[1]:
```python
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[47]:
```python
data = pd.read_excel('data.xlsx')
```

1 1. Data Preliminary analysis:

- Perform preliminary data inspection and report the findings as the structure of the data, missing values, duplicates etc.
- Based on the findings from the previous questions identify duplicates and remove them.

[3]:
```python
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9551 entries, 0 to 9550
Data columns (total 19 columns):
Restaurant ID           9551 non-null int64
Restaurant Name         9550 non-null object
Country Code            9551 non-null int64
City                    9551 non-null object
Address                 9551 non-null object
Locality                9551 non-null object
Locality Verbose        9551 non-null object
Longitude               9551 non-null float64
Latitude                9551 non-null float64
Cuisines                9542 non-null object
Average Cost for two    9551 non-null int64
Currency                9551 non-null object
Has Table booking       9551 non-null object
Has Online delivery     9551 non-null object
Price range             9551 non-null int64
Aggregate rating        9551 non-null float64
Rating color            9551 non-null object
Rating text             9551 non-null object
Votes                   9551 non-null int64
```

```
dtypes: float64(3), int64(5), object(11)
memory usage: 1.4+ MB
```

2 Clean variable names

[48]:
```
data.columns = data.columns.str.replace(' ','_')
```

2.1 values given as 0 are missing

[49]:
```
(data == 0).sum()
```

[49]:
```
Restaurant_ID              0
Restaurant_Name            0
Country_Code               0
City                       0
Address                    0
Locality                   0
Locality_Verbose           0
Longitude                498
Latitude                 498
Cuisines                   0
Average_Cost_for_two      18
Currency                   0
Has_Table_booking          0
Has_Online_delivery        0
Price_range                0
Aggregate_rating        2148
Rating_color               0
Rating_text                0
Votes                   1094
dtype: int64
```

3 Missing values for Latitude and Longitude

[51]:
```
missing_city = data[(data.Longitude ==0)|(data.Latitude == 0) ].City.unique()
len(missing_city)
```

[51]:
```
28
```

4 fill in Missing using the city names

[52]:
```
lat_n_long = data.groupby('City').agg('mean')[['Latitude','Longitude']].
 ↪loc[missing_city]
missing_city_loc = {x:tuple(lat_n_long.loc[x]) for x in missing_city}
((data.Latitude == 0) | (data.Longitude == 0)).sum()
