```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
from sklearn.feature_selection import RFECV

import seaborn as sns
```

```
!ls
```

```
sample_data  test.csv  train.csv
```

```
train=pd.read_csv('train.csv')
test=pd.read_csv('test.csv')
```

```
train.head()
```

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_
0	FDA15	9.30	Low Fat	0.016047	Dairy	249.8
1	DRC01	5.92	Regular	0.019278	Soft Drinks	48.2
2	FDN15	17.50	Low Fat	0.016760	Meat	141.6
					Fruits and	

```
train.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
```

```
train.describe(include='all')
```

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type
count	8523	7060.000000	8523	8523.000000	8523
unique	1559	NaN	5	NaN	16
top	FDW13	NaN	Low Fat	NaN	Fruits and Vegetables
freq	10	NaN	5089	NaN	1232
mean	NaN	12.857645	NaN	0.066132	NaN
std	NaN	4.643456	NaN	0.051598	NaN
min	NaN	4.555000	NaN	0.000000	NaN
25%	NaN	8.773750	NaN	0.026989	NaN
50%	NaN	12.600000	NaN	0.053931	NaN
75%	NaN	16.850000	NaN	0.094585	NaN

```
#checking for constant columns
[a for a in train.columns if train[a].nunique()==1]
```

```
[]
```

```
train.isna().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
```

```
train.Item_Weight.describe()
```

```
count    7060.000000
mean       12.857645
std         4.643456
min         4.555000
25%         8.773750
50%        12.600000
75%        16.850000
max        21.350000
Name: Item_Weight, dtype: float64
```

```
train.Item_Weight.fillna(train.Item_Weight.mean(),inplace=True)
```

```
train.isna().sum()
train.isna().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                  2410
Outlet_Location_Type            0
Outlet_Type                     0
Item_Outlet_Sales               0
dtype: int64
```

```
test.head()
```

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_
0	FDW58	20.750	Low Fat	0.007565	Snack Foods	107.8
1	FDW14	8.300	reg	0.038428	Dairy	87.3
2	NCN55	14.600	Low Fat	0.099575	Others	241.7

```
test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5681 entries, 0 to 5680
Data columns (total 11 columns):
 #   Column                     Non-Null Count  Dtype  
---  ------                     --------------  -----  
 0   Item_Identifier            5681 non-null   object 
 1   Item_Weight                4705 non-null   float64
 2   Item_Fat_Content           5681 non-null   object 
 3   Item_Visibility            5681 non-null   float64
 4   Item_Type                  5681 non-null   object 
 5   Item_MRP                   5681 non-null   float64
 6   Outlet_Identifier          5681 non-null   object 
 7   Outlet_Establishment_Year  5681 non-null   int64  
 8   Outlet_Size                4075 non-null   object 
 9   Outlet_Location_Type       5681 non-null   object 
 10  Outlet_Type                5681 non-null   object 
dtypes: float64(3), int64(1), object(7)
memory usage: 488.3+ KB
```

```
test.isna().sum()
```

