```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score
```

```
df = pd.read_csv(r'/content/avocado-csv.csv')
```

```
df
```

	Unnamed: 0	Date	AveragePrice	Total Volume	4046	4225	4770	Total Bags	Small Bags	Larg Bag
0	0	12/27/2015	1.33	64236.62	1036.74	54454.85	48.16	8696.87	8603.62	93.2
1	1	12/20/2015	1.35	54876.98	674.28	44638.81	58.33	9505.56	9408.07	97.4
2	2	12/13/2015	0.93	118220.22	794.70	109149.67	130.50	8145.35	8042.21	103.1
3	3	12/6/2015	1.08	78992.15	1132.00	71976.41	72.58	5811.16	5677.40	133.7
4	4	11/29/2015	1.28	51039.60	941.48	43838.39	75.78	6183.95	5986.26	197.6
...	...	...	...	...	...	...	...	...	...	.
18244	7	2/4/2018	1.63	17074.83	2046.96	1529.20	0.00	13498.67	13066.82	431.8
18245	8	1/28/2018	1.71	13888.04	1191.70	3431.50	0.00	9264.84	8940.04	324.8
18246	9	1/21/2018	1.87	13766.76	1191.92	2452.79	727.94	9394.11	9351.80	42.3
18247	10	1/14/2018	1.93	16205.22	1527.63	2981.04	727.01	10969.54	10919.54	50.0
18248	11	1/7/2018	1.62	17489.58	2894.77	2356.13	224.53	12014.15	11988.14	26.0

18249 rows × 14 columns

```
df.head()
```

	Unnamed: 0	Date	AveragePrice	Total Volume	4046	4225	4770	Total Bags	Small Bags	Large Bags	XLar Ba
0	0	12/27/2015	1.33	64236.62	1036.74	54454.85	48.16	8696.87	8603.62	93.25	
1	1	12/20/2015	1.35	54876.98	674.28	44638.81	58.33	9505.56	9408.07	97.49	
2	2	12/13/2015	0.93	118220.22	794.70	109149.67	130.50	8145.35	8042.21	103.14	
3	3	12/6/2015	1.08	78992.15	1132.00	71976.41	72.58	5811.16	5677.40	133.76	
4	4	11/29/2015	1.28	51039.60	941.48	43838.39	75.78	6183.95	5986.26	197.69	

