In [196]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import warnings
from sklearn.model_selection import cross_val_score
```

In [197]:
```
warnings.filterwarnings('ignore')
```

In [198]:
```
data = pd.read_csv("C:\\Users\\banga\\Downloads\\train.csv")
```

In [199]:
```
data.sample(5)
```

Out[199]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet
149	NCO26	7.235	Low Fat	0.076841	Household	117.5492	
3892	FDU31	10.500	Regular	0.024991	Fruits and Vegetables	217.9508	
5754	FDH47	13.500	Regular	0.128792	Starchy Foods	95.4068	
2853	FDJ45	17.750	Low Fat	0.073525	Seafood	34.8216	
6417	FDS45	5.175	Regular	0.029490	Snack Foods	107.6622	

Find Shape of Our Dataset (Number of Rows And Number of Columns)

In [200]:
```
data.shape
```

Out[200]:
```
(8523, 12)
```

Get Information About Our Dataset Like Total Number Rows, Total Number of Columns, Datatypes of Each Column And Memory Requirement

In [201]:
```
data.describe()
```

Out[201]:

	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

Check Null Values In The Dataset

In [202]:
```
data.isnull().sum()
```

Out[202]:
```
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 [203]:
```
per = data.isnull().sum() * 100 / len(data)
print(per)
```

```
Item_Identifier               0.000000
Item_Weight                  17.165317
Item_Fat_Content              0.000000
Item_Visibility               0.000000
Item_Type                     0.000000
Item_MRP                      0.000000
Outlet_Identifier             0.000000
Outlet_Establishment_Year     0.000000
Outlet_Size                  28.276428
Outlet_Location_Type          0.000000
Outlet_Type                   0.000000
Item_Outlet_Sales             0.000000
dtype: float64
```

Taking Care of Duplicate Values

In [204]:
```
data.duplicated().any()
```

Out[204]:
```
False
```

In [ ]:
```

```

Handling The missing Values

In [205]:
```
data['Item_Weight']
```

Out[205]:
```
0        9.300
1        5.920
2       17.500
3       19.200
4        8.930
         ...
8518     6.865
8519     8.380
8520    10.600
8521     7.210
8522    14.800
Name: Item_Weight, Length: 8523, dtype: float64
```

In [206]:
```
data['Outlet_Size']
```

Out[206]:
```
0       Medium
1       Medium
2       Medium
3          NaN
4         High
         ...
8518      High
8519       NaN
8520     Small
8521    Medium
8522     Small
Name: Outlet_Size, Length: 8523, dtype: object
```

Univariate Imputation

In [207]:
```
mean_weight = data['Item_Weight'].mean()
median_weight = data['Item_Weight'].median()
```

In [208]:
```
print(mean_weight,median_weight)
```

```
12.857645184135976 12.6
```

In [209]:
```
data['Item_Weight_mean']=data['Item_Weight'].fillna(mean_weight)
data['Item_Weight_median']=data['Item_Weight'].fillna(median_weight)
```

In [210]:
```
data.head(1)
```

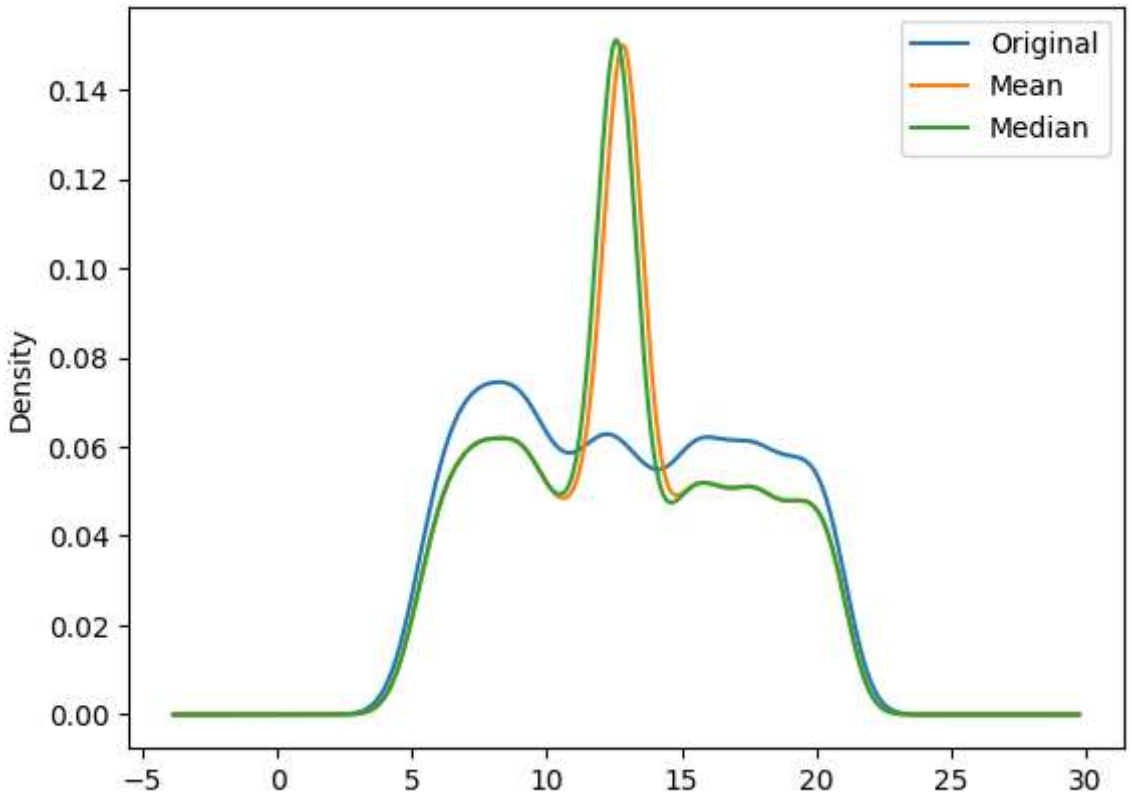
Out[210]:

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet_Id
0	FDA15	9.3	Low Fat	0.016047	Dairy	249.8092	C

In [211]:
```
print("Original Weight variable variance",data['Item_Weight'].var())
print("Item Weight variance after mean imputation",data['Item_Weight_mean'].va
print("Item Weight variance after median imputation",data['Item_Weight_median'
```

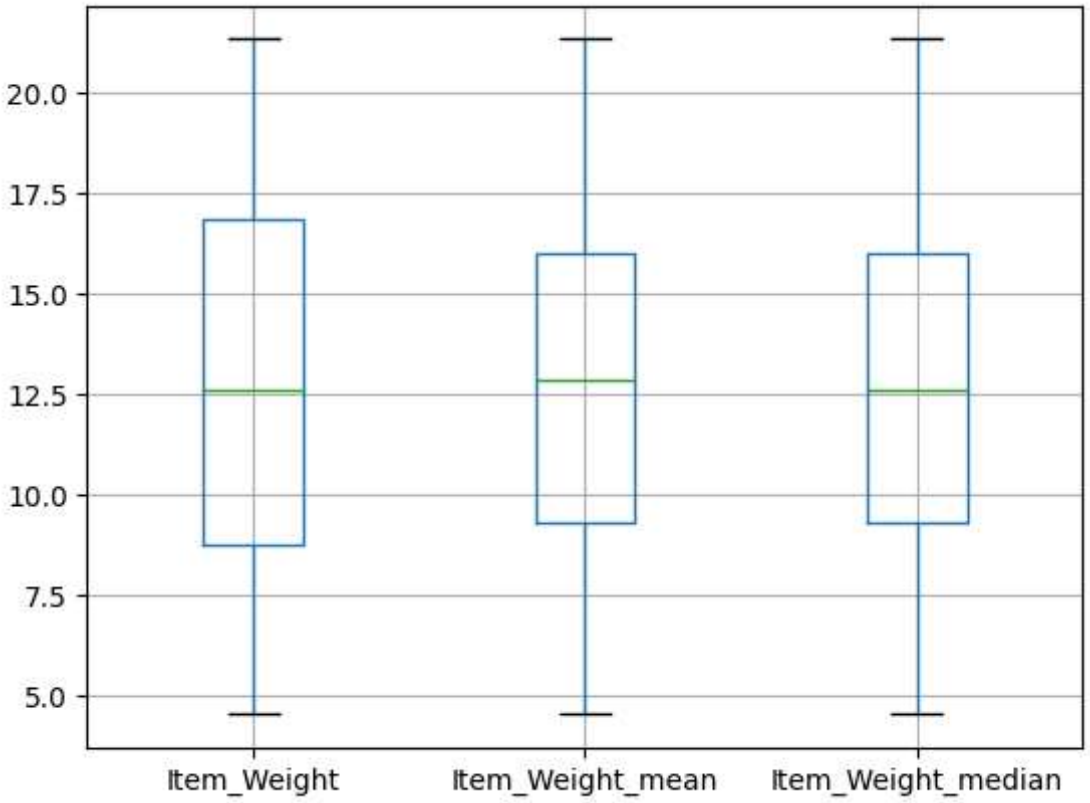
```
Original Weight variable variance 21.561688259836558
Item Weight variance after mean imputation 17.86012173506058
Item Weight variance after median imputation 17.869561454073647
```

In [212]:
```
data['Item_Weight'].plot(kind = "kde",label="Original")

data['Item_Weight_mean'].plot(kind = "kde",label = "Mean")

data['Item_Weight_median'].plot(kind = "kde",label = "Median")

plt.legend()
plt.show()
```



