```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from xgboost import XGBRegressor
from sklearn import metrics


data=pd.read_csv('Train.csv')


data.head()
```

| | Item_Identifier | Item_Weight | Item_Fat_Content | Item_Visibility | Item_Type | Item_MRP | Outlet_Identifier | Outlet_Establishment_Year | O |
|---|---|---|---|---|---|---|---|---|---|
| **0** | FDA15 | 9.30 | Low Fat | 0.016047 | Dairy | 249.8092 | OUT049 | 1999 | |
| **1** | DRC01 | 5.92 | Regular | 0.019278 | Soft Drinks | 48.2692 | OUT018 | 2009 | |
| **2** | FDN15 | 17.50 | Low Fat | 0.016760 | Meat | 141.6180 | OUT049 | 1999 | |
| **3** | FDX07 | 19.20 | Regular | 0.000000 | Fruits and Vegetables | 182.0950 | OUT010 | 1998 | |
| **4** | NCD19 | 8.93 | Low Fat | 0.000000 | Household | 53.8614 | OUT013 | 1987 | |

Next steps: Generate code with `data` View recommended plots

```
# number of points and number of features
data.shape
```

```
(8523, 12)
```

```
# getting  some information about dataset
data.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
```

## Categorical features

1. Item_Identifier
2. Item_Fat_Content
3. Item_Type
4. Outlet_Identifier
5. Outlet_Size
6. Outlet_Location_Type
7. Outlet_Type

## Numerical features

1. Item_Weight
2. Item_Visibility
3. Item_MRP
4. Outlet_Establishment_Year
5. Item_Outlet_Sales

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

```
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
```

```
# mean value of "item Weight" column
data['Item_Weight'].mean()
```

```
12.857645184135976
```

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

```
data['Outlet_Size'].mode()
```

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

```
# filling the missing in outlet size column with mode
mode_of_Outlet_size = data.pivot_table(values='Outlet_Size', columns='Outlet_Type', aggfunc=(lambda x: x.mode()[0]))
```

```
print(mode_of_Outlet_size)
```

```
Outlet_Type Grocery Store Supermarket Type1 Supermarket Type2  \
Outlet_Size         Small             Small            Medium

Outlet_Type Supermarket Type3
Outlet_Size            Medium
```

```
miss_values = data['Outlet_Size'].isnull()
```

```
print(miss_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
```

```
data.loc[miss_values, 'Outlet_Size'] = data.loc[miss_values,'Outlet_Type'].apply(lambda x: mode_of_Outlet_size[x])
```

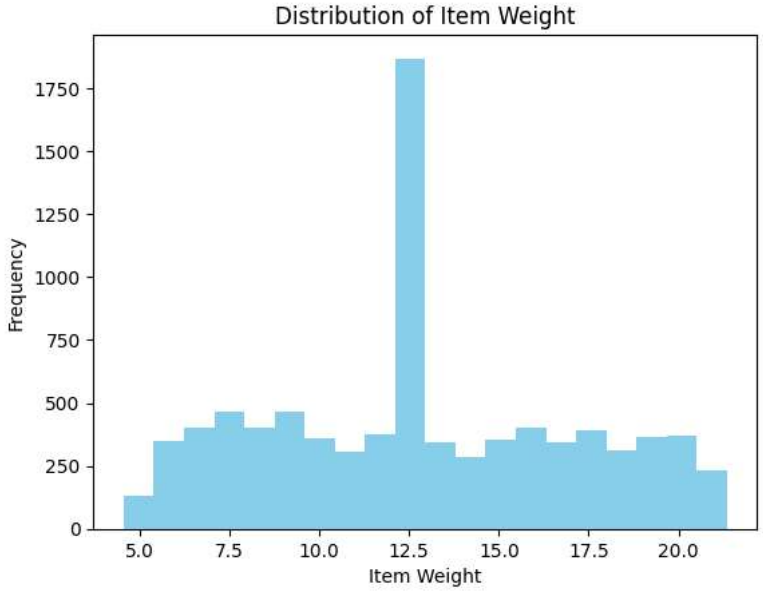
```
data.isnull().sum()
```

```
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
```

