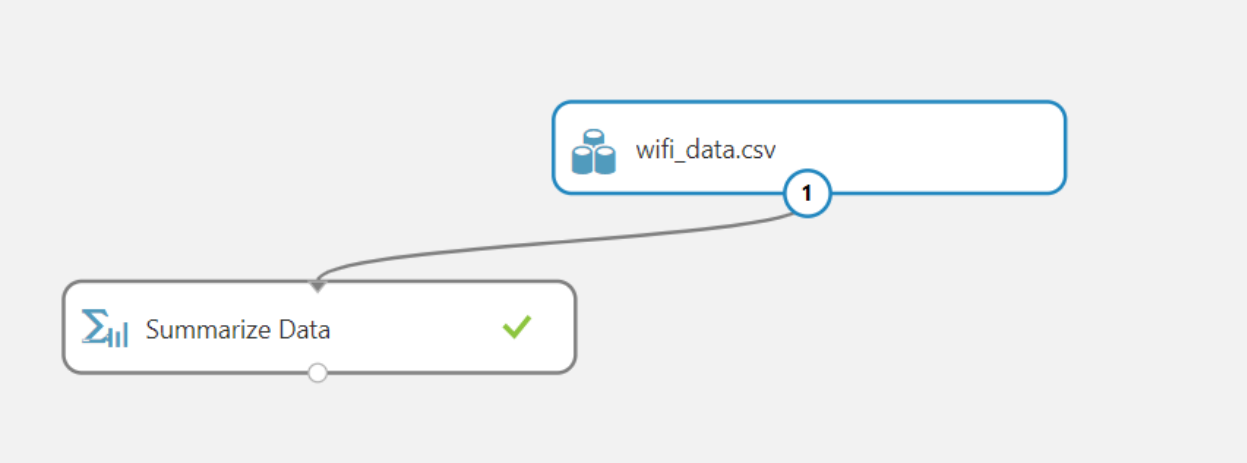
PROJECT – 4

1. Preprocessing the data. (4 points)



1. Report the size of the data set and check frequency distribution of the columns and write your inferences. (2 points)

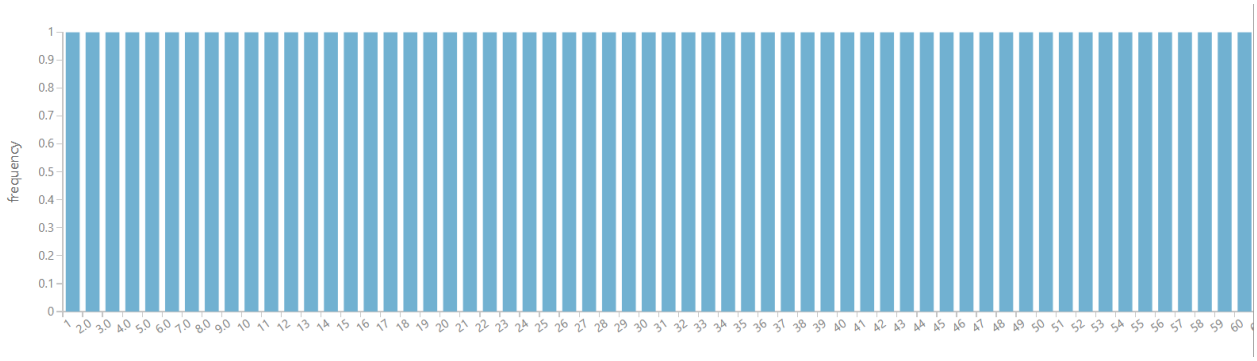
rows	columns
2566	10

Dataset have 2566 rows and 10 columns.

1. OBJECT-ID

Statistics

Mean	1283.5
Median	1283.5
Min	1
Max	2566
Standard Deviation	740.8847
Unique Values	2566
Missing Values	0
Feature Type	Numeric Feature

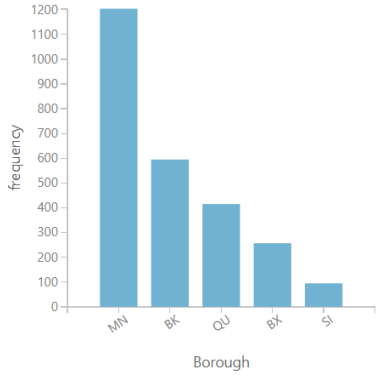


All the values are unique.

2. BOROUGH

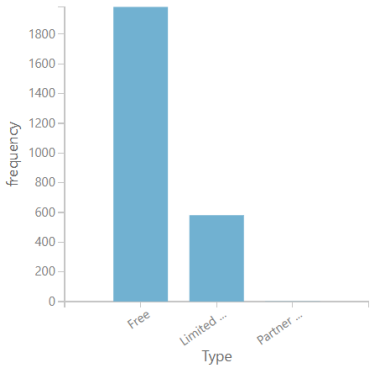
Statistics

Unique Values	5
Missing Values	0
Feature Type	String Feature



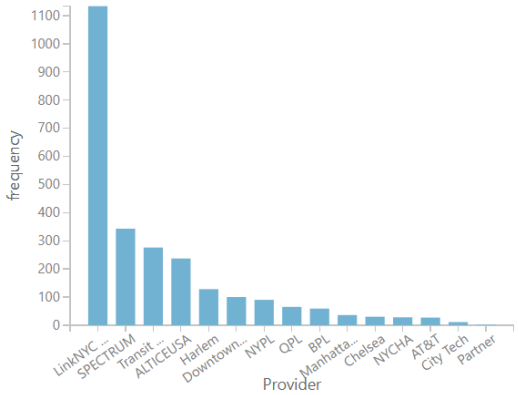
Statistics

Unique Values	3
Missing Values	0
Feature Type	String Feature



Statistics

Unique Values	15
Missing Values	0
Feature Type	String Feature



Statistics

Mean	40.7384
Median	40.7432
Min	40.5095
Max	40.9037
Standard Deviation	0.0708
Unique Values	2390
Missing Values	0
Feature Type	Numeric Feature

There are no missing values in dataset.

OBJECTID	2566	2566	0
Borough	2566	5	0
Type	2566	3	0
Provider	2566	15	0
Latitude	2566	2390	0
Longitude	2566	2375	0
Location_T	2566	6	0
City	2566	44	0
BoroCode	2566	5	0
NTACode	2566	178	0

And the above are the unique value count for each column

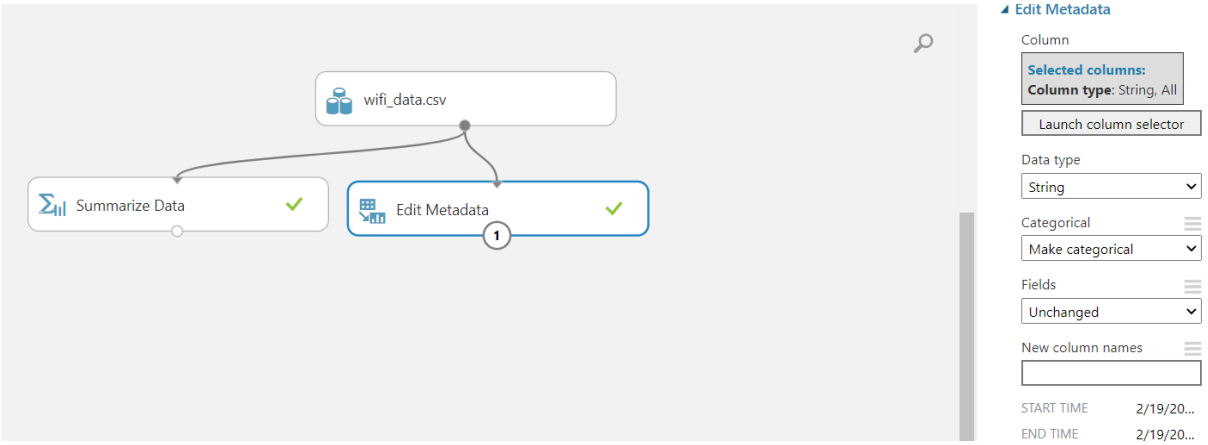
Data summary

Feature	Count	Unique Value Count	Missing Value Count	Min	Max	Mean	Mean Deviation	1st Quartile	Median	3rd Quartile	Mode	Range	Sample Variance	Sample Standard Deviation	Sample Skewness	Sample Kurtosis	P0.5	P1	P5	P95	P99	P99.5
OBJECTID	2566	2566	0	1	2566	1283.5	641.5	642.25	1283.5	1924.75	{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102...	2565	548910.166667	740.884719	0	-1.2	13.825	26.65	129.25	2437.75	2540.35	2553.175
Borough	2566	5	0																			

Type	2566	3	0						
Provider	2566	15	0						
Latitude	2566	2390	0	40.509531	40.903723	40.738396	0.056115		
	40.693069	40.743196	40.796066	40.687191	0.394192	0.005019			
	0.070845	-0.404158	-0.065426	40.568045	40.572667	40.591861			
	40.84605	40.874629	40.880524						
Longitude	2566	2375	0	-74.244107	-73.714838	-73.947564	0.048173		
	-73.985954	-73.958354	-73.922968	-73.769559	0.529269	0.004509			
	0.06715	0.582311	1.67407	-74.138192	-74.112341	-74.011847			
	-73.808307	-73.755022	-73.7441						
Location_T	2566	6	0						
City	2566	44	0						
BoroCode	2566	5	0	1	5	2.196804	1.163467	1	2
	3	1	4	1.644294	1.2823	0.512822	-1.126972	1	1
	1	4	5	5					
NTACode	2566	178	0						

My inference is that this data set contains the details of different wifi hotspot providers which can be either free, limited free or partnered and the code and their locations are given. This dataset will help us find the regions where wifi hotspot will tend to cluster and regions where there are no free wifi providers so that we can find the target audience for paid wifi providers.