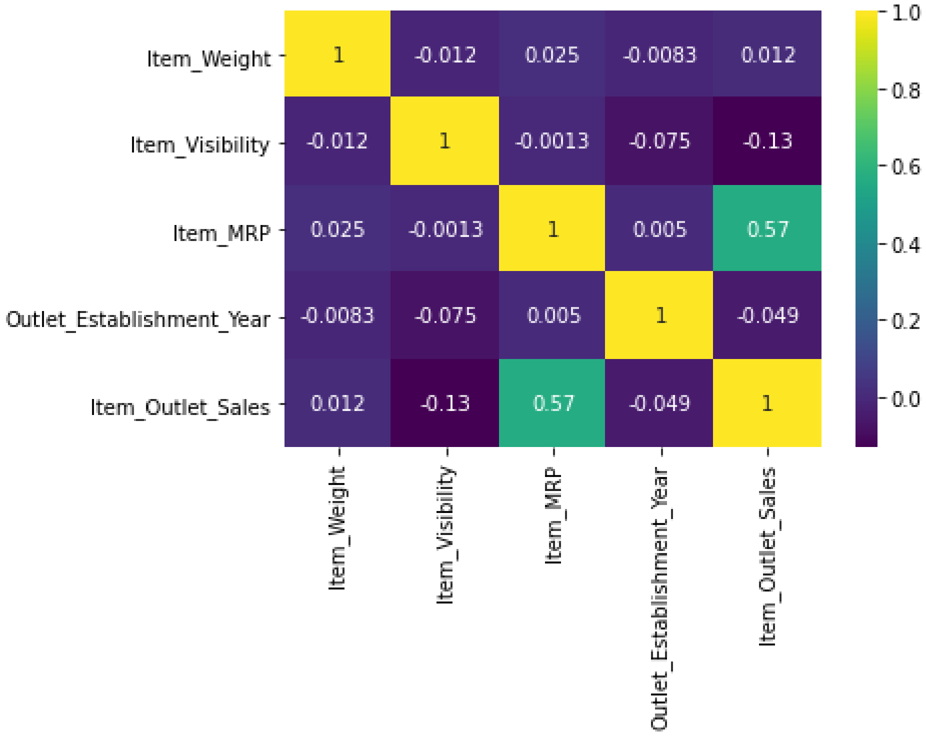
```
Item_Identifier                 0
Item_Weight                   976
Item_Fat_Content                0
Item_Visibility                 0
Item_Type                       0
Item_MRP                        0
```

```
Outlet_Identifier               0
Outlet_Establishment_Year       0
Outlet_Size                  1606
Outlet_Location_Type            0
Outlet_Type                     0
dtype: int64
```

```
test.Item_Weight.fillna(test.Item_Weight.mean(),inplace=True)
```

```
sns.heatmap(train.corr(),annot=True,fmt='.2g',cmap='viridis')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7faad5766ba8>
```



Item_mrp and item_outlet_sales are highly related

```
train.Outlet_Size.value_counts()
```

```
Medium    2793
Small     2388
High       932
Name: Outlet_Size, dtype: int64
```

```
train.groupby('Outlet_Size')['Item_Outlet_Sales'].mean()
```

```
Outlet_Size
High      2298.995256
Medium    2681.603542
Small     1912.149161
Name: Item_Outlet_Sales, dtype: float64
```

```
train.Outlet_Type.value_counts()
```

```
Supermarket Type1    5577
```

```
Grocery Store        1083
Supermarket Type3     935
Supermarket Type2     928
Name: Outlet_Type, dtype: int64
```

```
temp=train[train.Outlet_Size.isnull()][['Outlet_Size','Outlet_Type']]
```

```
temp
```

	Outlet_Size	Outlet_Type
3	NaN	Grocery Store
8	NaN	Supermarket Type1
9	NaN	Supermarket Type1
25	NaN	Supermarket Type1
28	NaN	Grocery Store
...	...	...
8502	NaN	Supermarket Type1
8508	NaN	Supermarket Type1
8509	NaN	Grocery Store
8514	NaN	Supermarket Type1
8519	NaN	Supermarket Type1

2410 rows × 2 columns

```
temp.Outlet_Type.value_counts()
```

```
Supermarket Type1    1855
Grocery Store         555
Name: Outlet_Type, dtype: int64
```

```
train.loc[train['Outlet_Type']=='Grocery Store','Outlet_Size']='Small'
train.loc[train['Outlet_Type']=='Supermarket Type1','Outlet_Size']=train.Outlet_Size.filln
train.loc[train['Outlet_Type']=='Supermarket Type2','Outlet_Size']=train.Outlet_Size.filln
```

```
test.loc[test['Outlet_Type']=='Grocery Store','Outlet_Size']='Small'
test.loc[test['Outlet_Type']=='Supermarket Type1','Outlet_Size']=test.Outlet_Size.fillna('
test.loc[test['Outlet_Type']=='Supermarket Type2','Outlet_Size']=test.Outlet_Size.fillna('
```

```
train.Item_Fat_Content.value_counts()
```