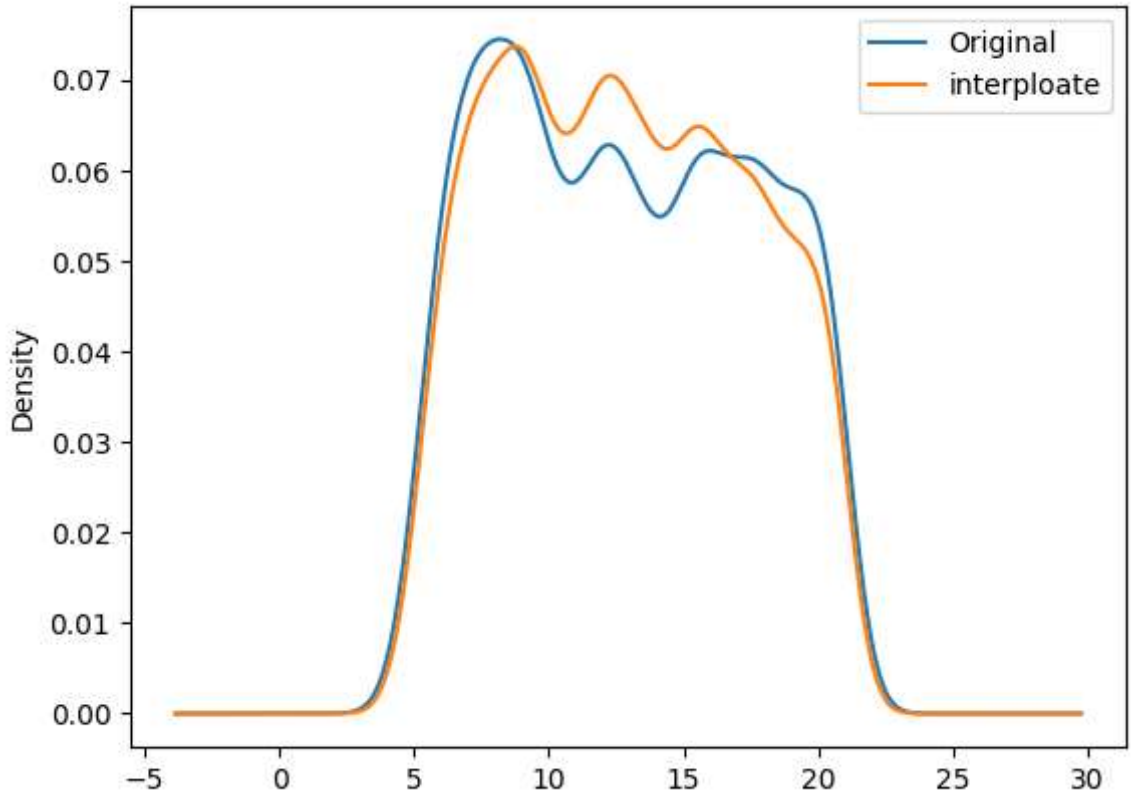
In [213]:
```
data[['Item_Weight','Item_Weight_mean','Item_Weight_median']].boxplot()
```

Out[213]: <Axes: >



In [214]:
```
data['Item_Weight_interploate']=data['Item_Weight'].interpolate(method="linear
```

In [215]:
```
data['Item_Weight'].plot(kind = "kde",label="Original")

data['Item_Weight_interploate'].plot(kind = "kde",label = "interploate")

plt.legend()
plt.show()
```



