Dawood Sarfraz

Project Title : Mart Sales Prediction Using XGBoost

Importing the Dependencies

In [1097]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

import warnings
warnings.simplefilter("ignore")
```

Data Collection and Processing

In [1005]:

```
# loading the data from csv file to Pandas DataFrame
df = pd.read_csv('Train.csv')
```

In [1006]:

```
df
```

Out[1006]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Ou
0	FDA15	9.300	Low Fat	0.016047	Dairy	249.8092	
1	DRC01	5.920	Regular	0.019278	Soft Drinks	48.2692	
2	FDN15	17.500	Low Fat	0.016760	Meat	141.6180	
3	FDX07	19.200	Regular	0.000000	Fruits and Vegetables	182.0950	
4	NCD19	8.930	Low Fat	0.000000	Household	53.8614	
...	...	...	...	...	...	...	
8518	FDF22	6.865	Low Fat	0.056783	Snack Foods	214.5218	
8519	FDS36	8.380	Regular	0.046982	Baking Goods	108.1570	
8520	NCJ29	10.600	Low Fat	0.035186	Health and Hygiene	85.1224	
8521	FDN46	7.210	Regular	0.145221	Snack Foods	103.1332	
8522	DRG01	14.800	Low Fat	0.044878	Soft Drinks	75.4670	

8523 rows × 12 columns

In [1007]:

```
# first 5 rows of the dataframe
df.head(5)
```

Out[1007]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outle
0	FDA15	9.30	Low Fat	0.016047	Dairy	249.8092	
1	DRC01	5.92	Regular	0.019278	Soft Drinks	48.2692	
2	FDN15	17.50	Low Fat	0.016760	Meat	141.6180	
3	FDX07	19.20	Regular	0.000000	Fruits and Vegetables	182.0950	
4	NCD19	8.93	Low Fat	0.000000	Household	53.8614	

In [1008]:

```
df.tail(10)
```

Out[1008]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Ou
8513	FDH31	12.000	Regular	0.020407	Meat	99.9042	
8514	FDA01	15.000	Regular	0.054489	Canned	57.5904	
8515	FDH24	20.700	Low Fat	0.021518	Baking Goods	157.5288	
8516	NCJ19	18.600	Low Fat	0.118661	Others	58.7588	
8517	FDF53	20.750	reg	0.083607	Frozen Foods	178.8318	
8518	FDF22	6.865	Low Fat	0.056783	Snack Foods	214.5218	
8519	FDS36	8.380	Regular	0.046982	Baking Goods	108.1570	
8520	NCJ29	10.600	Low Fat	0.035186	Health and Hygiene	85.1224	
8521	FDN46	7.210	Regular	0.145221	Snack Foods	103.1332	
8522	DRG01	14.800	Low Fat	0.044878	Soft Drinks	75.4670	

In [1009]:

```
df[4500:4510]
```

Out[1009]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Ou
4500	FDU25	12.350	Low Fat	0.026832	Canned	57.3246	
4501	NCU42	9.000	Low Fat	0.019617	Household	169.6474	
4502	FDH21	10.395	LF	0.052264	Seafood	158.4604	
4503	DRO47	10.195	Low Fat	0.112203	Hard Drinks	111.7860	
4504	FDC44	NaN	Low Fat	0.171761	Fruits and Vegetables	115.7518	
4505	NCL29	9.695	Low Fat	0.114171	Health and Hygiene	158.9604	
4506	FDL48	19.350	Regular	0.082266	Baking Goods	48.8034	
4507	FDJ21	16.700	Regular	0.038685	Snack Foods	146.6102	
4508	FDT40	5.985	LF	0.095795	Frozen Foods	128.4678	
4509	NCD43	8.850	Low Fat	0.026814	Household	103.7964	

In [1010]:

```
# number of data points & number of features
df.shape
```

Out[1010]:

```
(8523, 12)
```

In [1011]:

```
# getting some information about thye dataset
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8523 entries, 0 to 8522
Data columns (total 12 columns):
 #   Column                     Non-Null Count  Dtype  
---  ------                     --------------  -----  
 0   Item_Identifier            8523 non-null   object 
 1   Item_Weight                7060 non-null   float64
 2   Item_Fat_Content           8523 non-null   object 
 3   Item_Visibility            8523 non-null   float64
 4   Item_Type                  8523 non-null   object 
 5   Item_MRP                   8523 non-null   float64
 6   Outlet_Identifier          8523 non-null   object 
 7   Outlet_Establishment_Year  8523 non-null   int64  
 8   Outlet_Size                6113 non-null   object 
 9   Outlet_Location_Type       8523 non-null   object 
 10  Outlet_Type                8523 non-null   object 
 11  Item_Outlet_Sales          8523 non-null   float64
dtypes: float64(4), int64(1), object(7)
memory usage: 799.2+ KB
```

Type *Markdown* and LaTeX: α^2

In [1012]:

```
# checking for missing values
df.isnull().sum()
```

Out[1012]:

```
Item_Identifier               0
Item_Weight                1463
Item_Fat_Content              0
Item_Visibility               0
Item_Type                     0
Item_MRP                      0
Outlet_Identifier             0
Outlet_Establishment_Year     0
Outlet_Size                2410
Outlet_Location_Type          0
Outlet_Type                   0
Item_Outlet_Sales             0
dtype: int64
```

In [1013]:

```
df.duplicated().sum()
```

Out[1013]:

```
0
```

In [1014]:

```
df.describe()
```

Out[1014]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Establishment_Year	Item_Outlet_Sales
count	7060.000000	8523.000000	8523.000000	8523.000000	8523.000000
mean	12.857645	0.066132	140.992782	1997.831867	2181.288914
std	4.643456	0.051598	62.275067	8.371760	1706.499616
min	4.555000	0.000000	31.290000	1985.000000	33.290000
25%	8.773750	0.026989	93.826500	1987.000000	834.247400
50%	12.600000	0.053931	143.012800	1999.000000	1794.331000
75%	16.850000	0.094585	185.643700	2004.000000	3101.296400
max	21.350000	0.328391	266.888400	2009.000000	13086.964800

In [1015]:

```
df.columns # Total columns
```

Out[1015]:

```
Index(['Item_Identifier', 'Item_Weight', 'Item_Fat_Content', 'Item_V
isibility',
       'Item_Type', 'Item_MRP', 'Outlet_Identifier',
       'Outlet_Establishment_Year', 'Outlet_Size', 'Outlet_Location_
Type',
       'Outlet_Type', 'Item_Outlet_Sales'],
      dtype='object')
```

In [1016]:

```
cols = df.columns # Categorical values columns
num_cols = df._get_numeric_data().columns
num_cols
list(set(cols) - set(num_cols))
```

Out[1016]:

```
['Outlet_Type',
 'Item_Type',
 'Outlet_Size',
 'Outlet_Identifier',
 'Item_Identifier',
 'Item_Fat_Content',
 'Outlet_Location_Type']
```

In [1017]:

```
df['Item_Identifier'].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 8523 entries, 0 to 8522
Series name: Item_Identifier
Non-Null Count  Dtype
--------------  -----
8523 non-null   object
dtypes: object(1)
memory usage: 66.7+ KB
```

In [1018]:

```
df["Outlet_Size"].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 8523 entries, 0 to 8522
Series name: Outlet_Size
Non-Null Count  Dtype
--------------  -----
6113 non-null   object
dtypes: object(1)
memory usage: 66.7+ KB
```

In [1019]:

```
df["Outlet_Type"].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 8523 entries, 0 to 8522
Series name: Outlet_Type
Non-Null Count  Dtype
--------------  -----
8523 non-null   object
dtypes: object(1)
memory usage: 66.7+ KB
```

In [1020]:

```
df["Item_Fat_Content"].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 8523 entries, 0 to 8522
Series name: Item_Fat_Content
Non-Null Count  Dtype
--------------  -----
8523 non-null   object
dtypes: object(1)
memory usage: 66.7+ KB
```

In [1021]:

```
df["Item_Identifier"].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 8523 entries, 0 to 8522
Series name: Item_Identifier
Non-Null Count  Dtype
--------------  -----
8523 non-null   object
dtypes: object(1)
memory usage: 66.7+ KB
```

In [1022]:

```
df["Item_Type"].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 8523 entries, 0 to 8522
Series name: Item_Type
Non-Null Count  Dtype
--------------  -----
8523 non-null   object
dtypes: object(1)
memory usage: 66.7+ KB
```

In [1023]:

```
df["Outlet_Location_Type"].info()
```

```
<class 'pandas.core.series.Series'>
RangeIndex: 8523 entries, 0 to 8522
Series name: Outlet_Location_Type
Non-Null Count  Dtype
--------------  -----
8523 non-null   object
dtypes: object(1)
memory usage: 66.7+ KB
```

Handling Missing Values

Mean: Average of all values
Mode: Most Repeated value

In [1024]:

```
# mean value of "Item_Weight" column
df['Item_Weight'].mean()
```

Out[1024]:

```
12.857645184135976
```

In [1025]:

```
mean = df['Item_Weight'].mean()
```

In [1026]:

```
mean
```

Out[1026]:

```
12.857645184135976
```

In [1027]:

```
# filling the missing values in "Item_weight column" with "Mean" value
df['Item_Weight'].fillna(df['Item_Weight'].mean(), inplace=True)
```

In [1028]:

```
df.isnull().sum()
```

Out[1028]:

```
Item_Identifier                 0
Item_Weight                     0
Item_Fat_Content                0
Item_Visibility                 0
Item_Type                       0
Item_MRP                        0
Outlet_Identifier               0
Outlet_Establishment_Year       0
Outlet_Size                  2410
Outlet_Location_Type            0
Outlet_Type                     0
Item_Outlet_Sales               0
dtype: int64
```

In [1029]:

```
# mode of "Outlet_Size" column
df['Outlet_Size'].mode()
```

Out[1029]:

```
0    Medium
Name: Outlet_Size, dtype: object
```

In [1030]:

```
# filling the missing values in "Outlet_Size" column with Mode
mode_of_Outlet_size = df.pivot_table(values='Outlet_Size', columns='Outlet_Type',
```

In [1031]:

```
(mode_of_Outlet_size)
```

Out[1031]:

Outlet_Type	Grocery Store	Supermarket Type1	Supermarket Type2	Supermarket Type3
Outlet_Size	Small	Small	Medium	Medium

In [1032]:

```
missing_values = df['Outlet_Size'].isnull()
```

In [1033]:

```
print(missing_values)
```

```
0       False
1       False
2       False
3        True
4       False
        ...
8518    False
8519     True
8520    False
8521    False
8522    False
Name: Outlet_Size, Length: 8523, dtype: bool
```

In [1034]:

```
df.loc[missing_values, 'Outlet_Size'] = df.loc[missing_values,'Outlet_Type'].apply
```

In [1035]:

```
# checking for missing values
df.isnull().sum()
```

Out[1035]:

```
Item_Identifier              0
Item_Weight                  0
Item_Fat_Content              0
Item_Visibility              0
Item_Type                    0
Item_MRP                     0
Outlet_Identifier            0
Outlet_Establishment_Year    0
Outlet_Size                  0
Outlet_Location_Type         0
Outlet_Type                  0
Item_Outlet_Sales            0
dtype: int64
```

Data Analysis

In [1036]:

```
df.describe()
```

Out[1036]:

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Establishment_Year	Item_Outlet_Sales
count	8523.000000	8523.000000	8523.000000	8523.000000	8523.000000
mean	12.857645	0.066132	140.992782	1997.831867	2181.288914
std	4.226124	0.051598	62.275067	8.371760	1706.499616
min	4.555000	0.000000	31.290000	1985.000000	33.290000
25%	9.310000	0.026989	93.826500	1987.000000	834.247400
50%	12.857645	0.053931	143.012800	1999.000000	1794.331000
75%	16.000000	0.094585	185.643700	2004.000000	3101.296400
max	21.350000	0.328391	266.888400	2009.000000	13086.964800

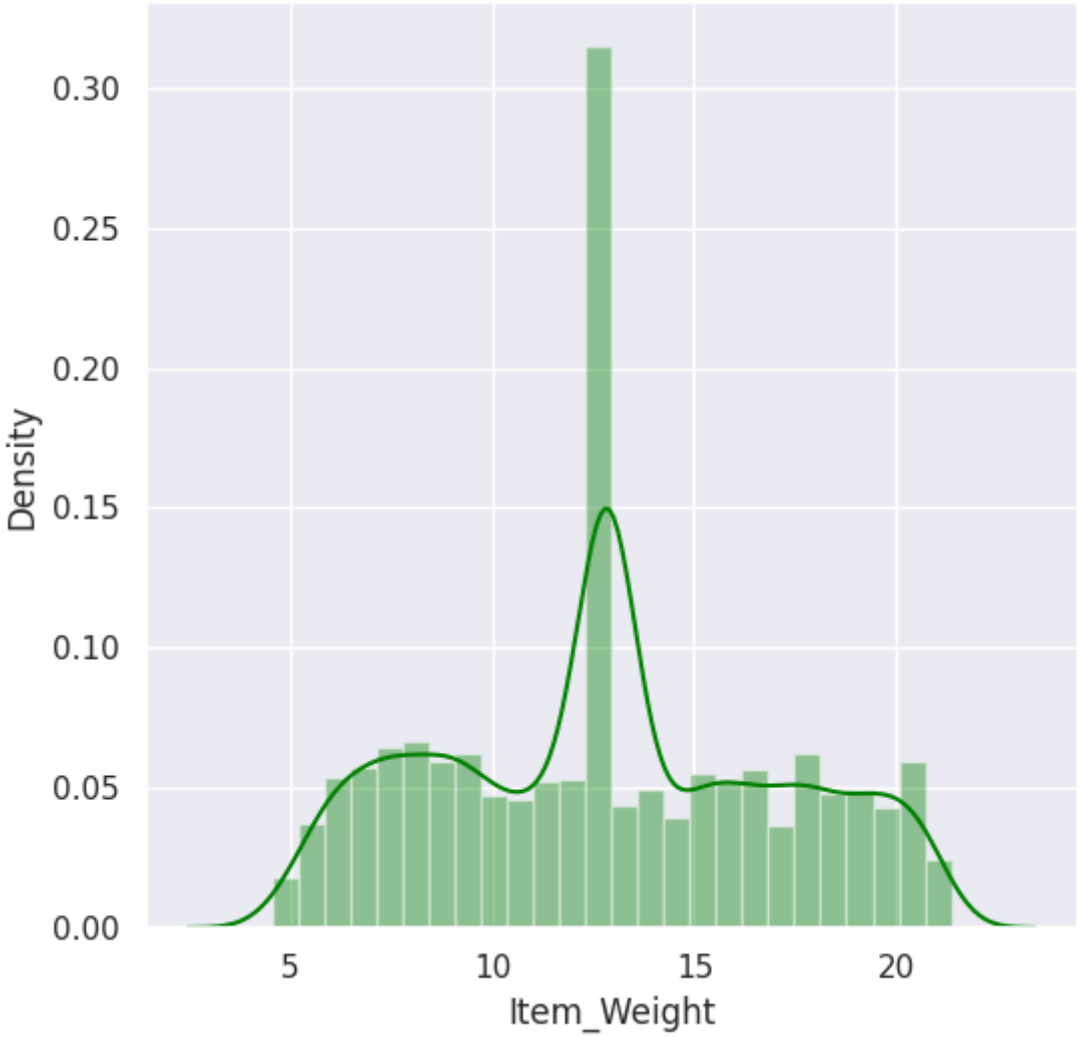
Numerical Features

In [1037]:

```
sns.set()
```

In [1038]:

```
# Item_Weight distribution
plt.figure(figsize=(6,6))
sns.distplot(df['Item_Weight'],color="green")
plt.show()
```



In [1039]:

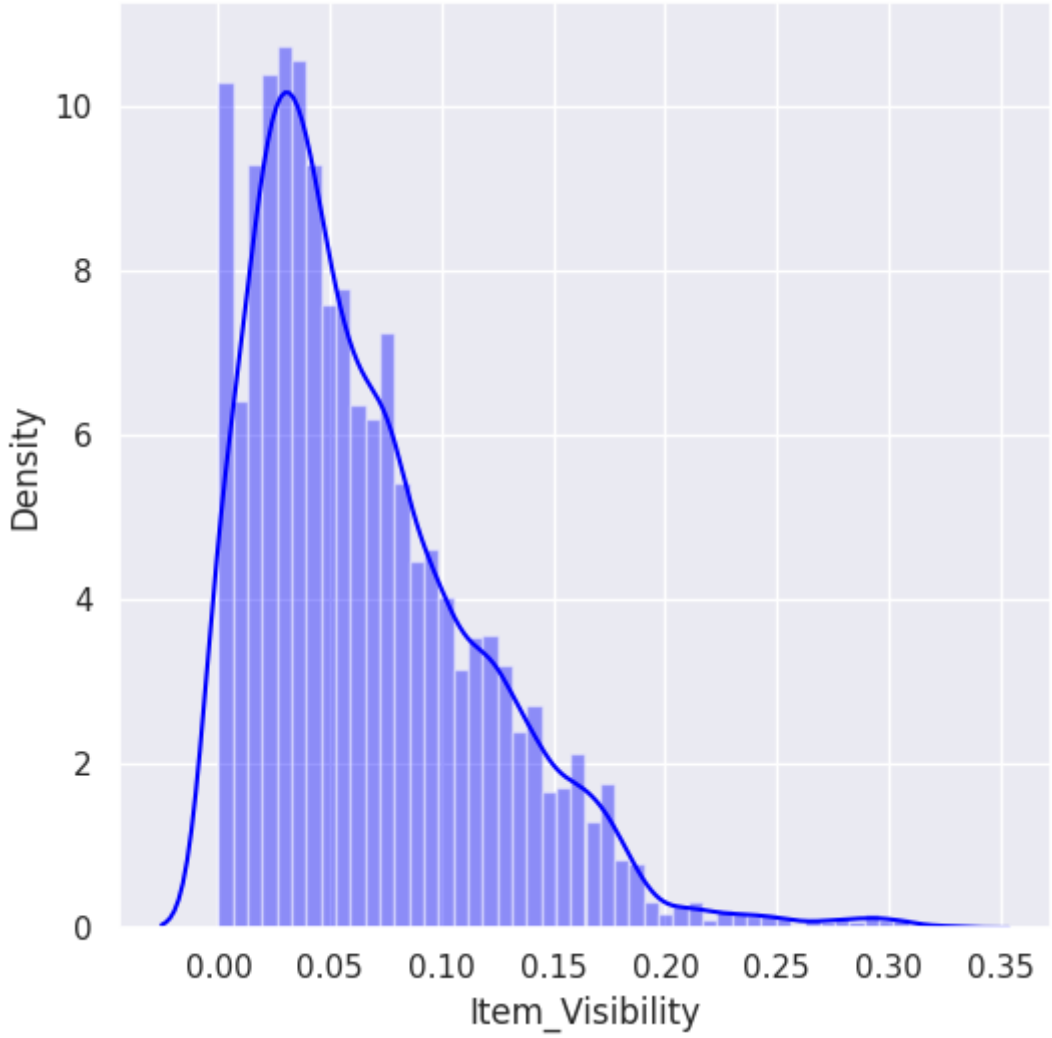
```
from collections import Counter
cnt = Counter()

for t in df['Item_Weight'] :
    cnt[t] += 1

cnt.most_common()
```

Out[1039]:

```
[(12.857645184135976, 1463),
 (12.15, 86),
 (17.6, 82),
 (13.65, 77),
 (11.8, 76),
 (9.3, 68),
 (15.1, 68),
 (10.5, 66),
 (16.7, 66),
 (19.35, 63),
 (16.0, 62),
 (20.7, 62),
 (9.8, 61),
 (17.7, 60),
 (17.75, 60),
 (18.85, 59),
 (15.85, 59),
 (15.0, 59)
```

In [1040]:

```
# Item Visibility distribution
plt.figure(figsize=(6,6))
sns.distplot(df['Item_Visibility'], color= "blue")
plt.show()
```



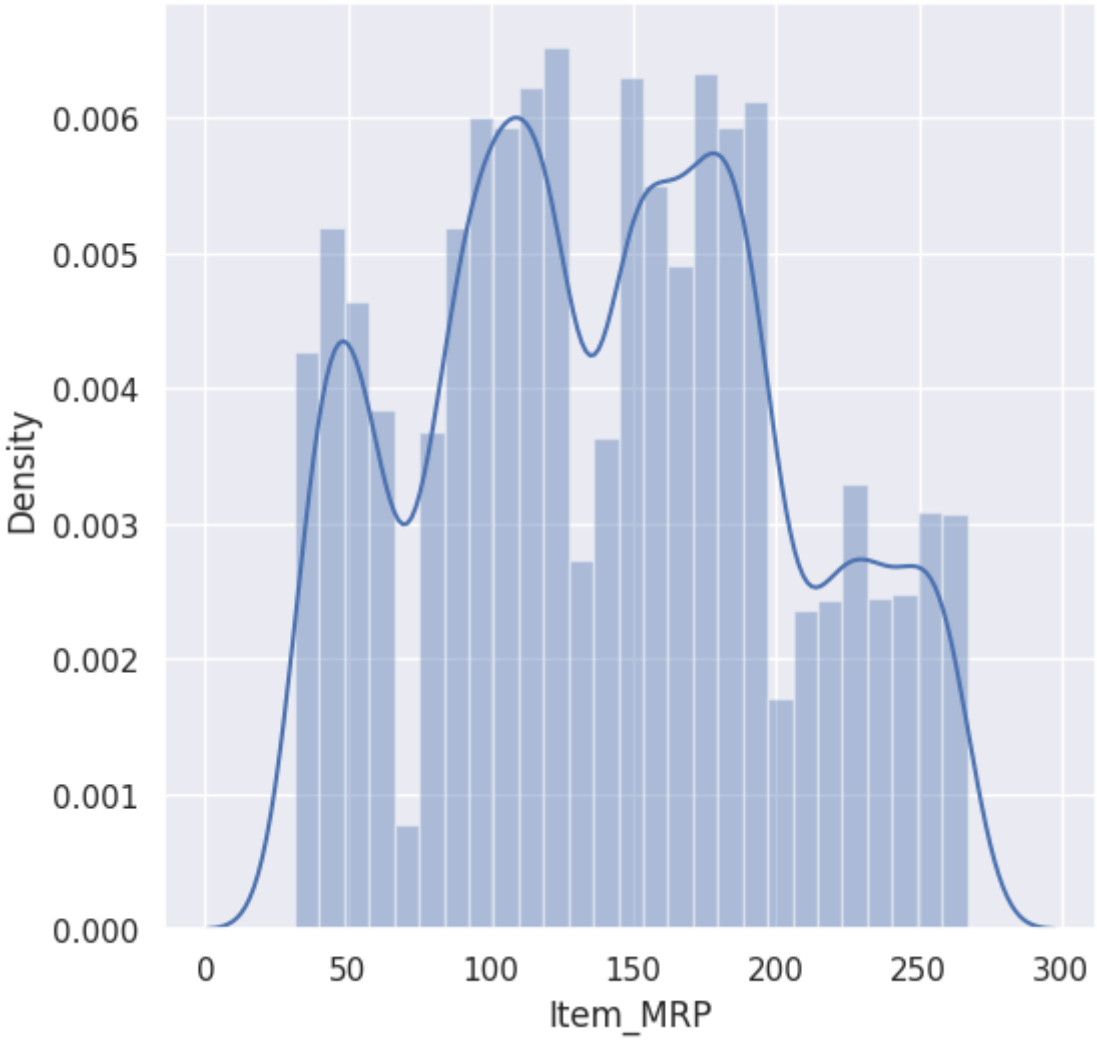
In [1041]:

```
from collections import Counter
cnt = Counter()

for t in df['Item_Visibility'] :
    cnt[t] += 1

cnt.most_common()
```

```
 (0.026676216, 1),
 (0.029380407, 1),
 (0.025715562, 1),
 (0.065026434, 1),
 (0.066315023, 1),
 (0.023664054, 1),
 (0.154627247, 1),
 (0.205294827, 1),
 (0.152261999, 1),
 (0.136275173, 1),
 (0.174621343, 1),
 (0.038597077, 1),
 (0.029799965, 1),
 (0.011314423, 1),
 (0.028118435, 1),
 (0.163350221, 1),
 (0.093307713, 1),
 (0.105994654, 1),
 (0.067055339, 1),
 (0.107376743, 1)
```

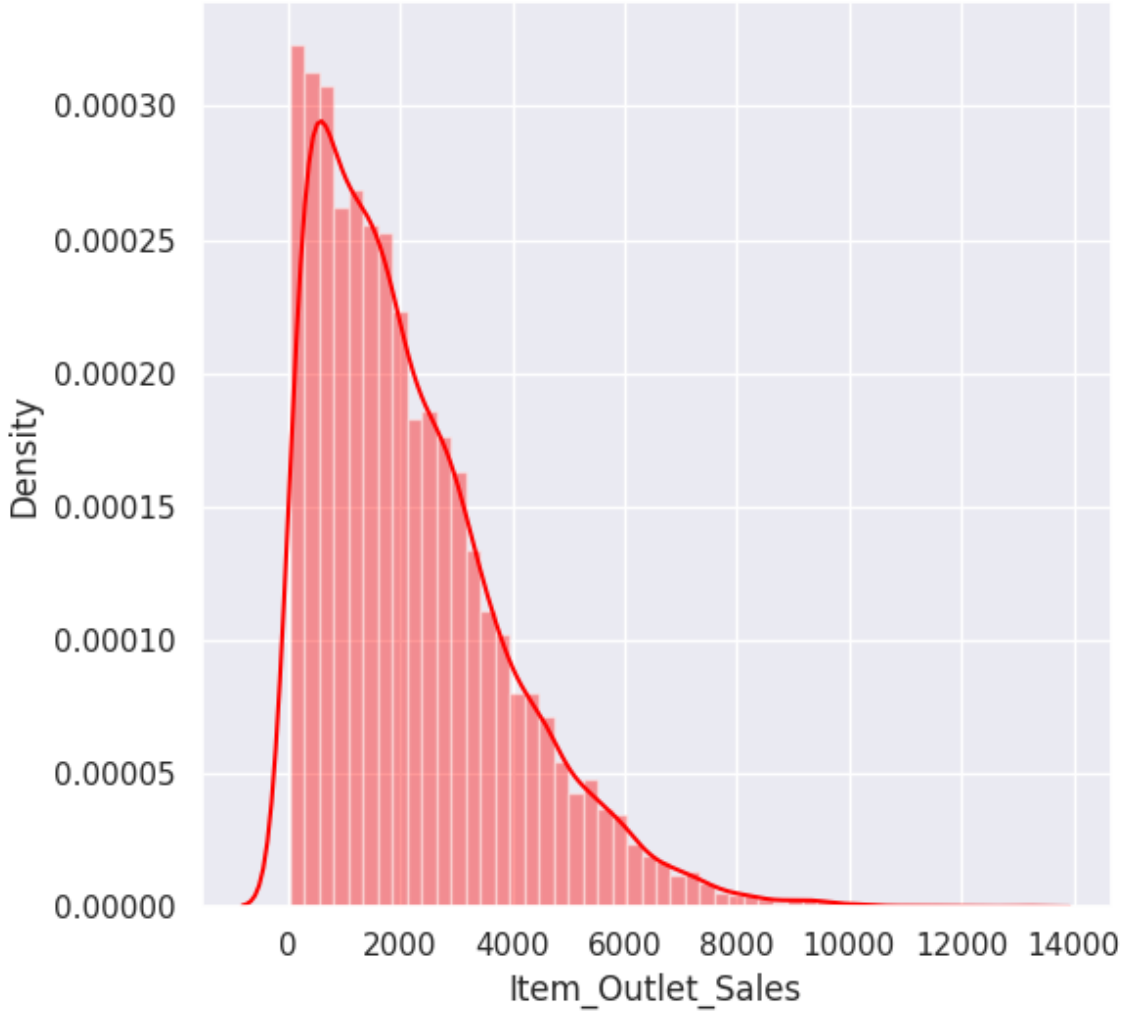
In [1042]:

```
# Item MRP distribution
plt.figure(figsize=(6,6))
sns.distplot(df['Item_MRP'])
plt.show()
```



In [1043]:

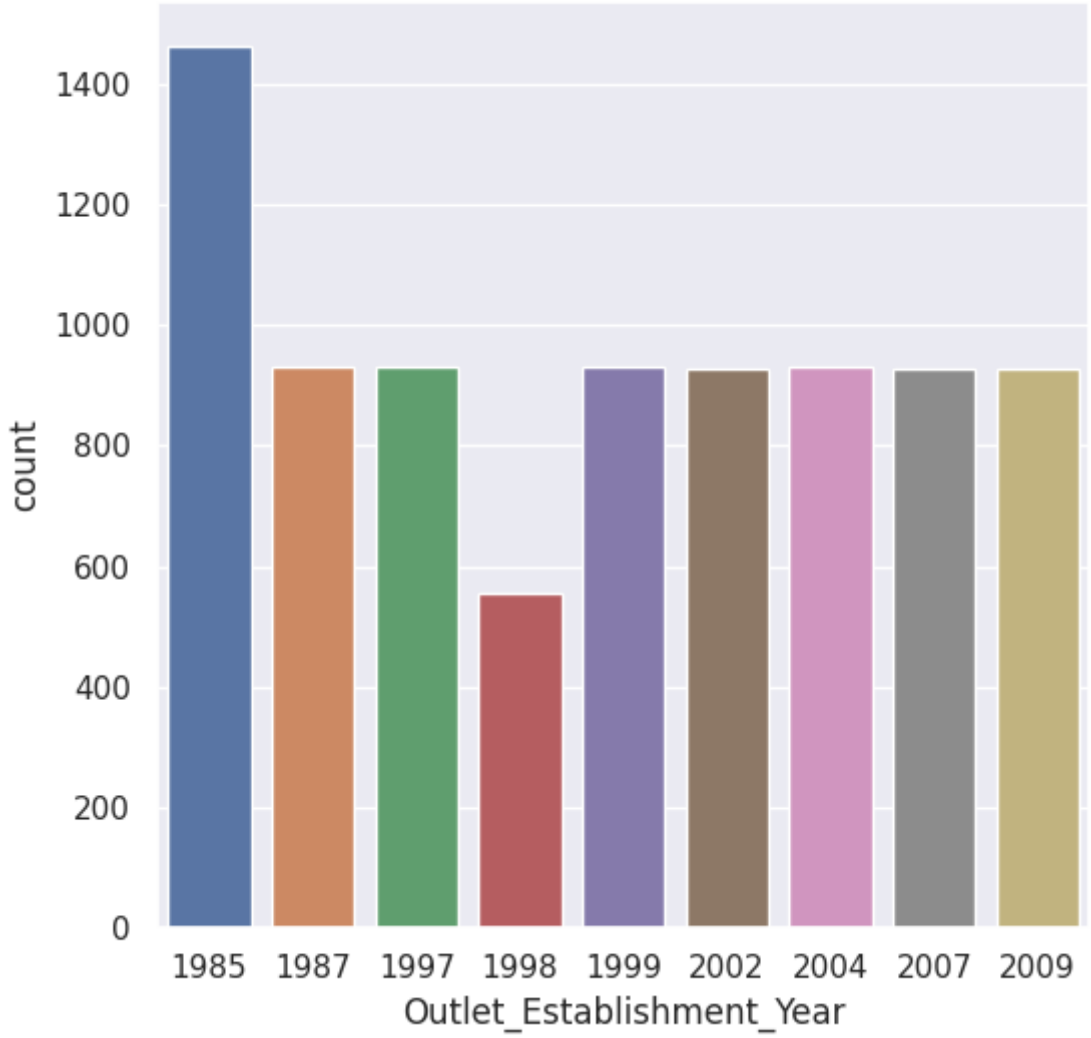
```
# Item_Outlet_Sales distribution
plt.figure(figsize=(6,6))
sns.distplot(df['Item_Outlet_Sales'],color="red")
plt.show()
```



In [ ]:

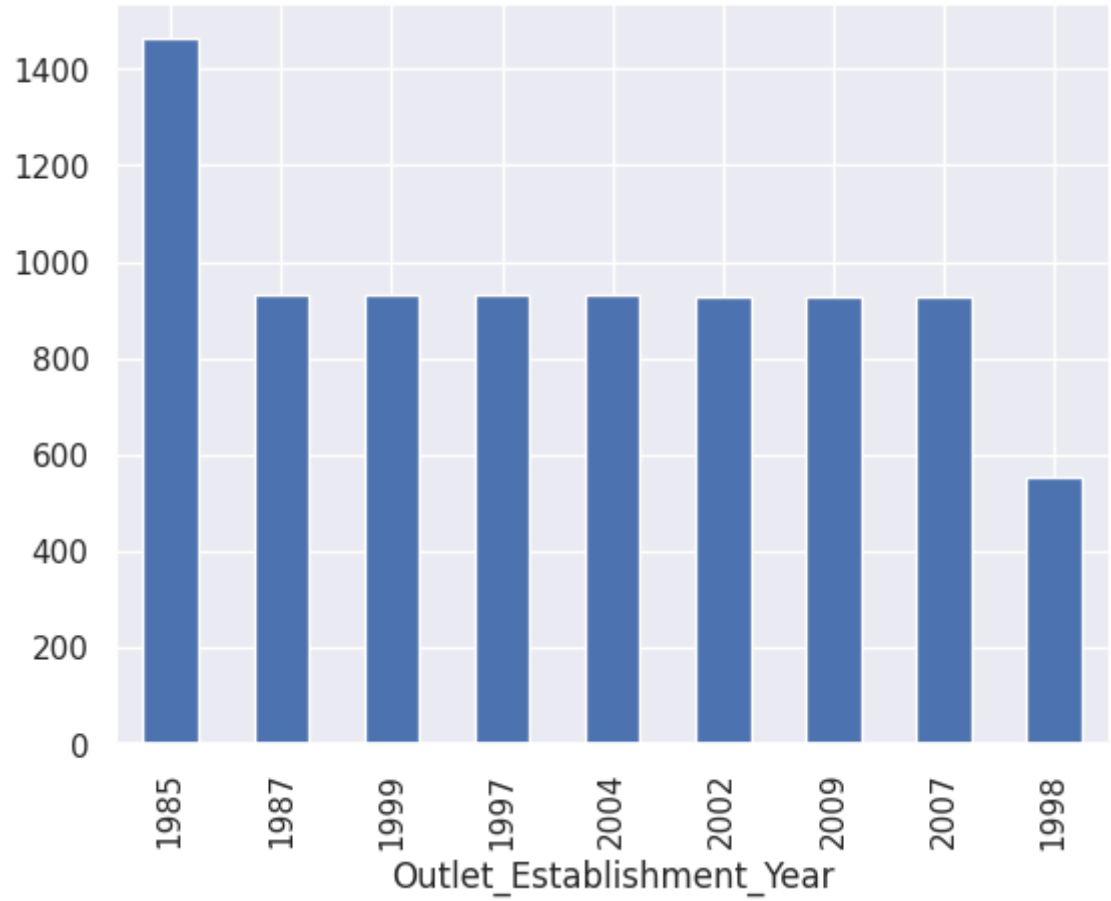
In [1044]:

```
# Outlet_Establishment_Year column
plt.figure(figsize=(6,6))
sns.countplot(x='Outlet_Establishment_Year', data=df)
plt.show()
```



In [1045]:

```
df['Outlet_Establishment_Year'].value_counts().plot(kind='bar')  # highly NOT rec
plt.show()
```



In [1046]:

```
from collections import Counter
cnt = Counter()

for t in df['Outlet_Establishment_Year'] :
    cnt[t] += 1

cnt.most_common()
```

Out[1046]:

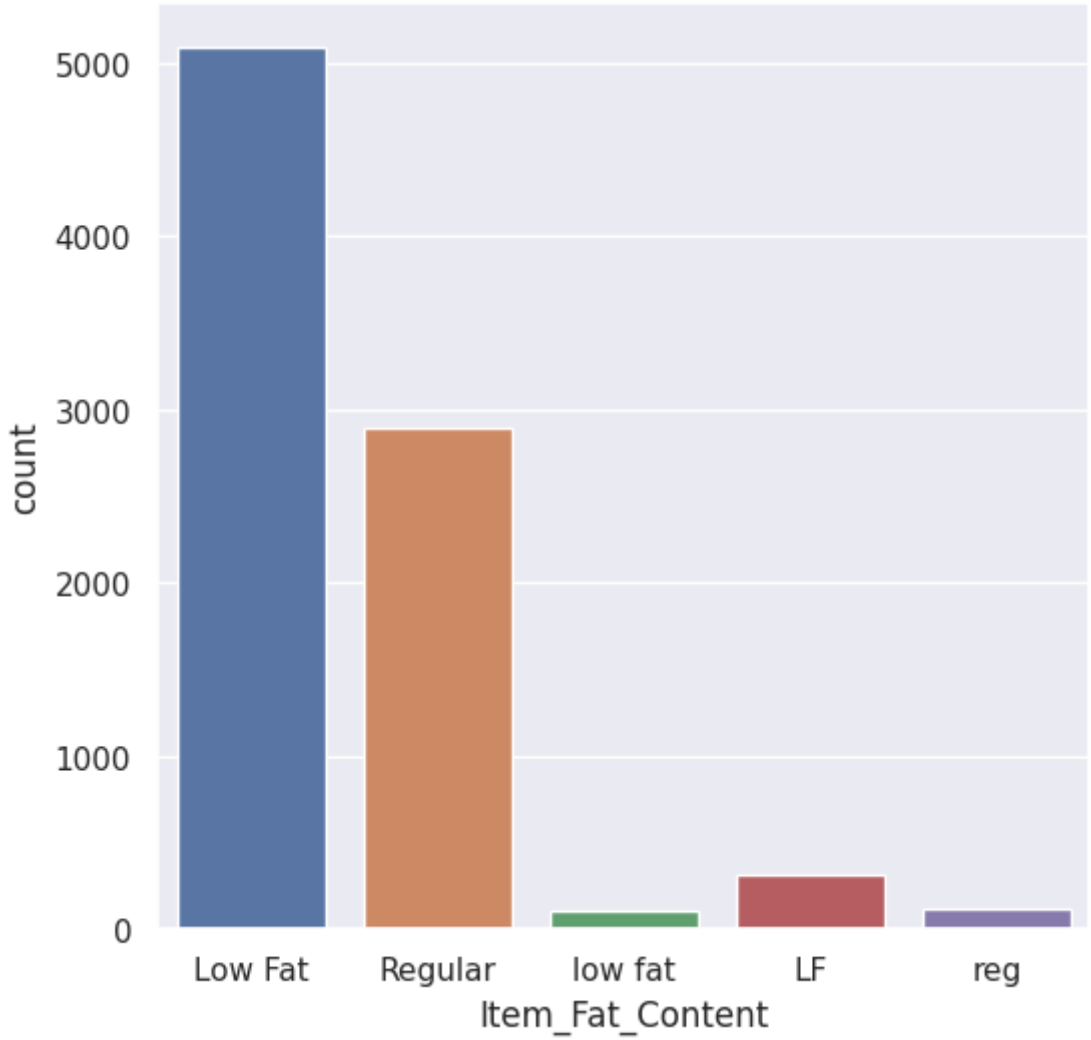
```
[(1985, 1463),
 (1987, 932),
 (1999, 930),
 (1997, 930),
 (2004, 930),
 (2002, 929),
 (2009, 928),
 (2007, 926),
 (1998, 555)]
```

In [ ]:

```
```

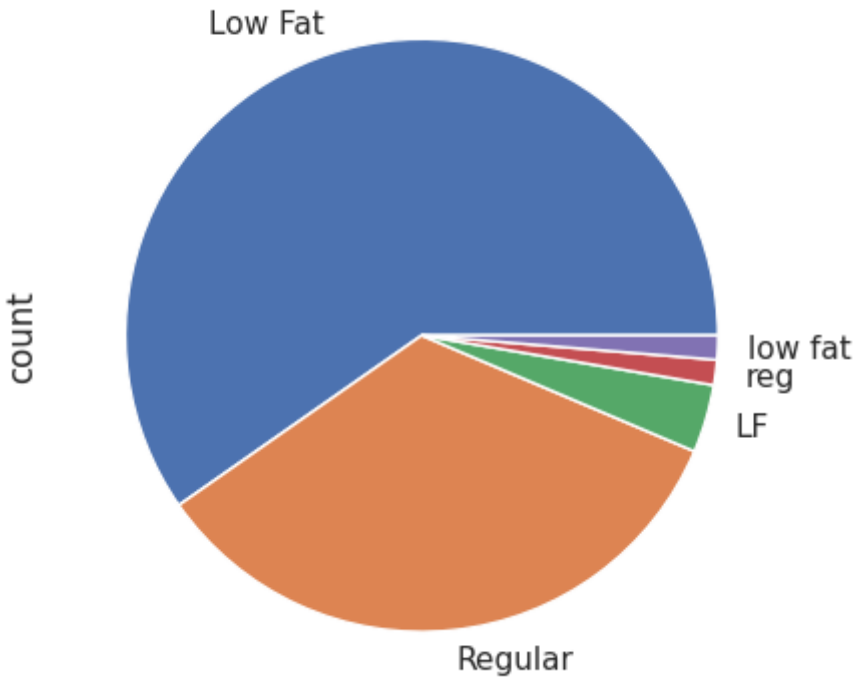
In [1047]:

```
# Item_Fat_Content column
plt.figure(figsize=(6,6))
sns.countplot(x='Item_Fat_Content', data=df)
plt.show()
```



In [1048]:

```
df['Item_Fat_Content'].value_counts().plot(kind='pie')  # highly NOT recommended!
plt.show()
```



In [1049]:

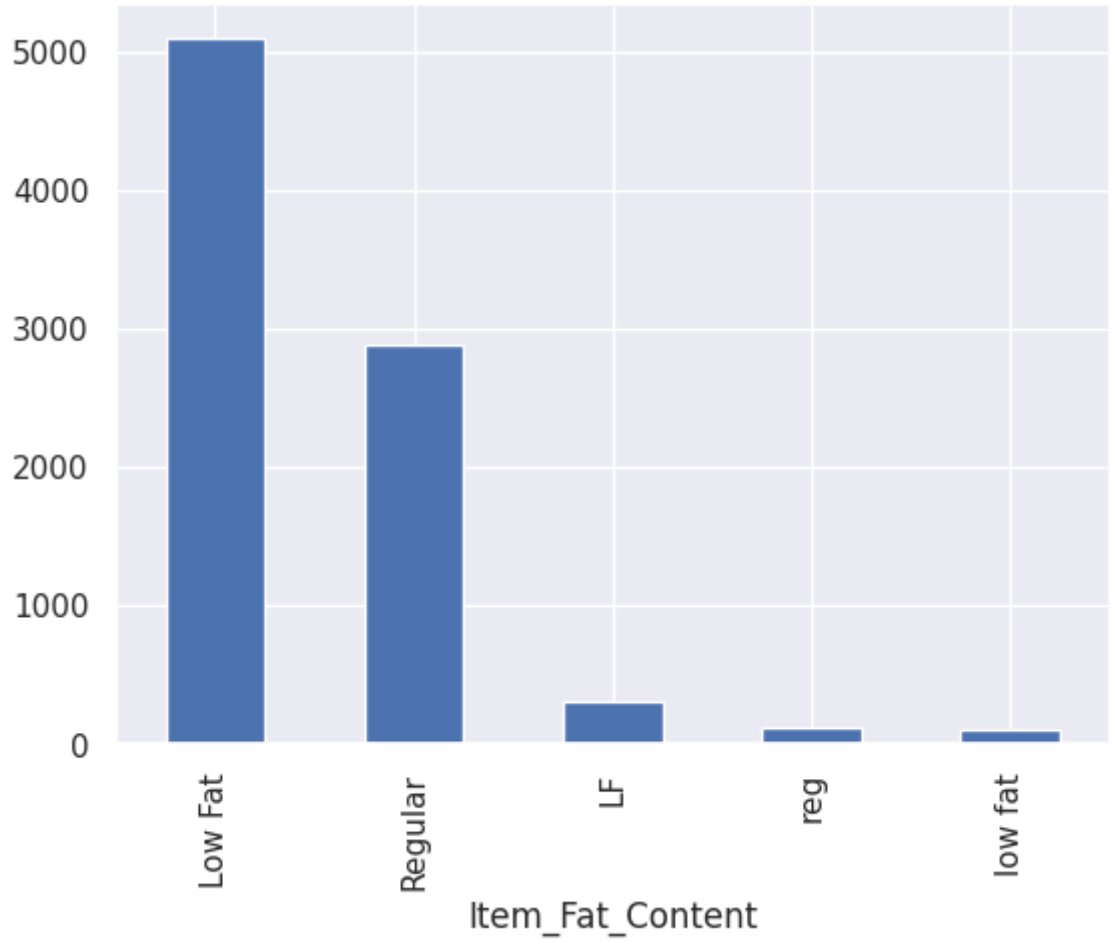
```
from collections import Counter
cnt = Counter()

for t in df['Item_Fat_Content'] :
    cnt[t] += 1

cnt.most_common()
```

Out[1049]:

```
[('Low Fat', 5089),
 ('Regular', 2889),
 ('LF', 316),
 ('reg', 117),
 ('low fat', 112)]
```

In [1050]:

```
df['Item_Fat_Content'].value_counts().plot(kind='bar')  # highly NOT recommended!
plt.show()
```



In [1051]:

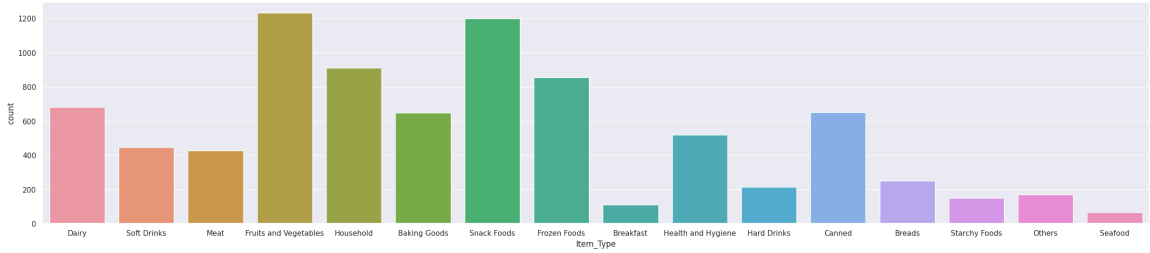
```
from collections import Counter
cnt = Counter()

for t in df['Item_Fat_Content'] :
    cnt[t] += 1

cnt.most_common()
```

Out[1051]:

```
[('Low Fat', 5089),
 ('Regular', 2889),
 ('LF', 316),
 ('reg', 117),
 ('low fat', 112)]
```

In [1052]:

```
# Item_Type column
plt.figure(figsize=(30,6))
sns.countplot(x='Item_Type', data=df)
plt.show()
```



In [1053]:

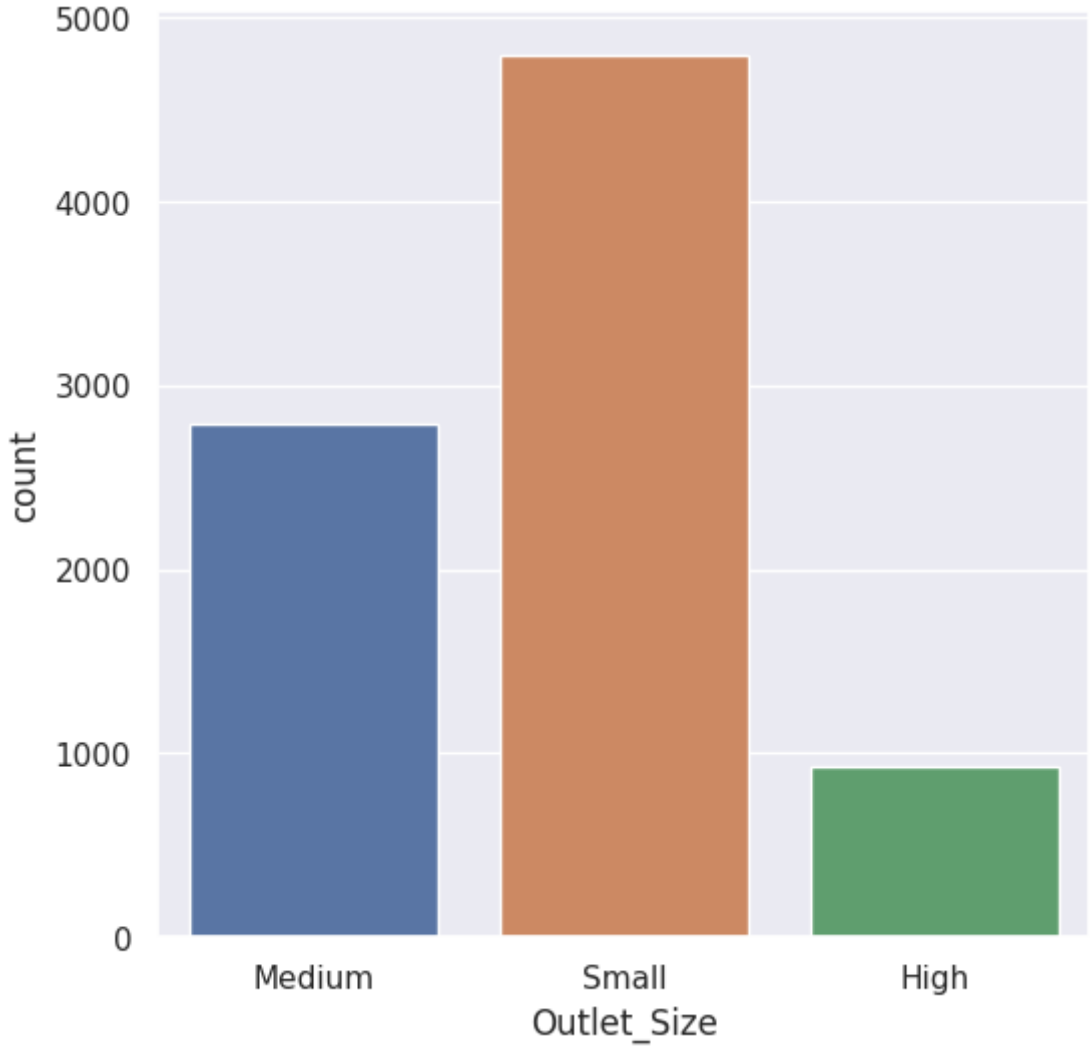
```
from collections import Counter
cnt = Counter()

for t in df['Item_Type'] :
    cnt[t] += 1

cnt.most_common()
```

Out[1053]:

```
[('Fruits and Vegetables', 1232),
 ('Snack Foods', 1200),
 ('Household', 910),
 ('Frozen Foods', 856),
 ('Dairy', 682),
 ('Canned', 649),
 ('Baking Goods', 648),
 ('Health and Hygiene', 520),
 ('Soft Drinks', 445),
 ('Meat', 425),
 ('Breads', 251),
 ('Hard Drinks', 214),
 ('Others', 169),
 ('Starchy Foods', 148),
 ('Breakfast', 110),
 ('Seafood', 64)]
```

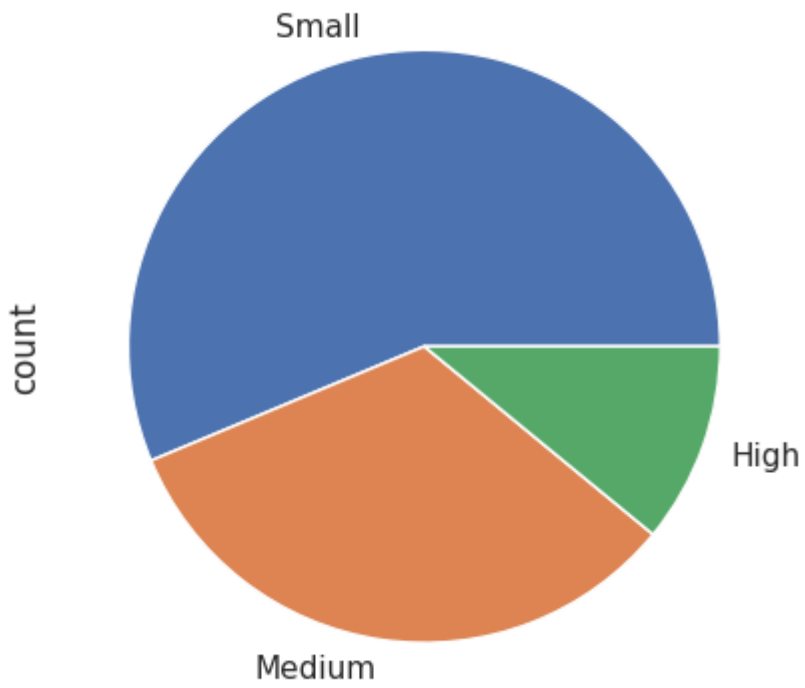
In [1054]:

```
# Outlet_Size column
plt.figure(figsize=(6,6))
sns.countplot(x='Outlet_Size', data=df)
plt.show()
```



In [1055]:

```
df['Outlet_Size'].value_counts().plot(kind='pie')  # highly NOT recommended!
plt.show()
```



In [1056]:

```
from collections import Counter
cnt = Counter()

for t in df['Outlet_Size'] :
    cnt[t] += 1

cnt.most_common()
```

Out[1056]:

```
[('Small', 4798), ('Medium', 2793), ('High', 932)]
```

Data Pre-Processing

In [1057]:

```
df.head()
```

Out[1057]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outle
0	FDA15	9.30	Low Fat	0.016047	Dairy	249.8092	
1	DRC01	5.92	Regular	0.019278	Soft Drinks	48.2692	
2	FDN15	17.50	Low Fat	0.016760	Meat	141.6180	
3	FDX07	19.20	Regular	0.000000	Fruits and Vegetables	182.0950	
4	NCD19	8.93	Low Fat	0.000000	Household	53.8614	

In [1058]:

```
df['Item_Fat_Content'].value_counts()
```

Out[1058]:

```
Item_Fat_Content
Low Fat    5089
Regular    2889
LF          316
reg         117
low fat     112
Name: count, dtype: int64
```

In [1059]:

```
df.replace({'Item_Fat_Content': {'low fat':'Low Fat','LF':'Low Fat', 'reg':'Regula
```

In [1060]:

```
df['Item_Fat_Content'].value_counts()
```

Out[1060]:

```
Item_Fat_Content
Low Fat    5517
Regular    3006
Name: count, dtype: int64
```

Label Encoding

In [1061]:

```
from sklearn.preprocessing import LabelEncoder
```

In [1062]:

```
encoder = LabelEncoder()
```

In [1063]:

```
df['Item_Identifier'] = encoder.fit_transform(df['Item_Identifier'])

df['Item_Fat_Content'] = encoder.fit_transform(df['Item_Fat_Content'])

df['Item_Type'] = encoder.fit_transform(df['Item_Type'])

df['Outlet_Identifier'] = encoder.fit_transform(df['Outlet_Identifier'])

df['Outlet_Size'] = (df['Outlet_Size']).astype(str)

df['Outlet_Size'] = encoder.fit_transform(df['Outlet_Size'])

df['Outlet_Location_Type'] = encoder.fit_transform(df['Outlet_Location_Type'])

df['Outlet_Type'] = encoder.fit_transform(df['Outlet_Type'])
```

In [1064]:

```
df
```

Out[1064]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Ou
0	156	9.300	0	0.016047	4	249.8092	
1	8	5.920	1	0.019278	14	48.2692	
2	662	17.500	0	0.016760	10	141.6180	
3	1121	19.200	1	0.000000	6	182.0950	
4	1297	8.930	0	0.000000	9	53.8614	
...	...	...	...	...	...	...	
8518	370	6.865	0	0.056783	13	214.5218	
8519	897	8.380	1	0.046982	0	108.1570	
8520	1357	10.600	0	0.035186	8	85.1224	
8521	681	7.210	1	0.145221	13	103.1332	
8522	50	14.800	0	0.044878	14	75.4670	

8523 rows × 12 columns

In [1065]:

```
df.head()
```

Out[1065]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet
0	156	9.30	0	0.016047	4	249.8092	
1	8	5.92	1	0.019278	14	48.2692	
2	662	17.50	0	0.016760	10	141.6180	
3	1121	19.20	1	0.000000	6	182.0950	
4	1297	8.93	0	0.000000	9	53.8614	

Splitting features and Target

In [ ]:

```

```

In [1098]:

```
X = df.drop(columns='Item_Outlet_Sales', axis=1)
Y = df['Item_Outlet_Sales']
```

In [1099]:

```
X
```

Out[1099]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Ou
0	156	9.300	0	0.016047	4	249.8092	
1	8	5.920	1	0.019278	14	48.2692	
2	662	17.500	0	0.016760	10	141.6180	
3	1121	19.200	1	0.000000	6	182.0950	
4	1297	8.930	0	0.000000	9	53.8614	
...	...	...	...	...	...	...	
8518	370	6.865	0	0.056783	13	214.5218	
8519	897	8.380	1	0.046982	0	108.1570	
8520	1357	10.600	0	0.035186	8	85.1224	
8521	681	7.210	1	0.145221	13	103.1332	
8522	50	14.800	0	0.044878	14	75.4670	

8523 rows × 11 columns

In [1100]:

```
X.head(10)
```

Out[1100]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet
0	156	9.300000	0	0.016047	4	249.8092	
1	8	5.920000	1	0.019278	14	48.2692	
2	662	17.500000	0	0.016760	10	141.6180	
3	1121	19.200000	1	0.000000	6	182.0950	
4	1297	8.930000	0	0.000000	9	53.8614	
5	758	10.395000	1	0.000000	0	51.4008	
6	696	13.650000	1	0.012741	13	57.6588	
7	738	12.857645	0	0.127470	13	107.7622	
8	440	16.200000	1	0.016687	5	96.9726	
9	990	19.200000	1	0.094450	5	187.8214	

In [1101]:

```
X.tail(10)
```

Out[1101]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Ou
8513	449	12.000	1	0.020407	10	99.9042	
8514	145	15.000	1	0.054489	3	57.5904	
8515	445	20.700	0	0.021518	0	157.5288	
8516	1356	18.600	0	0.118661	11	58.7588	
8517	389	20.750	1	0.083607	5	178.8318	
8518	370	6.865	0	0.056783	13	214.5218	
8519	897	8.380	1	0.046982	0	108.1570	
8520	1357	10.600	0	0.035186	8	85.1224	
8521	681	7.210	1	0.145221	13	103.1332	
8522	50	14.800	0	0.044878	14	75.4670	

In [1102]:

```
X[4500:4510]
```

Out[1102]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Ou
4500	987	12.350000	0	0.026832	3	57.3246	
4501	1506	9.000000	0	0.019617	9	169.6474	
4502	443	10.395000	0	0.052264	12	158.4604	
4503	137	10.195000	0	0.112203	7	111.7860	
4504	264	12.857645	0	0.171761	6	115.7518	
4505	1381	9.695000	0	0.114171	8	158.9604	
4506	610	19.350000	1	0.082266	0	48.8034	
4507	519	16.700000	1	0.038685	13	146.6102	
4508	950	5.985000	0	0.095795	5	128.4678	
4509	1301	8.850000	0	0.026814	9	103.7964	

In [1103]:

```
Y
```

Out[1103]:

```
0       3735.1380
1        443.4228
2       2097.2700
3        732.3800
4        994.7052
           ...
8518    2778.3834
8519     549.2850
8520    1193.1136
8521    1845.5976
8522     765.6700
Name: Item_Outlet_Sales, Length: 8523, dtype: float64
```

In [1104]:

```
Y.head(10)
```

Out[1104]:

```
0    3735.1380
1     443.4228
2    2097.2700
3     732.3800
4     994.7052
5     556.6088
6     343.5528
7    4022.7636
8    1076.5986
9    4710.5350
Name: Item_Outlet_Sales, dtype: float64
```

In [1105]:

```
Y.tail(10)
```

Out[1105]:

```
8513     595.2252
8514     468.7232
8515    1571.2880
8516     858.8820
8517    3608.6360
8518    2778.3834
8519     549.2850
8520    1193.1136
8521    1845.5976
8522     765.6700
Name: Item_Outlet_Sales, dtype: float64
```

In [1106]:

```
Y[4500:4510]
```

Out[1106]:

```
4500    1332.2658
4501    2526.7110
4502     158.4604
4503    1697.7900
4504    5351.0346
4505    1743.0644
4506     340.2238
4507    2770.3938
4508     508.6712
4509     210.3928
Name: Item_Outlet_Sales, dtype: float64
```

Splitting the data into Training data & Testing Data

In [1107]:

```
from sklearn.model_selection import train_test_split
```

In [1076]:

```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, random_st
```

In [1077]:

```
print(X.shape, X_train.shape, X_test.shape)
```

```
(8523, 11) (6818, 11) (1705, 11)
```

Machine Learning Model Training

In [1108]:

```
from xgboost import XGBRegressor, XGBClassifier
```

XGBoost Regressor

In [1109]:

```
print(X.shape, X_train.shape, X_test.shape)
```

```
(8523, 11) (6818, 11) (1705, 11)
```

In [1110]:

```
regressor = XGBRegressor()
```

In [1111]:

```
regressor.fit(X_train, Y_train)
```

Out[1111]:

```
XGBRegressor(base_score=None, booster=None, callbacks=None,
             colsample_bylevel=None, colsample_bynode=None,
             colsample_bytree=None, early_stopping_rounds=None,
             enable_categorical=False, eval_metric=None, feature_
types=None,
             gamma=None, gpu_id=None, grow_policy=None, importanc
e_type=None,
             interaction_constraints=None, learning_rate=None, ma
x_bin=None,
             max_cat_threshold=None, max_cat_to_onehot=None,
```

Evaluation

In [1112]:

```
# prediction on training data
training_data_prediction = regressor.predict(X_train)
```

Metrics : quantifying the quality of predictions

In [1115]:

```
from sklearn import metrics
```

In [1116]:

```
# R squared Value
r2_train = metrics.r2_score(Y_train, training_data_prediction)
print("R-Squared:", r2)
```

R-Squared: 0.8596212466140883

In [1117]:

```
mae = metrics.mean_absolute_error(Y_train, training_data_prediction)
print("MAE:",mae)
```

MAE: 464.67462940512064

In [1118]:

```
mse = metrics.mean_squared_error(Y_train, training_data_prediction)
print("MSE:", mse)
```

MSE: 415247.40456803684

In [1119]:

```
rmse = np.sqrt(mse) # or mse**(0.5)
print("R-Squared:", rmse)
```

R-Squared: 644.3969309114041

In [1120]:

```
r2 = metrics.r2_score(Y_train, training_data_prediction)
print("RMSE:", rmse)
```

RMSE: 644.3969309114041

Testing Data

In [1121]:

```
# prediction on test data
test_data_prediction = regressor.predict(X_test)
```

In [1122]:

```
mae = metrics.mean_absolute_error(Y_test, test_data_prediction)
print("MAE:",mae)
```

MAE: 786.9180486407753

In [1123]:

```
mse = metrics.mean_squared_error(Y_test, test_data_prediction)
print("MSE:", mse)
```

MSE: 1279131.4395240077

In [1124]:

```
rmse = np.sqrt(mse) # or mse**(0.5)
print("RMSE:", rmse)
```

```
RMSE: 1130.9869316327256
```

In [1125]:

```
r2 = metrics.r2_score(Y_test, test_data_prediction)
print("R-Squared:", r2)
```

```
R-Squared: 0.5293798650563337
```

In [ ]:

```

```

In [ ]:

```

```