BigMart

December 10, 2021

[1]:
```
#Step1 :Import all necessary librabries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder
import sklearn.linear_model
import sklearn.ensemble
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
```

1 Preprocessing

[4]:
```
#Load trainSet and use header to known about trainset
data=pd.read_csv('C:/Users/Gurudeo/Desktop/Personal/BigMart/data.csv')
print(data.head())
```

```
  Item_Fat_Content Item_Identifier  Item_MRP  Item_Outlet_Sales  \
0          Low Fat           FDA15  249.8092          3735.1380
1          Regular           DRC01   48.2692           443.4228
2          Low Fat           FDN15  141.6180          2097.2700
3          Regular           FDX07  182.0950           732.3800
4          Low Fat           NCD19   53.8614           994.7052

               Item_Type  Item_Visibility  Item_Weight  \
0                  Dairy         0.016047         9.30
1            Soft Drinks         0.019278         5.92
2                   Meat         0.016760        17.50
3  Fruits and Vegetables         0.000000        19.20
4              Household         0.000000         8.93

   Outlet_Establishment_Year Outlet_Identifier Outlet_Location_Type  \
0                       1999            OUT049               Tier 1
1                       2009            OUT018               Tier 3
2                       1999            OUT049               Tier 1
3                       1998            OUT010               Tier 3
4                       1987            OUT013               Tier 3
```

```
  Outlet_Size        Outlet_Type  Unnamed: 11 source
0      Medium  Supermarket Type1          NaN  train
1      Medium  Supermarket Type2          NaN  train
2      Medium  Supermarket Type1          NaN  train
3         NaN      Grocery Store          NaN  train
4        High  Supermarket Type1          NaN  train
```

[5]:
```
#describe dataset
data.describe()
```

[5]:
```
           Item_MRP  Item_Outlet_Sales  Item_Visibility   Item_Weight  \
count  14204.000000        8523.000000     14204.000000  11765.000000
mean     141.004977        2181.288914         0.065953     12.792854
std       62.086938        1706.499616         0.051459      4.652502
min       31.290000          33.290000         0.000000      4.555000
25%       94.012000         834.247400         0.027036      8.710000
50%      142.247000        1794.331000         0.054021     12.600000
75%      185.855600        3101.296400         0.094037     16.750000
max      266.888400       13086.964800         0.328391     21.350000

       Outlet_Establishment_Year  Unnamed: 11
count               14204.000000          0.0
mean                 1997.830681          NaN
std                     8.371664          NaN
min                  1985.000000          NaN
25%                  1987.000000          NaN
50%                  1999.000000          NaN
75%                  2004.000000          NaN
max                  2009.000000          NaN
```

[6]:
```
#Lets
data.Item_Fat_Content.value_counts()
```

[6]:
```
Low Fat    8485
Regular    4824
LF          522
reg         195
low fat     178
Name: Item_Fat_Content, dtype: int64
```

[7]:
```
data.Item_Type.value_counts()
```

[7]:
```
Fruits and Vegetables    2013
Snack Foods              1989
Household                1548
Frozen Foods             1426
Dairy                    1136
```

```
Baking Goods             1086
Canned                   1084
Health and Hygiene        858
Meat                      736
Soft Drinks               726
Breads                    416
Hard Drinks               362
Others                    280
Starchy Foods             269
Breakfast                 186
Seafood                    89
Name: Item_Type, dtype: int64
```

[8]:
```
data.Outlet_Size.value_counts()
```

[8]:
```
Medium    4655
Small     3980
High      1553
Name: Outlet_Size, dtype: int64
```

[9]:
```
data.Outlet_Type.value_counts()
```

[9]:
```
Supermarket Type1    9294
Grocery Store        1805
Supermarket Type3    1559
Supermarket Type2    1546
Name: Outlet_Type, dtype: int64
```

[10]:
```
data.Outlet_Location_Type.value_counts()
```

[10]:
```
Tier 3    5583
Tier 2    4641
Tier 1    3980
Name: Outlet_Location_Type, dtype: int64
```