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

```
train.Item_Fat_Content=train.Item_Fat_Content.replace('LF','Low Fat').replace('reg','Regul
```

```
test.Item_Fat_Content=test.Item_Fat_Content.replace('LF','Low Fat').replace('reg','Regular
```

```
train.Item_Fat_Content.value_counts()
```

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

```
train.Item_Type.value_counts()
```

```
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: Item_Type, dtype: int64
```

```
train.duplicated().sum()
```

```
0
```

```
train.head()
```

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_
0	FDA15	9.30	Low Fat	0.016047	Dairy	249.8
1	DRC01	5.92	Regular	0.019278	Soft Drinks	48.2
2	FDN15	17.50	Low Fat	0.016760	Meat	141.6
					Fruits and	

```
train['Outlet_Age']=2020-train.Outlet_Establishment_Year
test['Outlet_Age']=2020-test.Outlet_Establishment_Year
```

```
#Get the first two characters of ID:
train['Item_Type_Combined'] = train['Item_Identifier'].apply(lambda x: x[0:2])
```

```
train['Item_Type_Combined'] = train['Item_Identifier'].apply(lambda x: x[0:2])
#Rename them to more intuitive categories:
train['Item_Type_Combined'] = train['Item_Type_Combined'].map({'FD':'Food',
                                                             'NC':'Non-Consumable',
                                                             'DR':'Drinks'})
train['Item_Type_Combined'].value_counts()
```

```
     Food              6125
     Non-Consumable    1599
     Drinks             799
     Name: Item_Type_Combined, dtype: int64
```

```
#Get the first two characters of ID:
test['Item_Type_Combined'] = test['Item_Identifier'].apply(lambda x: x[0:2])
#Rename them to more intuitive categories:
test['Item_Type_Combined'] = test['Item_Type_Combined'].map({'FD':'Food',
                                                             'NC':'Non-Consumable',
                                                             'DR':'Drinks'})
test['Item_Type_Combined'].value_counts()
```

```
     Food              4076
     Non-Consumable    1087
     Drinks             518
     Name: Item_Type_Combined, dtype: int64
```

```
from sklearn.preprocessing import OneHotEncoder,StandardScaler,LabelEncoder
ohe=OneHotEncoder()
```

```
scaler=StandardScaler()
tr_weight=scaler.fit_transform(np.array(train.Item_Weight).reshape(-1,1))
te_weight=scaler.transform(np.array(test.Item_Weight).reshape(-1,1))
```

```
scaler=StandardScaler()
tr_age=scaler.fit_transform(np.array(train.Outlet_Age).reshape(-1,1))
te_age=scaler.transform(np.array(test.Outlet_Age).reshape(-1,1))
```

```
scaler=StandardScaler()
tr_Item_MRP=scaler.fit_transform(np.array(train.Item_MRP).reshape(-1,1))
te_Item_MRP=scaler.transform(np.array(test.Item_MRP).reshape(-1,1))
```

```
scaler=StandardScaler()
tr_Outlet_Establishment_Year=scaler.fit_transform(np.array(train.Outlet_Establishment_Year
te_Outlet_Establishment_Year=scaler.transform(np.array(test.Outlet_Establishment_Year).res
```

```
scaler=StandardScaler()
tr_visibility=scaler.fit_transform(np.array(train.Item_Visibility).reshape(-1,1))
te_visibility=scaler.transform(np.array(test.Item_Visibility).reshape(-1,1))
```

```
train.Item_Fat_Content=pd.get_dummies(train.Item_Fat_Content,drop_first=True)
test.Item_Fat_Content=pd.get_dummies(test.Item_Fat_Content,drop_first=True)
```

```
train.Item_Type=pd.get_dummies(train.Item_Type,drop_first=True)
test.Item_Fat_Content=pd.get_dummies(test.Item_Fat_Content,drop_first=True)
```

```
train.Item_Type_Combined=pd.get_dummies(train.Item_Type_Combined,drop_first=True)
test.Item_Type_Combined=pd.get_dummies(test.Item_Type_Combined,drop_first=True)
```

```
train.Outlet_Location_Type=train.Outlet_Location_Type.str.replace(' ','')
test.Outlet_Location_Type=test.Outlet_Location_Type.str.replace(' ','')
```

```
train.Outlet_Type=train.Outlet_Type.str.replace('Supermarket ','')
test.Outlet_Type=test.Outlet_Type.str.replace('Supermarket ','')
```

```
train.Item_Type=train.Item_Type.astype('str')
test.Item_Type=test.Item_Type.astype('str')
```

```
train.Item_Type=train.Item_Type.str.replace(' ','')
test.Item_Type=test.Item_Type.str.replace(' ','')
```

```
train.head()
```

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_
0	FDA15	9.30	0	0.016047	0	249.8
1	DRC01	5.92	1	0.019278	0	48.2
2	FDN15	17.50	0	0.016760	0	141.6
3	FDX07	19.20	1	0.000000	0	182.0
4	NCD19	8.93	0	0.000000	0	53.8

```
le=LabelEncoder()
le_type_tr=le.fit_transform(train.Outlet_Type)
le_type_te=le.transform(test.Outlet_Type)
```

```
le=LabelEncoder()
le_loc_tr=le.fit_transform(train.Outlet_Location_Type)
le_loc_te=le.transform(test.Outlet_Location_Type)
```

```
le=LabelEncoder()
le_loc_tr=le.fit_transform(train.Outlet_Size)
le_loc_te=le.transform(test.Outlet_Size)
```

```
y=train.Item_Outlet_Sales
```

```
## combine all 'one-hot' encoded features as Te.
tr =pd.DataFrame(pd.np.column_stack([ tr_weight,tr_Item_MRP,tr_Outlet_Establishment_Year,t

## CONCAT both dataframe ### ie Te and X_test(original dataframe)
## https://stackoverflow.com/questions/45963799/pandas-concat-resulting-in-nan-rows

l3=train.values.tolist()
l4=tr.values.tolist()
for i in range(len(l3)):
    l3[i].extend(l4[i])

train=pd.DataFrame(l3,columns=train.columns.tolist()+tr.columns.tolist())
train.shape
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:2: FutureWarning: The pa

(8523, 22)
```

```
## combine all 'one-hot' encoded features as Te.
te =pd.DataFrame(pd.np.column_stack([ te_weight,te_Item_MRP,te_Outlet_Establishment_Year,t

## CONCAT both dataframe ### ie Te and X_test(original dataframe)
## https://stackoverflow.com/questions/45963799/pandas-concat-resulting-in-nan-rows


l3=test.values.tolist()
l4=te.values.tolist()
for i in range(len(l3)):
    l3[i].extend(l4[i])

test=pd.DataFrame(l3,columns=test.columns.tolist()+te.columns.tolist())

test.shape
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:2: FutureWarning: The pa

(5681, 21)
```

```
train.drop(['Item_Identifier', 'Item_Weight', 'Item_Fat_Content', 'Item_Visibility',
       'Item_Type', 'Item_MRP', 'Outlet_Identifier',
       'Outlet_Establishment_Year', 'Outlet_Size', 'Outlet_Location_Type',
       'Outlet_Type',  'Outlet_Age', 'Item_Type_Combined'],axis=1,inplace=True)


test.drop(['Item_Identifier', 'Item_Weight', 'Item_Fat_Content', 'Item_Visibility',
       'Item_Type', 'Item_MRP', 'Outlet_Identifier',
       'Outlet_Establishment_Year', 'Outlet_Size', 'Outlet_Location_Type',
       'Outlet_Type',  'Outlet_Age', 'Item_Type_Combined'],axis=1,inplace=True)


train.shape
```

```
     (8523, 9)
```

```
test.shape
```

```
     (5681, 8)
```

```
from sklearn.linear_model import LinearRegression,Lasso,Ridge
linear_reg=LinearRegression()
train.drop('Item_Outlet_Sales',axis=1,inplace=True)
linear_reg.fit(train,y)
```

```
     LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)
```

```
print('slope',linear_reg.coef_)
print("intercept",linear_reg.intercept_)
```

```
     slope [  -5.21829707  969.90681615   -8.93103212 -104.12272401    8.93103212
       841.125576      5.57973161    5.57973161]
     intercept 1154.6905049329312
```

```
y_pred=linear_reg.predict(test)
```

```
test1=pd.read_csv('test.csv')
```

```
test1['Item_Outlet_Sales']=y_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('LinearRegressionSubmission.csv',index=False)
```

Ridge regression inorder to avoid overfitting

```
ridge=Ridge(alpha=0.05)

ridge.fit(train,y)
```

```
     Ridge(alpha=0.05, copy_X=True, fit_intercept=True, max_iter=None,
           normalize=False, random_state=None, solver='auto', tol=0.001)
```

```
ridge_pred=ridge.predict(test)
test1['Item_Outlet_Sales']=ridge_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('RidgeSubmission.csv',index=False)
```

Decision Tree Regresssion

```
from sklearn.tree import DecisionTreeRegressor
dt=DecisionTreeRegressor(max_depth=15,min_samples_leaf=100)
dt.fit(train,y)
dt_pred=dt.predict(test)

test1['Item_Outlet_Sales']=dt_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('DecisionTreeRegressorSubmission.csv',index=False)
```

```
from sklearn.tree import DecisionTreeRegressor
dt1=DecisionTreeRegressor(max_depth=10,min_samples_leaf=200)
dt1.fit(train,y)
dt_pred1=dt1.predict(test)

test1['Item_Outlet_Sales']=dt_pred1
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('DecisionTreeRegressor1Submission.csv',index=False)
```

RandomForestRegressor

```
from sklearn.ensemble import RandomForestRegressor
rf=RandomForestRegressor(n_estimators=200,n_jobs=5,max_depth=10,min_samples_leaf=200)
rf.fit(train,y)
rf_pred=rf.predict(test)

test1['Item_Outlet_Sales']=rf_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('RandomForestRegressorSubmission.csv',index=False)
```

```
from sklearn.model_selection import RandomizedSearchCV
from pprint import pprint
params={
    'bootstrap':[True,False],
    'n_estimators':[int(x) for x in np.linspace(200,2000,50)],
    'max_features':['auto','sqrt'],
    'max_depth':[int(x) for x in np.linspace(10,110,10)],
    'min_samples_leaf':[1,2,50],
    'min_samples_split':[2,5,10]
}
pprint(params)
```

```
{'bootstrap': [True, False],
 'max_depth': [10, 21, 32, 43, 54, 65, 76, 87, 98, 110],
 'max_features': ['auto', 'sqrt'],
 'min_samples_leaf': [1, 2, 50],
 'min_samples_split': [2, 5, 10],
 'n_estimators': [200,
                  236,
                  273,
                  310,
                  346,
                  383,
                  420,
                  457,
                  493,
                  530,
                  567,
                  604,
                  640,
                  677,
                  714,
                  751,
                  787,
                  824,
                  861,
                  897,
                  934,
                  971,
                  1008,
                  1044,
                  1081,
                  1118,
                  1155,
                  1191,
                  1228,
                  1265,
                  1302,
                  1338,
                  1375,
                  1412,
                  1448,
                  1485,
                  1522,
                  1559,
                  1595,
                  1632,
                  1669,
                  1706,
                  1742,
                  1779,
                  1816,
                  1853,
                  1889,
                  1926,
                  1963,
                  2000]}
```

```
rf1=RandomForestRegressor()
grid=RandomizedSearchCV(rf1,params,cv=10,random_state=95,n_jobs=-1,n_iter=100)
grid.fit(train,y)
```

```
/usr/local/lib/python3.6/dist-packages/joblib/externals/loky/process_executor.py:691
  "timeout or by a memory leak.", UserWarning
RandomizedSearchCV(cv=10, error_score=nan,
                   estimator=RandomForestRegressor(bootstrap=True,