```

[52]: 499

[53]:
```
len(lat_n_long)
```

[53]: 28

[8]:
```
for i in data.index:
    if  (data.loc[i,'Latitude'] == 0) or (data.loc[i , 'Longitude'] == 0):
        city = data.loc[i , 'City']
        lat, long = missing_city_loc[city]
        data.loc[i,'Latitude'] = lat
        data.loc[i,'Longitude'] = long
```

5 duplicates

[9]:
```
print('Any Duplicated Rows ? :' , data.duplicated().any())
print('No. of Duplicated Rows :', data.duplicated().sum())
```

```
Any Duplicated Rows ? : False
No. of Duplicated Rows : 0
```

[10]:
```
data.duplicated('Restaurant_ID').any()
```

[10]: False

[11]:
```
print('No. of unique Restaurant_IDs   :', data.Restaurant_ID.nunique())
print('No. of unique Restaurant_Names :', data.Restaurant_Name.nunique())
```

```
No. of unique Restaurant_IDs   : 9551
No. of unique Restaurant_Names : 7445
```

- Above data provides information that the restaurant ids are unique however there is an overlap in Restaurant names

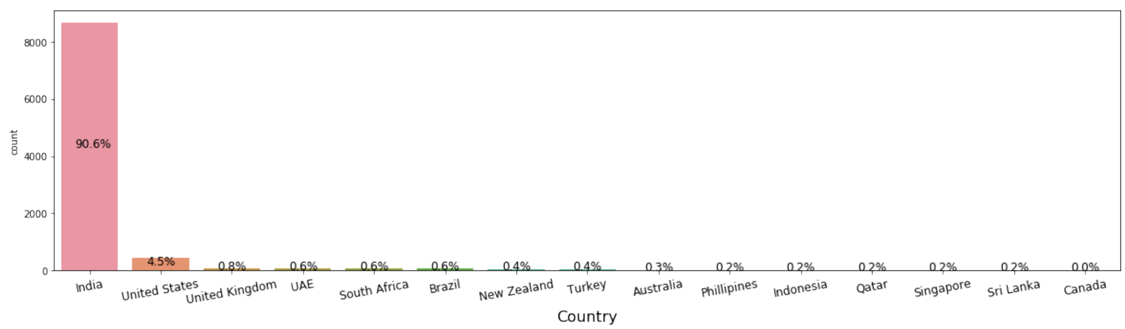
5.1 Geographical distribution

[12]:
```
country_code = pd.read_excel('Country-Code.xlsx')
country_code.columns = country_code.columns.str.replace(' ','_')
```

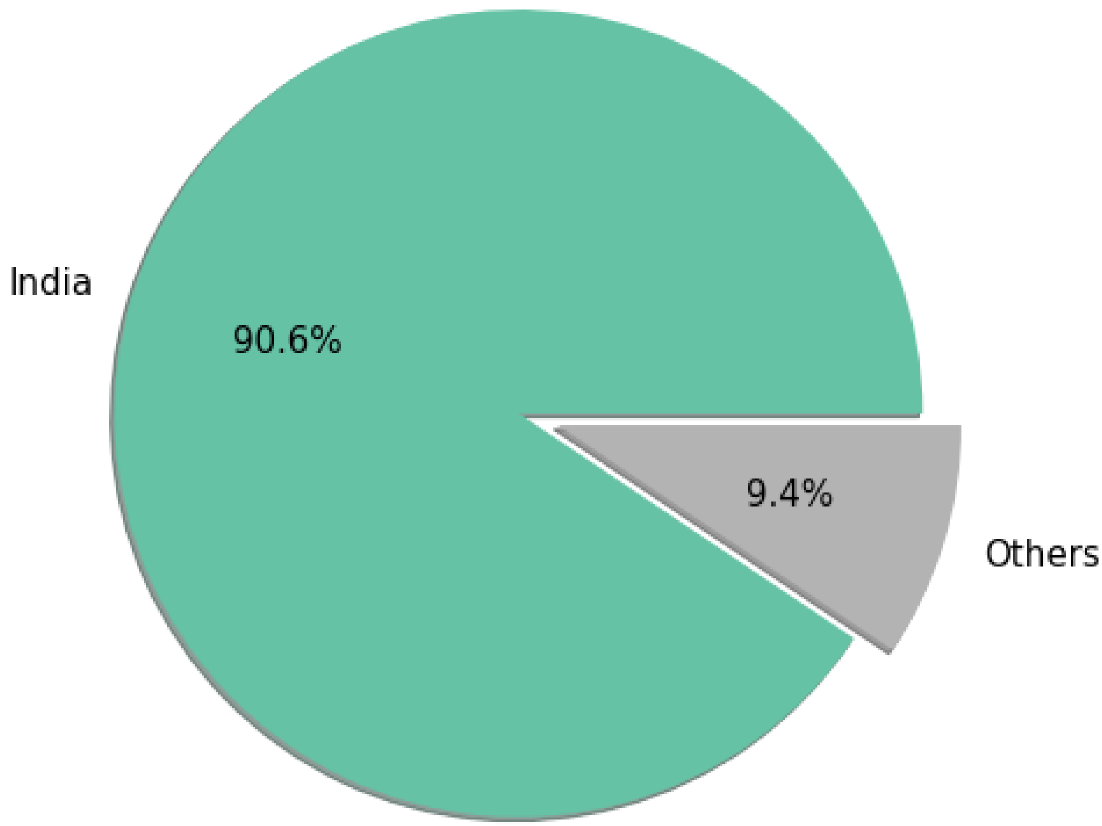
[13]:
```
data = pd.merge(data,country_code, on = 'Country_Code')
```

5.2 Explore the geographical distribution of the restaurants, finding out the cities with maximum / minimum number of restaurants.

[14]:
```
plt.figure(figsize = (20,5))
vc = pd.DataFrame(data.Country.value_counts()).rename({'Country':'Freq'}, axis␣
↪= 1)
vc['Perc'] = (vc.Freq/vc.Freq.sum()*100).round(1)
sns.countplot(x = 'Country', data = data, order = vc.index)
for i in range(len(vc)):
    plt.annotate(str(vc.Perc[i]) +'%', xy = (i -0.2, int(vc.Freq[i]/2)),␣
↪fontsize = 12)
plt.xticks(size = 12, rotation = 10)
plt.xlabel('Country',size = 16)
plt.show()
```



[15]:
```
vc = pd.Series()
vc['India'] = len(data[data.Country == 'India'])
vc['Others'] = len(data[data.Country != 'India'])

vc.plot.pie(radius = 2,autopct = '%1.1f%%' , textprops = {'size':15 }, explode␣
↪= [0.1,0.1], shadow = True, cmap ='Set2')
plt.xticks(size = 12, rotation = 10)
plt.ylabel('')
plt.show()
```



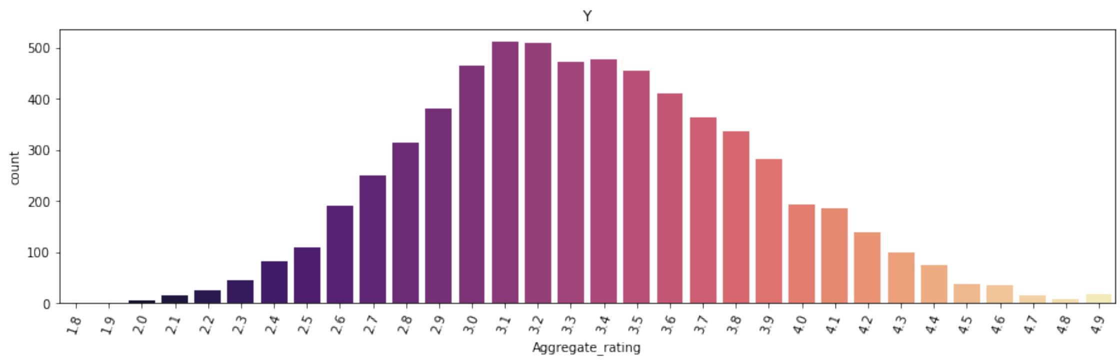
Quick Inferences - * Zomato's largest market is in India itself, nobody even comes close. * Analysing data from India should give us a pretty accurate representation of the entire data. * One important thing that might vary across different regions is the types of Cusinies. So it should be interesting to see how many cusinies are served throughout the world.

[16]:
```
data = data[data.Country == 'India']
```

6 Explore how ratings are distributed overall.

[17]:
```
data['Rating_cat'] = data['Aggregate_rating'].round(0).astype(int)
```

[18]:
```
plt.figure( figsize = (15, 4))
sns.countplot('Aggregate_rating', data = data[data.Aggregate_rating !=0] ,␣
 ↪palette = 'magma')
plt.tick_params('x', rotation = 70)
plt.title('Y')
plt.show()
```



[19]:
```
data["Rating_color"].value_counts()
Color_represents = data.groupby(['Rating_color'],as_index =␣
↪False)['Aggregate_rating'].mean()
```

[20]:
```
Color_represents.columns = ['Rating_color','Average_rating']
```

[21]:
```
Color_represents =Color_represents.
↪sort_values(by='Average_rating',ascending=False)
```

[22]:
```
Color_represents = Color_represents[0:5]
Color_represents['Ratings']  = ['Excellent','Very Good','Good','Okay','Poor']
```

[23]:
```
Color_represents
```

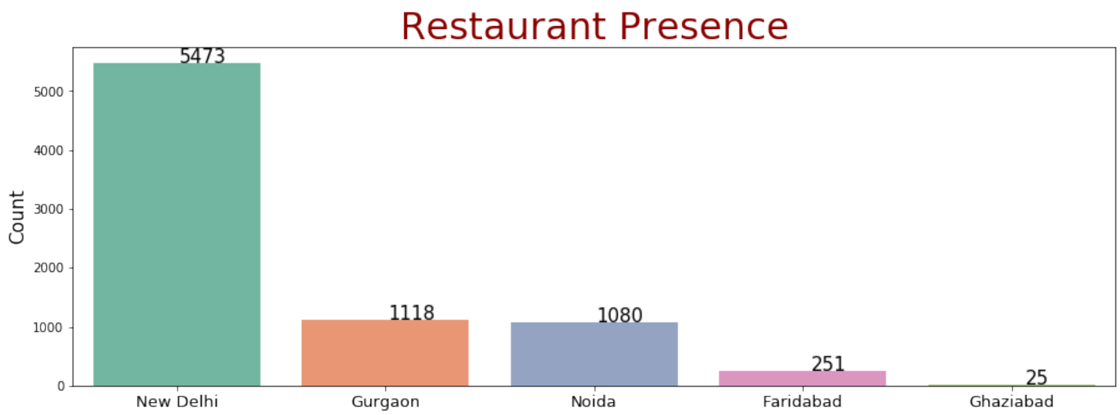
[23]:

	Rating_color	Average_rating	Ratings
0	Dark Green	4.646552	Excellent
1	Green	4.153324	Very Good
5	Yellow	3.677423	Good
2	Orange	3.048722	Okay
3	Red	2.296111	Poor

7 Restaurant franchise is a thriving venture. So, it becomes very important to explore the franchise with most national presence.

[25]:
```
plt.figure(figsize = (15,5))
vc = data.City.value_counts()[:5]
g = sns.barplot(x = vc.index, y = vc.values, palette = 'Set2')
g.set_xticklabels(g.get_xticklabels(),fontsize = 13)
for i in range(5):
    value = vc[i]
```

```
    g.text(y = value - 2,x = i +0.125 , s = value, color='black', ha="center",␣
 ↪fontsize = 15)
g.set_ylabel('Count', fontsize = 15)
g.set_title('Restaurant Presence', fontsize = 30, color = 'darkred')
plt.show()
```



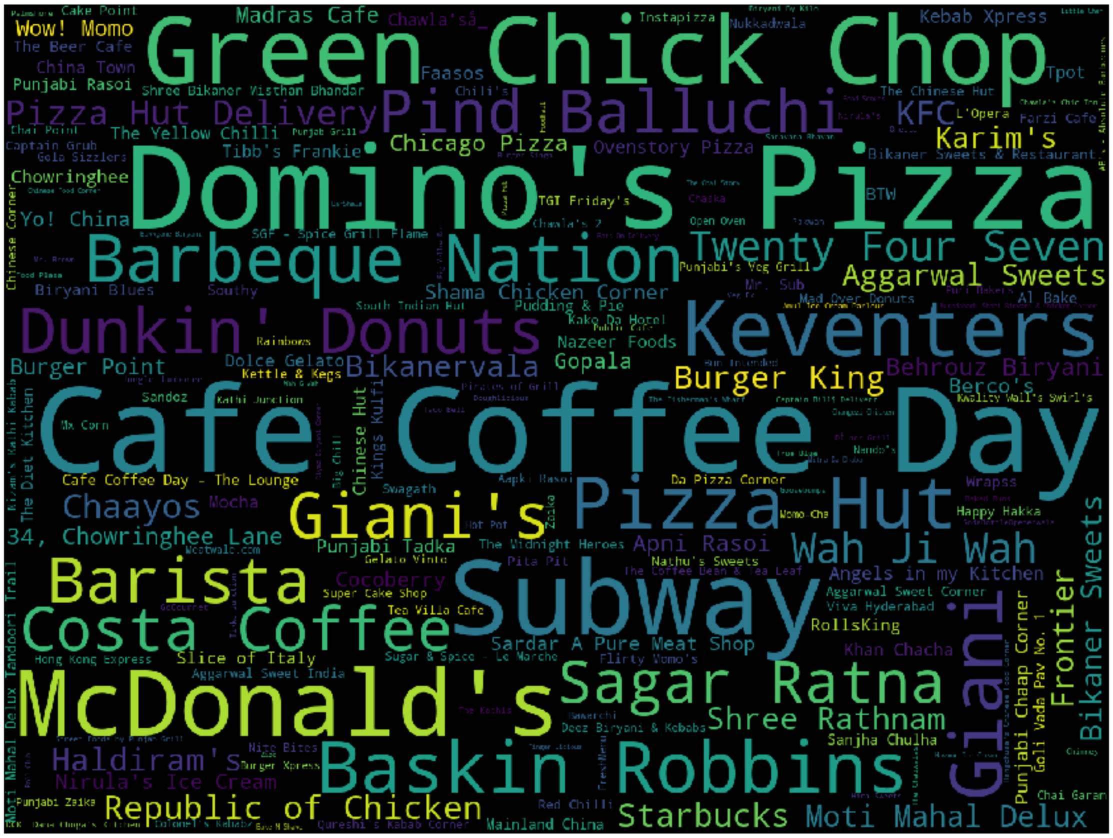
Here we can see that New Delhi has most no. of restaurants ,gurgaon,noida and Faridabad are behind it but by very huge margin,and other cities like Ahmedabad ,Amritsar,Bhubaneshwar have least no. of restaurants.It is a noticable point that there is not even a single city outside india to be in top 10 in no. of restaurants.

[ ]:

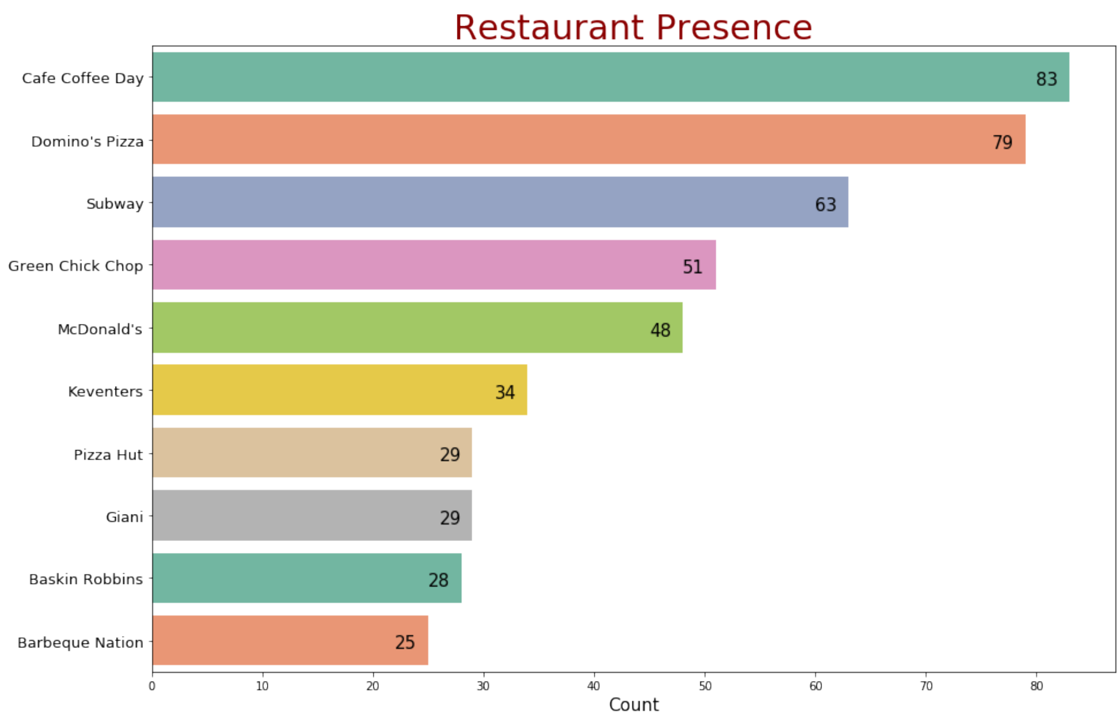
```

```

[26]:

```
from wordcloud import WordCloud, STOPWORDS
import numpy as np
stopwords = set(STOPWORDS)
wordcloud = (WordCloud(width=1440, height=1080, relative_scaling=0.5,␣
 ↪stopwords=stopwords).generate_from_frequencies(data['Restaurant_Name'].
 ↪value_counts()))
fig = plt.figure(1,figsize=(15, 15))
plt.imshow(wordcloud)
plt.axis('off')
plt.show()
```



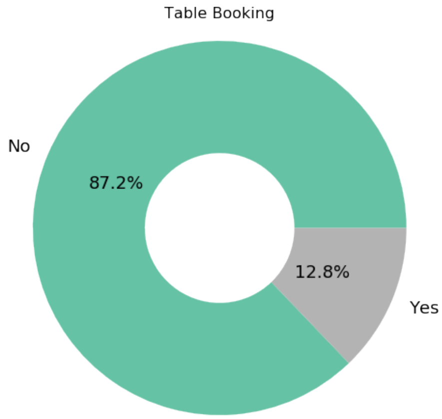

```python
plt.figure(figsize = (15,10))
vc = data.Restaurant_Name.value_counts()[:10]
g = sns.barplot(y = vc.index, x = vc.values, palette = 'Set2')
g.set_yticklabels(g.get_yticklabels(),fontsize = 13)
for i in range(10):
    value = vc[i]
    g.text(x = value - 2,y = i +0.125 , s = value, color='black', ha="center", fontsize = 15)
g.set_xlabel('Count', fontsize = 15)
g.set_title('c', fontsize = 30, color = 'darkred')
plt.show()
```

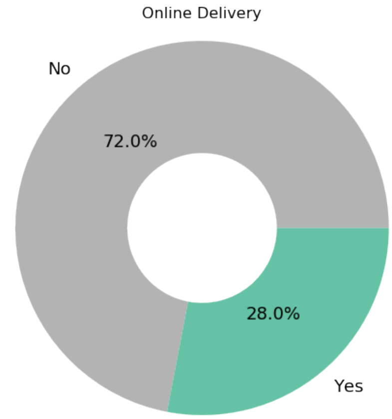


7.1 What is the ratio between restaurants that allow table booking vs that do not allow table booking?

7.2 What is the percentage of restaurants providing online delivery?

[28]:
```
f,axes = plt.subplots(1,2,figsize = (20,7))
data.Has_Table_booking.value_counts().plot.pie(ax = axes[0],autopct = '%0.
↪1f%%', radius = 1.25, wedgeprops = {'width' : 0.75}, cmap = 'Set2',
                                              textprops = {'size' : 18,} )
#axes[0].set_xticklabels(labels = axes[0].get_xticklabels(),rotation = 0)
axes[0].set_title('Table Booking\n',fontsize = 16)
axes[0].set_ylabel('')
data.Has_Online_delivery.value_counts().plot.pie(ax = axes[1], autopct = '%0.
↪1f%%', radius = 1.25,wedgeprops = {'width' : 0.75}, cmap = 'Set2_r',
                                               textprops = {'size' : 18} )
axes[1].set_title('Online Delivery\n', fontsize = 16)
#axes[1].set_xticklabels(labels = axes[1].get_xticklabels(),rotation = 0)
axes[1].set_ylabel('')
plt.tight_layout(w_pad = 20, h_pad = 10, pad = 4)
plt.show()
```



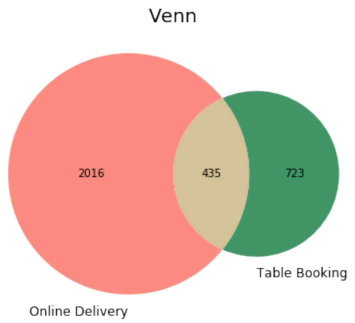


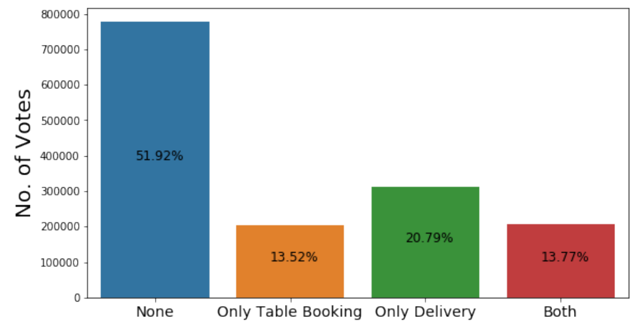
[29]:
```
pd.crosstab(data.Has_Online_delivery,data.Has_Table_booking)
```

[29]:
```
Has_Table_booking      No   Yes
Has_Online_delivery
No                   5545   684
Yes                  1996   427
```

[30]:
```
import matplotlib.pyplot as plt
from matplotlib_venn import venn2
```

[54]:
```
fig, ax = plt.subplots(1,2,figsize = (20,5))
s1 = set(data[data.Has_Online_delivery == 'Yes'].Restaurant_ID)
s2 = set(data[data.Has_Table_booking== 'Yes'].Restaurant_ID)
out = venn2([s1,s2],['Online Delivery','Table Booking'], ['salmon','seagreen'],␣
↪alpha = .91, ax = ax[0])
ax[0].set_title('Venn',fontsize =18)
#plt.show()

dc= data.pivot_table(index = ['Has_Online_delivery','Has_Table_booking'],␣
↪values = 'Votes', aggfunc = 'sum')
dc.index = ['None','Only Table Booking','Only Delivery','Both']
dc['Perc'] = (dc.Votes / dc.Votes.sum() *100).round(2)
sns.barplot(x = dc.index, y = dc.Votes, ax = ax[1])
plt.xticks( rotation = 0, fontsize = 14)
plt.xlabel('')
for i in range(len(dc)):
    plt.annotate(str(dc.Perc.iloc[i]) + '%',xy = (i-0.15, int(dc.Votes.iloc[i]/
↪2)), fontsize = 12 )
plt.ylabel('No. of Votes',fontsize = 20)
plt.show()
```





[55]:
```
dc
```

[55]:

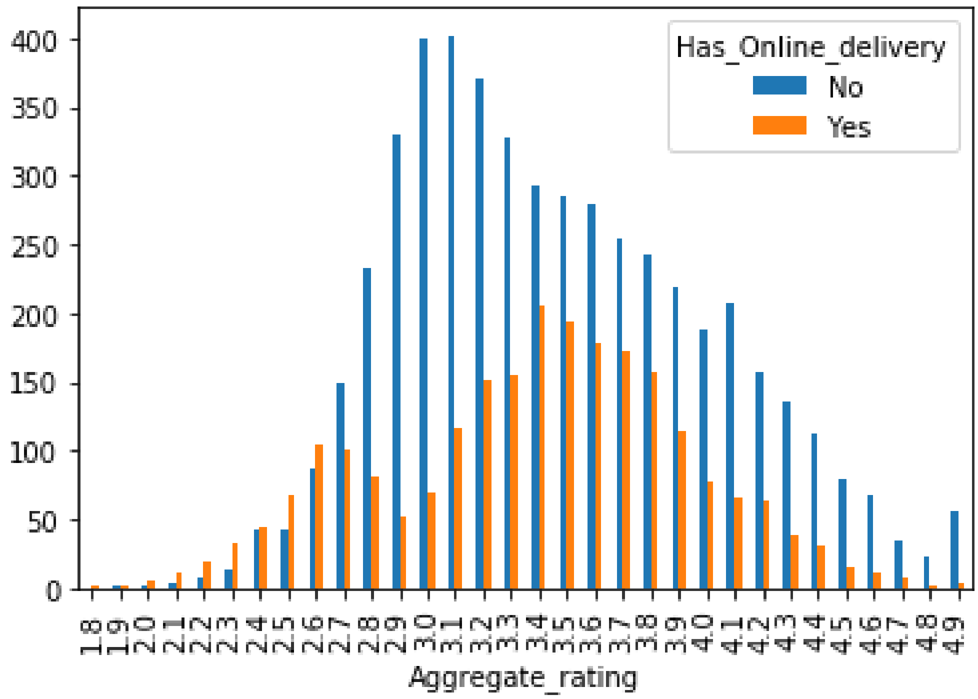
	Votes	Perc
None	778156	51.92
Only Table Booking	202575	13.52
Only Delivery	311592	20.79
Both	206322	13.77

7.3 Is there a difference in no. of votes for the restaurants that deliver and the restaurant that don't?

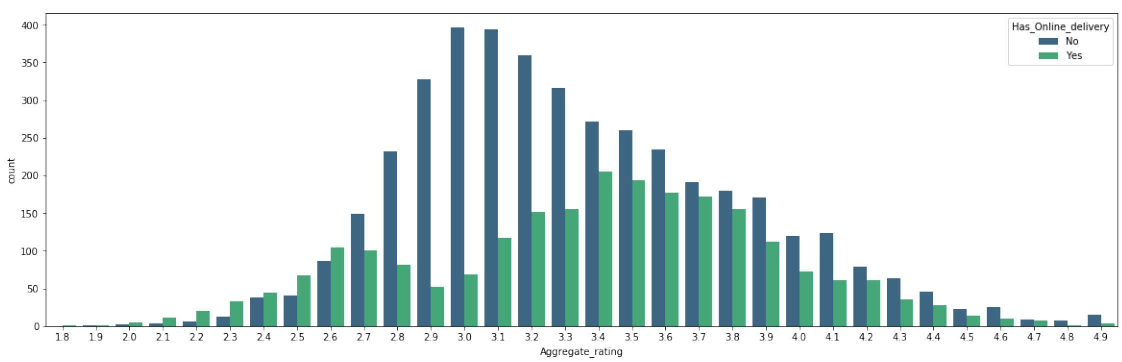
[ ]:
```

```

[56]:
```
d = data[data.Aggregate_rating != 0]
pd.crosstab(d.Aggregate_rating, d.Has_Online_delivery).plot.bar()
```

[56]: <matplotlib.axes._subplots.AxesSubplot at 0x1a21679dd0>



[32]:
```
plt.figure(figsize=(20,6))
sns.countplot(data=data[data.Aggregate_rating !=0],x='Aggregate_rating',hue='Has_Online_delivery',palette='viridis')
plt.show()
```



7.4 Restaurants across city

[33]:
```
top10 = data.City.value_counts()[:10]
top10[:2]
```

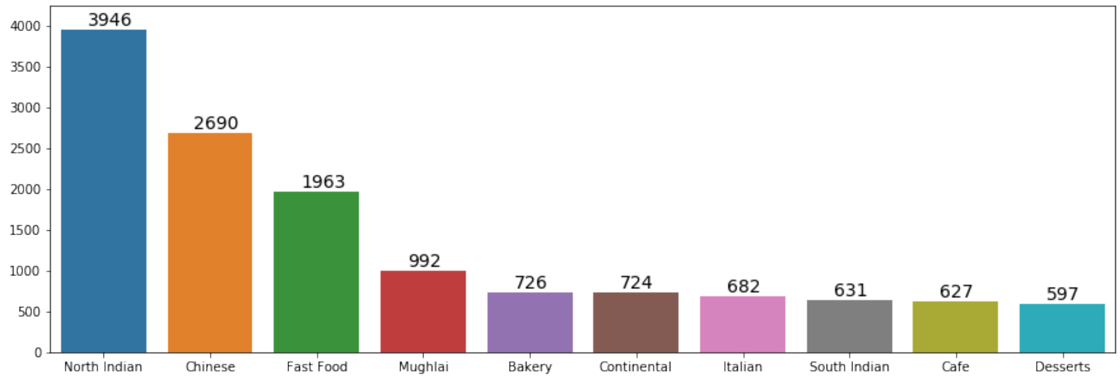
[33]:
```
New Delhi     5473
Gurgaon       1118
Name: City, dtype: int64
```

8 What are the top 10 cuisines served across cities?

[34]:
```
l = []
for i in data.Cuisines.str.split(','):
    l.extend(i)
s = pd.Series([i.strip() for i in l])
from wordcloud import WordCloud, STOPWORDS
stopwords = set(STOPWORDS)
wordcloud = (WordCloud(stopwords=stopwords).generate_from_frequencies(s.
 ↪value_counts()))
fig = plt.figure(1,figsize=(15, 15))
plt.imshow(wordcloud)
plt.axis('off')
plt.show()
```

[35]:
```
plt.figure(figsize = (15,5))
sns.barplot(x = s.value_counts()[:10].index, y = s.value_counts()[:10] )
```

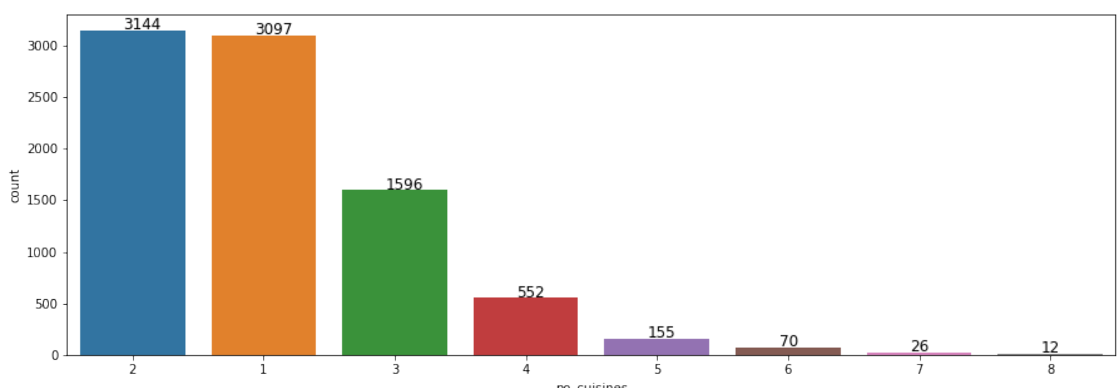
```
for i in range(10):
    plt.annotate(s.value_counts()[i], xy = (i-0.15,s.value_counts()[i]+50),␣
 ↪fontsize = 14)
plt.ylim(0, round(s.value_counts()[0]+300))
plt.show()
```



9 What is the maximum and minimum no. of cuisines that a restaurant serves? Also,what is the relationship between No. of cuisines served and Ratings

[36]:
```
data['no_cuisines'] = data.Cuisines.str.split(',').apply(len)
```

[37]:
```
plt.figure(figsize = (15,5))
vc = data.no_cuisines.value_counts()
sns.countplot('no_cuisines', data=data, order = vc.index)
for i in range(len(vc)):
    plt.annotate(vc.iloc[i], xy = (i-0.07,vc.iloc[i]+10), fontsize = 12)
plt.show()
```



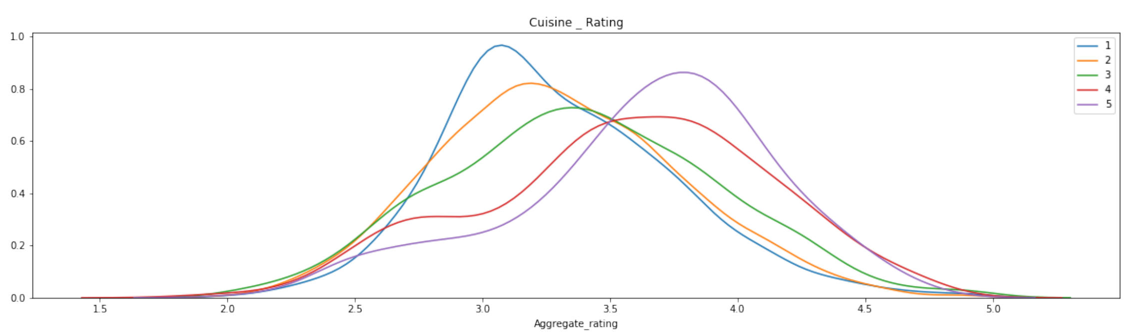
10 No of Cuisines vs Rating

[38]:
```
data.columns
```

[38]:
```
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', 'Price_range', 'Aggregate_rating',
       'Rating_color', 'Rating_text', 'Votes', 'Country', 'Rating_cat',
       'no_cuisines'],
      dtype='object')
```

[39]:
```
plt.figure(figsize = (20,5))
fusion_rate = data.loc[data.Aggregate_rating >0,['no_cuisines', 'Rating_cat',␣
↪'Aggregate_rating']].copy()
fusion_rate.loc[fusion_rate['no_cuisines'] > 5,'no_cuisines'] = 5
fusion_rate = fusion_rate.loc[fusion_rate.Aggregate_rating != -1, :]
pal = sns.color_palette('Oranges', 11)
for i in range(1,6):
        num_ix = fusion_rate['no_cuisines'] == i
        sns.distplot(fusion_rate.loc[num_ix, 'Aggregate_rating'], label =␣
↪str(i), hist = False)
        plt.legend()
        plt.title('Rating Distribution for fusion_number')
plt.title('Cuisine _ Rating')
```

[39]:
```
Text(0.5, 1.0, 'Cuisine _ Rating')
```



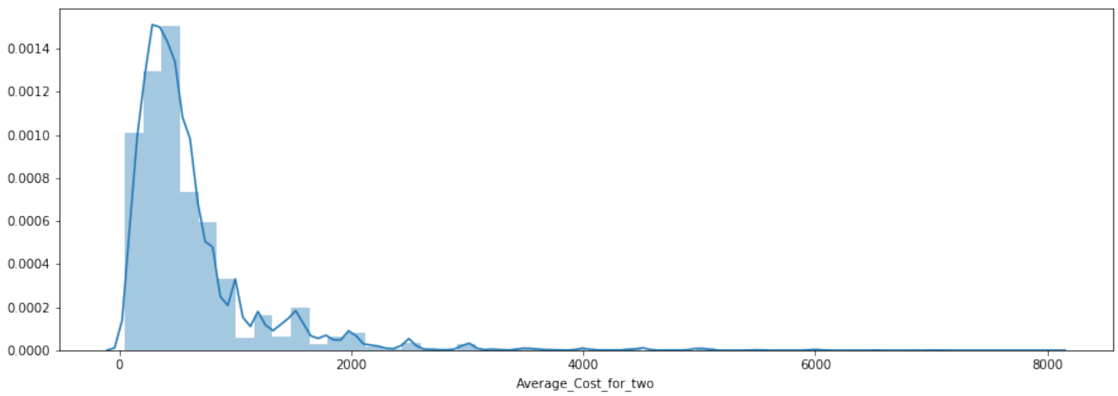
10.1 "More Number of Cusine, Higer Rate Restaruant."

Cuisine is a complex variables. It contains two types, Country and Kind of Food. I maybe have to divide them into two variables, country__cu/kind__cu. Most of restaraunt provided under 4 cusine, but More Number of Cusine, Higer Rate Restaruant

- the maximum no of cuisines served by a single restaurant is 8
- most of the restaurant are serving atleast 2 or 1 cuisine

11 Discuss the cost vs the other variables

[40]:
```
plt.figure(figsize = (15,5))
sns.distplot(data[data.Average_Cost_for_two != 0].Average_Cost_for_two)
plt.show()
```



12 Explain the factors in the data that may have an effect on ratings e.g. No. of cuisines, cost, delivery option etc.

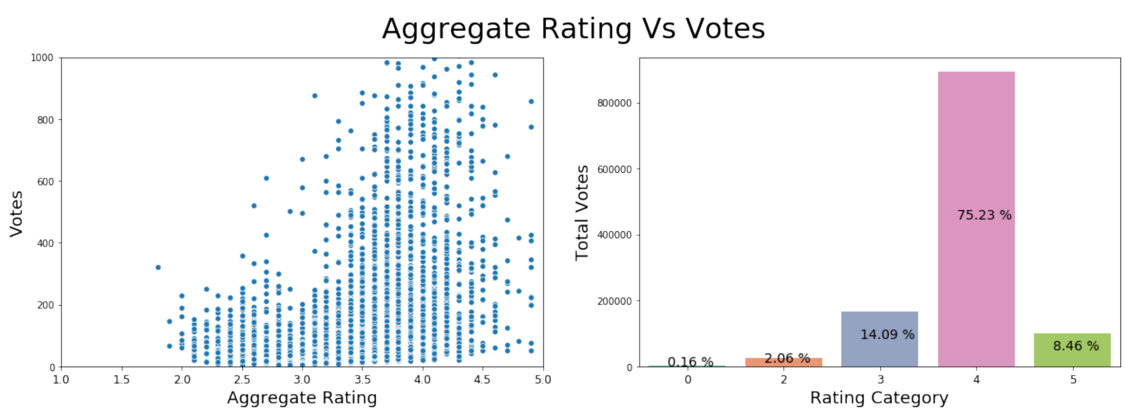
[41]:
```
data['Average_Cost_for_two_cat']= pd.cut(data[data.Average_Cost_for_two != 0].
 ↪Average_Cost_for_two,
       bins = [0, 200, 500, 1000, 3000, 5000,10000, 800000000],
       labels = ['<=200', '<=500', '<=1000', '<=3000', '<=5000', '<=10000', 'no␣
 ↪limit'])
```

[42]:
```
f = plt.figure(figsize = (20,10))

ax = plt.subplot2grid((2,5), (0,0),colspan = 2)
sns.countplot(data['Average_Cost_for_two_cat'], ax = ax, palette = sns.
 ↪color_palette('magma', 7))
ax.set_title('Average Price')
```

```
ax.set_xlabel('')
ax.tick_params('x', rotation = 70)

ax = plt.subplot2grid((2,5), (0,2), colspan = 3)
sns.boxplot(x = 'Average_Cost_for_two_cat', y = 'Aggregate_rating', data = data, ax = ax, palette = sns.color_palette('magma', 7))
count = data['Price_range'].value_counts().reset_index()
count.columns = ['Price_range', 'Count']

ax = plt.subplot2grid((2,5), (1,0),colspan = 2)
sns.barplot(x = 'Price_range', y = 'Count', data = count, ax=ax, palette = sns.color_palette('magma', 5))
ax.set_title('Price Range')
ax.set_xlabel('')

ax = plt.subplot2grid((2,5), (1,2), colspan = 3)
sns.boxplot(x='Price_range', y ='Aggregate_rating', data = data, ax = ax, palette = sns.color_palette('magma', 5))
plt.subplots_adjust(wspace = 0.3, hspace = 0.4,)
plt.suptitle('Price Count & Rating Distribution', size = 30)
plt.show()
```

12.1 Aggregate Rating vs Votes

[43]:
```
f,ax = plt.subplots(1,2,figsize=(20,6))
sns.scatterplot(data=data,x='Aggregate_rating',y='Votes', ax = ax[0], palette =␣
↪'Set2')
agg = data.pivot_table(index = 'Rating_cat', values = 'Votes', aggfunc = 'sum').
↪reset_index()
agg['Perc_votes']= (agg.Votes/agg.Votes.sum()*100).round(2)
sns.barplot(x = 'Rating_cat', y = 'Votes', data = agg, ax = ax[1], palette=␣
↪'Set2')
for i in range(len(agg)):
    ax[1].annotate(str(agg.Perc_votes[i])+' %', xy = (i-0.2,int(agg.Votes[i]/
↪2)), fontsize = 14, fontweight = 'medium')
ax[0].set_ylim(0,1000)
ax[0].set_xlim(1,5)
ax[0].set_ylabel('Votes',fontsize = 18 )
ax[0].set_xlabel('Aggregate Rating',fontsize = 18 )
ax[0].set_xticklabels(ax[0].get_xticks(),fontsize = 12)
ax[1].set_ylabel('Total Votes',fontsize = 18 )
ax[1].set_xlabel('Rating Category',fontsize = 18 )
ax[1].set_xticklabels(agg.Rating_cat,fontsize = 12)
plt.suptitle('Aggregate Rating Vs Votes', size = 30)

plt.show()
```



[ ]:

[ ]: