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

Read data

```
data = pd.read_csv('/content/train_v9rqX0R.csv')
data.head()
```

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRI
0	FDA15	9.30	Low Fat	0.016047	Dairy	249.809
1	DRC01	5.92	Regular	0.019278	Soft Drinks	48.269
2	FDN15	17.50	Low Fat	0.016760	Meat	141.618
3	FDX07	19.20	Regular	0.000000	Fruits and Vegetables	182.095
4	NCD19	8.93	Low Fat	0.000000	Household	53.861

```
data.shape
```

```
(8523, 12)
```

check for null 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
```

```
data.dtypes
```

```
Item_Identifier              object
Item_Weight                 float64
Item_Fat_Content             object
Item_Visibility             float64
Item_Type                    object
Item_MRP                    float64
Outlet_Identifier            object
Outlet_Establishment_Year     int64
Outlet_Size                  object
Outlet_Location_Type         object
Outlet_Type                  object
Item_Outlet_Sales           float64
dtype: object
```

```
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
```

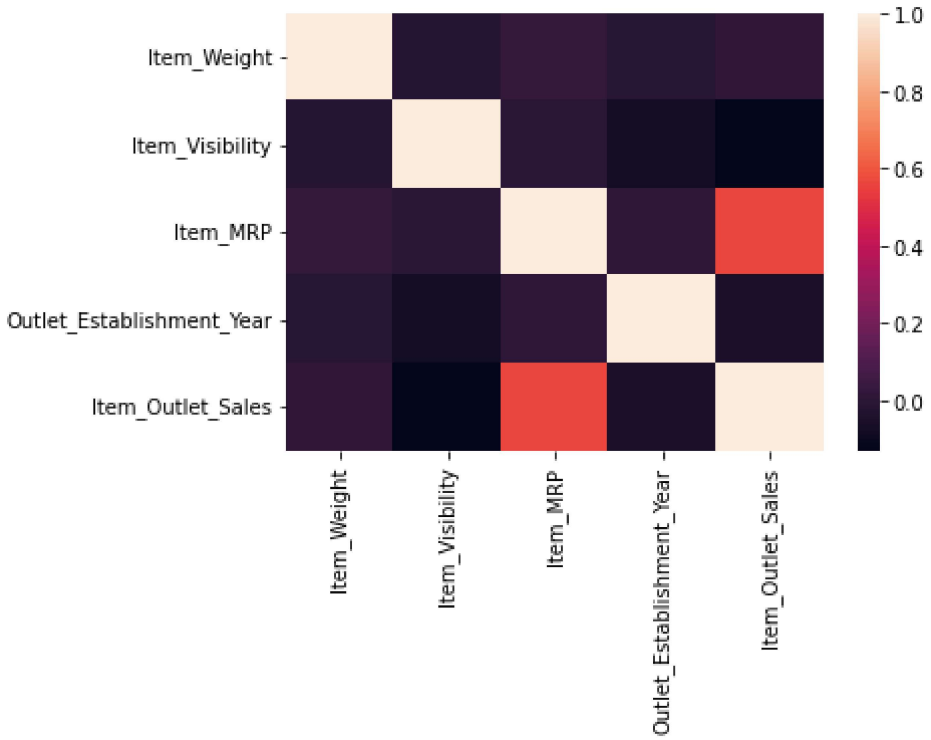
```
data.describe()
```

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Establishment_Year	Item_Outle
count	7060.000000	8523.000000	8523.000000	8523.000000	8523
mean	12.857645	0.066132	140.992782	1997.831867	2181
std	4.643456	0.051598	62.275067	8.371760	1706

check the correlation in columns

```
sns.heatmap(data.corr())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fd946641ad0>
```



Box plot of undesrstanding distribution and check for outliers

```
sns.boxplot(x="Item_Fat_Content", y="Item_Outlet_Sales", data=data)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f835a82c250>
```


```
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
```

Replace the null values with median for numeric columns