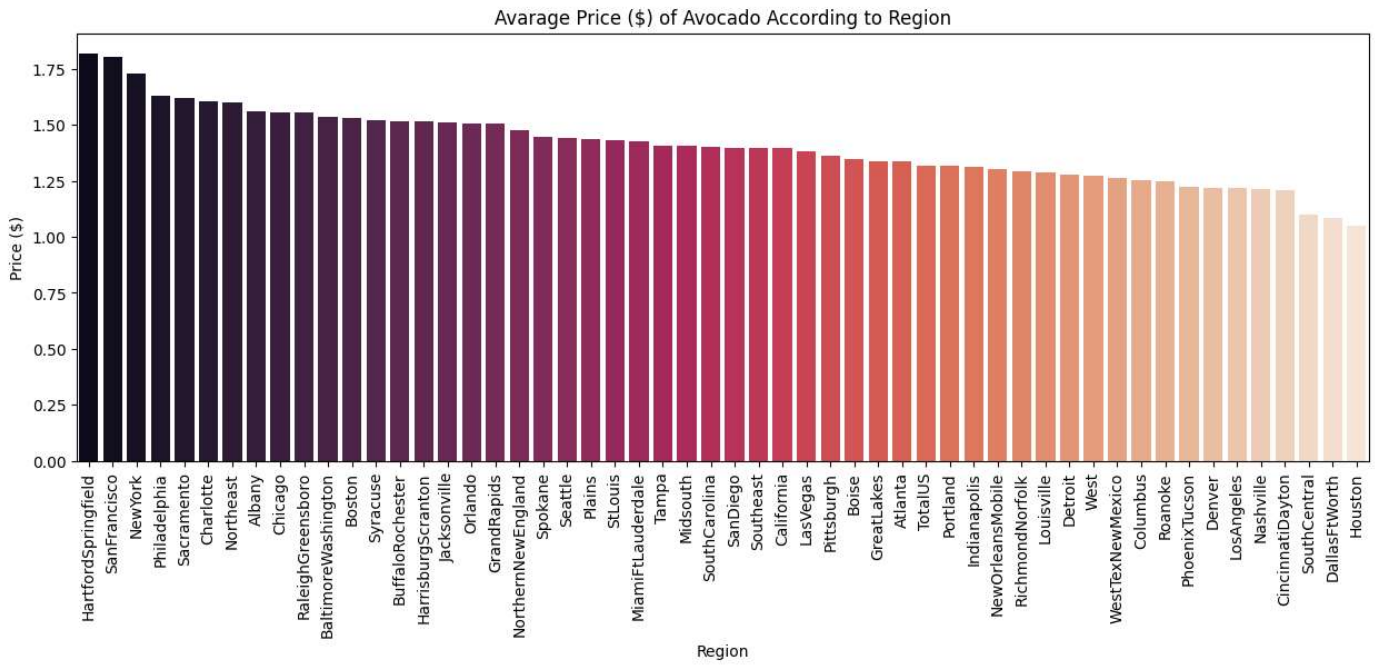
```
df = df.drop(columns=['Unnamed: 0','4046','4225','4770','Date'],axis=1)
```

```
df.head()
```

	AveragePrice	Total Volume	Total Bags	Small Bags	Large Bags	XLarge Bags	type	year	region
0	1.33	64236.62	8696.87	8603.62	93.25	0.0	conventional	2015	Albany
1	1.35	54876.98	9505.56	9408.07	97.49	0.0	conventional	2015	Albany
2	0.93	118220.22	8145.35	8042.21	103.14	0.0	conventional	2015	Albany
3	1.08	78992.15	5811.16	5677.40	133.76	0.0	conventional	2015	Albany

```
def get_avarage(df,column):
    """
    Description: This function to return the average value of the column

    Arguments:
        df: the DataFrame.
        column: the selected column.
    Returns:
        column's average
    """
    return sum(df[column])/len(df)


def get_avarge_between_two_columns(df,column1,column2):
    """
    Description: This function calculate the average between two columns in the dataset

    Arguments:
        df: the DataFrame.
        column1:the first column.
        column2:the scond column.
    Returns:
        Sorted data for relation between column1 and column2
    """

    List=list(df[column1].unique())
    average=[]

    for i in List:
        x=df[df[column1]==i]
        column1_average= get_avarage(x,column2)
        average.append(column1_average)

    df_column1_column2=pd.DataFrame({'column1':List,'column2':average})
    column1_column2_sorted_index=df_column1_column2.column2.sort_values(ascending=False).index.values
    column1_column2_sorted_data=df_column1_column2.reindex(column1_column2_sorted_index)

    return column1_column2_sorted_data


def plot(data,xlabel,ylabel):
    """
    Description: This function to draw a barplot

    Arguments:
        data: the DataFrame.
        xlabel: the label of the first column.
        ylabel: the label of the second column.
    Returns:
        None
    """

    plt.figure(figsize=(15,5))
    ax=sns.barplot(x=data.column1,y=data.column2,palette='rocket')
    plt.xticks(rotation=90)
    plt.xlabel(xlabel)
    plt.ylabel(ylabel)
    plt.title(('Avarage '+ylabel+' of Avocado According to '+xlabel));
```

```
data1 = get_avarge_between_two_columns(df,'region','AveragePrice')
plot(data1,'Region','Price ($)')
```




```
print(data1['column1'].iloc[-1], " is the region producing avocado with the lowest price.")
```

```
     Houston  is the region producing avocado with the lowest price.
```

```
# what is the highest region of avocado production
```

```
# Checking  if there are outlier values or not.
```

```
data2 = get_avarge_between_two_columns(df,'region','Total Volume')
sns.boxplot(x=data2.column2).set_title("Figure: Boxplot repersenting outlier columns.")
```

```
Text(0.5, 1.0, 'Figure: Boxplot repersenting outlier columns.')
```