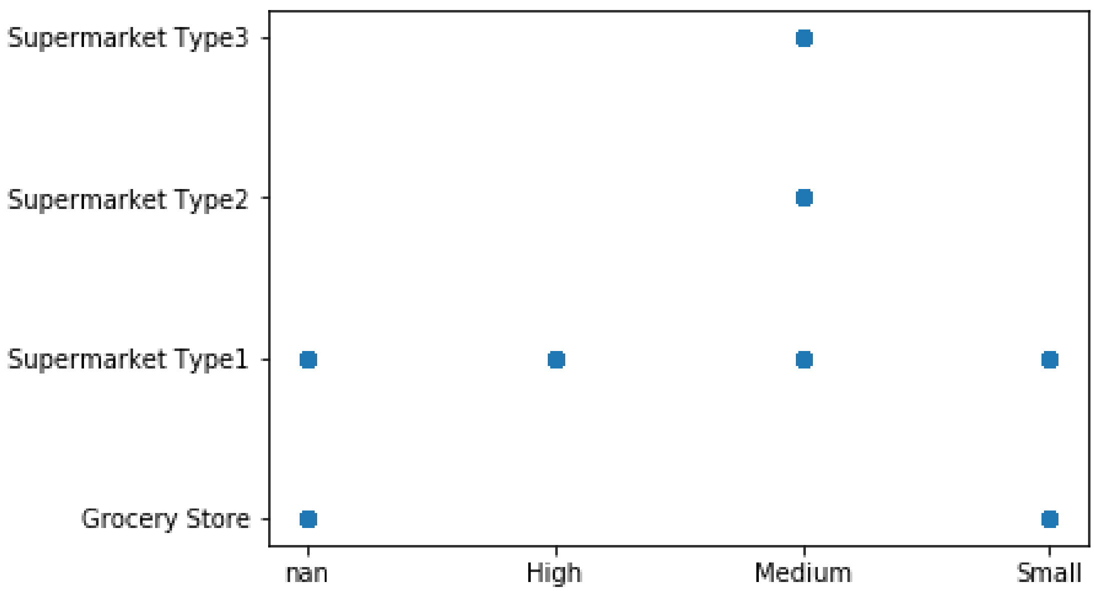
[11]:
```
data_Missing=data.isnull().sum()
```

[12]:
```
data_Missing
```

[12]:
```
Item_Fat_Content                0
Item_Identifier                 0
Item_MRP                        0
Item_Outlet_Sales            5681
Item_Type                       0
Item_Visibility                 0
Item_Weight                  2439
Outlet_Establishment_Year       0
Outlet_Identifier               0
```

```
Outlet_Location_Type            0
Outlet_Size                  4016
Outlet_Type                     0
Unnamed: 11                 14204
source                          0
dtype: int64
```

[13]:
```
#filling value of Outlet_Size.
#Hypothesis: Outlet_Size depends on Oulet Type and Outlet__Location_Type
plt.scatter(data['Outlet_Size'],data['Outlet_Type'])
plt.show()
#from
```



[14]:
```
twowaytable=pd.crosstab(data['Outlet_Size'],data['Outlet_Type'])
twowaytable
```

[14]:
```
Outlet_Type  Grocery Store  Supermarket Type1  Supermarket Type2  \
Outlet_Size
High                     0               1553                  0
Medium                   0               1550               1546
Small                  880               3100                  0

Outlet_Type  Supermarket Type3
Outlet_Size
High                         0
Medium                    1559
Small                        0
```