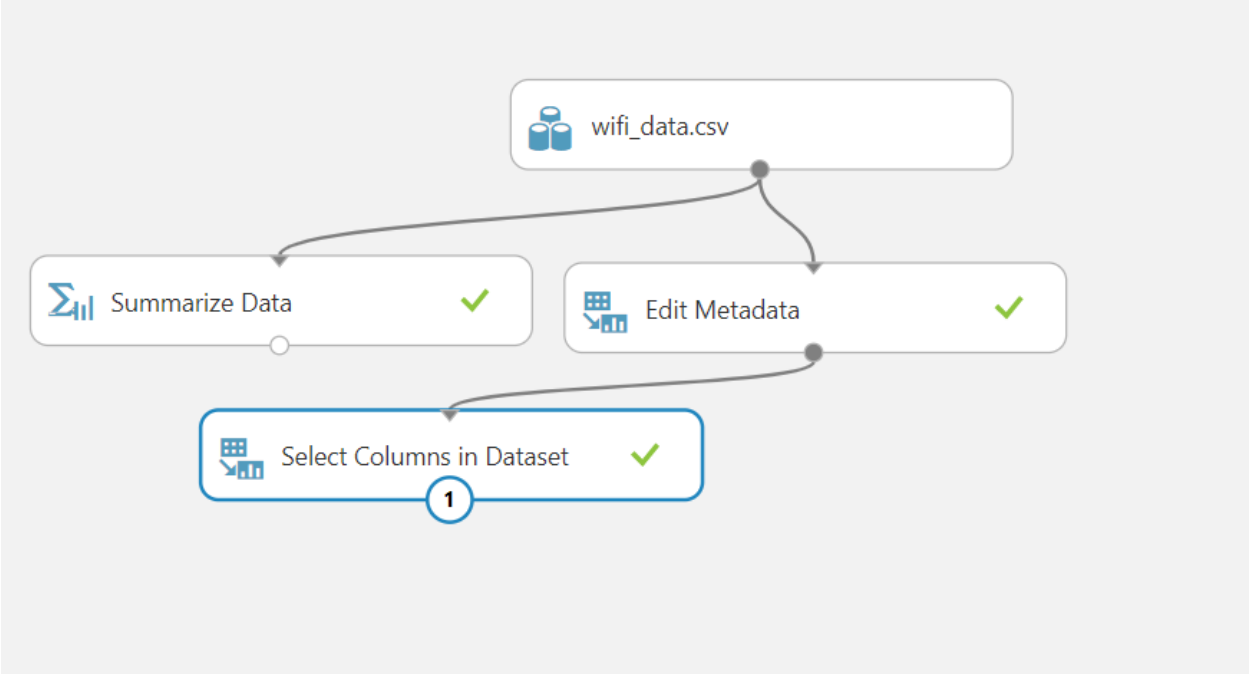
2. Convert string features into categories. (1 points)



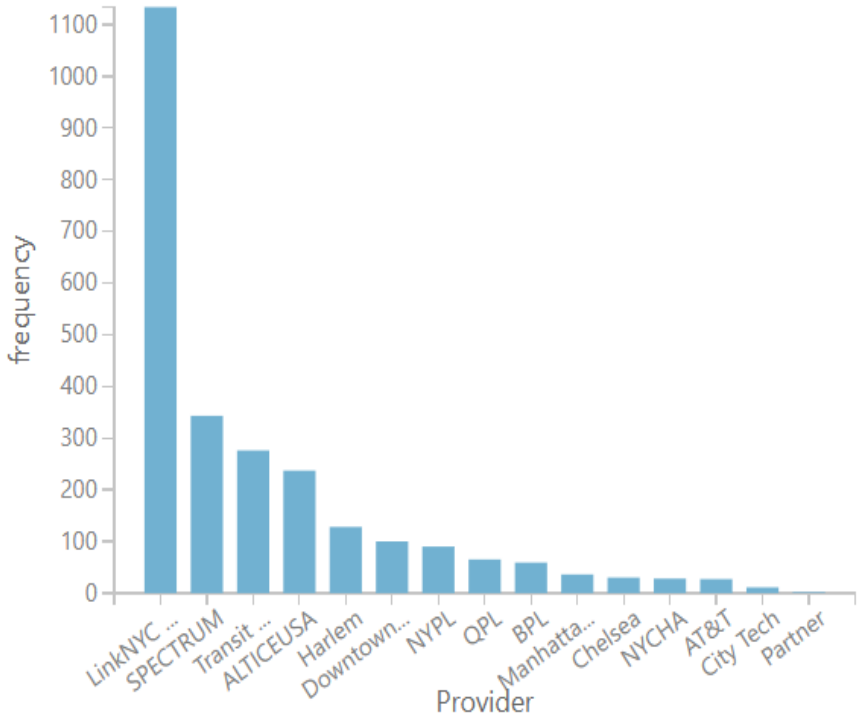
Made string data categorical.

3. Select relevant features for model building. Drop the redundant and irrelevant features. (1 point)

   Object ID, latitude and longitude are not useful so we are dropping that column out. There so many unique values and less common ones.

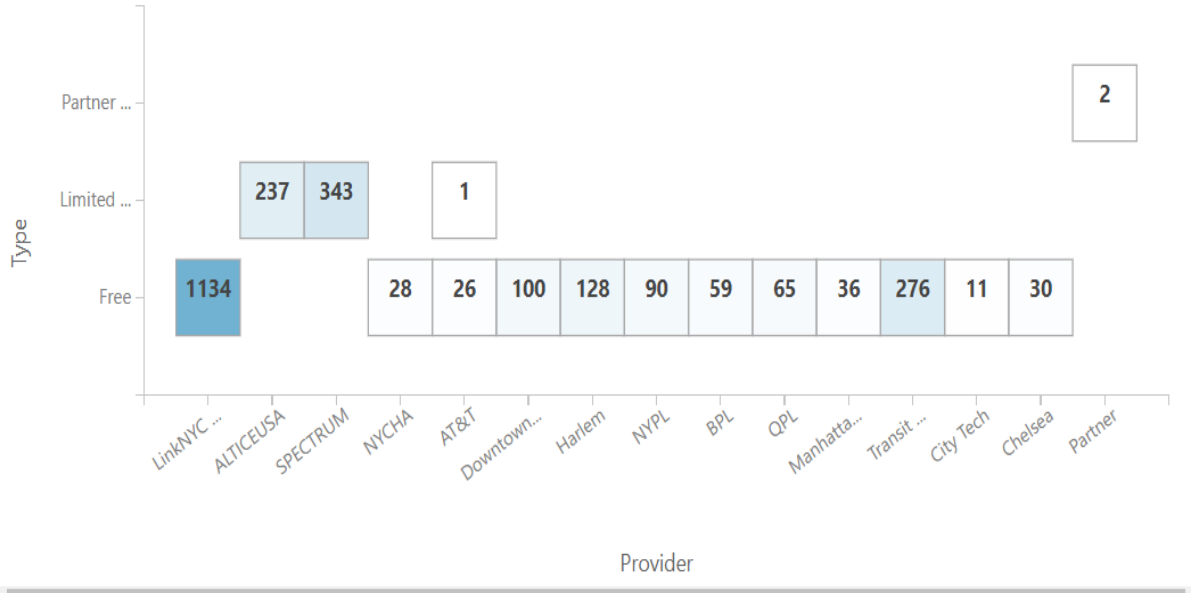


2. Perform univariate and bivariate analysis and answer the following questions. (8 points)
   1. Which provider has the highest number of wifi hotspots? (1 point)



LinkNYC – Citybridge has highest no. of wifi providers that is 44% i.e. 1134 wifi hotspots.

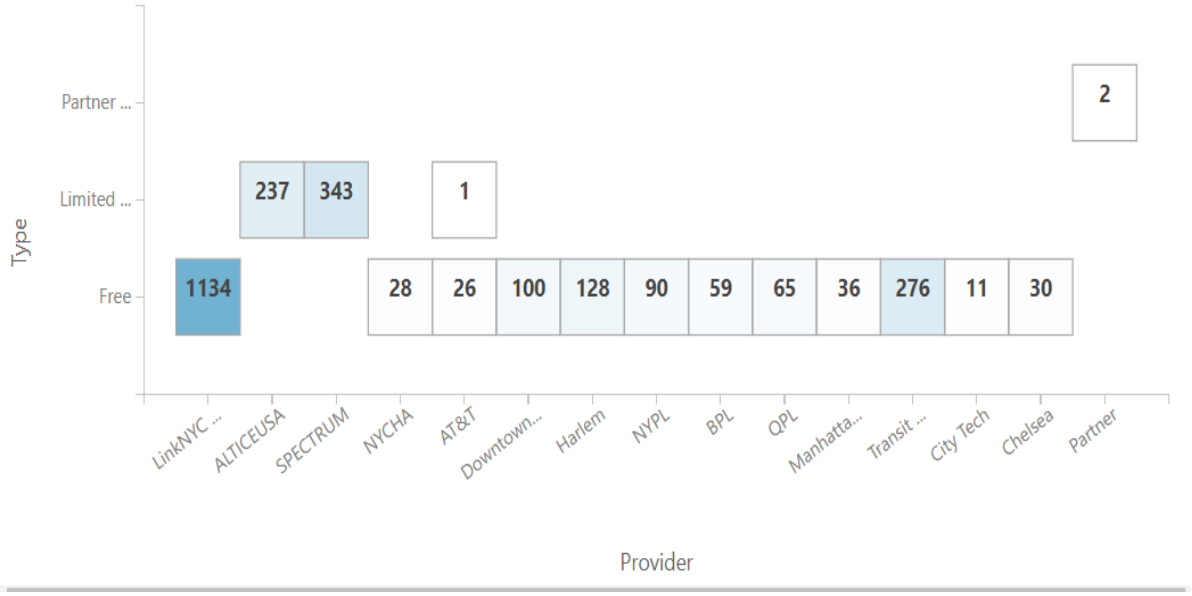
2. Which provider provides the highest number of free wifi hotspots? (1 point)
   Wifi provider with highest no. of free wifi hotspots is LinkNYC – Citybridge and no. is 1134