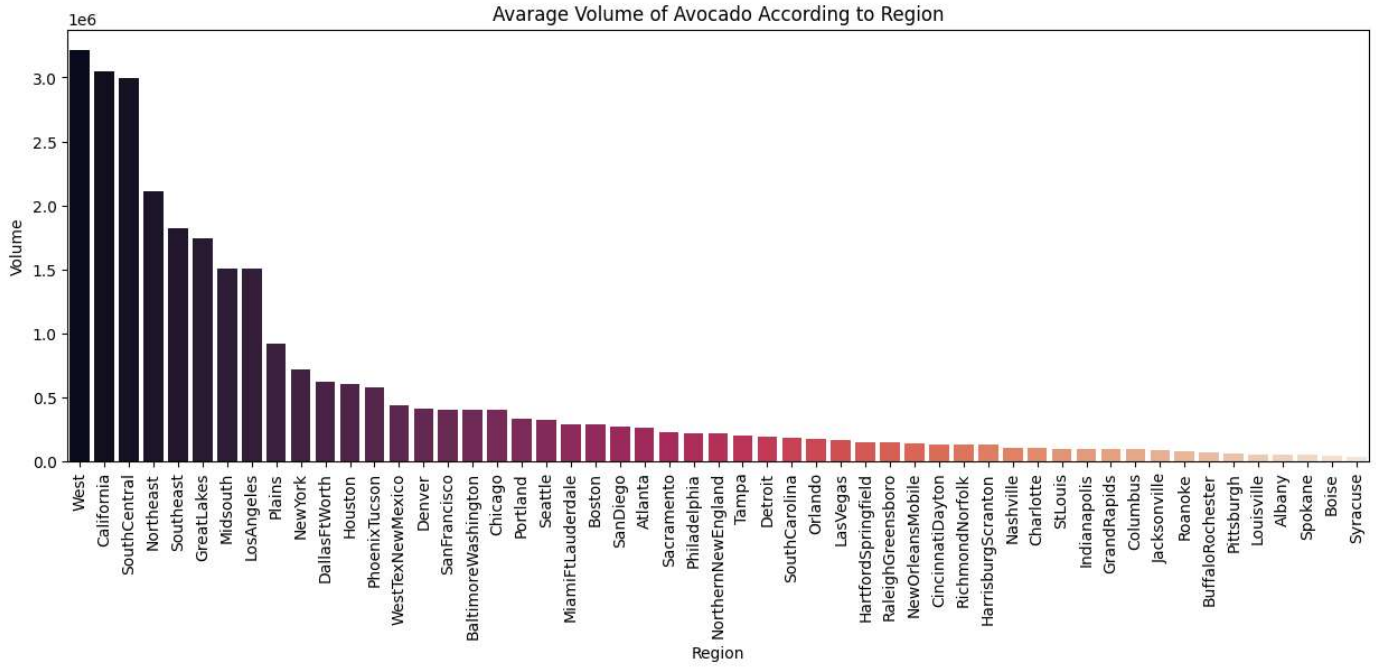
```
outlier_region = data2[data2.column2>10000000]
print(outlier_region['column1'].iloc[-1],"is outlier value")
```

```
TotalUS is outlier value
```

```
# Remove the outlier values
```

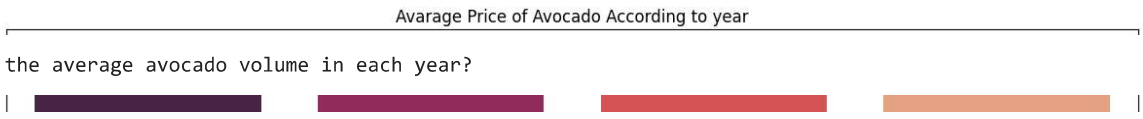
```
outlier_region.index
data2 = data2.drop(outlier_region.index,axis=0)
```

```
plot(data2,'Region','Volume')
```




```
# What is the average avocado prices in each year?
```

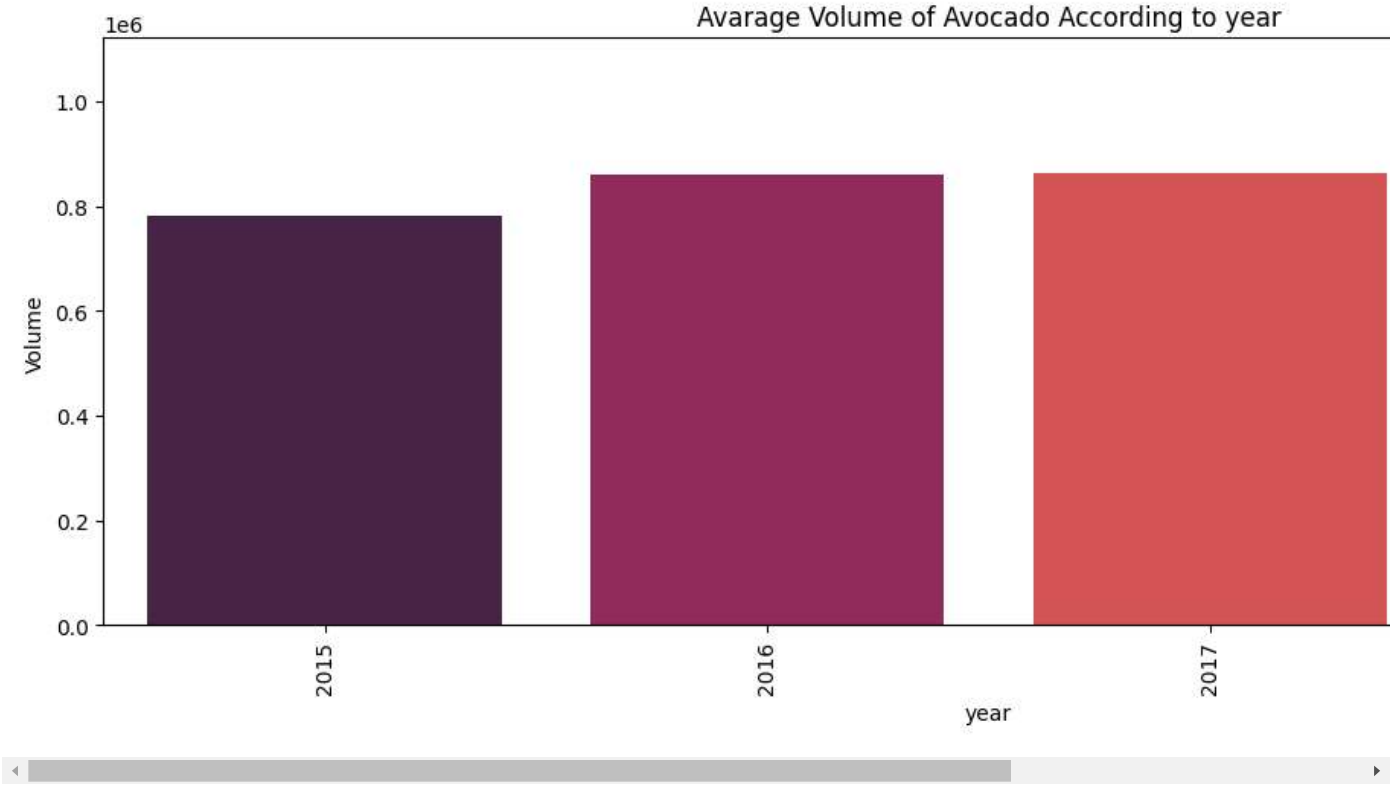
```
data3 = get_avarge_between_two_columns(df,'year','AveragePrice')
plot(data3,'year','Price')
```




```
# What is the average avocado volume in each year?
```



```
data4 = get_avarge_between_two_columns(df,'year','Total Volume')
plot(data4,'year','Volume')
```




```
# Data Modeling
#we built the regrassion model by using linear regrassion from sklearn to predict the Avocado Price
# Changing some column types in to catagories


df['region'] = df['region'].astype('category')
df['region'] = df['region'].cat.codes
df['type'] = df['type'].astype('category')
df['type'] = df['type'].cat.codes


df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18249 entries, 0 to 18248
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype  
---  ------        --------------  -----  
 0   AveragePrice  18249 non-null  float64
 1   Total Volume  18249 non-null  float64
 2   Total Bags    18249 non-null  float64
 3   Small Bags    18249 non-null  float64
 4   Large Bags    18249 non-null  float64
 5   XLarge Bags   18249 non-null  float64
 6   type          18249 non-null  int8   
 7   year          18249 non-null  int64  
 8   region        18249 non-null  int8   
dtypes: float64(6), int64(1), int8(2)
memory usage: 1.0 MB
```

```
df.head()
```