In [ ]:
```

```

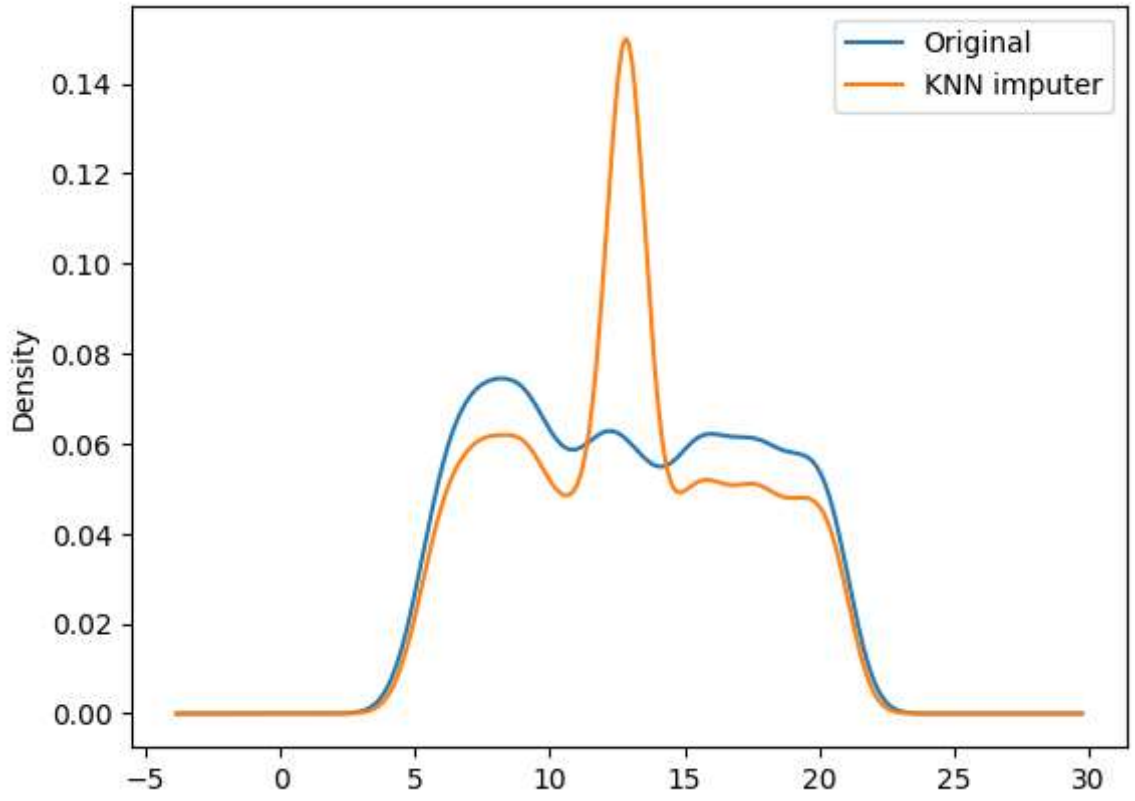
Multivariate Imputaion

In [216]:
```
from sklearn.impute import KNNImputer
```

In [217]:
```
knn = KNNImputer(n_neighbors=10,weights="distance")
```

In [218]:
```
data['knn_imputer']= knn.fit_transform(data[['Item_Weight']]).ravel()
```

In [219]:
```
data['Item_Weight'].plot(kind = "kde",label="Original")

data['knn_imputer'].plot(kind = "kde",label = "KNN imputer")

plt.legend()
plt.show()
```



In [220]:
```
data = data.drop(['Item_Weight','Item_Weight_mean','Item_Weight_median','knn_i
```

In [221]:
```
data.head(1)
```

Out[221]:

	Item_Identifier	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet_Identifier	Outlet
0	FDA15	Low Fat	0.016047	Dairy	249.8092	OUT049	

In [222]:
```
data.isnull().sum()
```

Out[222]:
```
Item_Identifier                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
Item_Weight_interploate        0
dtype: int64
```

Outlet_Size

In [223]:
```
data['Outlet_Size'].value_counts()
```

Out[223]:
```
Outlet_Size
Medium    2793
Small     2388
High       932
Name: count, dtype: int64
```

In [224]:
```
data['Outlet_Type'].value_counts()
```

Out[224]:
```
Outlet_Type
Supermarket Type1    5577
Grocery Store        1083
Supermarket Type3     935
Supermarket Type2     928
Name: count, dtype: int64
```

In [225]:
```
mode_outlet = data.pivot_table(values='Outlet_Size',columns='Outlet_Type',aggf
```

In [226]:
```
mode_outlet
```

Out[226]:

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

In [227]:
```
missing_values = data['Outlet_Size'].isnull()
```

In [228]:
```
missing_values
```

Out[228]:
```
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 [229]:
```
data.loc[missing_values,'Outlet_Size'] = data.loc[missing_values,'Outlet_Type'
```

In [230]:
```
data.isnull().sum()
```

Out[230]:
```
Item_Identifier              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
Item_Weight_interploate      0
dtype: int64
```

Item_Fat_Content

In [231]:
```
data.columns
```

Out[231]:
```
Index(['Item_Identifier', 'Item_Fat_Content', 'Item_Visibility', 'Item_Type',
       'Item_MRP', 'Outlet_Identifier', 'Outlet_Establishment_Year',
       'Outlet_Size', 'Outlet_Location_Type', 'Outlet_Type',
       'Item_Outlet_Sales', 'Item_Weight_interploate'],
      dtype='object')
```

In [232]:
```
data['Item_Fat_Content'].value_counts()
```

Out[232]:
```
Item_Fat_Content
Low Fat    5089
Regular    2889
LF          316
reg         117
low fat     112
Name: count, dtype: int64
```

In [233]:
```
data.replace({'Item_Fat_Content':{'Low Fat':'LF','low fat':'LF','reg':'Regular
```

In [234]:
```
data['Item_Fat_Content'].value_counts()
```

Out[234]:
```
Item_Fat_Content
LF         5517
Regular    3006
Name: count, dtype: int64
```

Item_Visibility

In [235]:
```
data.columns
```

Out[235]:
```
Index(['Item_Identifier', 'Item_Fat_Content', 'Item_Visibility', 'Item_Type',
       'Item_MRP', 'Outlet_Identifier', 'Outlet_Establishment_Year',
       'Outlet_Size', 'Outlet_Location_Type', 'Outlet_Type',
       'Item_Outlet_Sales', 'Item_Weight_interploate'],
      dtype='object')
```

In [236]:
```
data['Item_Visibility'].value_counts()
```

Out[236]:
```
Item_Visibility
0.000000    526
0.076975      3
0.162462      2
0.076841      2
0.073562      2
           ...
0.013957      1
0.110460      1
0.124646      1
0.054142      1
0.044878      1
Name: count, Length: 7880, dtype: int64
```

In [237]:
```
data['Item_Visibility_interpolate']=data['Item_Visibility'].replace(0,np.nan).
```

In [238]:
```
data.head(1)
```

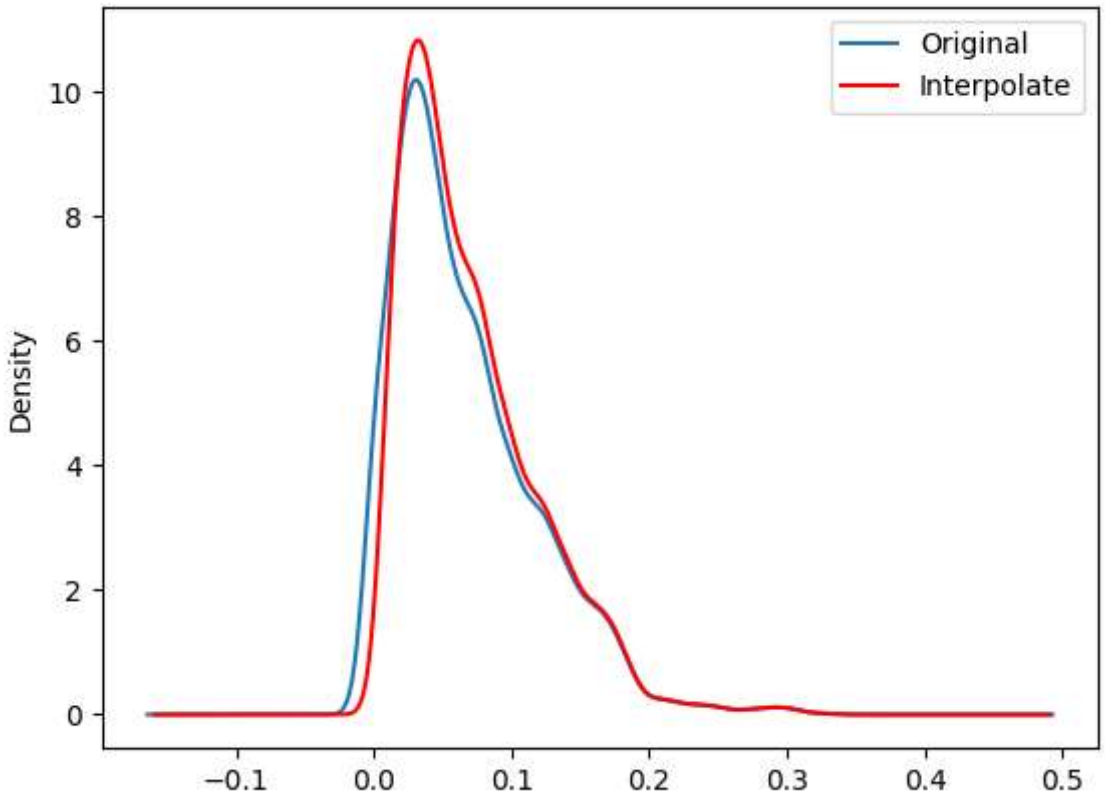
Out[238]:

	Item_Identifier	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRP	Outlet_Identifier	Outlet
0	FDA15	LF	0.016047	Dairy	249.8092	OUT049	

In [239]:
```
data['Item_Visibility_interpolate'].value_counts()
```

Out[239]:
```
Item_Visibility_interpolate
0.076975    3
0.044024    2
0.040912    2
0.076856    2
0.078759    2
           ..
0.021011    1
0.099189    1
0.076866    1
0.014116    1
0.044878    1
Name: count, Length: 8405, dtype: int64
```

In [240]:
```
data['Item_Visibility'].plot(kind="kde",label="Original")