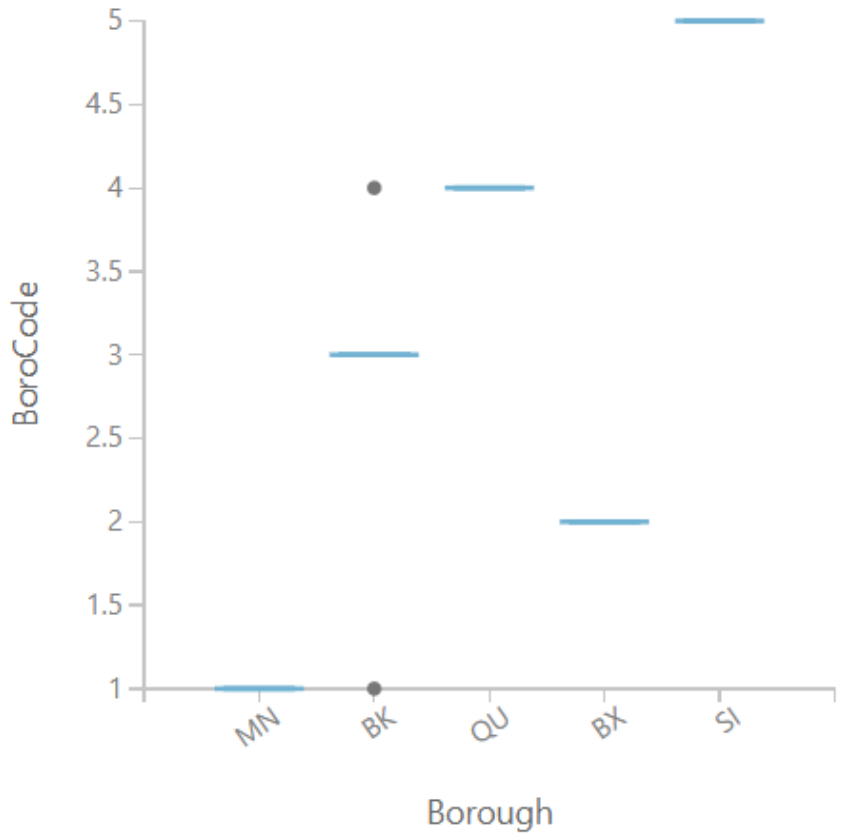
3. List down the name of providers that provide “Limited Free” type of wifi. (1point)

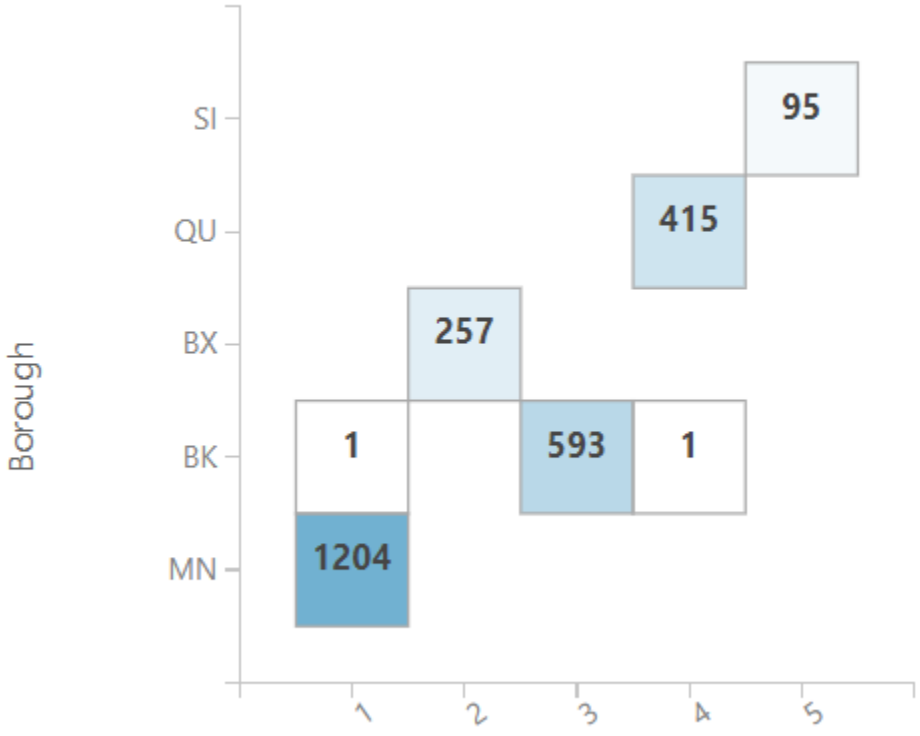
   There are 3 wifi providers who provide Limited Free wifi and they are –

   1. ALTICEUSA
   2. SPECTRUM
   3. AT&T



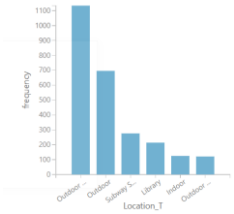
4. What is the correlation coefficient between borough and BoroCode. (2 points)


5
4.5
4
3.5
3
2.5
2
1.5
1
BoroCode
MN
BK
QU
BX
SI
Borough

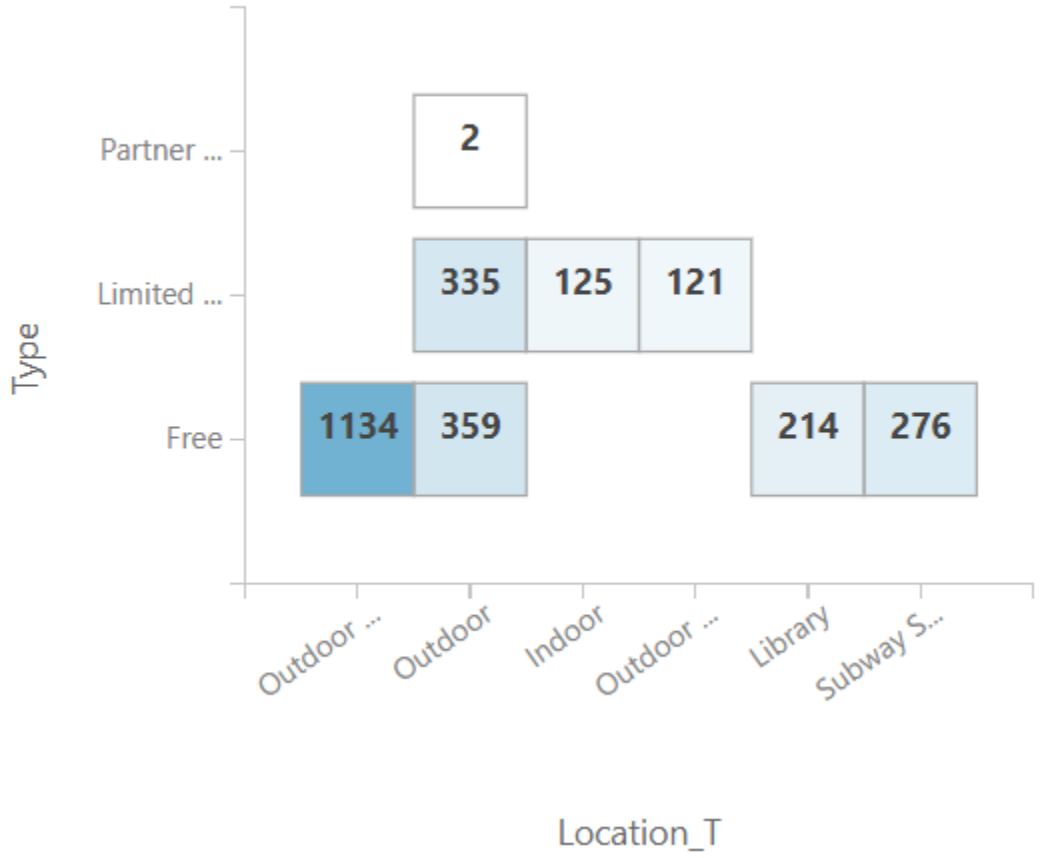

SI
QU
BX
BK
MN
Borough
95
415
257
1
593
1
1204
1
2
3
4
5

As boro code increases there are less number of borough and also a particular borough as usually same boro code. Only BK has boro codes 1, 3, 4 rest have same boro code for a given borough.

5. Are there any indoor free wifi hotspots? (2 points)

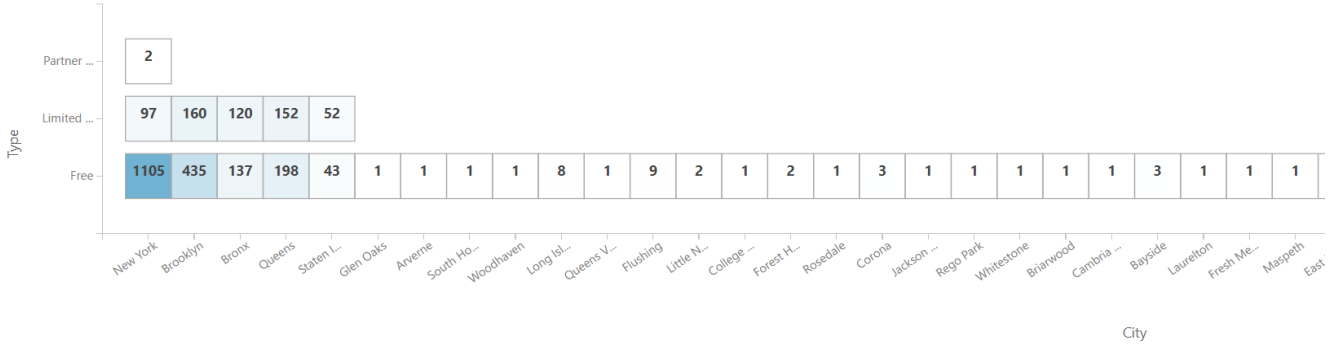


There are 129 i.e. 4.9% indoor wifis



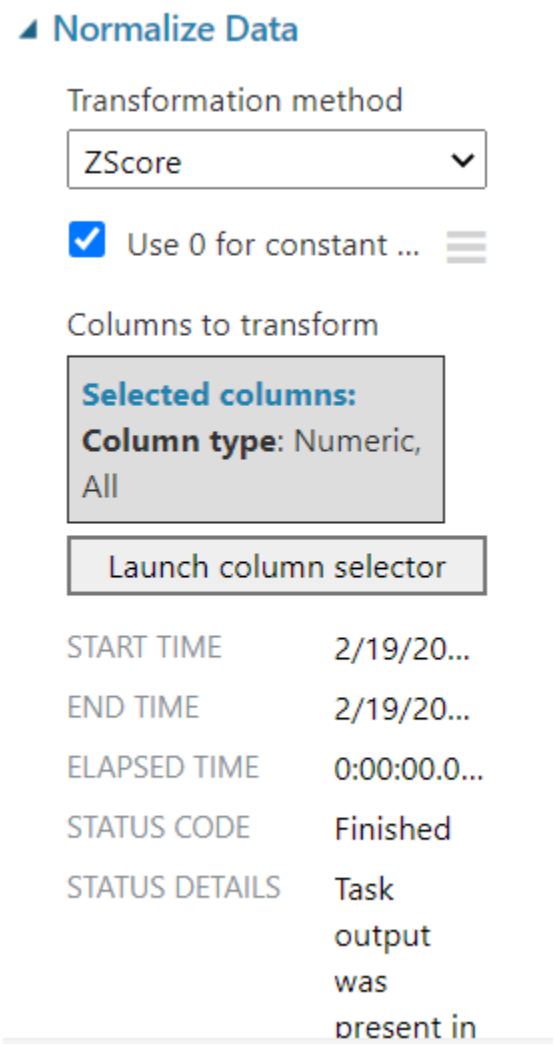
No, there are no free wifi provider which are indoor

6. Which city has the “partner_site” type wifi hotspot? (1 point)



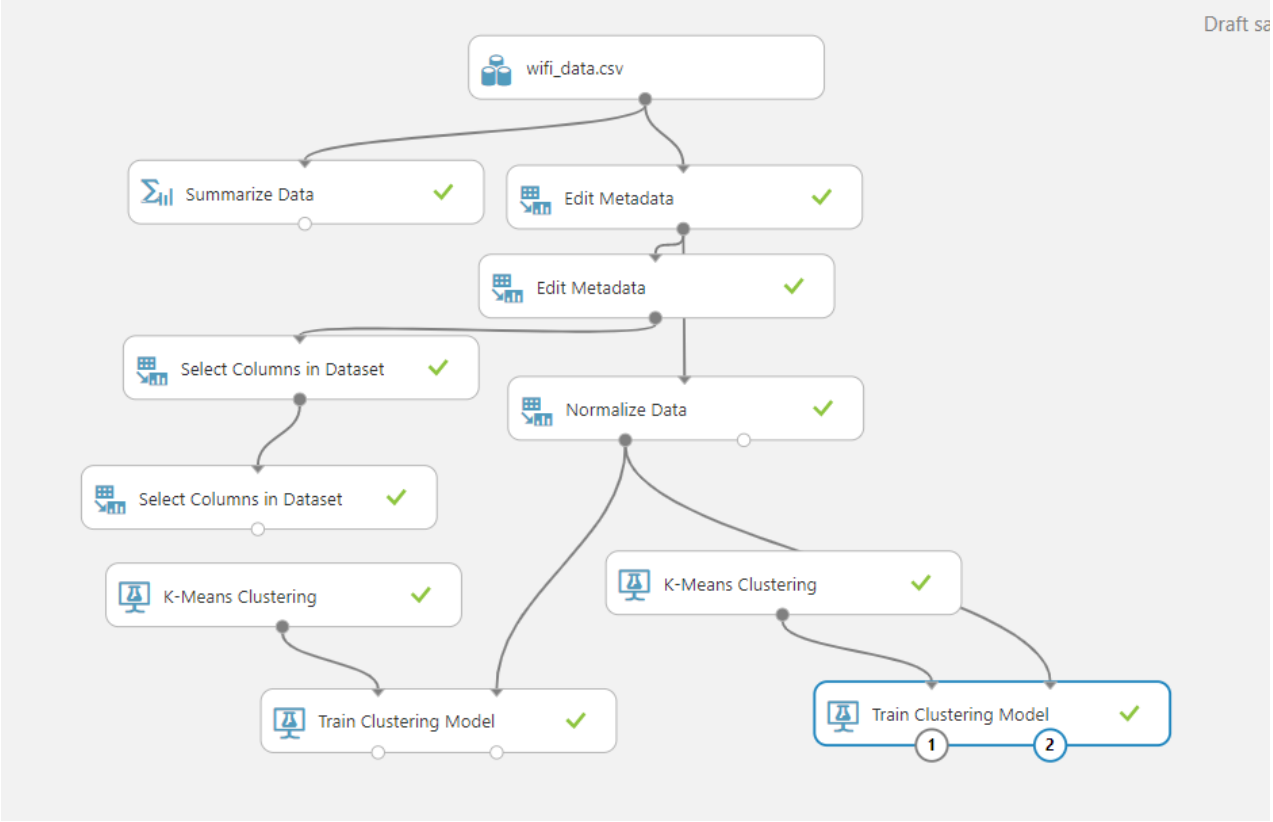
Only New York have “partner_site” type wifi.

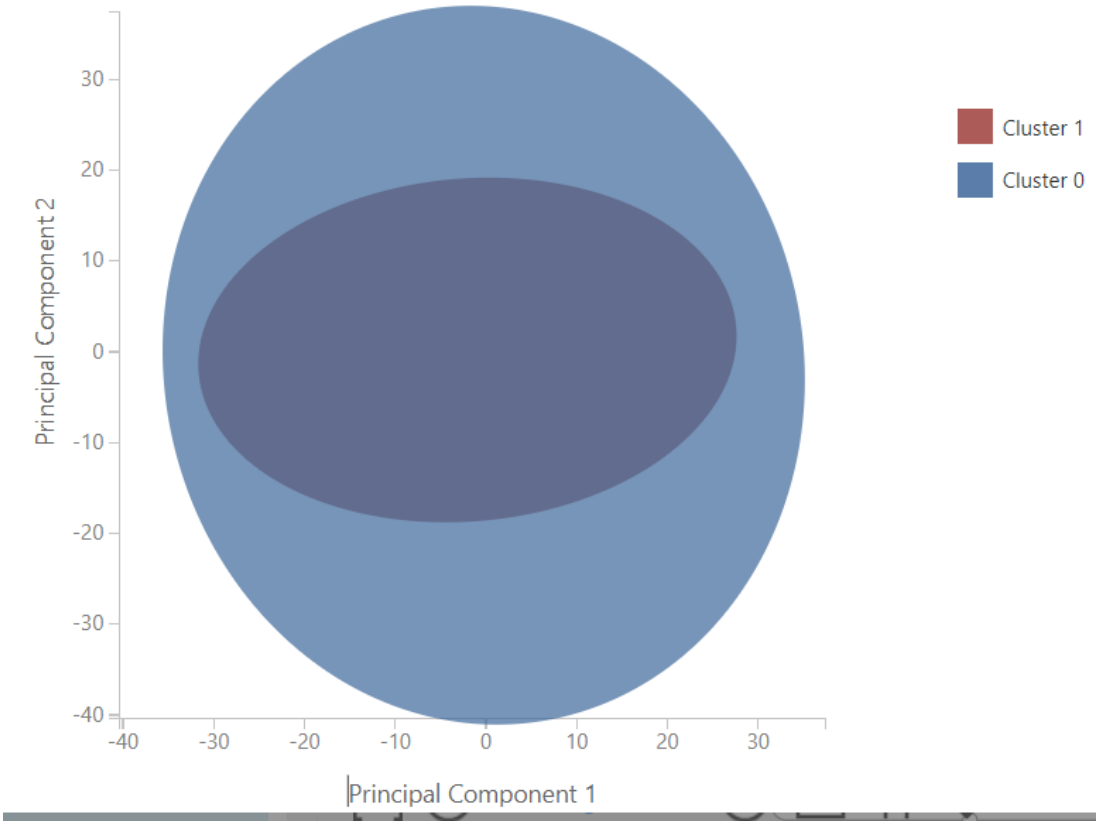
3. Apply following techniques to identify the natural cluster of wifi hotspots locations. And mention the number of optimal clusters and their properties. (6 points)
    1. Normalize the data. (1 point)

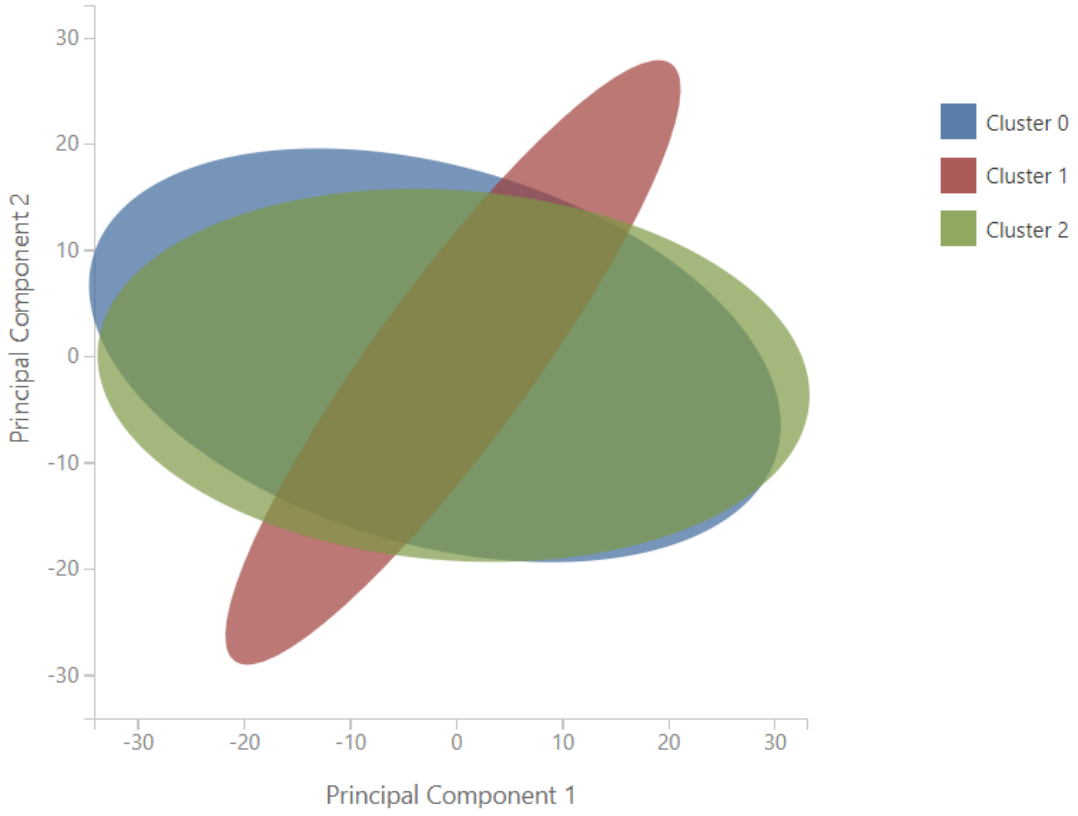


Did Z-score normalization

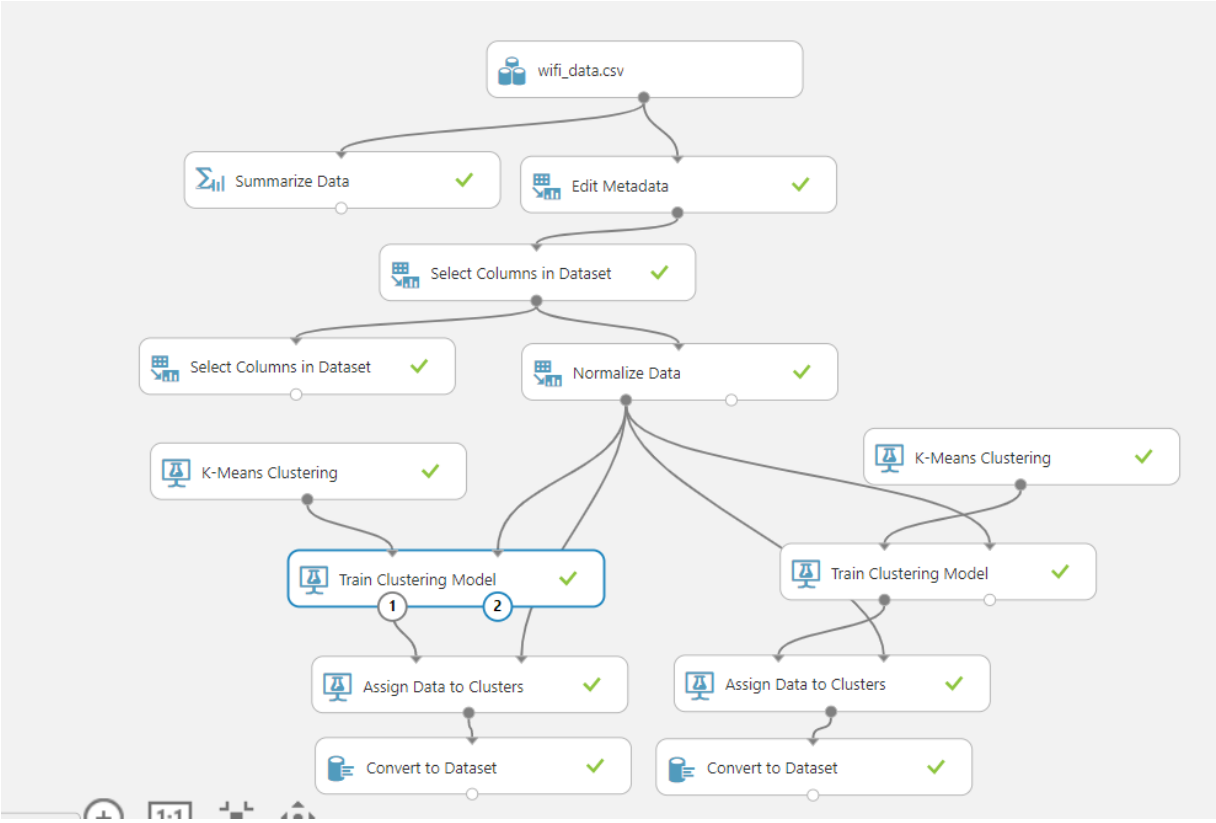
    2. Build a K-means clustering model for k=2 and 3. (2 points)


Draft sa
wifi_data.csv
Summarize Data
Edit Metadata
Edit Metadata
Select Columns in Dataset
Normalize Data
Select Columns in Dataset
K-Means Clustering
K-Means Clustering
Train Clustering Model
Train Clustering Model
1
2

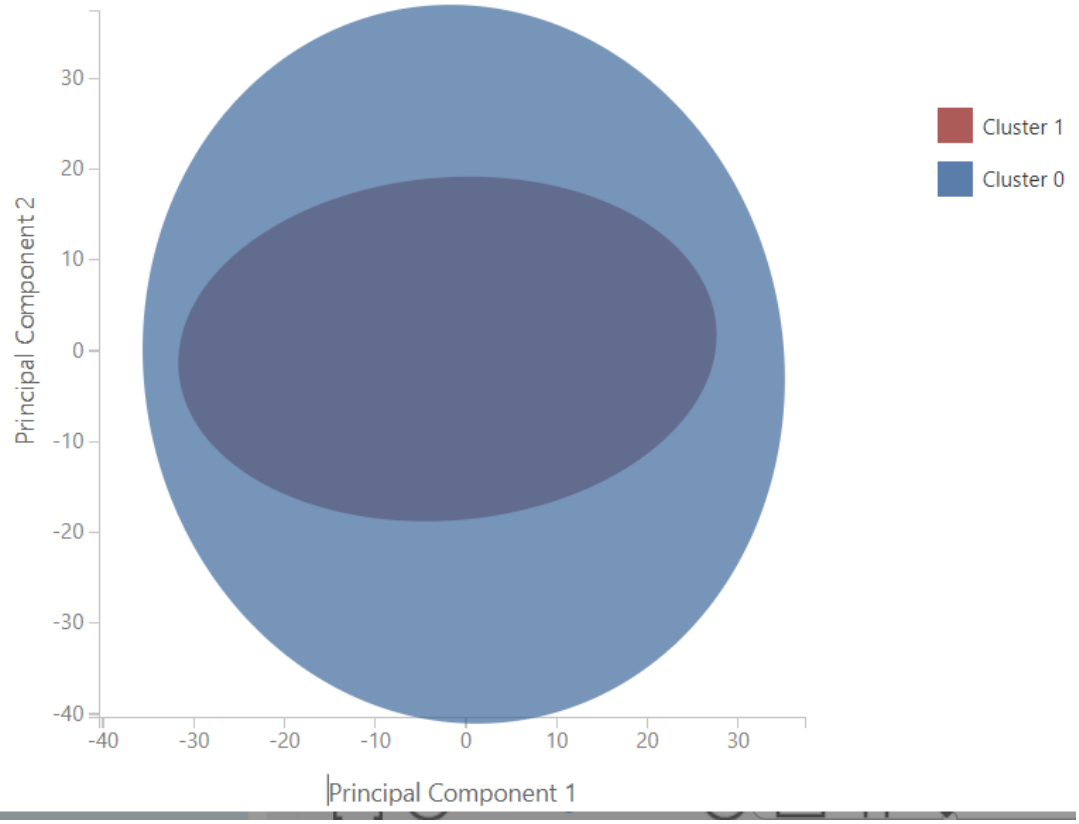

Cluster 1
Cluster 0
Principal Component 2
30
20
10
0
-10
-20
-30
-40
-40
-30
-20
-10
0
10
20
30
Principal Component 1