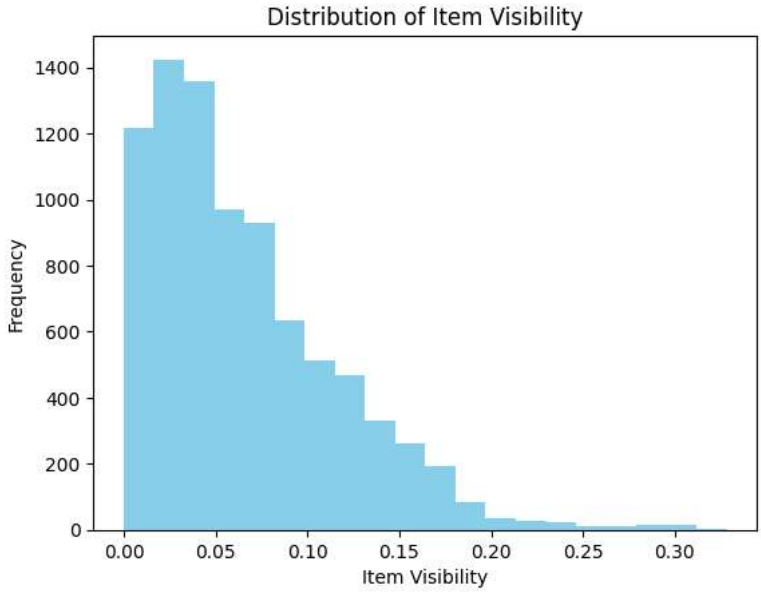
```
data.describe()
```

| | 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 |

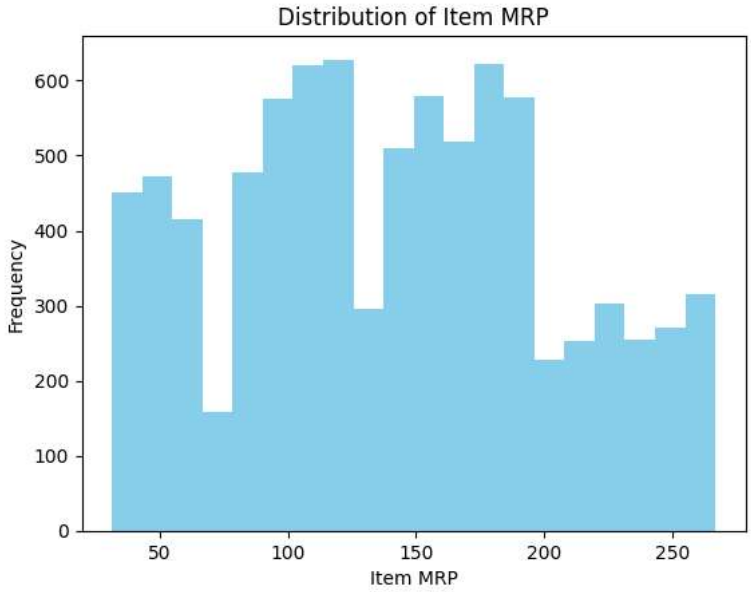
```
# Create histogram for Item_Weight
plt.hist(data['Item_Weight'], bins=20, color='skyblue')
plt.xlabel('Item Weight')
plt.ylabel('Frequency')
plt.title('Distribution of Item Weight')
plt.show()
```




```
# Create histogram for Item_Visibility
plt.hist(data['Item_Visibility'], bins=20, color='skyblue')
plt.xlabel('Item Visibility')
plt.ylabel('Frequency')
plt.title('Distribution of Item Visibility')
plt.show()
```

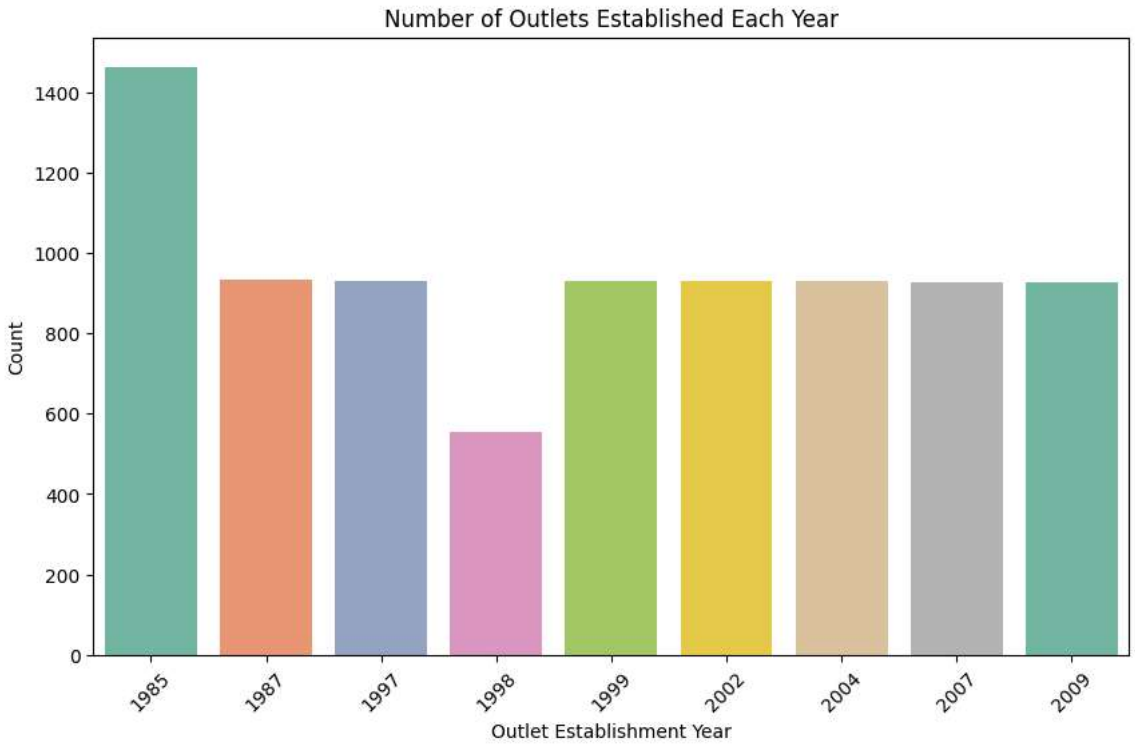



```
# Create histogram for Item_MRP
plt.hist(data['Item_MRP'], bins=20, color='skyblue')
plt.xlabel('Item MRP')
plt.ylabel('Frequency')
plt.title('Distribution of Item MRP')
plt.show()
```

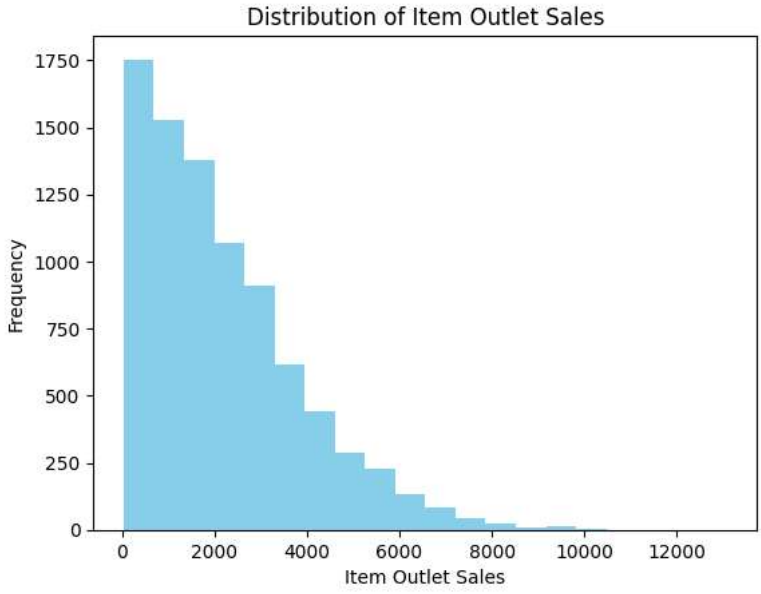



```
plt.figure(figsize=(10, 6))
sns.countplot(data=data, x='Outlet_Establishment_Year', palette='Set2')
plt.xlabel('Outlet Establishment Year')
plt.ylabel('Count')
plt.title('Number of Outlets Established Each Year')
plt.xticks(rotation=45)
plt.show()
```

```
<ipython-input-51-b82c1d7f94c3>:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legen

  sns.countplot(data=data, x='Outlet_Establishment_Year', palette='Set2')
```