                                                   ccp_alpha=0.0,
                                                   criterion='mse',
                                                   max_depth=None,
                                                   max_features='auto',
                                                   max_leaf_nodes=None,
                                                   max_samples=None,
                                                   min_impurity_decrease=0.0,
                                                   min_impurity_split=None,
                                                   min_samples_leaf=1,
                                                   min_samples_split=2,
                                                   min_weight_fraction_leaf=0.0,
                                                   n_estimators=100,
                                                   n_jobs=None, oob_score=Fal...
                                                      76, 87, 98, 110],
                                        'max_features': ['auto', 'sqrt'],
                                        'min_samples_leaf': [1, 2, 50],
                                        'min_samples_split': [2, 5, 10],
                                        'n_estimators': [200, 236, 273, 310,
                                                         346, 383, 420, 457,
                                                         493, 530, 567, 604,
                                                         640, 677, 714, 751,
                                                         787, 824, 861, 897,
                                                         934, 971, 1008, 1044,
                                                         1081, 1118, 1155, 1191,
                                                         1228, 1265, ...]},
                   pre_dispatch='2*n_jobs', random_state=95, refit=True,
                   return_train_score=False, scoring=None, verbose=0)
```

```
grid.best_estimator_
```

```
     RandomForestRegressor(bootstrap=True, ccp_alpha=0.0, criterion='mse',
                           max_depth=98, max_features='auto', max_leaf_nodes=None,
                           max_samples=None, min_impurity_decrease=0.0,
                           min_impurity_split=None, min_samples_leaf=50,
                           min_samples_split=5, min_weight_fraction_leaf=0.0,
                           n_estimators=1595, n_jobs=None, oob_score=False,
                           random_state=None, verbose=0, warm_start=False)
```

```
grid.best_params_
```

```
     {'bootstrap': True,
      'max_depth': 98,
      'max_features': 'auto',
      'min_samples_leaf': 50,
      'min_samples_split': 5,
      'n_estimators': 1595}
```

```
from sklearn.ensemble import RandomForestRegressor
rf2=RandomForestRegressor(bootstrap=True, ccp_alpha=0.0, criterion='mse',
                      max_depth=98, max_features='auto', max_leaf_nodes=None,
                      max_samples=None, min_impurity_decrease=0.0,
                      min_impurity_split=None, min_samples_leaf=50,
                      min_samples_split=5, min_weight_fraction_leaf=0.0,
                      n_estimators=1595, n_jobs=None, oob_score=False,
                      random_state=None, verbose=0, warm_start=False)
rf2.fit(train,y)
```

```
rf2.fit(train,y)
rf_pred2=rf2.predict(test)

test1['Item_Outlet_Sales']=rf_pred2
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('RandomForestRegressor_HPT_Submission.csv',index=False)
```

