14	1	0
3	4	1	1	749	1	35.0	1	0	617	53.1000	75	1	0
4	5	0	3	245	0	35.0	0	0	250	8.0500	14	1	0

CONCLUSION :

Hence we have successfully implemented the feature engineering on the given dataset. We have cleaned the data, observed the outliers and also the rare variables. We have also applied the necessary steps required for the Feature Engineering and also for the Exploratory Data Analysis

In [ ]:

```

```