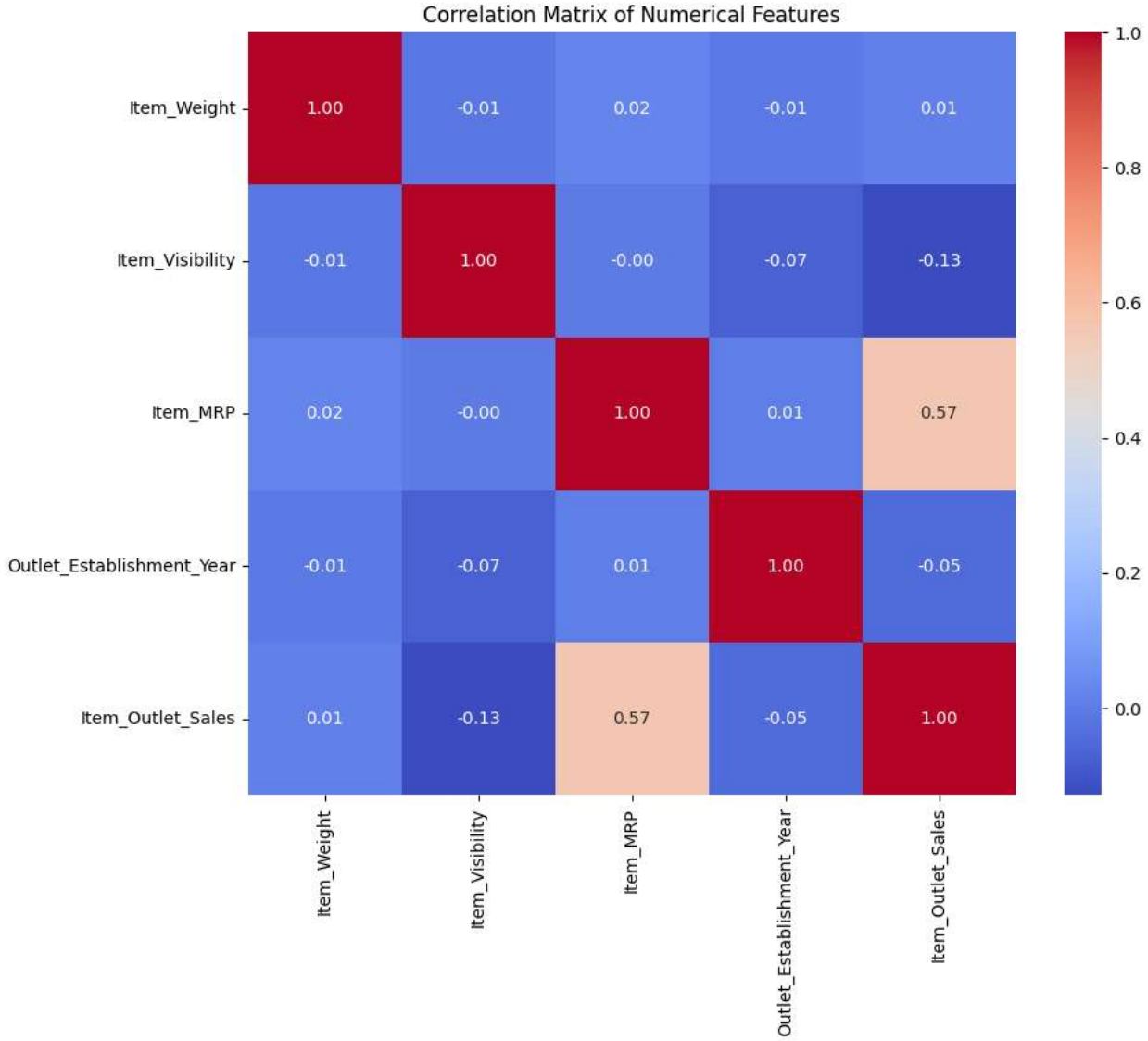



```
plt.hist(data['Item_Outlet_Sales'], bins=20, color='skyblue')
plt.xlabel('Item Outlet Sales')
plt.ylabel('Frequency')
plt.title('Distribution of Item Outlet Sales')
plt.show()
```