data['Item_Visibility_interpolate'].plot(kind="kde",color='red',label="Interpo

plt.legend()
plt.show()
```



In [241]:
```
data = data.drop('Item_Visibility',axis=1)
```

In [242]:
```
data.head(1)
```

Out[242]:

	Item_Identifier	Item_Fat_Content	Item_Type	Item_MRP	Outlet_Identifier	Outlet_Establishment_
0	FDA15	LF	Dairy	249.8092	OUT049	

Item_Type

In [243]:
```
data.columns
```

Out[243]:
```
Index(['Item_Identifier', 'Item_Fat_Content', 'Item_Type', 'Item_MRP',
       'Outlet_Identifier', 'Outlet_Establishment_Year', 'Outlet_Size',
       'Outlet_Location_Type', 'Outlet_Type', 'Item_Outlet_Sales',
       'Item_Weight_interploate', 'Item_Visibility_interpolate'],
      dtype='object')
```

In [244]:
```
data['Item_Type'].value_counts()
```

Out[244]:
```
Item_Type
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
Name: count, dtype: int64
```

Item_Identifier

In [245]:
```
data.columns
```

Out[245]:
```
Index(['Item_Identifier', 'Item_Fat_Content', 'Item_Type', 'Item_MRP',
       'Outlet_Identifier', 'Outlet_Establishment_Year', 'Outlet_Size',
       'Outlet_Location_Type', 'Outlet_Type', 'Item_Outlet_Sales',
       'Item_Weight_interploate', 'Item_Visibility_interpolate'],
      dtype='object')
```

In [246]:
```
data['Item_Identifier'].value_counts().sample(5)
```

Out[246]:
```
Item_Identifier
NCD07    4
FDG20    5
FDU11    6
NCQ38    7
FDR12    6
Name: count, dtype: int64
```

In [247]:
```
data['Item_Identifier'] =data['Item_Identifier'].apply(lambda x : x[:2])
```

In [248]:
```
data['Item_Identifier'].value_counts()
```

Out[248]:
```
Item_Identifier
FD    6125
NC    1599
DR     799
Name: count, dtype: int64
```

Outlet_Establishment_Year

In [249]:
```
data.columns
```

Out[249]:
```
Index(['Item_Identifier', 'Item_Fat_Content', 'Item_Type', 'Item_MRP',
       'Outlet_Identifier', 'Outlet_Establishment_Year', 'Outlet_Size',
       'Outlet_Location_Type', 'Outlet_Type', 'Item_Outlet_Sales',
       'Item_Weight_interploate', 'Item_Visibility_interpolate'],
      dtype='object')
```

In [250]:
```
data['Outlet_Establishment_Year']
```

Out[250]:
```
0       1999
1       2009
2       1999
3       1998
4       1987
        ...
8518    1987
8519    2002
8520    2004
8521    2009
8522    1997
Name: Outlet_Establishment_Year, Length: 8523, dtype: int64
```

In [251]:
```
import datetime as dt
```

In [252]:
```
current_year = dt.datetime.today().year
```

In [253]:
```
current_year
```

Out[253]: 2023

In [254]:
```
data['Outlet_age']= current_year - data['Outlet_Establishment_Year']
```

In [255]:
```
data.head(1)
```

Out[255]:

	Item_Identifier	Item_Fat_Content	Item_Type	Item_MRP	Outlet_Identifier	Outlet_Establishment_
0	FD	LF	Dairy	249.8092	OUT049	

In [256]:
```
data = data.drop('Outlet_Establishment_Year',axis=1)
```

In [257]:
```
data.head()
```

Out[257]:

	Item_Identifier	Item_Fat_Content	Item_Type	Item_MRP	Outlet_Identifier	Outlet_Size	Outlet_L
0	FD	LF	Dairy	249.8092	OUT049	Medium	
1	DR	Regular	Soft Drinks	48.2692	OUT018	Medium	
2	FD	LF	Meat	141.6180	OUT049	Medium	
3	FD	Regular	Fruits and Vegetables	182.0950	OUT010	Small	
4	NC	LF	Household	53.8614	OUT013	High	

Handling Categorical Columns

In [258]:
```
from sklearn.preprocessing import OrdinalEncoder

data_encoded = data.copy()

cat_cols = data.select_dtypes(include=['object']).columns

for col in cat_cols:
    oe = OrdinalEncoder()
    data_encoded[col]=oe.fit_transform(data_encoded[[col]])
    print(oe.categories_)
```

```
[array(['DR', 'FD', 'NC'], dtype=object)]
[array(['LF', 'Regular'], dtype=object)]
[array(['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'], dtype=object)]
[array(['OUT010', 'OUT013', 'OUT017', 'OUT018', 'OUT019', 'OUT027',
       'OUT035', 'OUT045', 'OUT046', 'OUT049'], dtype=object)]
[array(['High', 'Medium', 'Small'], dtype=object)]
[array(['Tier 1', 'Tier 2', 'Tier 3'], dtype=object)]
[array(['Grocery Store', 'Supermarket Type1', 'Supermarket Type2',
       'Supermarket Type3'], dtype=object)]
```

In [259]:
```
data_encoded.head(3)
```

Out[259]:

	Item_Identifier	Item_Fat_Content	Item_Type	Item_MRP	Outlet_Identifier	Outlet_Size	Outlet_L
0	1.0	0.0	4.0	249.8092	9.0	1.0	
1	0.0	1.0	14.0	48.2692	3.0	1.0	
2	1.0	0.0	10.0	141.6180	9.0	1.0	

In [260]:
```
X = data_encoded.drop('Item_Outlet_Sales',axis=1)
y = data_encoded['Item_Outlet_Sales']
```

In [261]:
```
y
```

Out[261]:
```
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 [262]:
```
pip install xgboost
```

```
Requirement already satisfied: xgboost in a:\py\lib\site-packages (2.0.3)
Requirement already satisfied: numpy in a:\py\lib\site-packages (from xgboos
t) (1.24.3)
Requirement already satisfied: scipy in a:\py\lib\site-packages (from xgboos
t) (1.10.1)
Note: you may need to restart the kernel to use updated packages.

WARNING: You are using pip version 21.2.3; however, version 23.3.2 is availab
le.
You should consider upgrading via the 'A:\py\python.exe -m pip install --upgr
ade pip' command.
```