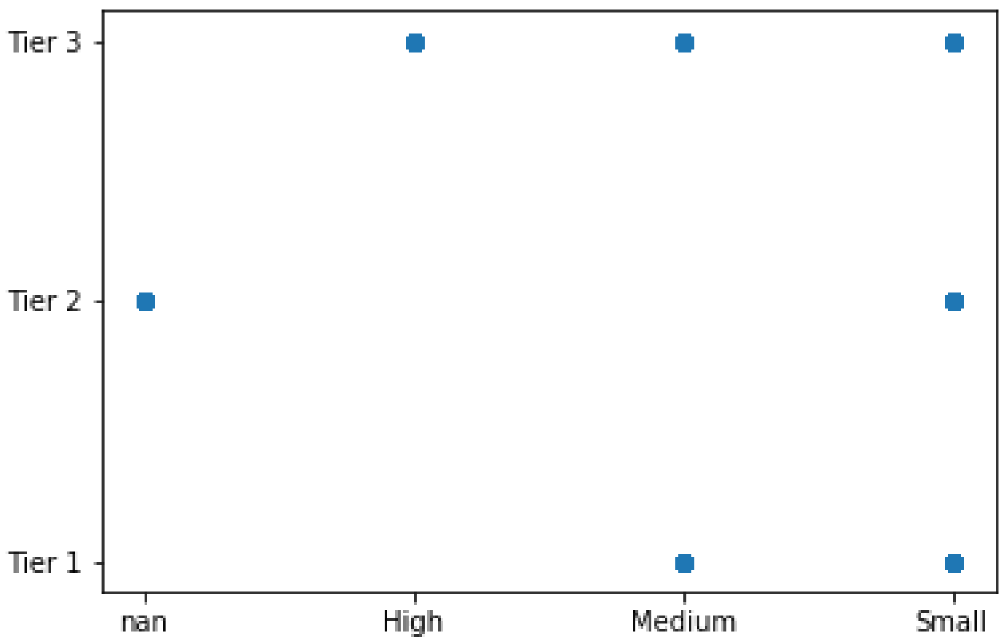
[15]:
```
#From above plot and table we can assume that Glacceray shops are of small size
#SO map Glocessary Shop and Size
```

[16]:
```
d={'Grocery Store':'Small'}
s=data.Outlet_Type.map(d)
data.Outlet_Size=data.Outlet_Size.combine_first(s)
```

[ ]:
```

```

[17]:
```
plt.scatter(data['Outlet_Size'],data['Outlet_Location_Type'])
plt.show()
```



[18]:
```
twowaytable=pd.crosstab(data['Outlet_Size'],data['Outlet_Location_Type'])
twowaytable
```

[18]:

Outlet_Location_Type	Tier 1	Tier 2	Tier 3
Outlet_Size			
High	0	0	1553
Medium	1550	0	3105
Small	2430	1550	925

[19]:
```
#From plot and table we conclude that Tier 2 is of size small .
#So map Tier 2 and Size
```

[20]:
```
d={'Tier 2':'Small'}
s=data.Outlet_Location_Type.map(d)
data.Outlet_Size=data.Outlet_Size.combine_first(s)
```

[21]:
```
data.Outlet_Size.isnull().any()
```

[21]:
```
False
```

[22]:
```
#Fill missing values of weight of Item According to means of Item Identifier
```

[23]:
```
data['Item_Weight']=data['Item_Weight'].fillna(data.
↪groupby('Item_Identifier')['Item_Weight'].transform('mean'))
```

[24]:
```
data.Item_Weight.isnull().sum()
```

[24]:
```
0
```

[25]:
```
#fill Item_Weigth by theire corresponding Item_Type
List=['Baking Goods','Breads','Breakfast','Canned','Dairy','Frozen␣
↪Foods','Fruits and Vegetables','Hard Drinks','Health and␣
↪Hygiene','Household','Meat','Others','Seafood','Snack Foods','Soft␣
↪Drinks','Starchy Foods']
Mean_values_Item_Type_data=data.groupby('Item_Type')['Item_Weight'].mean()
for i in List:
    d={i:Mean_values_Item_Type_data[i]}
    s=data.Item_Type.map(d)
    data.Item_Weight=data.Item_Weight.combine_first(s)
Mean_values_Item_Type_data=data.groupby('Item_Type')['Item_Weight'].mean()
```