```
data['Item_Weight'] = data['Item_Weight'].fillna(data['Item_Weight'].median())
```

```
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                2410
Outlet_Location_Type          0
Outlet_Type                   0
Item_Outlet_Sales             0
dtype: int64
```

Replace the null values with most occuring data for non numeric columns

```
data['Outlet_Size'] = data['Outlet_Size'].fillna(data.groupby('Outlet_Size')['Item_Identifier
```

```
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
```

Encode all non numeric columns

```
from sklearn.preprocessing import LabelEncoder
encoder = LabelEncoder()
columns = ['Outlet_Type','Outlet_Location_Type','Outlet_Size','Outlet_Identifier','Item_Type'
for column in columns:
  data[column] = encoder.fit_transform(data[column])
```

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

```
x = data.drop(['Item_Outlet_Sales'], axis = 1)
y = data['Item_Outlet_Sales']
```

```
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import classification_report, accuracy_score, confusion_matrix
```

```
model = RandomForestRegressor()
```

```
model.fit(x,y)
```

```
RandomForestRegressor()
```

Readint the test data

```
test_data = pd.read_csv('/content/test_AbJTz2l.csv')
```

```
test_data1 = pd.read_csv('/content/test_AbJTz2l.csv')
```

```
test_data1.head()
```

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRI
0	FDW58	20.750	Low Fat	0.007565	Snack Foods	107.862
1	FDW14	8.300	reg	0.038428	Dairy	87.319
2	NCN55	14.600	Low Fat	0.099575	Others	241.753
3	FDQ58	7.315	Low Fat	0.015388	Snack Foods	155.034
4	FDY38	NaN	Regular	0.118599	Dairy	234.230

```
test_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
dtype: int64
```

Transforming the test data

```
from sklearn.preprocessing import LabelEncoder
encoder = LabelEncoder()
columns = ['Outlet_Type','Outlet_Location_Type','Outlet_Size','Outlet_Identifier','Item_Type'
for column in columns:
  test_data[column] = encoder.fit_transform(test_data[column])


test_data['Outlet_Size'] = test_data['Outlet_Size'].fillna(test_data.groupby('Outlet_Size')['
test_data['Item_Weight'] = test_data['Item_Weight'].fillna(test_data['Item_Weight'].median())
```

```
test_data.head()
```

	Item_Identifier	Item_Weight	Item_Fat_Content	Item_Visibility	Item_Type	Item_MRI
0	1103	20.750	1	0.007565	13	107.862
1	1067	8.300	4	0.038428	4	87.319
2	1406	14.600	1	0.099575	11	241.753
3	809	7.315	1	0.015388	13	155.034
4	1184	12.500	2	0.118599	4	234.230

```
y_pred = model.predict(test_data)

pred_data = pd.DataFrame(y_pred)
pred_data.to_csv('test.csv')

pred_data.head()
```

	Item_Identifier	Outlet_Identifier	Item_Outlet_Sales
0	FDW58	OUT049	1785.109670
1	FDW14	OUT017	1401.402472
2	NCN55	OUT010	693.736968
3	FDQ58	OUT017	2385.834378
4	FDY38	OUT027	6109.167744

Giving the proper column name for the predcted values

```
pred_data['Item_Identifier'] = test_data1['Item_Identifier']


pred_data['Outlet_Identifier'] = test_data1['Outlet_Identifier']

pred_data =  pred_data.rename(columns={0: 'Item_Outlet_Sales'})

pred_data = pred_data[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
```

find the current parameters

```
print('current parameters', model.get_params())
```

```
current parameters {'bootstrap': True, 'ccp_alpha': 0.0, 'criterion': 'squared_error',
```

```
from sklearn.model_selection import RandomizedSearchCV
```

creating random values for hyper parameters and creating grid