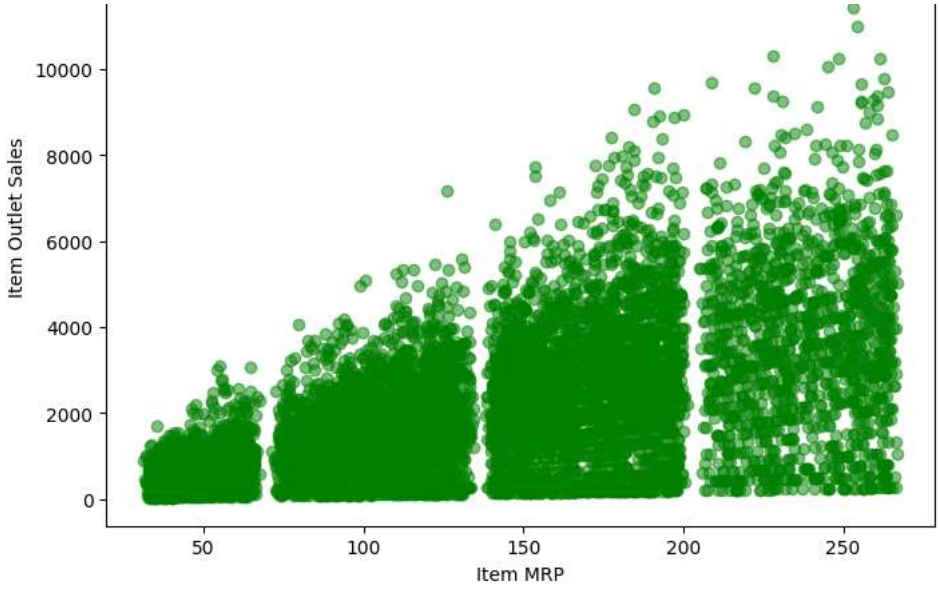


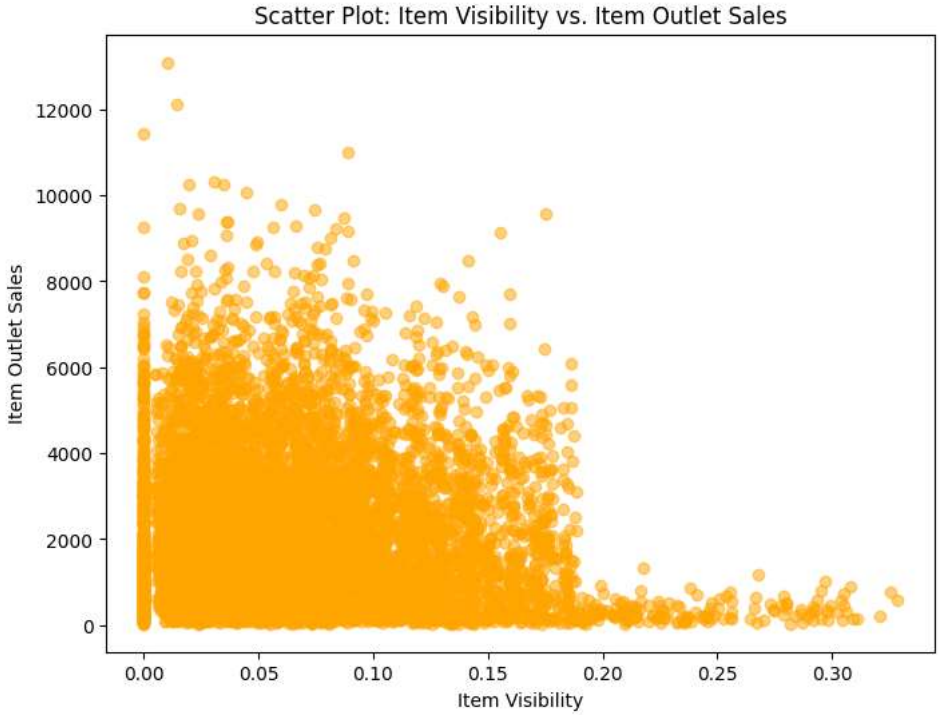

```
corr_matrix = data.corr()

# Plot heatmap
plt.figure(figsize=(10, 8))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', fmt=".2f")
plt.title('Correlation Matrix of Numerical Features')
plt.show()
```

```
<ipython-input-53-012006afef41>:1: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a future versio
  corr_matrix = data.corr()
```

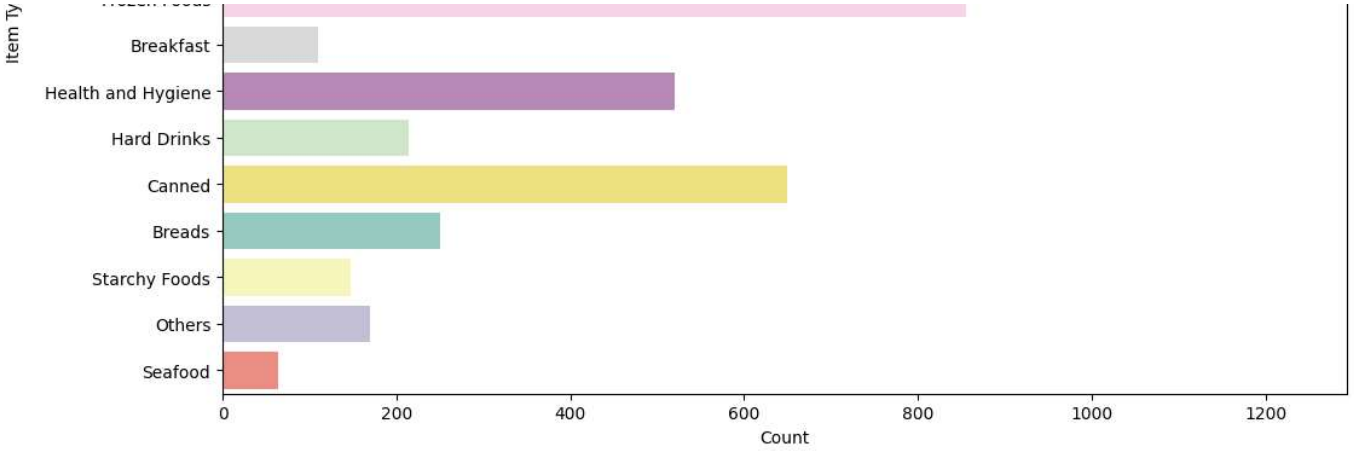



```
# Scatter plot: Item_Weight vs. Item_Outlet_Sales
plt.figure(figsize=(8, 6))
plt.scatter(data['Item_Weight'], data['Item_Outlet_Sales'], alpha=0.5, color='skyblue')
plt.xlabel('Item Weight')
plt.ylabel('Item Outlet Sales')
plt.title('Scatter Plot: Item Weight vs. Item Outlet Sales')
plt.show()

# Scatter plot: Item_MRP vs. Item_Outlet_Sales
plt.figure(figsize=(8, 6))
plt.scatter(data['Item_MRP'], data['Item_Outlet_Sales'], alpha=0.5, color='green')
plt.xlabel('Item MRP')
plt.ylabel('Item Outlet Sales')
plt.title('Scatter Plot: Item MRP vs. Item Outlet Sales')
plt.show()

# Scatter plot: Item_Visibility vs. Item_Outlet_Sales
plt.figure(figsize=(8, 6))
plt.scatter(data['Item_Visibility'], data['Item_Outlet_Sales'], alpha=0.5, color='orange')
plt.xlabel('Item Visibility')
plt.ylabel('Item Outlet Sales')
plt.title('Scatter Plot: Item Visibility vs. Item Outlet Sales')
plt.show()
```