Random Forest Regressor

XGBRFRegressor

In [263]:
```
from xgboost import XGBRFRegressor

xg = XGBRFRegressor(n_estimators=100,random_state=42)
scores = cross_val_score(xg,X,y,cv=5,scoring='r2')
print(scores.mean())
```

```
0.5954067732342189
```

In [264]:
```
xg = XGBRFRegressor(n_estimators=100,random_state=42)

xg1 = xg.fit(X,y)
pd.DataFrame({
    'feature':X.columns,
    'XGBRF_importance':xg1.feature_importances_

}).sort_values(by='XGBRF_importance',ascending=False)
```

Out[264]:

	feature	XGBRF_importance
7	Outlet_Type	0.349864
5	Outlet_Size	0.192658
10	Outlet_age	0.175040
3	Item_MRP	0.131012
4	Outlet_Identifier	0.130735
6	Outlet_Location_Type	0.013184
9	Item_Visibility_interpolate	0.002493
8	Item_Weight_interploate	0.001770
2	Item_Type	0.001566
0	Item_Identifier	0.000999
1	Item_Fat_Content	0.000680

In [265]:
```
['Item_Visibility_interpolate','Item_Weight_interploate',
'Item_Type','Outlet_Location_Type','Item_Identifier','Item_Fat_Content']
```

Out[265]:
```
['Item_Visibility_interpolate',
 'Item_Weight_interploate',
 'Item_Type',
 'Outlet_Location_Type',
 'Item_Identifier',
 'Item_Fat_Content']
```

In [266]:
```
from xgboost import XGBRFRegressor

xg = XGBRFRegressor(n_estimators=100,random_state=42)
scores = cross_val_score(xg1,X.drop(['Item_Visibility_interpolate','Item_Weigh
'Item_Type','Outlet_Location_Type','Item_Identifier','Item_Fat_Content'],axis=
print(scores.mean())
```

```
0.5966037632320667
```

In [267]:
```
final_data = X.drop(columns=['Item_Visibility_interpolate','Item_Weight_interp
'Item_Type','Outlet_Location_Type','Item_Identifier','Item_Fat_Content'],axis=
```

In [268]:
```
final_data
```

Out[268]:

	Item_MRP	Outlet_Identifier	Outlet_Size	Outlet_Type	Outlet_age
0	249.8092	9.0	1.0	1.0	24
1	48.2692	3.0	1.0	2.0	14
2	141.6180	9.0	1.0	1.0	24
3	182.0950	0.0	2.0	0.0	25
4	53.8614	1.0	0.0	1.0	36
...	...	...	...	...	...
8518	214.5218	1.0	0.0	1.0	36
8519	108.1570	7.0	2.0	1.0	21
8520	85.1224	6.0	2.0	1.0	19
8521	103.1332	3.0	1.0	2.0	14
8522	75.4670	8.0	2.0	1.0	26

8523 rows × 5 columns

In [ ]:
```
```

Best Model

In [269]:
```
from xgboost import XGBRFRegressor
```

In [270]:
```
xg_final = XGBRFRegressor()
```

In [271]:
```
xg_final.fit(final_data,y)
```

Out[271]:
```
XGBRFRegressor(base_score=None, booster=None, callbacks=None,
               colsample_bylevel=None, colsample_bytree=None, device=Non
e,
               early_stopping_rounds=None, enable_categorical=False,
               eval_metric=None, feature_types=None, gamma=None,
               grow_policy=None, importance_type=None,
               interaction_constraints=None, max_bin=None,
               max_cat_threshold=None, max_cat_to_onehot=None,
               max_delta_step=None, max_depth=None, max_leaves=None,
               min_child_weight=None, missing=nan, monotone_constraints=N
```

In [272]:
```
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_absolute_error
```

In [273]:
```
X_train,X_test,y_train,y_test = train_test_split(final_data,y,
                                                 test_size=0.20,
                                                 random_state=42)
```