[26]:
```
data.Item_Weight.isnull().any()
```

[26]:
```
False
```

[27]:
```
data.Item_Visibility.value_counts()
```

[27]:
```
0.000000    879
0.076856      3
0.076841      3
0.077290      3
0.077169      3
0.076975      3
0.077011      3
0.076792      3
0.076483      3
0.046899      2
0.159844      2
0.135708      2
0.135944      2
```

0.072298	2
0.136008	2
0.136896	2
0.203401	2
0.081788	2
0.075049	2
0.058369	2
0.104784	2
0.080131	2
0.072411	2
0.024635	2
0.052069	2
0.079968	2
0.179192	2
0.079806	2
0.121767	2
0.080625	2
…	
0.013147	1
0.098790	1
0.073397	1
0.137756	1
0.017937	1
0.105126	1
0.044156	1
0.141639	1
0.094411	1
0.074883	1
0.039236	1
0.044497	1
0.051147	1
0.175061	1
0.039034	1
0.077508	1
0.078943	1
0.077170	1
0.042959	1
0.013173	1
0.069939	1
0.011305	1
0.069042	1
0.012216	1
0.064142	1
0.209684	1
0.019592	1
0.013530	1
0.008772	1

```
0.066817     1
Name: Item_Visibility, Length: 13006, dtype: int64
```

[28]:
```
#From above observations therir are many zeros for item_Visiblity which not␣
 ↪possible so
#fill by corresponding means of Item_Identifiers
data['Item_Visibility'].replace(0.00000,np.nan)#first fill by nam for simplicity
data['Item_Visibility'].fillna(data.
 ↪groupby('Item_Identifier')['Item_Visibility'].transform('mean'))
```

[28]:
```
0        0.016047
1        0.019278
2        0.016760
3        0.000000
4        0.000000
5        0.000000
6        0.012741
7        0.127470
8        0.016687
9        0.094450
10       0.000000
11       0.045464
12       0.100014
13       0.047257
14       0.068024
15       0.069089
16       0.008596
17       0.069196
18       0.034238
19       0.102492
20       0.138190
21       0.035400
22       0.025698
23       0.057557
24       0.025896
25       0.099887
26       0.066693
27       0.019356
28       0.161467
29       0.072222
           …
14174    0.048645
14175    0.087847
14176    0.028977
14177    0.000000
14178    0.099375
14179    0.158425
```

```
14180    0.035911
14181    0.037656
14182    0.044073
14183    0.026065
14184    0.000000
14185    0.026234
14186    0.033516
14187    0.045168
14188    0.024110
14189    0.014019
14190    0.045270
14191    0.288892
14192    0.072529
14193    0.037092
14194    0.054463
14195    0.036594
14196    0.094053
14197    0.030704
14198    0.070411
14199    0.013496
14200    0.142991
14201    0.073529
14202    0.000000
14203    0.104720
Name: Item_Visibility, Length: 14204, dtype: float64
```

[29]:
```
data['Item_Visibility'].fillna(data.
↪groupby('Item_Identifier')['Item_Visibility'].transform('mean'))
```

[29]:
```
0        0.016047
1        0.019278
2        0.016760
3        0.000000
4        0.000000
5        0.000000
6        0.012741
7        0.127470
8        0.016687
9        0.094450
10       0.000000
11       0.045464
12       0.100014
13       0.047257
14       0.068024
15       0.069089
16       0.008596
17       0.069196
```

```
18       0.034238
19       0.102492
20       0.138190
21       0.035400
22       0.025698
23       0.057557
24       0.025896
25       0.099887
26       0.066693
27       0.019356
28       0.161467
29       0.072222
             …
14174    0.048645
14175    0.087847
14176    0.028977
14177    0.000000
14178    0.099375
14179    0.158425
14180    0.035911
14181    0.037656
14182    0.044073
14183    0.026065
14184    0.000000
14185    0.026234
14186    0.033516
14187    0.045168
14188    0.024110
14189    0.014019
14190    0.045270
14191    0.288892
14192    0.072529
14193    0.037092
14194    0.054463
14195    0.036594
14196    0.094053
14197    0.030704
14198    0.070411
14199    0.013496
14200    0.142991
14201    0.073529
14202    0.000000
14203    0.104720
Name: Item_Visibility, Length: 14204, dtype: float64
```

[30]:

```
data.Item_Visibility.isnull().any()
```

[30]: False

2 Feature Engineering

[31]:
```
#Fat_Content showing redudancy of differnt types
data.Item_Fat_Content.value_counts()
```

[31]:
```
Low Fat    8485
Regular    4824
LF          522
reg         195
low fat     178
Name: Item_Fat_Content, dtype: int64
```

[32]:
```
#Now replace LF by Low Fat ,low fat by lf,reg by Regular
data['Item_Fat_Content']=data['Item_Fat_Content'].replace({'low fat':'Low␣
↪Fat','reg':'Regular','LF':'Low Fat'})
data.Item_Fat_Content.value_counts()
```

[32]:
```
Low Fat    9185
Regular    5019
Name: Item_Fat_Content, dtype: int64
```

[33]:
```
#no of years outlet is working conditon
data['Outlet_Years']=2018-data['Outlet_Establishment_Year']
```

[34]:
```
Mean_Visibility=data['Item_Visibility'].mean()
```

[35]:
```
data['Item_Visibility_MeanRatio']=data.apply(lambda x:x['Item_Visibility']/
↪Mean_Visibility,axis=1)
```

[36]:
```
#As Item Id and Outlet Id
```

[37]:
```
#Convert categorical into numerical
var_mod=['Item_Fat_Content','Outlet_Location_Type','Outlet_Size','Outlet_Type','Item_Type']
number=LabelEncoder()
```

[38]:
```
#Item_Identifier and outlet_Identifier are also useful for making prediction
data['Outlet']=number.fit_transform(data['Outlet_Identifier'])
data['Identifier']=number.fit_transform(data['Item_Identifier'])
```

[39]:
```
for i in var_mod:
      data[i]=number.fit_transform(data[i])
```

[40]:
```
data.head()
```

[40]:
```
   Item_Fat_Content Item_Identifier  Item_MRP  Item_Outlet_Sales  Item_Type  \
0                 0           FDA15  249.8092          3735.1380          4
1                 1           DRC01   48.2692           443.4228         14
2                 0           FDN15  141.6180          2097.2700         10
3                 1           FDX07  182.0950           732.3800          6
4                 0           NCD19   53.8614           994.7052          9

   Item_Visibility  Item_Weight  Outlet_Establishment_Year Outlet_Identifier  \
0         0.016047         9.30                       1999            OUT049
1         0.019278         5.92                       2009            OUT018
2         0.016760        17.50                       1999            OUT049
3         0.000000        19.20                       1998            OUT010
4         0.000000         8.93                       1987            OUT013

   Outlet_Location_Type  Outlet_Size  Outlet_Type  Unnamed: 11 source  \
0                     0            1            1          NaN  train
1                     2            1            2          NaN  train
2                     0            1            1          NaN  train
3                     2            2            0          NaN  train
4                     2            0            1          NaN  train

   Outlet_Years  Item_Visibility_MeanRatio  Outlet  Identifier
0            19                   0.243315       9         156
1             9                   0.292303       3           8
2            19                   0.254122       9         662
3            20                   0.000000       0        1121
4            31                   0.000000       1        1297
```

[41]:
```python
predictors=['Item_Weigth','Item_Fat_Content','Item_Visibility','Item_Type','Item_MRP','Outlet_
            'Outlet','Identifier']
```

[42]:
```python
X=data[data.columns[1:]]
y=data['Item_Outlet_Sales']
```

[44]:
```python
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.25,␣
 ↪random_state=42)
```

[57]:
```python
Linear_Model=LinearRegression(normalize=True)
```