	AveragePrice	Total Volume	Total Bags	Small Bags	Large Bags	XLarge Bags	type	year	region
0	1.33	64236.62	8696.87	8603.62	93.25	0.0	0	2015	0
1	1.35	54876.98	9505.56	9408.07	97.49	0.0	0	2015	0
2	0.93	118220.22	8145.35	8042.21	103.14	0.0	0	2015	0
3	1.08	78992.15	5811.16	5677.40	133.76	0.0	0	2015	0
4	1.28	51039.60	6183.95	5986.26	197.69	0.0	0	2015	0

```
# split data into x and y
X = df.drop(['AveragePrice'],axis=1)
y = df['AveragePrice']

# split data into training and testing dataset
X_train,X_test, y_train, y_test = train_test_split(X,y,test_size=0.3,random_state=15)


print("training set:",X_train.shape,'-',y_train.shape[0],'samples')
print("testing set:",X_test.shape,'-',y_test.shape[0], 'samples')
```

```
training set: (12774, 8) - 12774 samples
testing set: (5475, 8) - 5475 samples
```

```
# build and fit the model

from sklearn.preprocessing import StandardScaler

# Create an instance of StandardScaler
scaler = StandardScaler()

# Fit the scaler to your training data
scaler.fit(X_train)

# Transform the training and test data using the scaler
X_train_scaled = scaler.transform(X_train)
X_test_scaled = scaler.transform(X_test)

# Build and fit the linear regression model
model = LinearRegression()
model.fit(X_train_scaled, y_train)
```

```
▾ LinearRegression
LinearRegression()
```

```
# Evaluate the Results:



# Prediction and Calculate the accuracy for the testing dataset
test_pre = model.predict(X_test)
test_score = r2_score(y_test,test_pre)
print("The accuracy of testing dataset",test_score*100)
```

```
The accuracy of testing dataset -1.4505457449012067e+23
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:432: UserWarning: X has feature names, but LinearRegression wa
  warnings.warn(
```

```
# Prediction and Calculate the accuracy for the training dataset
train_pre = model.predict(X_train)
train_score = r2_score(y_train,train_pre)
print("The accuracy of training dataset",train_score*100)
```

```
The accuracy of training dataset -1.1461742718581598e+23
/usr/local/lib/python3.10/dist-packages/sklearn/base.py:432: UserWarning: X has feature names, but LinearRegression wa
  warnings.warn(
```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