In [274]:
```
xg_final.fit(X_train,y_train)
```

Out[274]:
```
XGBRFRegressor(base_score=None, booster=None, callbacks=None,
               colsample_bylevel=None, colsample_bytree=None, device=Non
e,
               early_stopping_rounds=None, enable_categorical=False,
               eval_metric=None, feature_types=None, gamma=None,
               grow_policy=None, importance_type=None,
               interaction_constraints=None, max_bin=None,
               max_cat_threshold=None, max_cat_to_onehot=None,
               max_delta_step=None, max_depth=None, max_leaves=None,
               min_child_weight=None, missing=nan, monotone_constraints=N
```

In [275]:
```
y_pred = xg_final.predict(X_test)
```

In [276]:
```
mean_absolute_error(y_test,y_pred)
```

Out[276]:
```
713.9516489619299
```

Prediction on Unseen Data

In [277]:
```
pred = xg_final.predict(np.array([[141.6180,9.0,1.0,1.0,24]]))[0]
print(pred)
```

```
2067.0864
```

In [278]:
```
print(f"Sales Value is between {pred-714.42} and {pred+714.42}")
```

```
Sales Value is between 1352.66642578125 and 2781.50642578125
```

Save Model Using Joblib

In [279]:
```
import joblib
```

In [280]:
```
joblib.dump(xg_final,'bigmart_model')
```

Out[280]:
```
['bigmart_model']
```

In [281]:
```
model = joblib.load('bigmart_model')
```

In [282]:
```
pred = model.predict(np.array([[141.6180,9.0,1.0,1.0,24]]))
print(pred)
```

```
[2067.0864]
```

In [283]:
```
print(f"Sales Value is between {pred-714.42} and {pred+714.42}")
```

```
Sales Value is between [1352.6665] and [2781.5063]
```

GUI

In [284]:
```
import dash
from dash import html, dcc, Input, Output, State
```

In [285]:
```
app = dash.Dash(__name__)
```

In [291]:

```
import dash
from dash import html, dcc, Input, Output, State
import pandas as pd

# Initialize the Dash app
app = dash.Dash(__name__)

# Define the layout of the app
app.layout = html.Div([
    html.Div([
        html.H1("SALES PREDICTOR", style={'text-align': 'center'}),

        html.Div([
            html.Label("ITEM_MRP:"),
            dcc.Input(id='ITEM_MRP', type='number', placeholder='Enter item MR
                      style={'margin': '10px', 'padding': '10px'}),
            html.Br(),
            html.Label("OUTLET_INDENTIFIER:"),
            dcc.Input(id='OUTLET_INDENTIFIER', type='number', placeholder='Ent
                      style={'margin': '10px', 'padding': '10px'}),

            html.Br(),
            html.Label("OUTLET_SIZE:"),
            dcc.Input(id='OUTLET_SIZE', type='number', placeholder='Enter valu
                      style={'margin': '10px', 'padding': '10px'}),
            html.Br(),
            html.Label("OUTLET_TYPE:"),
            dcc.Input(id='OUTLET_TYPE', type='number', placeholder='Enter valu
                      style={'margin': '10px', 'padding': '10px'}),
            html.Br(),
            html.Label("OUTLET_AGE:"),
            dcc.Input(id='OUTLET_AGE', type='number', placeholder='Enter Outle
                      style={'margin': '10px', 'padding': '10px'}),
            html.Br(),
            html.Button('Predict Sales Price', id='predict_button', n_clicks=0
                        style={'margin': '10px', 'padding': '10px', 'backgroun
        ], style={'text-align': 'center'}),

        html.Div(id='prediction_output', style={'text-align': 'center', 'font-
    ], style={'width': '50%', 'margin': '0 auto', 'border': '2px solid #007BFF
])

# Define callback to update output
@app.callback(
    Output('prediction_output', 'children'),
    [Input('predict_button', 'n_clicks')],
    [State('ITEM_MRP', 'value'),
     State('OUTLET_INDENTIFIER', 'value'),
     State('OUTLET_SIZE', 'value'),
     State('OUTLET_TYPE', 'value'),
     State('OUTLET_AGE', 'value')]
)
def update_output(n_clicks,ITEM_MRP,OUTLET_INDENTIFIER,OUTLET_SIZE,OUTLET_TYPE
    if n_clicks > 0 and all(v is not None for v in [ITEM_MRP,OUTLET_INDENTIFIE
        # Prepare the feature vector
        features = pd.DataFrame([[ITEM_MRP,OUTLET_INDENTIFIER,OUTLET_SIZE,OUTL
                                  columns=['Item_MRP','Outlet_Identifier','Outle
```

```
        # Predict
        prediction = model.predict(features)[0]
        return 'Predicted Sales are between  '+str(prediction-714)+"  and  "+s
    elif n_clicks > 0:
        return 'Please enter all values to get a prediction'
    return ''

# Run the app
if __name__ == '__main__':
    app.run_server(debug=True)
```

In [ ]: