Import Libraries

In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
```

Load the Dataset

In [2]:
```
df = pd.read_csv("Dataset .csv")
```

In [3]:
```
df
```

Out[3]:

	Restaurant ID	Restaurant Name	Country Code	City	Address	Locality	Locality Verbose	Longitude
0	6317637	Le Petit Souffle	162	Makati City	Third Floor, Century City Mall, Kalayaan Avenu...	Century City Mall, Poblacion, Makati City	Century City Mall, Poblacion, Makati City, Mak...	121.02753
1	6304287	Izakaya Kikufuji	162	Makati City	Little Tokyo, 2277 Chino Roces Avenue, Legaspi...	Little Tokyo, Legaspi Village, Makati City	Little Tokyo, Legaspi Village, Makati City, Ma...	121.01410
2	6300002	Heat - Edsa Shangri-La	162	Mandaluyong City	Edsa Shangri-La, 1 Garden Way, Ortigas, Mandal...	Edsa Shangri-La, Ortigas, Mandaluyong City	Edsa Shangri-La, Ortigas, Mandaluyong City, Ma...	121.05683
3	6318506	Ooma	162	Mandaluyong City	Third Floor, Mega Fashion Hall, SM Megamall, O...	SM Megamall, Ortigas, Mandaluyong City	SM Megamall, Ortigas, Mandaluyong City, Mandal...	121.05647
4	6314302	Sambo Kojin	162	Mandaluyong City	Third Floor, Mega Atrium, SM Megamall, Ortigas...	SM Megamall, Ortigas, Mandaluyong City	SM Megamall, Ortigas, Mandaluyong City, Mandal...	121.05750
...	...	...	...	...	...	...	...	...
9546	5915730	Naml Gurme	208	��stanbul	Kemanke�� Karamustafa Pa��a Mahallesi, Rıhtım ...	Karak�_y	Karak�_y, ��stanbul	28.97739
9547	5908749	Ceviz A��acı	208	��stanbul	Ko��uyolu Mahallesi, Muhittin ��st�_nda�� Cadd...	Ko��uyolu	Ko��uyolu, ��stanbul	29.04129
9548	5915807	Huqqa	208	��stanbul	Kuru�_e��me Mahallesi,	Kuru�_e��me	Kuru�_e��me, ��stanbul	29.03464

					Muallim Naci Caddesi, N...			
9549	5916112	A���k Kahve	208	��stanbul	Kuru�_e��me Mahallesi, Muallim Naci Caddesi, N...	Kuru�_e��me	Kuru�_e��me, ��stanbul	29.036019
9550	5927402	Walter's Coffee Roastery	208	��stanbul	Cafea��a Mahallesi, Bademaltı Sokak, No 21/B, ...	Moda	Moda, ��stanbul	29.026016

9551 rows × 21 columns

Data Analysis

In [4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9551 entries, 0 to 9550
Data columns (total 21 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   Restaurant ID         9551 non-null   int64  
 1   Restaurant Name       9551 non-null   object 
 2   Country Code          9551 non-null   int64  
 3   City                  9551 non-null   object 
 4   Address               9551 non-null   object 
 5   Locality              9551 non-null   object 
 6   Locality Verbose      9551 non-null   object 
 7   Longitude             9551 non-null   float64
 8   Latitude              9551 non-null   float64
 9   Cuisines              9542 non-null   object 
 10  Average Cost for two  9551 non-null   int64  
 11  Currency              9551 non-null   object 
 12  Has Table booking     9551 non-null   object 
 13  Has Online delivery   9551 non-null   object 
 14  Is delivering now     9551 non-null   object 
 15  Switch to order menu  9551 non-null   object 
 16  Price range           9551 non-null   int64  
 17  Aggregate rating      9551 non-null   float64
 18  Rating color          9551 non-null   object 
 19  Rating text           9551 non-null   object 
 20  Votes                 9551 non-null   int64  
dtypes: float64(3), int64(5), object(13)
memory usage: 1.5+ MB
```

In [5]:
```
df.describe()
```

Out[5]:

	Restaurant ID	Country Code	Longitude	Latitude	Average Cost for two	Price range	Aggregate rating	Vot
count	9.551000e+03	9551.000000	9551.000000	9551.000000	9551.000000	9551.000000	9551.000000	9551.0000
mean	9.051128e+06	18.365616	64.126574	25.854381	1199.210763	1.804837	2.666370	156.9097
std	8.791521e+06	56.750546	41.467058	11.007935	16121.183073	0.905609	1.516378	430.1691
min	5.300000e+01	1.000000	-157.948486	-41.330428	0.000000	1.000000	0.000000	0.0000
25%	3.019625e+05	1.000000	77.081343	28.478713	250.000000	1.000000	2.500000	5.0000

50%	6.004089e+06	1.000000	77.191964	28.570469	400.000000	2.000000	3.200000	31.0000
75%	1.835229e+07	1.000000	77.282006	28.642758	700.000000	2.000000	3.700000	131.0000
max	1.850065e+07	216.000000	174.832089	55.976980	800000.000000	4.000000	4.900000	10934.0000

In [6]:
```
df.duplicated().sum()
```

Out[6]:
```
0
```

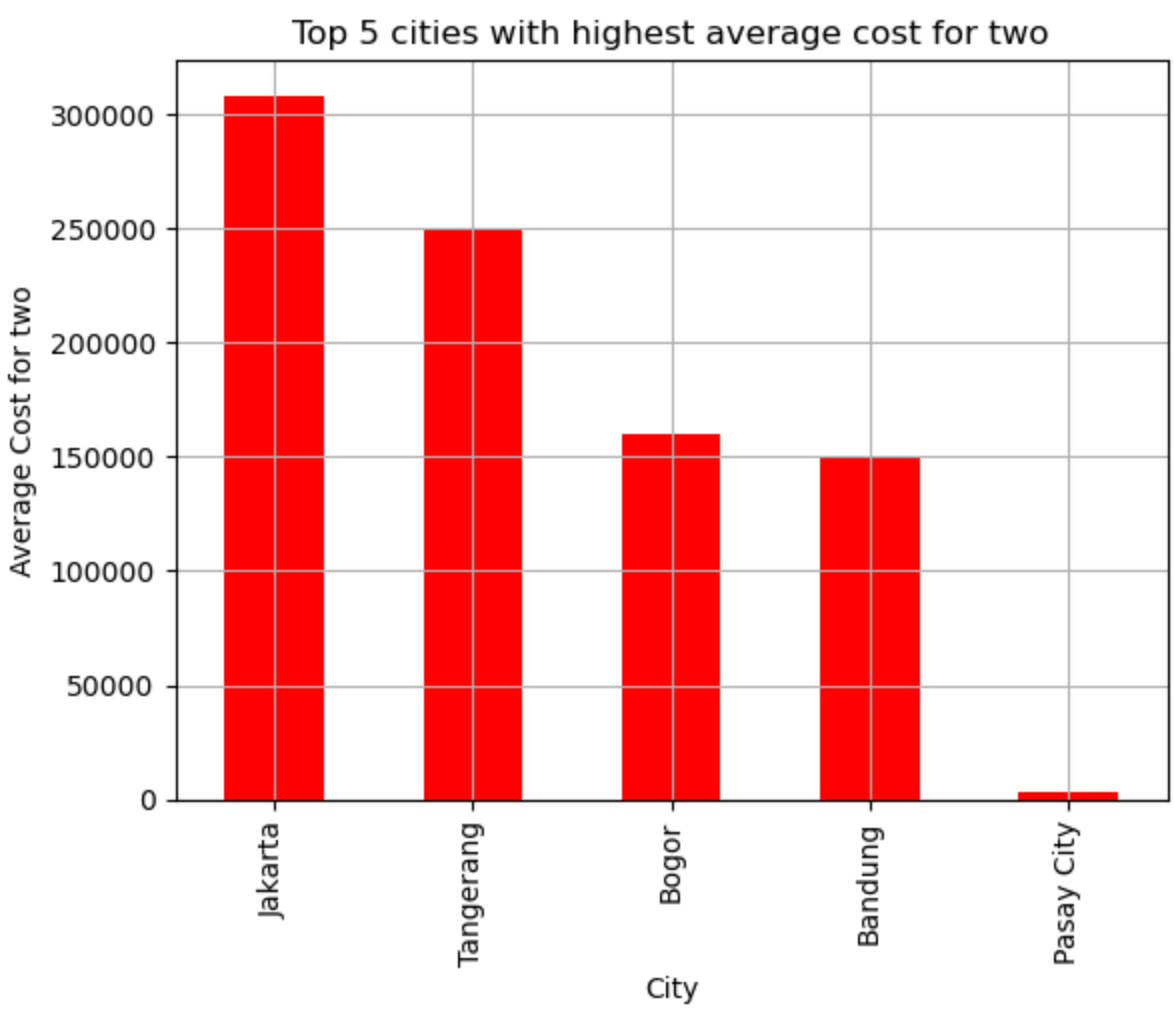
In [7]:
```
df.isna().sum()
```

Out[7]:
```
Restaurant ID           0
Restaurant Name         0
Country Code            0
City                    0
Address                 0
Locality                0
Locality Verbose        0
Longitude               0
Latitude                0
Cuisines                9
Average Cost for two    0
Currency                0
Has Table booking       0
Has Online delivery     0
Is delivering now       0
Switch to order menu    0
Price range             0
Aggregate rating        0
Rating color            0
Rating text             0
Votes                   0
dtype: int64
```

In [8]:
```
df.columns
```

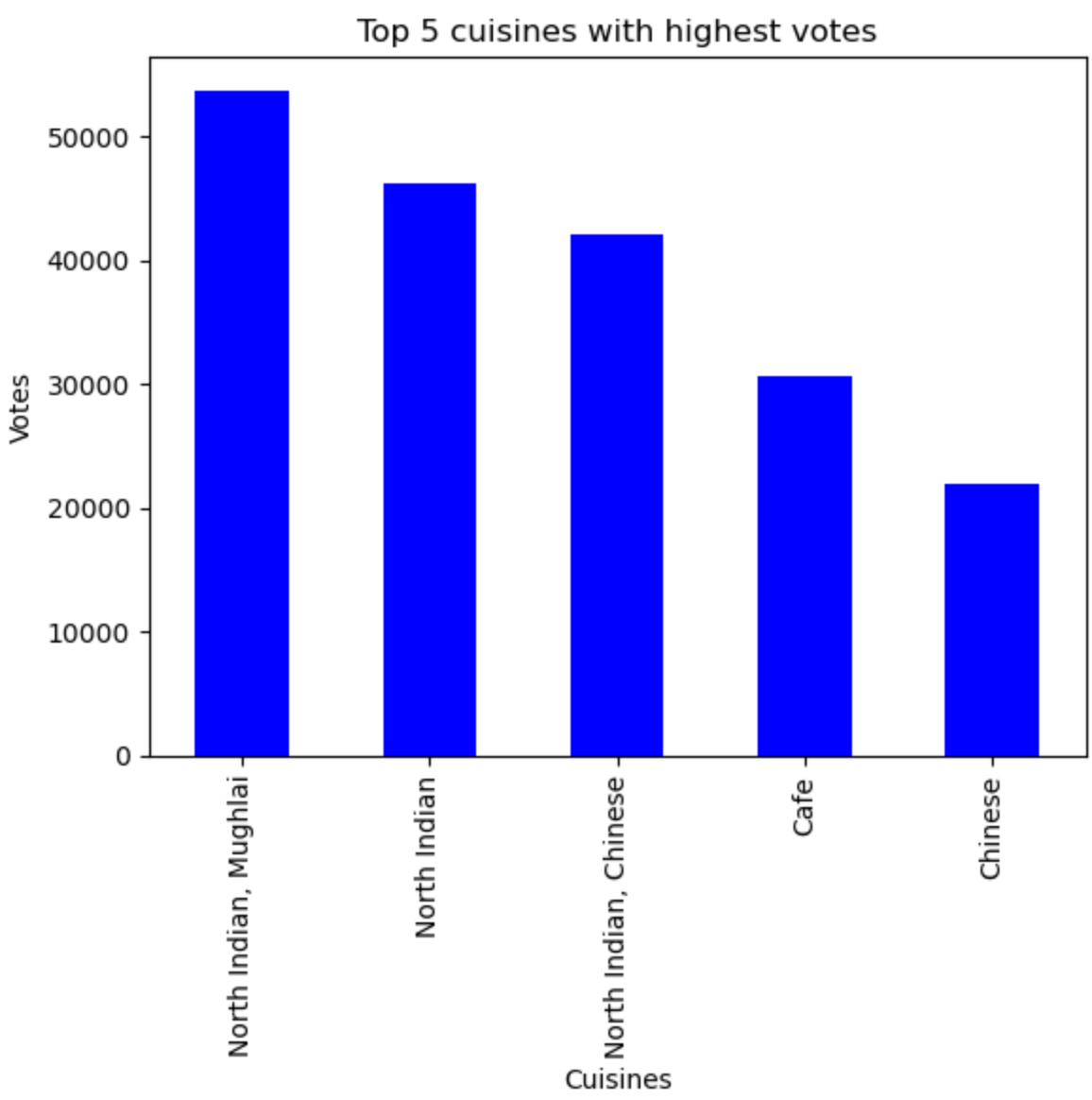
Out[8]:
```
Index(['Restaurant ID', 'Restaurant Name', 'Country Code', 'City', 'Address',
       'Locality', 'Locality Verbose', 'Longitude', 'Latitude', 'Cuisines',
       'Average Cost for two', 'Currency', 'Has Table booking',
       'Has Online delivery', 'Is delivering now', 'Switch to order menu',
       'Price range', 'Aggregate rating', 'Rating color', 'Rating text',
       'Votes'],
      dtype='object')
```

In [9]:
```
#Group by city and calculate average price
df.groupby('City')['Average Cost for two'].mean().sort_values(ascending=False).head().pl
plt.title('Top 5 cities with highest average cost for two')
plt.xlabel('City')
plt.ylabel('Average Cost for two')
plt.grid()
plt.show()
```



In [10]:
```
#Cusinine count
df.groupby('Cuisines')['Votes'].sum().sort_values(ascending=False).head().plot(kind='bar
plt.title('Top 5 cuisines with highest votes')
plt.xlabel('Cuisines')
plt.ylabel('Votes')

plt.show()
```



In [11]:
```
data_Cuisines_Votes = df.groupby('Cuisines')['Votes'].sum().reset_index()
```

In [12]:
```
data_Cuisines_Votes[data_Cuisines_Votes['Votes']!=0]
```

Out[12]:

	Cuisines	Votes
0	Afghani	39
1	Afghani, Mughlai, Chinese	2
3	Afghani, North Indian, Pakistani, Arabian	3
4	African	373
5	African, Portuguese	265
...	...	...
1820	Western, Asian, Cafe	259
1821	Western, Fusion, Fast Food	32
1822	World Cuisine	95
1823	World Cuisine, Mexican, Italian	115
1824	World Cuisine, Patisserie, Cafe	1034

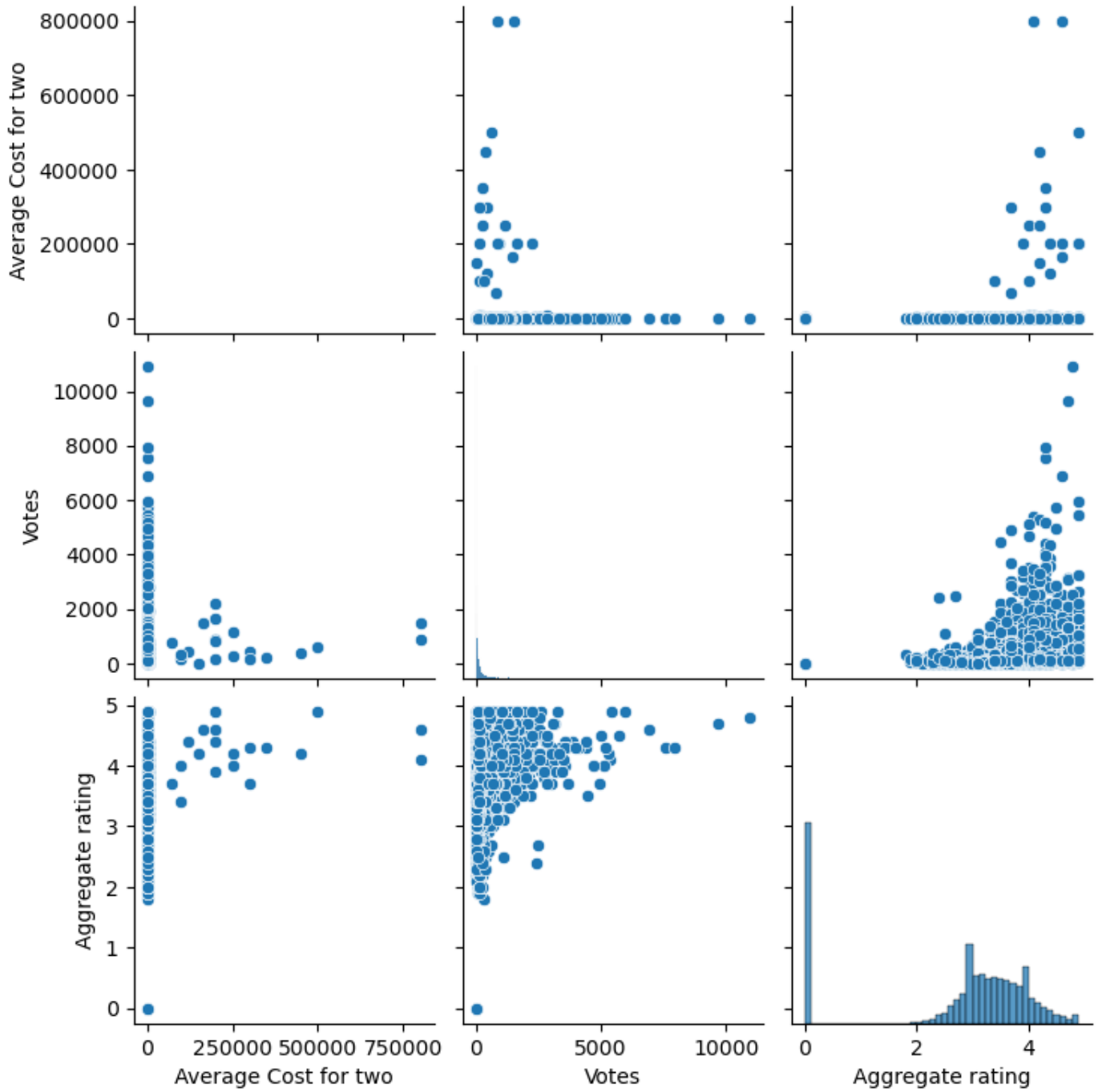
1777 rows × 2 columns

In [13]:
```
df.columns
```

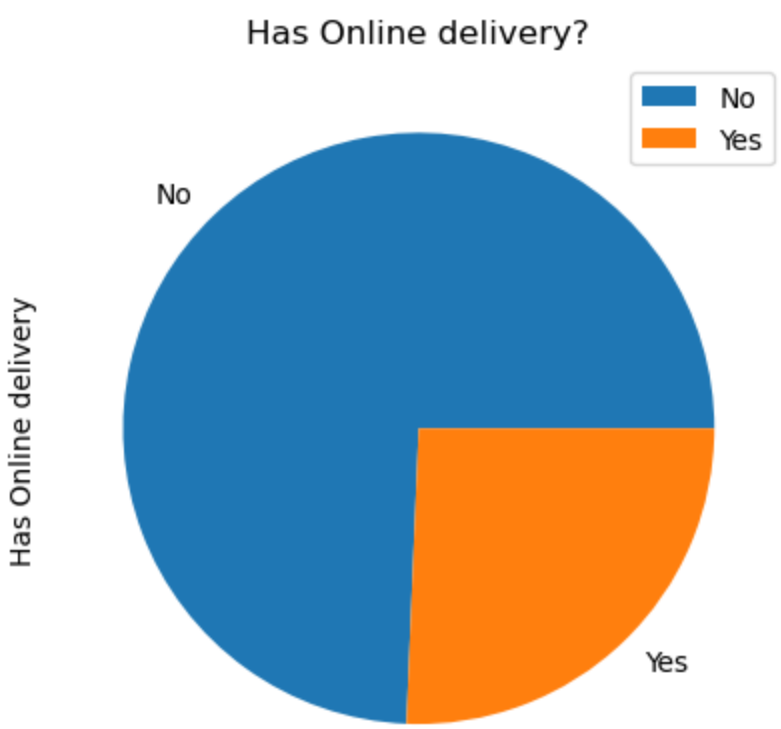
Out[13]:
```
Index(['Restaurant ID', 'Restaurant Name', 'Country Code', 'City', 'Address',
       'Locality', 'Locality Verbose', 'Longitude', 'Latitude', 'Cuisines',
       'Average Cost for two', 'Currency', 'Has Table booking',
       'Has Online delivery', 'Is delivering now', 'Switch to order menu',
       'Price range', 'Aggregate rating', 'Rating color', 'Rating text',
       'Votes'],
      dtype='object')
```

In [14]:
```
sns.pairplot(data=df[["Average Cost for two", "Votes", "Aggregate rating"]])
```

Out[14]:
```
<seaborn.axisgrid.PairGrid at 0x15adff6f690>
```



In [15]:
```
df["Has Online delivery"].value_counts().plot(kind='pie')
plt.title('Has Online delivery?')
plt.legend()
plt.show()
```



In [16]:
```
df.columns
```

Out[16]:
```
Index(['Restaurant ID', 'Restaurant Name', 'Country Code', 'City', 'Address',
       'Locality', 'Locality Verbose', 'Longitude', 'Latitude', 'Cuisines',
       'Average Cost for two', 'Currency', 'Has Table booking',
       'Has Online delivery', 'Is delivering now', 'Switch to order menu',
       'Price range', 'Aggregate rating', 'Rating color', 'Rating text',
       'Votes'],
      dtype='object')
```

In [17]:
```
df[['Aggregate rating','Rating text']].sort_values(by='Aggregate rating',ascending=False
```

Out[17]:

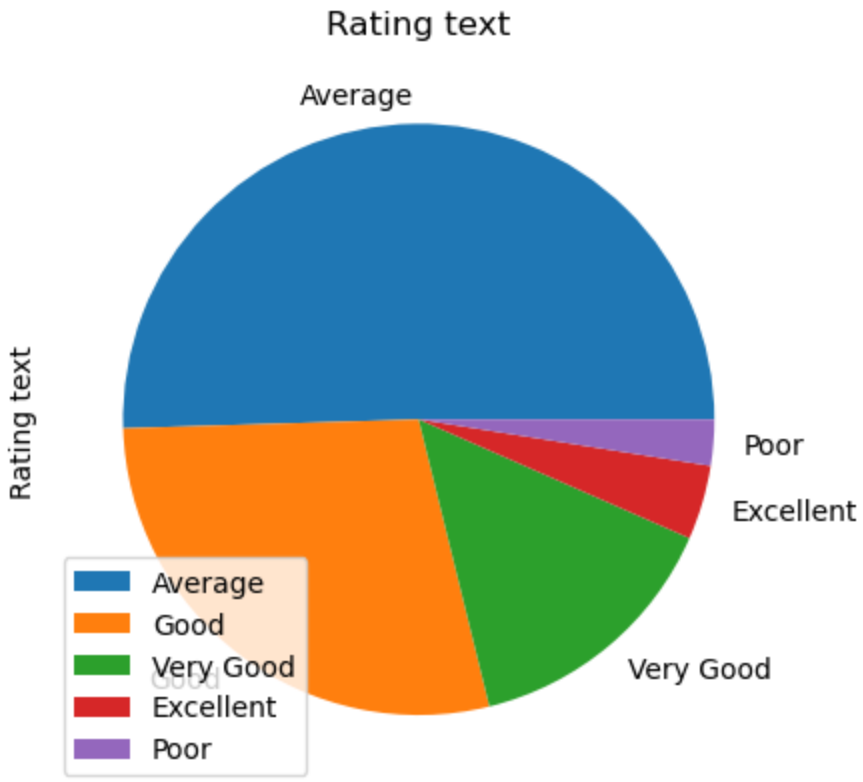
	Aggregate rating	Rating text
1381	4.9	Excellent
589	4.9	Excellent
374	4.9	Excellent
9303	4.9	Excellent
9299	4.9	Excellent
...	...	...
9062	2.6	Average
1133	2.6	Average
3301	2.6	Average
6268	2.6	Average
6267	2.6	Average

7000 rows × 2 columns

Feature Engineering

In [18]:
```
df= df[df["Rating text"] != "Not rated"]
```

In [19]:
```
df["Rating text"].value_counts().plot(kind='pie')
plt.title('Rating text')
plt.legend()
plt.show()
```



In [20]:
```
X=df[['Average Cost for two','Has Table booking','Has Online delivery','Price range']]
```

In [21]:
```
#above 2 and below 2.5 Poor
#above 2.5 and below 3.5 Average
#above 3.5 and below 4.0 Good
#above 4.0 and below 4.5 Very Good
#above 4.5 Excellent
```

In [22]:
```
y= df[["Aggregate rating"]]
```

In [23]:
```
X
```

Out[23]:

	Average Cost for two	Has Table booking	Has Online delivery	Price range
0	1100	Yes	No	3
1	1200	Yes	No	3
2	4000	Yes	No	4
3	1500	No	No	4
4	1500	Yes	No	4
...	...	...	...	...
9546	80	No	No	3
9547	105	No	No	3
9548	170	No	No	4

9549	120	No	No	4
9550	55	No	No	2

7403 rows × 4 columns

In [24]:
```
from sklearn import preprocessing
labelencoder=preprocessing.LabelEncoder()
```

In [25]:
```
X['Has Table booking']=labelencoder.fit_transform(X['Has Table booking'])
```

```
C:\Users\Ayushi\AppData\Local\Temp\ipykernel_11104\3278653462.py:1: SettingWithCopyWarni
ng:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_
guide/indexing.html#returning-a-view-versus-a-copy
  X['Has Table booking']=labelencoder.fit_transform(X['Has Table booking'])
```

In [26]:
```
#Has Table booking 0 is no 1 is yes
X['Has Online delivery']=labelencoder.fit_transform(X['Has Online delivery'])
```

```
C:\Users\Ayushi\AppData\Local\Temp\ipykernel_11104\1069125123.py:2: SettingWithCopyWarni
ng:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_
guide/indexing.html#returning-a-view-versus-a-copy
  X['Has Online delivery']=labelencoder.fit_transform(X['Has Online delivery'])
```

In [27]:
```
X
```

Out[27]:

	Average Cost for two	Has Table booking	Has Online delivery	Price range
0	1100	1	0	3
1	1200	1	0	3
2	4000	1	0	4
3	1500	0	0	4
4	1500	1	0	4
...	...	...	...	...
9546	80	0	0	3
9547	105	0	0	3
9548	170	0	0	4
9549	120	0	0	4
9550	55	0	0	2

7403 rows × 4 columns

In [28]:
```
from sklearn.preprocessing import StandardScaler
scaler=StandardScaler()
```

In [29]:
```
X=scaler.fit_transform(X)
```

Machine Learning

In [30]:
```
from sklearn.model_selection import train_test_split
```

In [31]:
```
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2)
```

In [32]:
```
from sklearn.metrics import mean_squared_error
import numpy as np
```

In [33]:
```
def modelresults(predictions):
    print("Mean Squared Error:{}".format(mean_squared_error (y_test, predictions)))
    print('Root Mean Squared Error:{}'.format(np.sqrt(mean_squared_error(y_test, predict
```

In [34]:
```
from sklearn.linear_model import LinearRegression
lr=LinearRegression()
```

In [35]:
```
lr.fit(X_train,y_train)
```

Out[35]:
```
▾ LinearRegression
LinearRegression()
```

In [36]:
```
predictions_from_lr = lr.predict(X_test)
```

In [37]:
```
modelresults(predictions_from_lr)
```

```
Mean Squared Error:0.2465089621978426
Root Mean Squared Error:0.4964966890099496
```

In [38]:
```
from sklearn.svm import SVR
from sklearn.model_selection import GridSearchCV
```

In [39]:
```
svrmodel=SVR()
```

In [40]:
```
param_gridsvr={ "C":[0.1,0.5],"kernel":["rbf","poly"],"degree":[2,3]}
```

In [41]:
```
gridsearchsvr=GridSearchCV(svrmodel,param_gridsvr)
```

In [42]:
```
gridsearchsvr.fit(X_train,y_train)
```

```
C:\Users\Ayushi\anaconda4\Lib\site-packages\sklearn\utils\validation.py:1184: DataConver
sionWarning: A column-vector y was passed when a 1d array was expected. Please change th
e shape of y to (n_samples, ), for example using ravel().
  y = column_or_1d(y, warn=True)
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```

Out[42]:

```
▸ GridSearchCV
▸ estimator: SVR
  ▸ SVR
```

In [43]:
```
predsgridSearchsvr=gridsearchsvr.predict(X_test)
```

In [44]:
```
modelresults(predsgridSearchsvr)
```

```
Mean Squared Error:0.24111981892938783
Root Mean Squared Error:0.4910395288868177
```

In [45]:
```
from sklearn.tree import DecisionTreeRegressor
```

In [46]:
```
param_grid={
    "max_depth":[3,4,5,6,7,8,9,10],
    "min_samples_leaf":[1,2,3],
    "min_samples_split":[2,3,4,5]
}
```

In [47]:
```
treeModel=DecisionTreeRegressor()
```

In [48]:
```
grid_tree=GridSearchCV(treeModel,param_grid=param_grid)
```

In [49]:
```
grid_tree.fit(X_train,y_train)
```

Out[49]:

```
▸ GridSearchCV
▸ estimator: DecisionTreeRegressor
  ▸ DecisionTreeRegressor
```

In [50]:
```
treepredictions = grid_tree.predict(X_test)
```

In [51]:
```
modelresults(treepredictions)
```

```
Mean Squared Error:0.20748199665723238
Root Mean Squared Error:0.45550191729259754
```

In [52]:
```
from sklearn.ensemble import RandomForestRegressor
```

In [53]:
```
rfrmodel=RandomForestRegressor()
```

In [54]:
```
param_gridrfr={"max_depth":[3,4,5,6,7,8,9,10],"n_estimators":[2,5,10]}
```

In [55]:
```
gridrfr= GridSearchCV(rfrmodel,param_grid=param_gridrfr)
```

In [56]:
```
gridrfr.fit(X_train,y_train)
```

```
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```

Out[56]:

```
▸ GridSearchCV
▸ estimator: RandomForestRegressor
    ▸ RandomForestRegressor
```

In [57]:

```python
RandomForestRegressorPredictions=gridrfr.predict(X_test)
```

In [58]:

```python
modelresults(RandomForestRegressorPredictions)
```

```
Mean Squared Error:0.2045871465393458
Root Mean Squared Error:0.45231310675166797
```

In [59]:

```python
gridrfr.best_params_
```

Out[59]:

```
{'max_depth': 7, 'n_estimators': 5}
```

In [60]:

```python
grid_tree.best_params_
```

Out[60]:

```
{'max_depth': 7, 'min_samples_leaf': 1, 'min_samples_split': 5}
```

In [61]:

```python
from sklearn.neighbors import KNeighborsRegressor
knn= KNeighborsRegressor()
knn_param_grid={"n_neighbors":[9,10,11,12,13,14,15,16]}
knn_grid_search=GridSearchCV(knn,knn_param_grid)
```

In [62]:

```python
knn_grid_search.fit(X_train,y_train)
```

Out[62]:

```
▸ GridSearchCV
▸ estimator: KNeighborsRegressor
    ▸ KNeighborsRegressor
```

In [63]:
```python
knn_predictions=knn_grid_search.predict(X_test)
```

In [64]:
```python
modelresults(knn_predictions)
```

```
Mean Squared Error:0.21553526966576636
Root Mean Squared Error:0.46425776209533254
```

In [65]:
```python
knn_grid_search.best_params_
```

Out[65]:
```
{'n_neighbors': 16}
```

In [66]:
```python
from sklearn.ensemble import AdaBoostRegressor
ada=AdaBoostRegressor()
ada_param_grid={"n_estimators": [50,100,150,200,250],
                "learning_rate": [0.1,0.25,0.5,0.75,1]}
ada_grid_search= GridSearchCV(ada,ada_param_grid)
```

In [67]:
```python
ada_grid_search.fit(X_train,y_train)
```

```
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```

```
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```
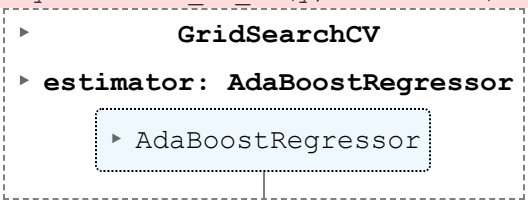

Out[67]:



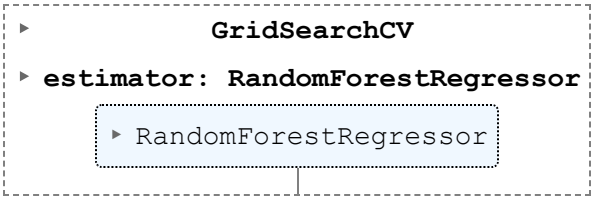
In [68]:
```
adapreds=ada_grid_search.predict(X_test)
```

In [69]:
```
modelresults(adapreds)
```

```
Mean Squared Error:0.21201058739155607
Root Mean Squared Error:0.46044607435785145
```

In [70]:
```
gridrfr
```

Out[70]:

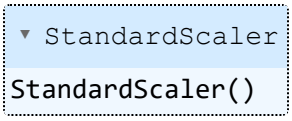


In [71]:
```
import joblib
joblib.dump(gridrfr,"mlmodel.pkl")
```

Out[71]:
```
['mlmodel.pkl']
```

In [72]:
```
scaler
```

Out[72]:



Thank You