

Assessment

October 20, 2020

```
[1]: import pandas as pd
import numpy as np
import sklearn as skl
```

```
[2]: ds=pd.read_csv('2020-XTern-DS.csv')
ds.head()
```

```
[2]: Restaurant  Latitude  Longitude  Cuisines \
0    ID_6321  39.262605 -85.837372  Fast Food, Rolls, Burger, Salad, Wraps
1    ID_2882  39.775933 -85.740581                Ice Cream, Desserts
2    ID_1595  39.253436 -85.123779      Italian, Street Food, Fast Food
3    ID_5929  39.029841 -85.332050      Mughlai, North Indian, Chinese
4    ID_6123  39.882284 -85.517407                Cafe, Beverages
```

	Average_Cost	Minimum_Order	Rating	Votes	Reviews	Cook_Time
0	\$20.00	\$50.00	3.5	12	4	30 minutes
1	\$10.00	\$50.00	3.5	11	4	30 minutes
2	\$15.00	\$50.00	3.6	99	30	65 minutes
3	\$25.00	\$99.00	3.7	176	95	30 minutes
4	\$20.00	\$99.00	3.2	521	235	65 minutes

```
[3]: dfi=pd.DataFrame(ds)
df=dfi
df
```

```
[3]: Restaurant  Latitude  Longitude  \
0    ID_6321  39.262605 -85.837372
1    ID_2882  39.775933 -85.740581
2    ID_1595  39.253436 -85.123779
3    ID_5929  39.029841 -85.332050
4    ID_6123  39.882284 -85.517407
...
2014  ID_4366  39.624978 -85.189212
2015  ID_319  39.133719 -85.503020
2016  ID_3104  39.662987 -85.950894
2017  ID_4396  39.301765 -85.662768
2018  ID_8403  39.460944 -85.484355
```

	Cuisines	Average_Cost	Minimum_Order	\
0	Fast Food, Rolls, Burger, Salad, Wraps	\$20.00	\$50.00	
1	Ice Cream, Desserts	\$10.00	\$50.00	
2	Italian, Street Food, Fast Food	\$15.00	\$50.00	
3	Mughlai, North Indian, Chinese	\$25.00	\$99.00	
4	Cafe, Beverages	\$20.00	\$99.00	
...	
2014	North Indian, Pizza, Burger, Continental	\$40.00	\$0.00	
2015	Awadhi, Bihari	\$40.00	\$99.00	
2016	Fast Food, Beverages	\$10.00	\$50.00	
2017	Kebab, Fast Food	\$10.00	\$50.00	
2018	Desserts, Beverages	\$150.00	\$50.00	

	Rating	Votes	Reviews	Cook_Time
0	3.5	12	4	30 minutes
1	3.5	11	4	30 minutes
2	3.6	99	30	65 minutes
3	3.7	176	95	30 minutes
4	3.2	521	235	65 minutes
...
2014	-	-	-	30 minutes
2015	4.1	118	91	30 minutes
2016	NEW	-	-	30 minutes
2017	-	-	-	30 minutes
2018	4.1	271	172	45 minutes

[2019 rows x 10 columns]

```
[4]: df.dtypes
```

```
[4]: Restaurant      object
Latitude           float64
Longitude          float64
Cuisines           object
Average_Cost       object
Minimum_Order      object
Rating            object
Votes             object
Reviews           object
Cook_Time         object
dtype: object
```

```
[5]: from sklearn import preprocessing
le = preprocessing.LabelEncoder()
Cuisines_En= le.fit_transform(df['Cuisines'])
Cuisines_map = dict(zip(le.classes_, le.transform(le.classes_)))
Cuisines_map
```

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'North Indian, Biryani, Kebab, BBQ': 477,
'North Indian, Biryani, Mughlai': 478,
'North Indian, Biryani, Rolls': 479,
'North Indian, Cafe, Fast Food, Beverages': 480,
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'North Indian, Chinese, Bengali': 484,
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'North Indian, Chinese, Continental, Beverages': 489,
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'North Indian, Chinese, Continental, Italian': 491,
'North Indian, Chinese, Continental, Seafood': 492,
'North Indian, Chinese, Fast Food': 493,
'North Indian, Chinese, Goan': 494,
'North Indian, Chinese, Healthy Food': 495,
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'North Indian, Chinese, Italian, Fast Food': 498,
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'North Indian, Chinese, Kebab, Mughlai': 500,
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'North Indian, Chinese, Momos': 503,
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'North Indian, Chinese, Mughlai, Fast Food': 507,
'North Indian, Chinese, Mughlai, Fast Food, Beverages': 508,
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 'North Indian, Chinese, Odia': 512,
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 'North Indian, Chinese, Rolls, Desserts, Biryani': 515,
 'North Indian, Chinese, Rolls, Momos': 516,
 'North Indian, Chinese, Seafood': 517,
 'North Indian, Chinese, South Indian': 518,
 'North Indian, Chinese, South Indian, Continental': 519,
 'North Indian, Chinese, South Indian, Desserts': 520,
 'North Indian, Chinese, South Indian, Fast Food': 521,
 'North Indian, Chinese, South Indian, Fast Food, Biryani': 522,
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 'North Indian, Chinese, Street Food': 524,
 'North Indian, Chinese, Street Food, Fast Food': 525,
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 'North Indian, Continental, Asian, Pizza': 528,
 'North Indian, Continental, Chinese, Italian': 529,
 'North Indian, Continental, Chinese, Italian, Lebanese, Momos': 530,
 'North Indian, Continental, Chinese, Juices': 531,
 'North Indian, Continental, Chinese, Steak': 532,
 'North Indian, Continental, Healthy Food': 533,
 'North Indian, Continental, Italian': 534,
 'North Indian, Fast Food': 535,
 'North Indian, Fast Food, Beverages': 536,
 'North Indian, Fast Food, Biryani, Rolls, Wraps': 537,
 'North Indian, Fast Food, Chinese': 538,
 'North Indian, Fast Food, Chinese, Continental': 539,
 'North Indian, Fast Food, Chinese, South Indian': 540,
 'North Indian, Gujarati': 541,
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 'North Indian, Healthy Food, South Indian': 543,
 'North Indian, Italian, Continental': 544,
 'North Indian, Italian, Continental, Finger Food': 545,
 'North Indian, Italian, Continental, Lebanese, Desserts, Beverages': 546,
 'North Indian, Kebab': 547,
 'North Indian, Kebab, Biryani': 548,
 'North Indian, Kebab, Chinese': 549,
 'North Indian, Kebab, Mughlai': 550,
 'North Indian, Lucknowi': 551,
 'North Indian, Maharashtrian': 552,
 'North Indian, Maharashtrian, Chinese': 553,
 'North Indian, Mangalorean': 554,
 'North Indian, Mithai, Fast Food, South Indian, Chinese': 555,
 'North Indian, Mughlai': 556,

'North Indian, Mughlai, Beverages': 557,
 'North Indian, Mughlai, Biryani': 558,
 'North Indian, Mughlai, Biryani, Rolls, Momos': 559,
 'North Indian, Mughlai, Chinese': 560,
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 'North Indian, Mughlai, Chinese, Continental': 562,
 'North Indian, Mughlai, Chinese, Fast Food, Momos': 563,
 'North Indian, Mughlai, Chinese, Italian': 564,
 'North Indian, Mughlai, Chinese, Kebab': 565,
 'North Indian, Mughlai, Chinese, Momos': 566,
 'North Indian, Mughlai, Italian, Chinese': 567,
 'North Indian, Mughlai, Kebab': 568,
 'North Indian, Mughlai, Momos': 569,
 'North Indian, Pizza, Burger, Continental': 570,
 'North Indian, Rolls': 571,
 'North Indian, Rolls, Biryani': 572,
 'North Indian, Rolls, Chinese': 573,
 'North Indian, Rolls, Desserts': 574,
 'North Indian, Rolls, Lebanese': 575,
 'North Indian, Sandwich': 576,
 'North Indian, Sandwich, Desserts, Beverages, Continental, Chinese, Biryani, Mughlai': 577,
 'North Indian, Seafood': 578,
 'North Indian, Seafood, Biryani': 579,
 'North Indian, Seafood, Biryani, Kerala': 580,
 'North Indian, Seafood, Chinese': 581,
 'North Indian, South Indian': 582,
 'North Indian, South Indian, Assamese, Maharashtrian, Bengali': 583,
 'North Indian, South Indian, Chinese': 584,
 'North Indian, South Indian, Chinese, Arabian': 585,
 'North Indian, South Indian, Chinese, Bakery': 586,
 'North Indian, South Indian, Chinese, Bengali, Odia, Biryani, Beverages': 587,
 'North Indian, South Indian, Chinese, Beverages': 588,
 'North Indian, South Indian, Chinese, Desserts': 589,
 'North Indian, South Indian, Chinese, Fast Food': 590,
 'North Indian, South Indian, Chinese, Fast Food, Mithai': 591,
 'North Indian, South Indian, Chinese, Street Food': 592,
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 'North Indian, South Indian, Desserts, Beverages': 594,
 'North Indian, South Indian, Fast Food': 595,
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 'North Indian, South Indian, Street Food': 599,
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'North Indian, Street Food, Chinese': 603,
'North Indian, Street Food, Desserts': 604,
'North Indian, Street Food, Fast Food, Chinese': 605,
'North Indian, Street Food, Juices': 606,
'North Indian, Street Food, South Indian, Fast Food, Chinese': 607,
'North Indian, Street Food, South Indian, Mithai': 608,
'North Indian, Thai, Chinese': 609,
'North Indian, Thai, Goan, Mughlai, Seafood': 610,
'Odia, Bengali, Salad, North Indian': 611,
'Odia, North Indian, Chinese': 612,
'Paan': 613,
'Paan, Fast Food': 614,
'Parsi': 615,
'Parsi, Bakery': 616,
'Pizza': 617,
'Pizza, Beverages': 618,
'Pizza, Burger, Fast Food': 619,
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'Pizza, Continental, Fast Food': 621,
'Pizza, Desserts': 622,
'Pizza, Fast Food': 623,
'Pizza, Fast Food, Beverages': 624,
'Pizza, Fast Food, Italian': 625,
'Pizza, Italian': 626,
'Pizza, Italian, Beverages': 627,
'Pizza, Italian, Desserts, Beverages': 628,
'Pizza, Mexican, Italian': 629,
'Pizza, Salad, Burger, Sandwich, Lebanese, Italian': 630,
'Portuguese, Wraps, Burger, Salad': 631,
'Rajasthani, North Indian': 632,
'Raw Meats, Naga': 633,
'Raw Meats, North Indian, Fast Food': 634,
'Rolls': 635,
'Rolls, Beverages': 636,
'Rolls, Biryani': 637,
'Rolls, Chinese': 638,
'Rolls, Fast Food': 639,
'Rolls, Kebab': 640,
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'Rolls, Lebanese': 642,
'Rolls, North Indian': 643,
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'Rolls, North Indian, Chinese': 645,
'Rolls, North Indian, Chinese, Momos, Biryani': 646,
'Rolls, Salad, Sandwich': 647,
'Rolls, Sandwich, Fast Food': 648,

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 'Salad, Continental, Italian, Mexican, Desserts, Beverages': 651,
 'Salad, European, Steak, Healthy Food, Beverages, Finger Food': 652,
 'Salad, Healthy Food, Fast Food': 653,
 'Salad, Rolls, Fast Food': 654,
 'Salad, Sandwich, Momos, Wraps, Beverages': 655,
 'Sandwich': 656,
 'Sandwich, Beverages, Fast Food': 657,
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 Beverages': 659,
 'Sandwich, Fast Food': 660,
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 'Sandwich, Fast Food, North Indian, Street Food, Maharashtrian, Beverages':
 662,
 'Sandwich, Italian, Desserts': 663,
 'Seafood, Chinese, Fast Food, North Indian, Maharashtrian': 664,
 'Seafood, Mughlai, North Indian': 665,
 'Seafood, North Indian': 666,
 'Seafood, North Indian, Chinese, Thai': 667,
 'Seafood, Rolls, BBQ': 668,
 'South Indian': 669,
 'South Indian, Beverages': 670,
 'South Indian, Biryani, Hyderabad, Fast Food, Chinese': 671,
 'South Indian, Chettinad': 672,
 'South Indian, Chinese': 673,
 'South Indian, Chinese, North Indian': 674,
 'South Indian, Chinese, Street Food': 675,
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 'South Indian, Fast Food, Desserts': 679,
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 'South Indian, Fast Food, North Indian': 681,
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 'South Indian, Juices, Desserts': 684,
 'South Indian, Mithai': 685,
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 'South Indian, North Indian, Biryani': 688,
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 'South Indian, North Indian, Chinese, Street Food': 693,

```
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'South Indian, Street Food': 696,
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'Street Food, Fast Food': 702,
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'Street Food, Maharashtrian': 706,
'Street Food, Mithai': 707,
'Street Food, North Indian': 708,
'Street Food, North Indian, Mithai': 709,
'Street Food, North Indian, Mithai, South Indian, Burger, Beverages': 710,
'Street Food, North Indian, South Indian, Mithai': 711,
'Street Food, South Indian': 712,
'Tamil, Biryani, Chettinad, North Indian, Chinese, South Indian': 713,
'Tamil, Biryani, South Indian, Chettinad, North Indian, Chinese': 714,
'Tea, Beverages, Fast Food': 715,
'Tea, Fast Food': 716,
'Tea, Fast Food, North Indian, Chinese': 717,
'Thai': 718,
'Thai, Salad, Seafood': 719,
'Tibetan': 720,
'Tibetan, Chinese, Momos': 721,
'Tibetan, Momos': 722,
'Wraps, Fast Food': 723,
'Wraps, Healthy Food, Sandwich, Salad': 724,
'Wraps, North Indian, Biryani, Fast Food': 725}
```

```
[6]: import locale
      #convert currency to number by deleting signs
      locale.setlocale(locale.LC_ALL, '')
      df['Average_Cost']=df.Average_Cost.map(lambda x: locale.atof(x.strip('$')))
      df['Minimum_Order']=df.Minimum_Order.map(lambda x: locale.atof(x.strip('$')))
      df['Cook_Time']=df.Cook_Time.map(lambda x: locale.atof(x.strip(' minutes')))
```

```
[7]: df.dtypes
      mean_ave=round(np.mean(df['Average_Cost']),1)
      mean_min=round(np.mean(df['Minimum_Order']),1)
      mean_cook=int(np.mean(df['Cook_Time']))
      print(mean_ave,mean_min,mean_cook)
```

20.1 53.3 36

```
[8]: df.isnull().sum()
```

```
[8]: Restaurant      0
Latitude           0
Longitude          0
Cuisines           0
Average_Cost       0
Minimum_Order      0
Rating             0
Votes             0
Reviews            0
Cook_Time          0
dtype: int64
```

```
[9]: df.dtypes
```

```
[9]: Restaurant      object
Latitude          float64
Longitude          float64
Cuisines           object
Average_Cost       float64
Minimum_Order      float64
Rating             object
Votes             object
Reviews            object
Cook_Time          float64
dtype: object
```

```
[10]: import re
df['Rating']=df['Rating'].replace('NEW',np.nan)
df['Rating']=df['Rating'].replace('Opening Soon',np.nan)
df['Rating']=df['Rating'].replace('-',np.nan)
df['Votes']=df['Votes'].replace('-',np.nan)
df['Reviews']=df['Reviews'].replace('-',np.nan)
```

```
[11]: mid=df.dropna()
mid
mid[['Reviews']]=mid[['Reviews']].astype(int)
mid[['Votes']]=mid[['Votes']].astype(int)
mid[['Rating']]=mid[['Rating']].astype(float)
mean_r=round(mid['Rating'].mean(),1)
mean_re=int(mid['Reviews'].mean())
mean_v=int(mid['Votes'].mean())
```

c:\program files\python37\lib\site-packages\pandas\core\frame.py:2963:

SettingWithCopyWarning:

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

```
self[k1] = value[k2]
```

```
[12]: #fill new and coming soon with the mean of the column
df[['Rating']] = df[['Rating']].fillna(value=mean_r)
df[['Reviews']] = df[['Reviews']].fillna(value=mean_re)
df[['Votes']] = df[['Votes']].fillna(value=mean_v)
df['Reviews']=df['Reviews'].astype(int)
df['Votes']=df['Votes'].astype(int)
df['Rating']=df['Rating'].astype(float)
df
```

```
[12]:
```

	Restaurant	Latitude	Longitude	\
0	ID_6321	39.262605	-85.837372	
1	ID_2882	39.775933	-85.740581	
2	ID_1595	39.253436	-85.123779	
3	ID_5929	39.029841	-85.332050	
4	ID_6123	39.882284	-85.517407	
...	
2014	ID_4366	39.624978	-85.189212	
2015	ID_319	39.133719	-85.503020	
2016	ID_3104	39.662987	-85.950894	
2017	ID_4396	39.301765	-85.662768	
2018	ID_8403	39.460944	-85.484355	

	Cuisines	Average_Cost	Minimum_Order	\
0	Fast Food, Rolls, Burger, Salad, Wraps	20.0	50.0	
1	Ice Cream, Desserts	10.0	50.0	
2	Italian, Street Food, Fast Food	15.0	50.0	
3	Mughlai, North Indian, Chinese	25.0	99.0	
4	Cafe, Beverages	20.0	99.0	
...	
2014	North Indian, Pizza, Burger, Continental	40.0	0.0	
2015	Awadhi, Bihari	40.0	99.0	
2016	Fast Food, Beverages	10.0	50.0	
2017	Kebab, Fast Food	10.0	50.0	
2018	Desserts, Beverages	150.0	50.0	

	Rating	Votes	Reviews	Cook_Time
0	3.5	12	4	30.0
1	3.5	11	4	30.0
2	3.6	99	30	65.0
3	3.7	176	95	30.0
4	3.2	521	235	65.0
...

2014	3.6	260	127	30.0
2015	4.1	118	91	30.0
2016	3.6	260	127	30.0
2017	3.6	260	127	30.0
2018	4.1	271	172	45.0

[2019 rows x 10 columns]

```
[13]: import matplotlib.pyplot as plt
      from sklearn.cluster import KMeans
```

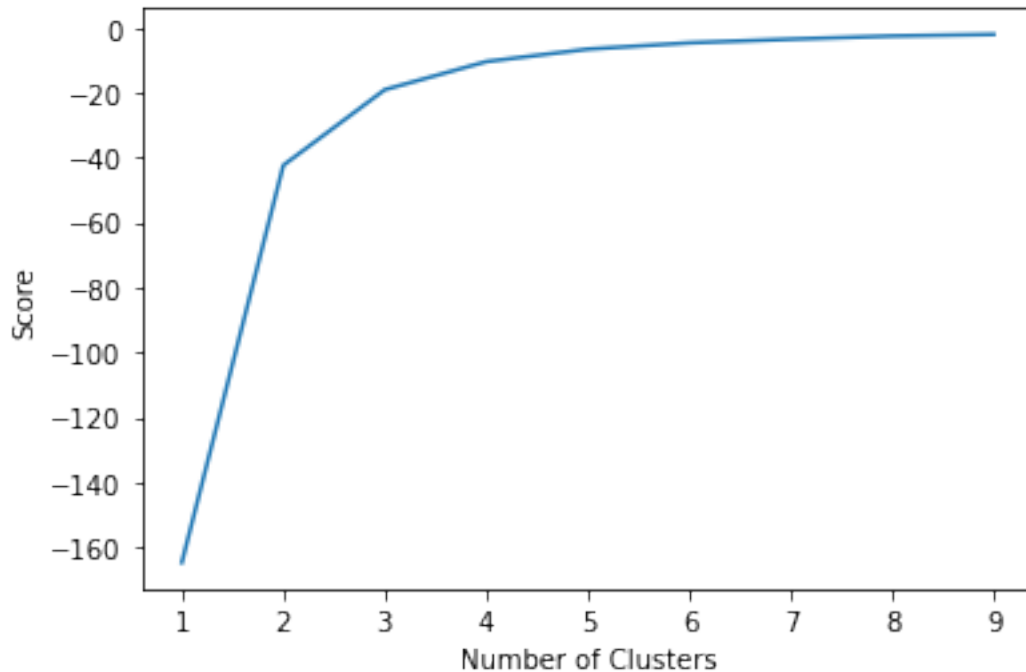
```
[14]: position=df.loc[:,['Restaurant','Longitude','Latitude']]
      position
```

```
[14]:
```

	Restaurant	Longitude	Latitude
0	ID_6321	-85.837372	39.262605
1	ID_2882	-85.740581	39.775933
2	ID_1595	-85.123779	39.253436
3	ID_5929	-85.332050	39.029841
4	ID_6123	-85.517407	39.882284
...
2014	ID_4366	-85.189212	39.624978
2015	ID_319	-85.503020	39.133719
2016	ID_3104	-85.950894	39.662987
2017	ID_4396	-85.662768	39.301765
2018	ID_8403	-85.484355	39.460944

[2019 rows x 3 columns]

```
[15]: k_num = range(1,10)
      k_mean = [KMeans(n_clusters=i) for i in k_num]
      y_axis = position[['Latitude']]
      x_axis = position[['Longitude']]
      score = [k_mean[i].fit(y_axis).score(y_axis) for i in range(len(k_mean))]
      plt.plot(k_num, score)
      plt.xlabel('Number of Clusters')
      plt.ylabel('Score')
      plt.show()
```



```
[16]: kmeans = KMeans(n_clusters = 3, init = 'k-means++')
kmeans.fit(position[position.columns[1:3]])
position['cluster_label'] = kmeans.fit_predict(position[position.columns[1:3]])
centers = kmeans.cluster_centers_
labels = kmeans.predict(position[position.columns[1:3]])
```

```
[17]: #pickup points
centers
```

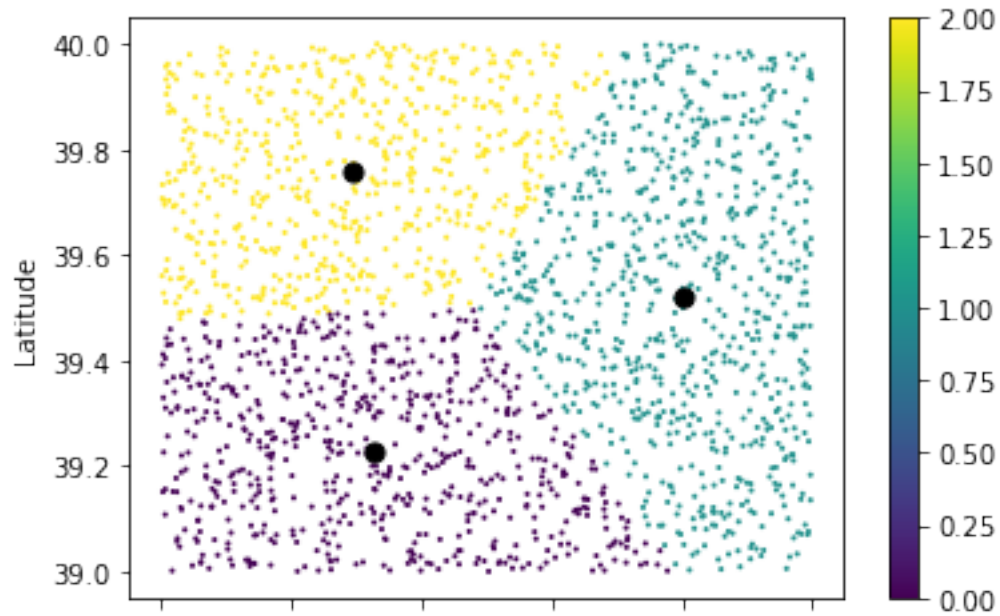
```
[17]: array([[ -85.67357407,  39.22841794],
        [ -85.19748642,  39.5213233 ],
        [ -85.70781007,  39.75884229]])
```

```
[18]: position.head()
```

```
[18]:   Restaurant  Longitude  Latitude  cluster_label
0    ID_6321  -85.837372   39.262605             0
1    ID_2882  -85.740581   39.775933             2
2    ID_1595  -85.123779   39.253436             1
3    ID_5929  -85.332050   39.029841             0
4    ID_6123  -85.517407   39.882284             2
```

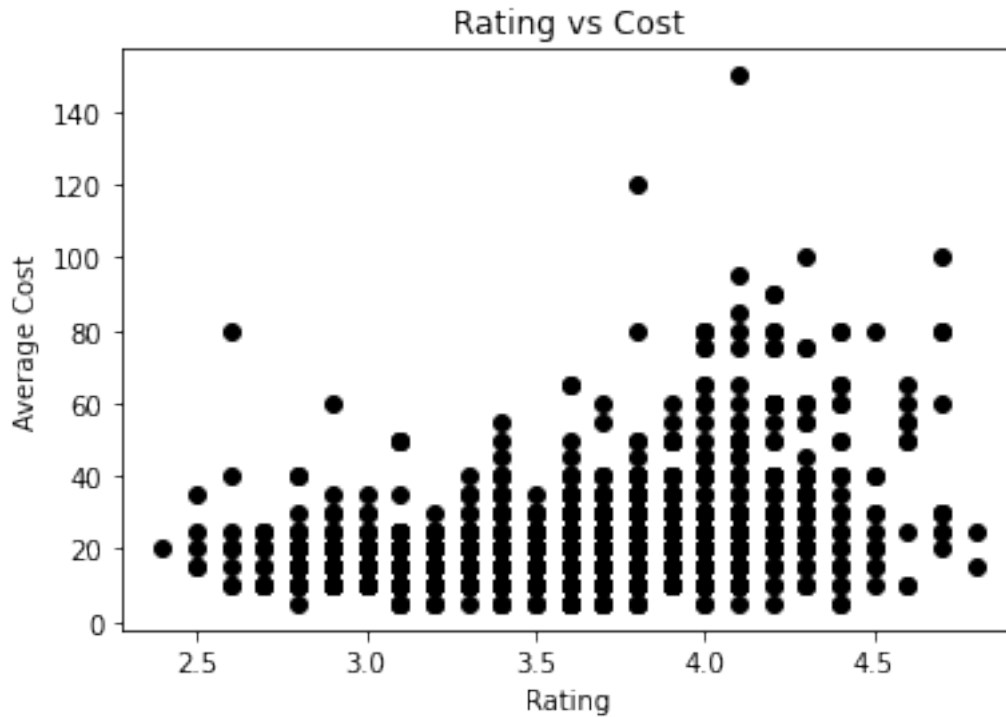
```
[19]: position.plot.scatter(x = 'Longitude', y = 'Latitude', c=labels, s=1,
    ↪ cmap='viridis')
plt.scatter(centers[:, 0], centers[:, 1], c='black', s=50, alpha=1)
```

[19]: <matplotlib.collections.PathCollection at 0x1dcbb740a90>



```
[20]: # Customer Rating vs Average Cost
plt.plot(df['Rating'],df['Average_Cost'],'o',color='black')
plt.xlabel('Rating')
plt.ylabel('Average Cost')
plt.title('Rating vs Cost')
```

[20]: Text(0.5, 1.0, 'Rating vs Cost')



```
[21]: med=df
estimate=med.loc[:,['Cuisines','Cook_Time']]
estimate
```

```
[21]:
```

	Cuisines	Cook_Time
0	Fast Food, Rolls, Burger, Salad, Wraps	30.0
1	Ice Cream, Desserts	30.0
2	Italian, Street Food, Fast Food	65.0
3	Mughlai, North Indian, Chinese	30.0
4	Cafe, Beverages	65.0
...
2014	North Indian, Pizza, Burger, Continental	30.0
2015	Awadhi, Bihari	30.0
2016	Fast Food, Beverages	30.0
2017	Kebab, Fast Food	30.0
2018	Desserts, Beverages	45.0

[2019 rows x 2 columns]

```
[23]: aggregation_functions = {'Cook_Time': 'mean'}
estimate_new = estimate.groupby(estimate['Cuisines']).
    ↳ aggregate(aggregation_functions)
```



```
[24]: #estimate time by cuisines
      estimate_new
```

```
[24]:
```

Cuisines	Cook_Time
Afghan, BBQ, Biryani, Seafood	30.000000
American	30.000000
American, Beverages, Burger, Cafe, Coffee, Dess...	30.000000
American, Fast Food	37.500000
American, Italian, Cafe, Salad	45.000000
...	...
Tibetan, Chinese, Momos	45.000000
Tibetan, Momos	30.000000
Wraps, Fast Food	30.000000
Wraps, Healthy Food, Sandwich, Salad	58.333333
Wraps, North Indian, Biryani, Fast Food	65.000000

```
[726 rows x 1 columns]
```

```
[ ]:
```

```
[ ]:
```