```
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_Visi
0	FDA15	9.30	Low Fat	0.
1	DRC01	5.92	Regular	0.
2	FDN15	17.50	Low Fat	0.
3	FDX07	19.20	Regular	0.

```
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
```

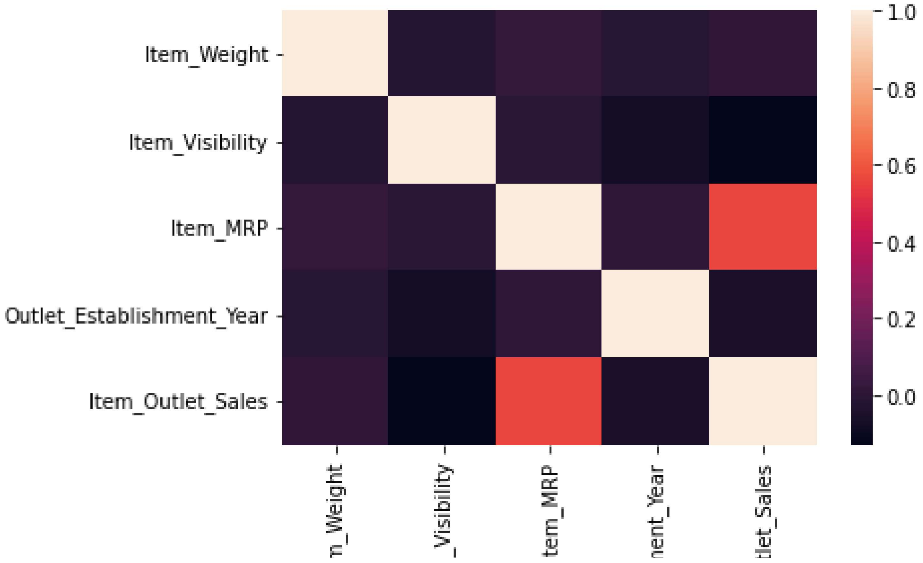
```
data.describe()
```

	Item_Weight	Item_Visibility	Item_MRP	Outlet_Estal
count	7060.000000	8523.000000	8523.000000	
mean	12.857645	0.066132	140.992782	
std	4.643456	0.051598	62.275067	

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()
```

```
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_Visi
0	FDW58	20.750	Low Fat	0.0
1	FDW14	8.300	reg	0.0
2	NCN55	14.600	Low Fat	0.0
3	FDQ58	7.315	Low Fat	0.0
4	FDY38	NaN	Regular	0.1

```
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
```

```
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_Visi
0	1103	20.750	1	0.0
1	1067	8.300	4	0.0
2	1406	14.600	1	0.0
3	809	7.315	1	0.0

```
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

```
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

```
pred_data.to_csv('test3.csv')
```

```
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
```

print the best parameters

```
rf_random.best_params_
```

```
{'bootstrap': True,
 'max_depth': 10,
 'max_features': 'sqrt',
 'min_samples_leaf': 4,
 'min_samples_split': 2,
 'n_estimators': 1600}
```

evaluating the best model

```
best_model = rf_random.best_estimator_
print('accuracy of the model is ',best_model.score(x_test, y_test)*100)
```

```
accuracy of the model is  78.04878048780488
```

The best model is the model with default hyper parameter

Executing (7m 53s) … > … > _run_sea… > evaluate_candi… > __cal… > retrie… > wrap_future_r… > res… > wa… ••• ✕