```
# Number of trees in random forest
n_estimators = [int(x) for x in np.linspace(start = 200, stop = 2000, num = 10)]
# Number of features to consider at every split
max_features = ['auto', 'sqrt']
# Maximum number of levels in tree
max_depth = [int(x) for x in np.linspace(10, 110, num = 11)]
max_depth.append(None)
# Minimum number of samples required to split a node
min_samples_split = [2, 5, 10]
# Minimum number of samples required at each leaf node
min_samples_leaf = [1, 2, 4]
# Method of selecting samples for training each tree
bootstrap = [True, False]

# Create the random grid
random_grid = {'n_estimators': n_estimators,
               'max_features': max_features,
               'max_depth': max_depth,
               'min_samples_split': min_samples_split,
               'min_samples_leaf': min_samples_leaf,
               'bootstrap': bootstrap}

print(random_grid)
```

```
{'n_estimators': [200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000], 'max_feature
```

```
# Use the random grid to search for best hyperparameters
# First create the base model to tune
rf = RandomForestRegressor()
# Random search of parameters, using 3 fold cross validation,
# search across 100 different combinations, and use all available cores
rf_random = RandomizedSearchCV(estimator = rf, param_distributions = random_grid, n_iter = 10
# Fit the random search model
rf_random.fit(x, y)
```

```
Fitting 3 folds for each of 10 candidates, totalling 30 fits
/usr/local/lib/python3.7/dist-packages/joblib/externals/loky/process_executor.py:705: U
  "timeout or by a memory leak.", UserWarning
RandomizedSearchCV(cv=3, estimator=RandomForestRegressor(), n_jobs=-1,
```

```
                   param_distributions={'bootstrap': [True, False],
                                        'max_depth': [10, 20, 30, 40, 50, 60,
                                                      70, 80, 90, 100, 110,
                                                      None],
                                        'max_features': ['auto', 'sqrt'],
                                        'min_samples_leaf': [1, 2, 4],
                                        'min_samples_split': [2, 5, 10],
                                        'n_estimators': [200, 400, 600, 800,
                                                         1000, 1200, 1400, 1600,
                                                         1800, 2000]},
                   random_state=42, verbose=2)
```

print the best parameters

```
rf_random.best_params_
```

```
{'bootstrap': True,
 'max_depth': 10,
 'max_features': 'sqrt',
 'min_samples_leaf': 2,
 'min_samples_split': 5,
 'n_estimators': 200}
```

evaluating the best model

```
best_model = rf_random.best_estimator_
pred_tune = best_model.predict(test_data)
```

The best model is the model with default hyper parameter

```
pred_data_tuned = pred_data[['Item_Identifier','Outlet_Identifier','Item_Outlet_Sales']]
```

```
pred_data_tuned['Item_Outlet_Sales'] = pred_tune
```

```
pred_data_tuned.head()
```

```
pred_data_tuned.reset_index(drop=True, inplace=True)
pred_data.reset_index(drop=True, inplace=True)
```

1	FDW14	OUT017	1394.587516

predicted value in the test data for the normal model

```
pred_data.head()
```

	Item_Identifier	Outlet_Identifier	Item_Outlet_Sales
0	FDW58	OUT049	1785.109670
1	FDW14	OUT017	1401.402472
2	NCN55	OUT010	693.736968
3	FDQ58	OUT017	2385.834378
4	FDY38	OUT027	6109.167744

predicted value in the test data for the tuned model.

the tuning was perfomed using RandomSearchCV

```
pred_data_tuned.head()
```

	Item_Identifier	Outlet_Identifier	Item_Outlet_Sales
0	FDW58	OUT049	1788.749769
1	FDW14	OUT017	1394.587516
2	NCN55	OUT010	817.322394
3	FDQ58	OUT017	2458.007444
4	FDY38	OUT027	5405.383431

lets see the score of each submission in Analytics Vidhya:

saving the both file into csv

```
pred_data.to_csv('test_normal.csv')
```

```
pred_data_tuned.to_csv('test_tuned.csv')
```

The score for Normal model is 1184.2392

The score for tuned model is 1163.8211

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