lightgbm

```
!pip install lightgbm
```

```
    Requirement already satisfied: lightgbm in /usr/local/lib/python3.6/dist-packages (2
    Requirement already satisfied: scikit-learn in /usr/local/lib/python3.6/dist-packages
    Requirement already satisfied: scipy in /usr/local/lib/python3.6/dist-packages (from
    Requirement already satisfied: numpy in /usr/local/lib/python3.6/dist-packages (from
    Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.6/dist-packages
```

```
import lightgbm
```

```
lgb=lightgbm.LGBMRegressor()
lgb.fit(train,y)
lgb_pred=lgb.predict(test)

test1['Item_Outlet_Sales']=lgb_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('LGBMRegressor_HPT_Submission.csv',index=False)
```

```
import xgboost
xgb=xgboost.XGBRegressor()
xgb.fit(train,y)
xgb_pred=xgb.predict(test)

test1['Item_Outlet_Sales']=xgb_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('XGBRegressor_Submission.csv',index=False)
```

```
    [16:24:10] WARNING: /workspace/src/objective/regression_obj.cu:152: reg:linear is now
```

```
import xgboost
xgb1=xgboost.XGBRegressor(n_estimators=1000, learning_rate=0.05)
xgb1.fit(train,y)
xgb_pred1=xgb1.predict(test)
```

```
xgb_pred1=xgb1.predict(test)

test1['Item_Outlet_Sales']=xgb_pred1
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('XGBRegressor1_Submission.csv',index=False)
```

```
[16:24:10] WARNING: /workspace/src/objective/regression_obj.cu:152: reg:linear is now
```

```
import sklearn
ex_tree=sklearn.ensemble.ExtraTreesRegressor()
ex_tree.fit(train,y)
ex_tree_pred=ex_tree.predict(test)

test1['Item_Outlet_Sales']=ex_tree_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('ExtraTreesRegressor.csv',index=False)
```

```
import sklearn
gbdt_tree=sklearn.ensemble.GradientBoostingRegressor()
gbdt_tree.fit(train,y)
gbdt_tree_pred=gbdt_tree.predict(test)

test1['Item_Outlet_Sales']=gbdt_tree_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('GradientBoostingRegressor_Submission.csv',index=False)
```

```
! pip install tpot
import tpot
```

```
Requirement already satisfied: tpot in /usr/local/lib/python3.6/dist-packages (0.11.6
Requirement already satisfied: tqdm>=4.36.1 in /usr/local/lib/python3.6/dist-packages
Requirement already satisfied: update-checker>=0.16 in /usr/local/lib/python3.6/dist-
Requirement already satisfied: stopit>=1.1.1 in /usr/local/lib/python3.6/dist-package
Requirement already satisfied: pandas>=0.24.2 in /usr/local/lib/python3.6/dist-packag
Requirement already satisfied: numpy>=1.16.3 in /usr/local/lib/python3.6/dist-package
Requirement already satisfied: joblib>=0.13.2 in /usr/local/lib/python3.6/dist-packag
Requirement already satisfied: deap>=1.2 in /usr/local/lib/python3.6/dist-packages (f
Requirement already satisfied: scipy>=1.3.1 in /usr/local/lib/python3.6/dist-packages
Requirement already satisfied: scikit-learn>=0.22.0 in /usr/local/lib/python3.6/dist-
Requirement already satisfied: requests>=2.3.0 in /usr/local/lib/python3.6/dist-packa
Requirement already satisfied: pytz>=2017.2 in /usr/local/lib/python3.6/dist-packages
Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.6/dis
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.6/dist-pac
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.6/dist-pa
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.6/dist-packages
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.6/dist-packages (fr
```

```
from tpot import TPOTRegressor
```

```
tpot=TPOTRegressor(generations=8)
tpot.fit(train,y)
```

```
TPOTRegressor(config_dict=None, crossover_rate=0.1, cv=5,
              disable_update_check=False, early_stop=None, generations=8,
              log_file=None, max_eval_time_mins=5, max_time_mins=None,
              memory=None, mutation_rate=0.9, n_jobs=1, offspring_size=None,
              periodic_checkpoint_folder=None, population_size=100,
              random_state=None, scoring=None, subsample=1.0, template=None,
              use_dask=False, verbosity=0, warm_start=False)
```

```
tpot_pred=tpot.predict(test)
```

```
test1['Item_Outlet_Sales']=tpot_pred
sample = test1[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
sample.to_csv('TPOTRegressor.csv',index=False)
```