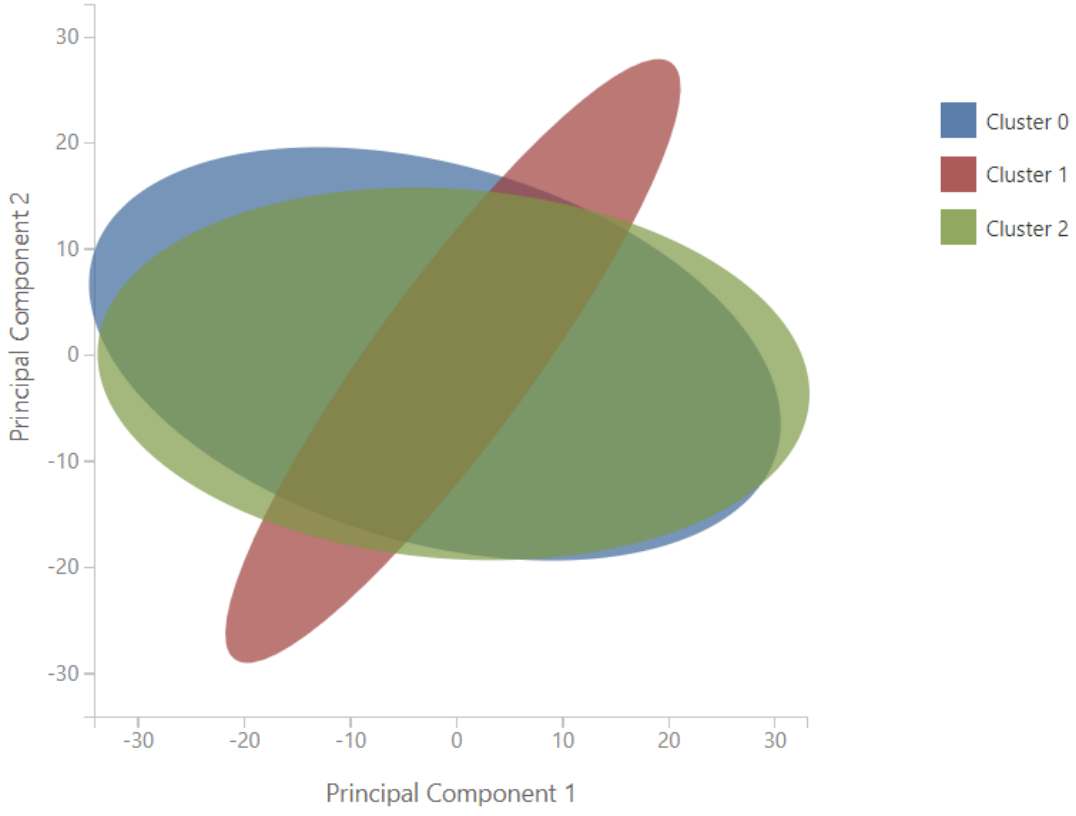


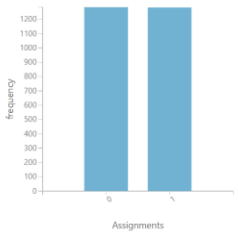
Trained 2 models with 2 and 3 clusters.

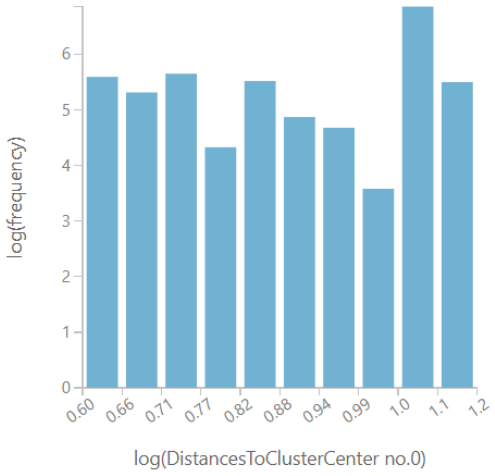


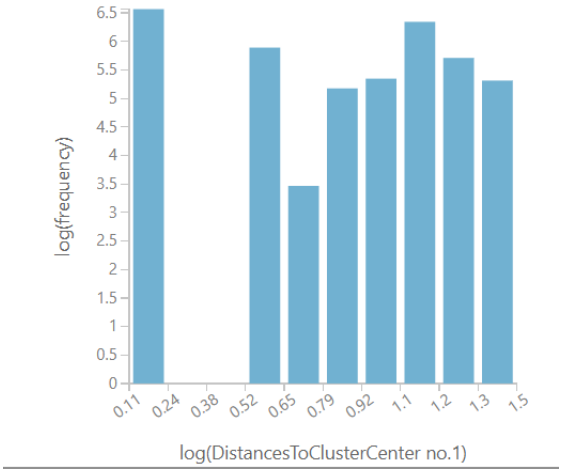
3. Visualize the clusters. (1point)

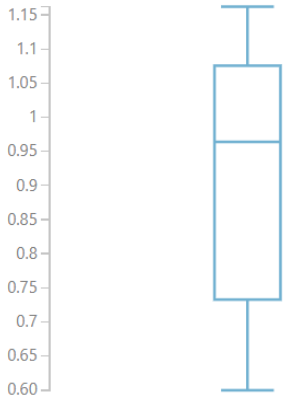

Cluster 1
Cluster 0
Principal Component 2
30
20
10
0
-10
-20
-30
-40
-40
-30
-20
-10
0
10
20
30
Principal Component 1

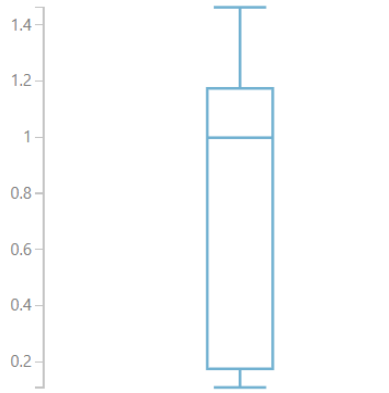

Cluster 0
Cluster 1
Cluster 2
Principal Component 2
30
20
10
0
-10
-20
-30
-30
-20
-10
0
10
20
30
Principal Component 1

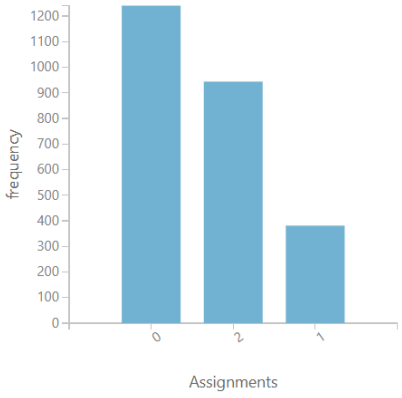

frequency
Assignments

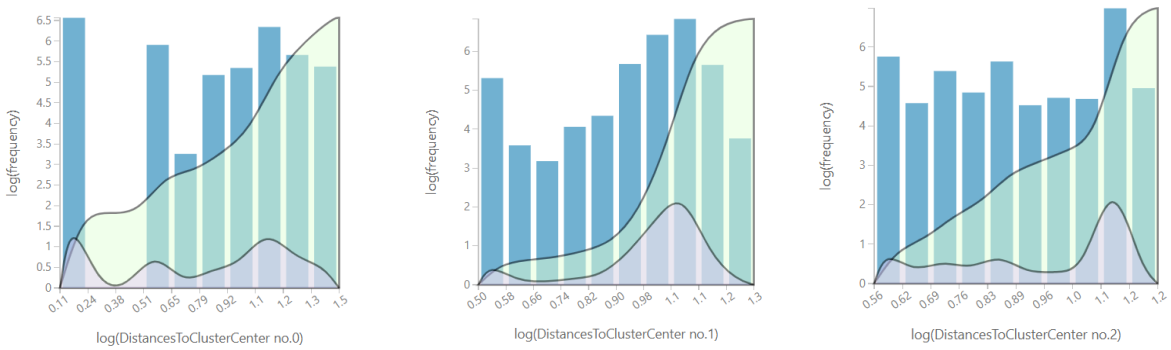

log(frequency)
log(DistancesToClusterCenter no.0)

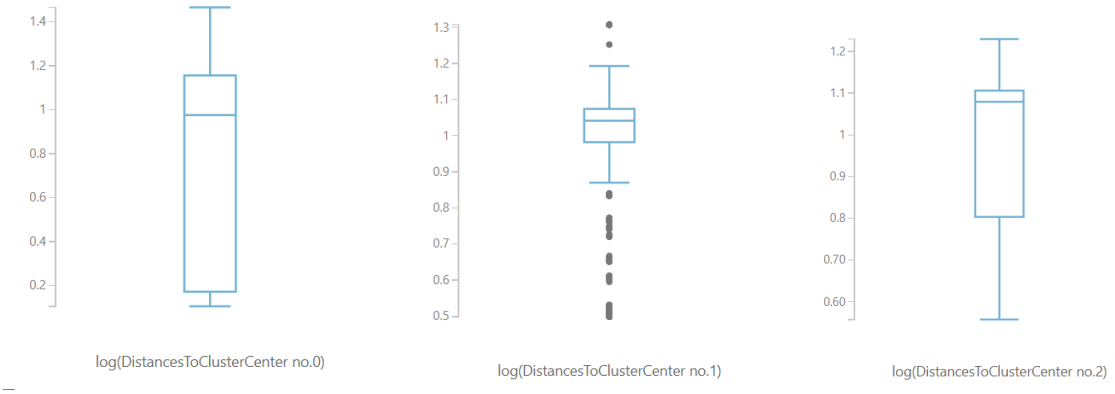

log(frequency)
log(DistancesToClusterCenter no.1)


log(DistancesToClusterCenter no.0)

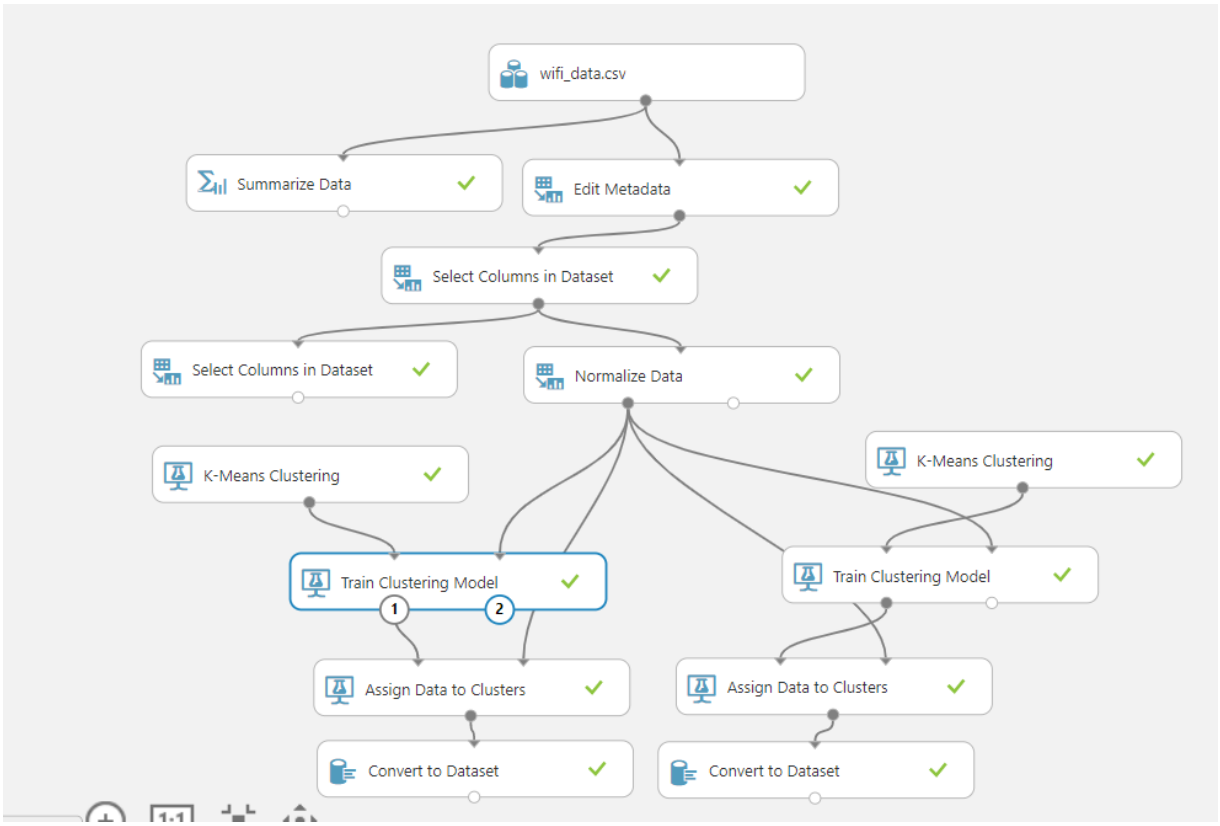

log(DistancesToClusterCenter no.1)


frequency
Assignments

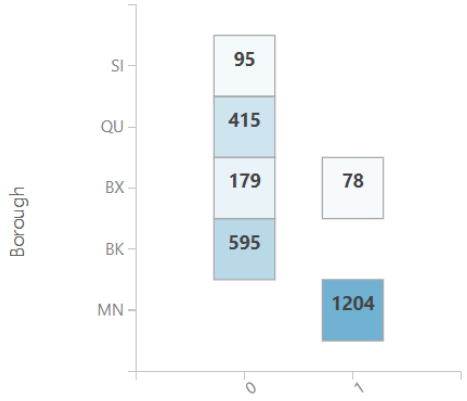


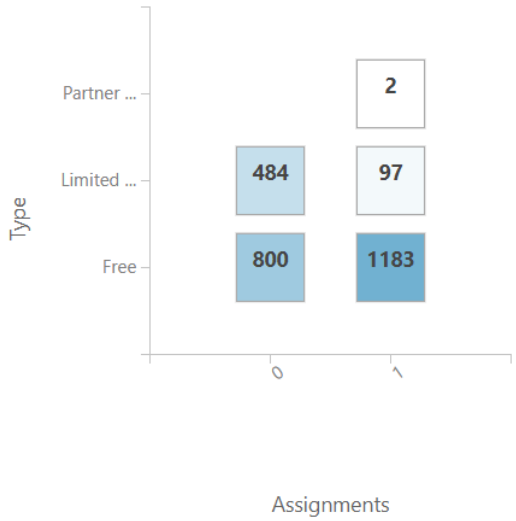


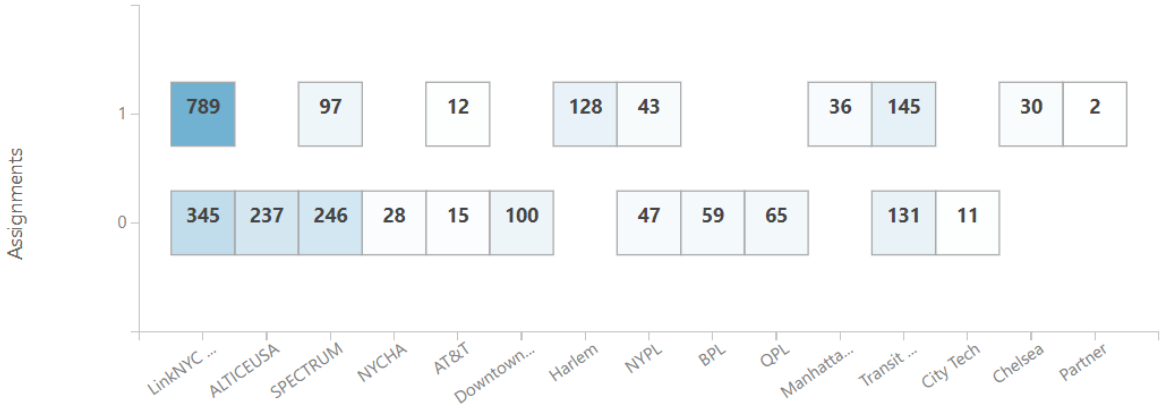
4. Assign cluster labels to the dataset and perform bivariate analysis between cluster labels and various features and write your inferences. (2 points)

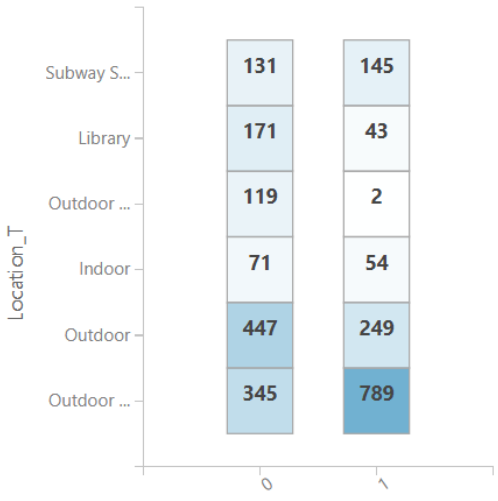


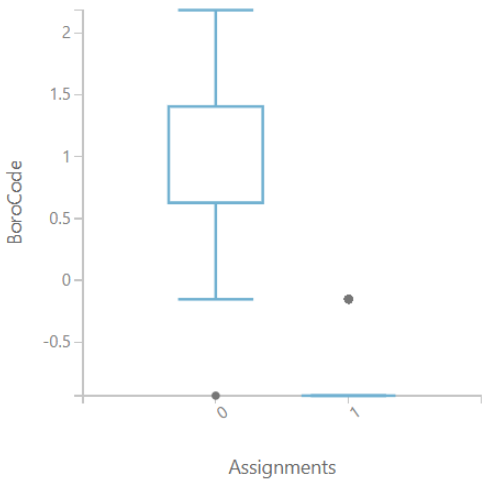
For 2 cluster classification

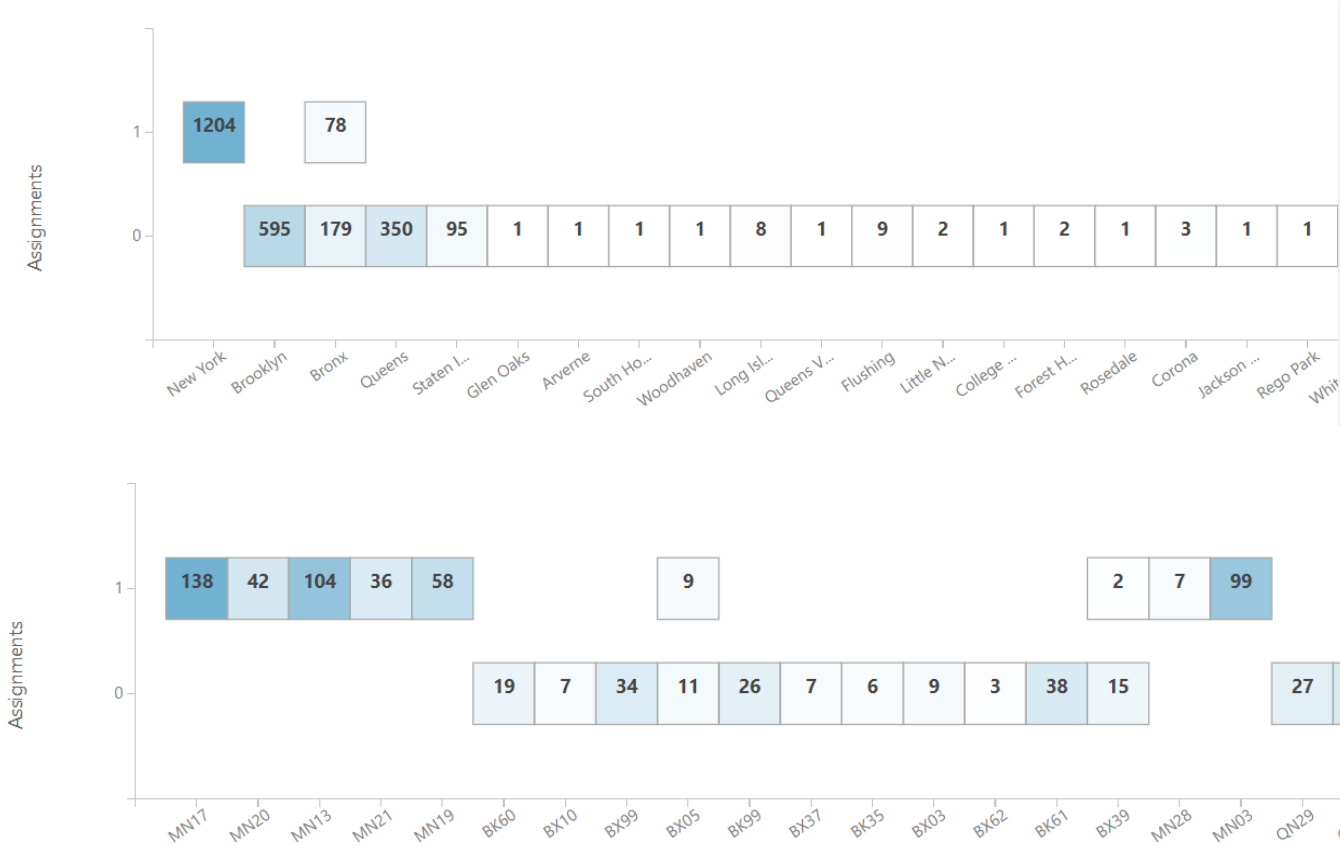




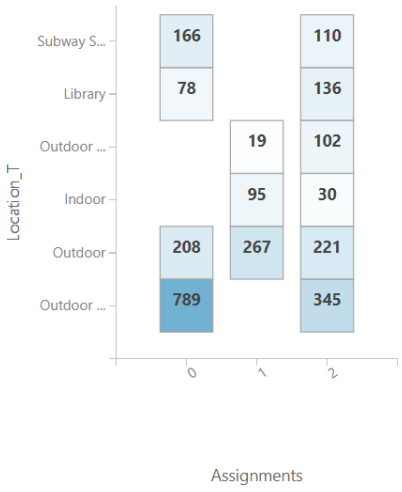


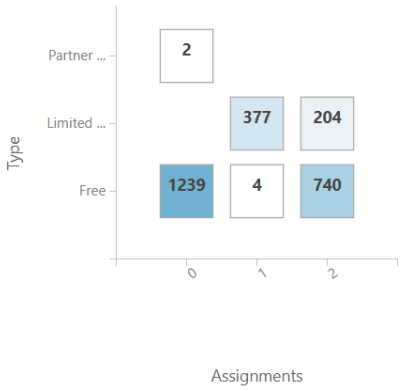


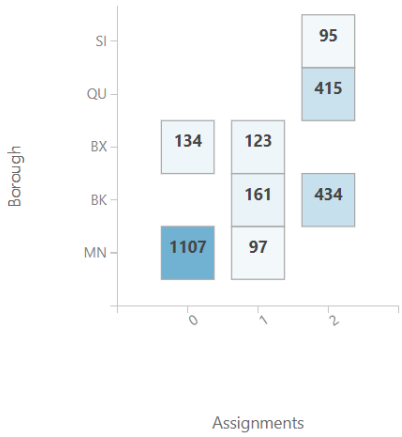


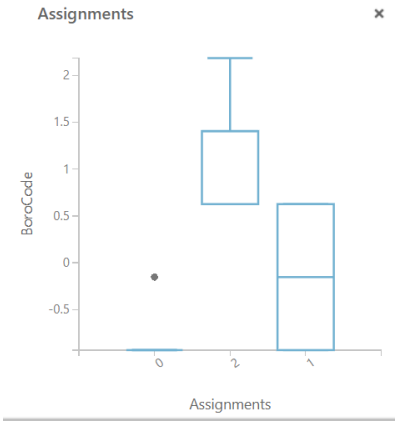


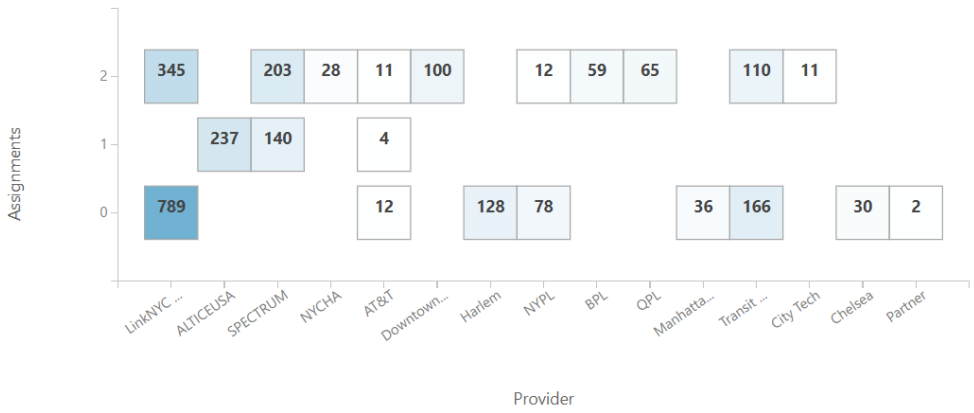
One of the major thing we notice here is that in the city column the assignment of cluster 0 are none and all are from cluster 1 and also there is only 1 more city having cluster 1 so we can say city id not a major classification feature.

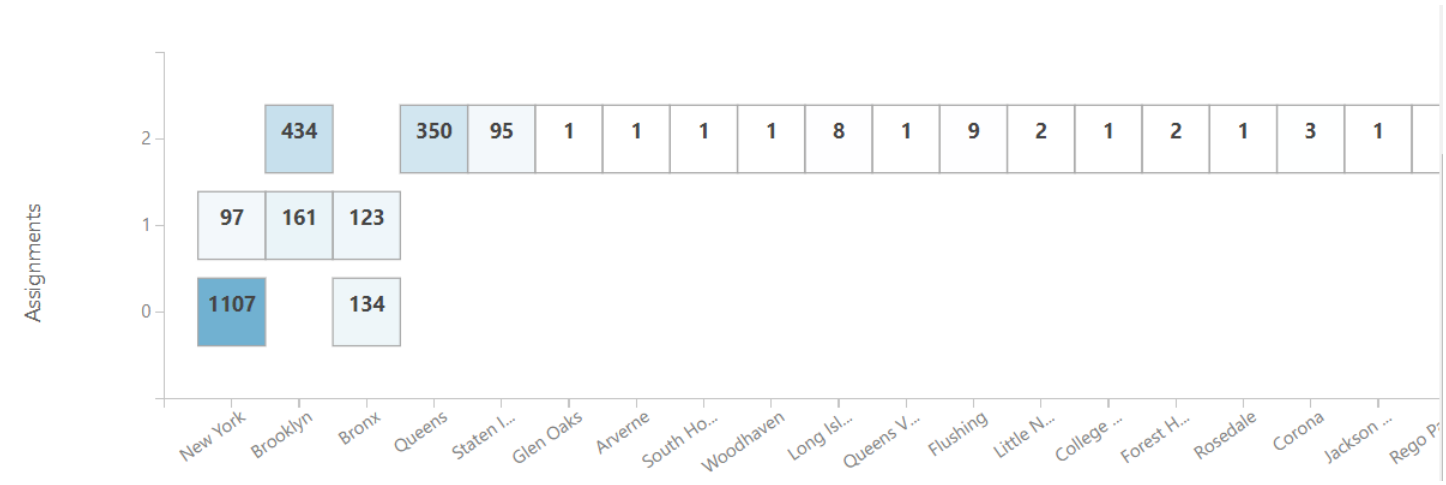


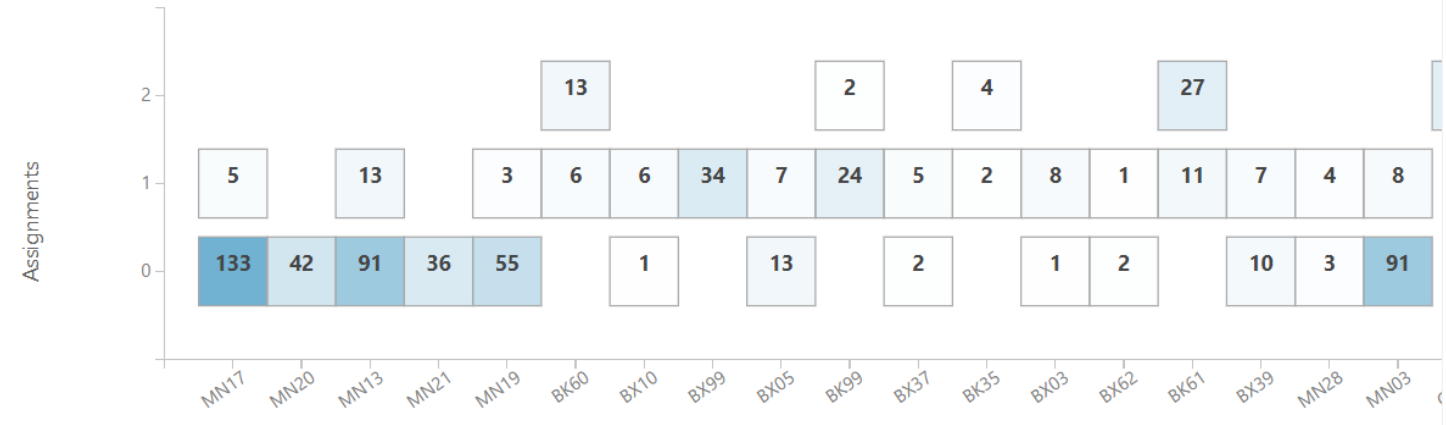












I prefer 3 cluster classification as there is less overlap between the the clusters in the first 1 there are so many overlaps that its kind of intersecting so 3 cluster classification is better.