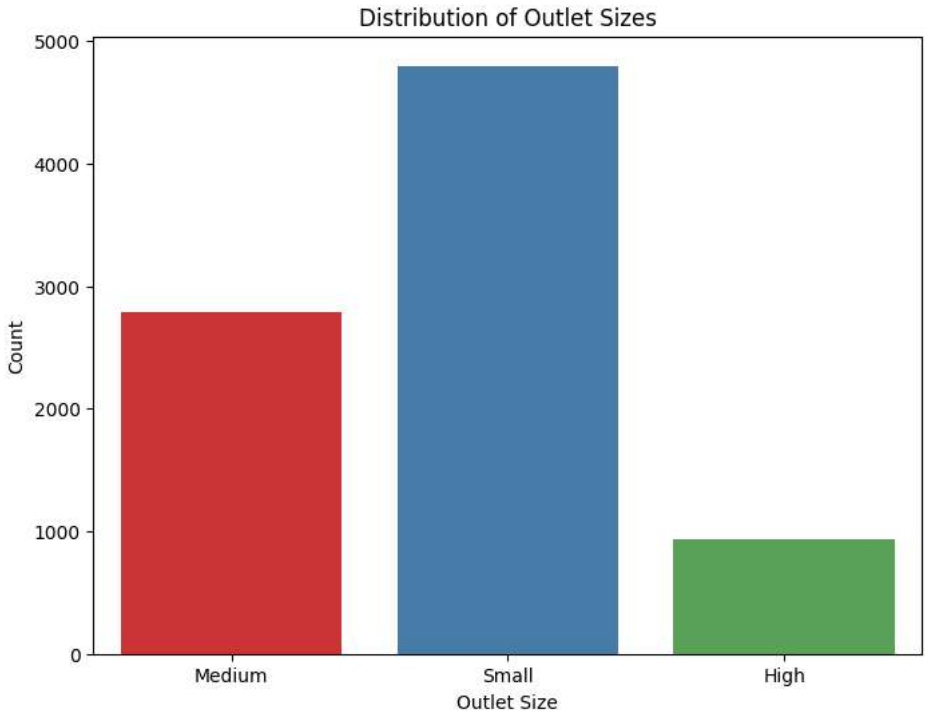

Item Outlet Sales
Item MRP
0
2000
4000
6000
8000
10000
50
100
150
200
250


Scatter Plot: Item Visibility vs. Item Outlet Sales
Item Outlet Sales
Item Visibility
0
2000
4000
6000
8000
10000
12000
0.00
0.05
0.10
0.15
0.20
0.25
0.30

```
# Create count plot for Item_Fat_Content
plt.figure(figsize=(8, 6))
sns.countplot(data=data, x='Item_Fat_Content', palette='Set2')
plt.xlabel('Item Fat Content')
plt.ylabel('Count')
plt.title('Distribution of Item Fat Content')
plt.show()

# Create count plot for Item_Type
plt.figure(figsize=(12, 8))
sns.countplot(data=data, y='Item_Type', palette='Set3')
plt.xlabel('Count')
plt.ylabel('Item Type')
plt.title('Distribution of Item Types')
plt.show()

# Create count plot for Outlet_Size
plt.figure(figsize=(8, 6))
sns.countplot(data=data, x='Outlet_Size', palette='Set1')
plt.xlabel('Outlet Size')
plt.ylabel('Count')
plt.title('Distribution of Outlet Sizes')
plt.show()
```

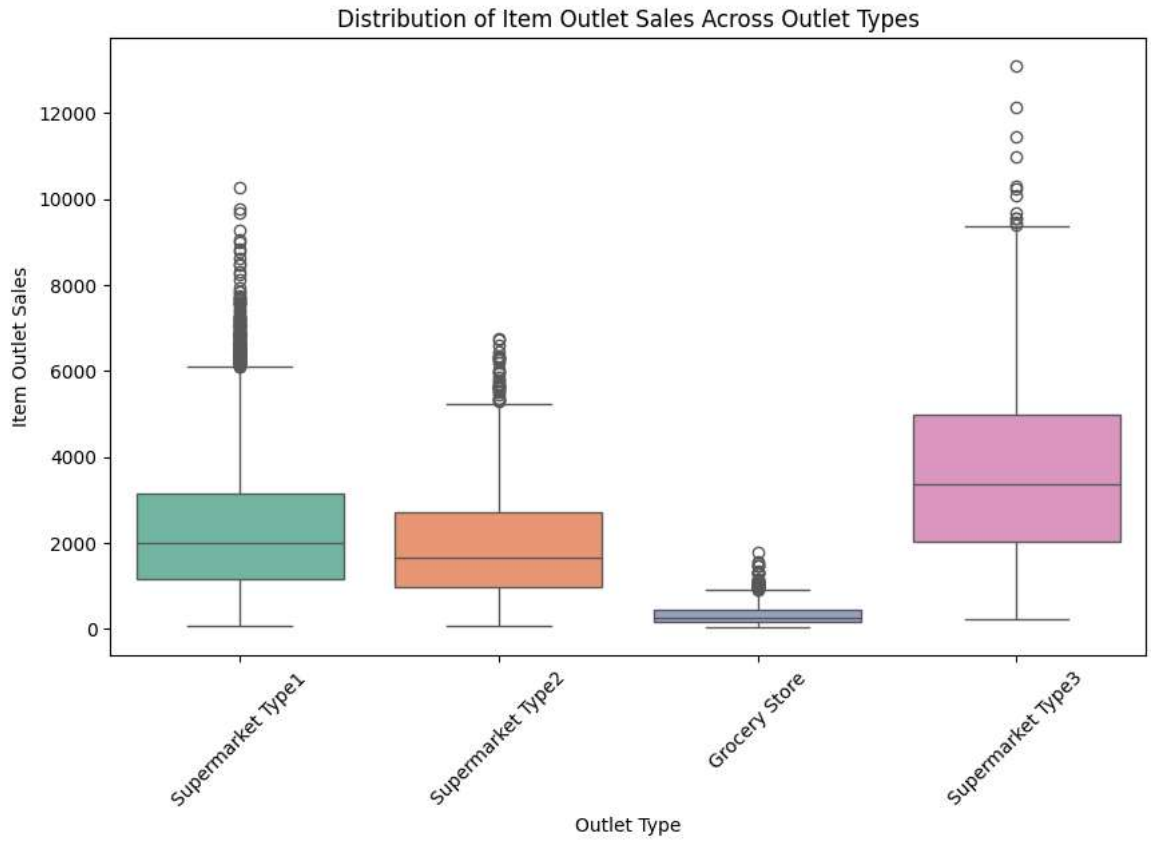



```
<ipython-input-55-904d7413c385>:19: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `leg

  sns.countplot(data=data, x='Outlet_Size', palette='Set1')
```



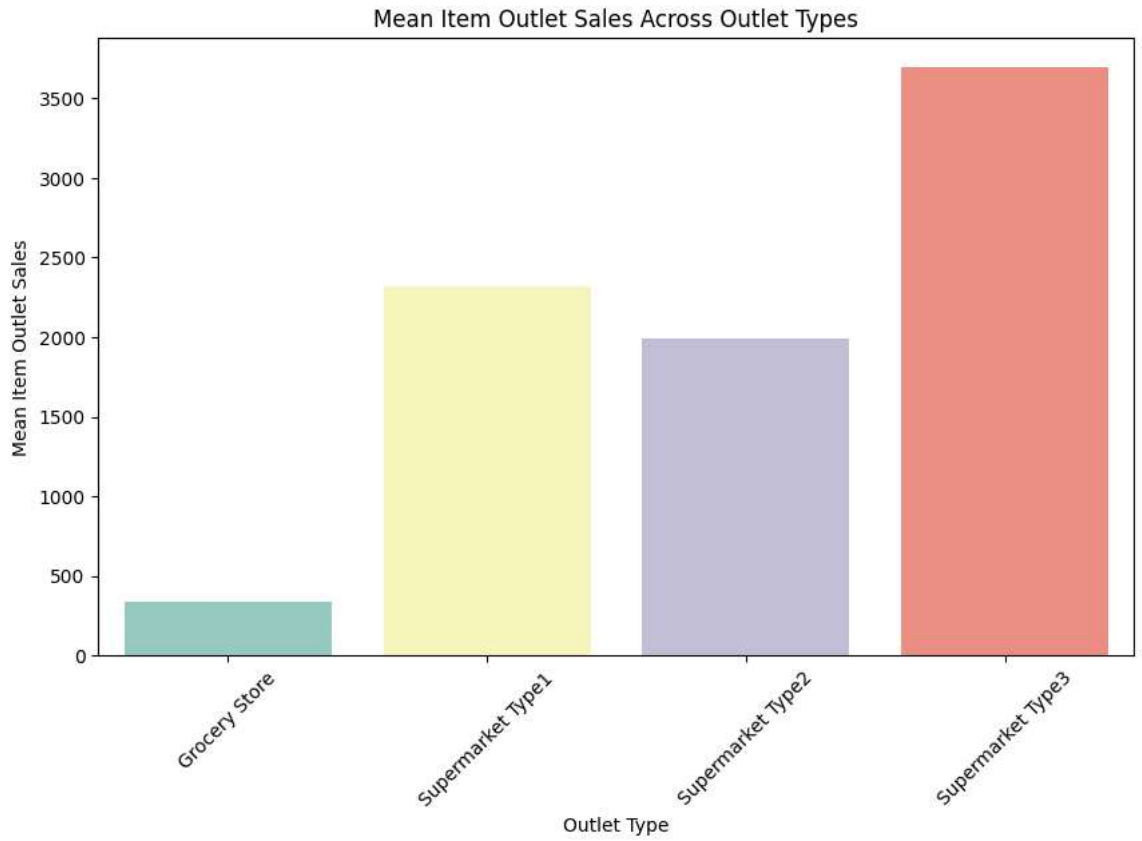
```
plt.figure(figsize=(10, 6))
sns.boxplot(data=data, x='Outlet_Type', y='Item_Outlet_Sales', palette='Set2')
plt.xlabel('Outlet Type')
plt.ylabel('Item Outlet Sales')
plt.title('Distribution of Item Outlet Sales Across Outlet Types')
plt.xticks(rotation=45)
plt.show()
```

```
<ipython-input-56-bfda9d2c98ae>:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legen

  sns.boxplot(data=data, x='Outlet_Type', y='Item_Outlet_Sales', palette='Set2')
```



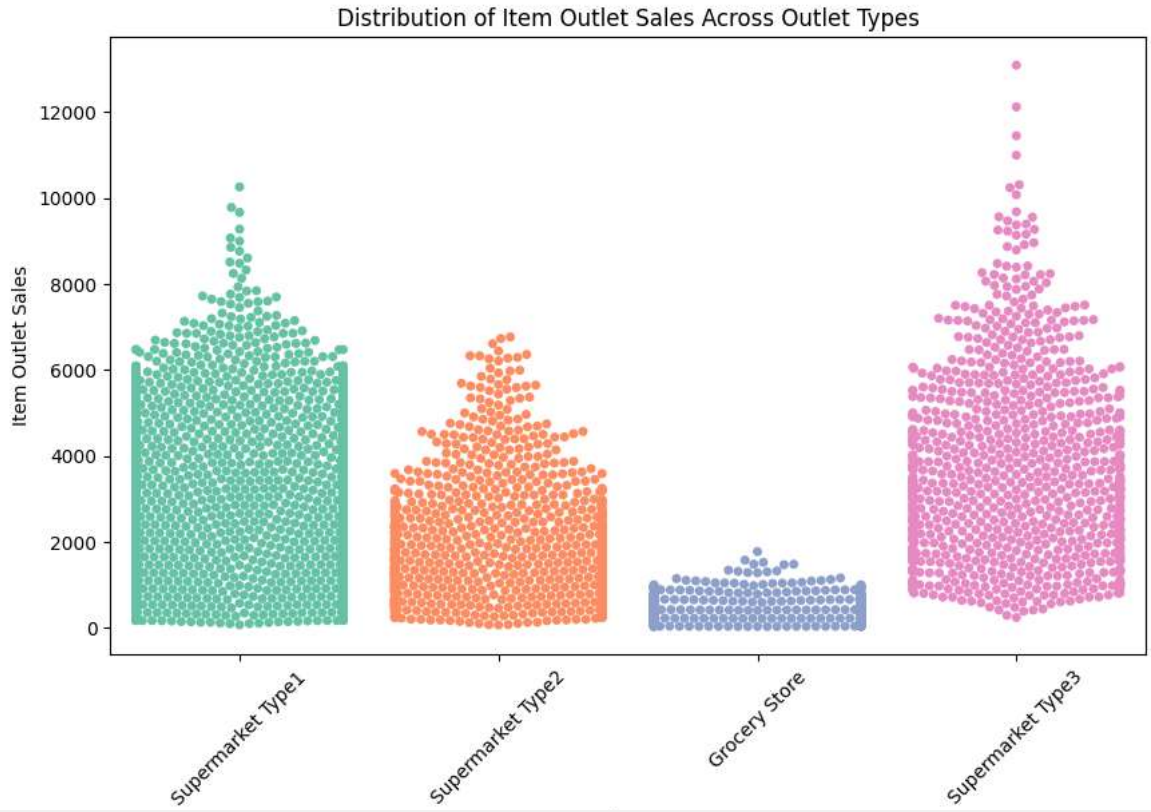

```
# Calculate mean Item_Outlet_Sales for each Outlet_Type
sales_by_outlet_type = data.groupby('Outlet_Type')['Item_Outlet_Sales'].mean().reset_index()

# Create grouped bar plot
plt.figure(figsize=(10, 6))
sns.barplot(data=sales_by_outlet_type, x='Outlet_Type', y='Item_Outlet_Sales', palette='Set3')
plt.xlabel('Outlet Type')
plt.ylabel('Mean Item Outlet Sales')
plt.title('Mean Item Outlet Sales Across Outlet Types')
plt.xticks(rotation=45)
plt.show()
```

```
<ipython-input-57-d218b788f2a3>:6: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legen

  sns.barplot(data=sales_by_outlet_type, x='Outlet_Type', y='Item_Outlet_Sales', palette='Set3')
```



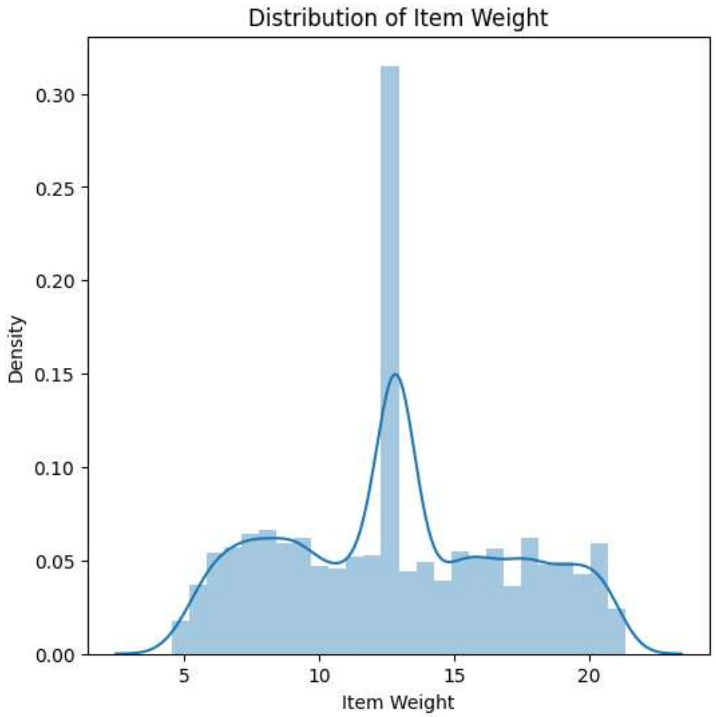

```
plt.figure(figsize=(10, 6))
sns.swarmplot(data=data, x='Outlet_Type', y='Item_Outlet_Sales', palette='Set2')
plt.xlabel('Outlet Type')
plt.ylabel('Item Outlet Sales')
plt.title('Distribution of Item Outlet Sales Across Outlet Types')
plt.xticks(rotation=45)
plt.show()
```

```
<ipython-input-31-68c88e63ed44>:2: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `leg

  sns.swarmplot(data=data, x='Outlet_Type', y='Item_Outlet_Sales', palette='Set2')
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398: UserWarning: 83.8% of the points cannot be placed; you may want
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398: UserWarning: 39.7% of the points cannot be placed; you may want
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398: UserWarning: 85.4% of the points cannot be placed; you may want
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398: UserWarning: 20.0% of the points cannot be placed; you may want
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398: UserWarning: 86.4% of the points cannot be placed; you may want
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398: UserWarning: 47.2% of the points cannot be placed; you may want
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398: UserWarning: 87.3% of the points cannot be placed; you may want
  warnings.warn(msg, UserWarning)
/usr/local/lib/python3.10/dist-packages/seaborn/categorical.py:3398: UserWarning: 29.2% of the points cannot be placed; you may want
  warnings.warn(msg, UserWarning)
```




```
plt.figure(figsize=(6,6))
sns.distplot(data['Item_Weight'])
plt.xlabel('Item Weight')
plt.ylabel('Density')
plt.title('Distribution of Item Weight')
plt.show()
```

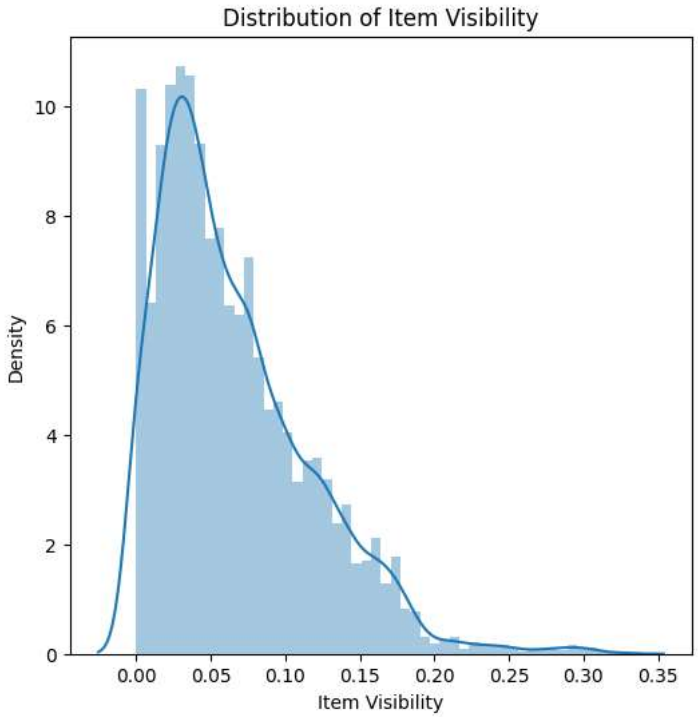
```
<ipython-input-58-0e9f504d4b59>:2: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data['Item_Weight'])
```




```
plt.figure(figsize=(6,6))
sns.distplot(data['Item_Visibility'])
plt.xlabel('Item Visibility')
plt.ylabel('Density')
plt.title('Distribution of Item Visibility')
plt.show()
```

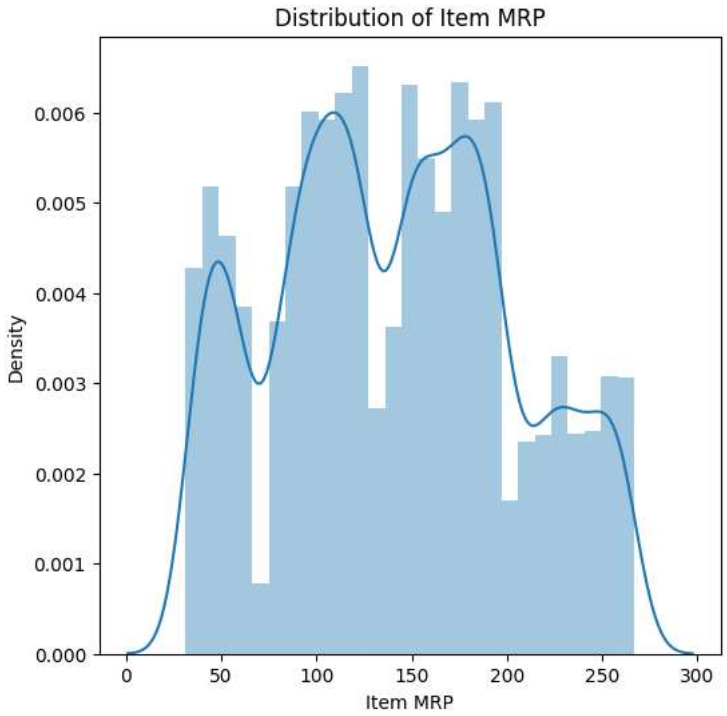
```
<ipython-input-59-1d3b565027ce>:2: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751
```

```
sns.distplot(data['Item_Visibility'])
```



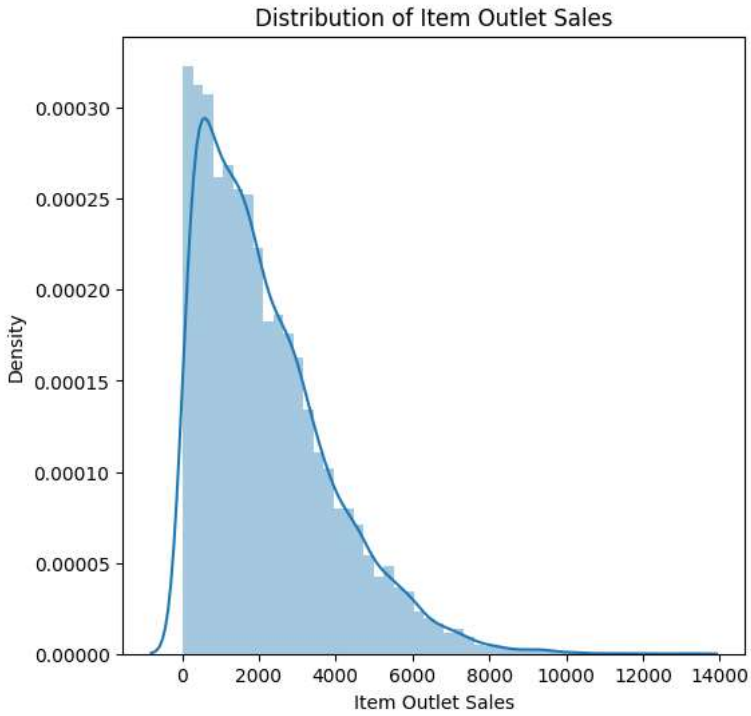

```
plt.figure(figsize=(6,6))
sns.distplot(data['Item_MRP'])
plt.xlabel('Item MRP')
plt.ylabel('Density')
plt.title('Distribution of Item MRP')
plt.show()
```

```
<ipython-input-60-919a5639f9d5>:2: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data['Item_MRP'])
```




```
plt.figure(figsize=(6,6))
sns.distplot(data['Item_Outlet_Sales'])
plt.xlabel('Item Outlet Sales')
plt.ylabel('Density')
plt.title('Distribution of Item Outlet Sales')
plt.show()
```

```
<ipython-input-61-fbeb4676e718>:2: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(data['Item_Outlet_Sales'])
```




```
# Count plot for Outlet Establishment Year
plt.figure(figsize=(8, 6))
sns.countplot(x='Outlet_Establishment_Year', data=data, palette='Set2')
plt.xlabel('Outlet Establishment Year')
plt.ylabel('Count')
plt.title('Number of Outlets Established Each Year')
plt.xticks(rotation=45)
plt.show()
```