

Report

The Battle of the Neighborhoods

Introduction

Universities in New York are very desirable and can be very expensive with prices increasing every year. The annual average college tuition is \$ 18,800, \$ 4,721 more than the United States average. In addition to these costs, there are very expensive housing costs, in addition to books and other academic needs.

The private university is much more expensive and tuition averages \$ 27,500 to \$ 54,500 for Columbia University, which is considered the most expensive university in New York.

The academic school year is generally September through June with an optional summer term (which increases enrollment). Scholarships and financial aid can help students attend the college of their choice, but most students must obtain loans to complete their education.

Students not only need money to enter their dream school, they also need to get high enough scores on national exams like the SAT or ACT, achieve a minimum average in high school, and apply to additional circular activities like sports and clubs. Extras, such as being a descendant of a student can also reflect positively in favor of the applicant. The better the university, the more difficult it will be to be accepted. Ivy League schools like Harvard, Brown, Cornell, Princeton and Yale have very high standards to maintain their prestige.



Business Problem

In New York City, there are a large number of prestigious universities. In this work, we will focus on finding a location that is free of universities and academies to establish a business based on education. Despite the fact that there are a large number of prestigious schools, a study can be made to see if there is any location where there is more business opportunity

Data

First, we analyze how many Neighborhoods and Boroughs are in Manhattan, the data was downloaded from:

https://geo.nyu.edu/catalog/nyu_2451_34572

```
Borough      40  
Neighborhood  40  
Latitude      40  
Longitude     40  
dtype: int64
```

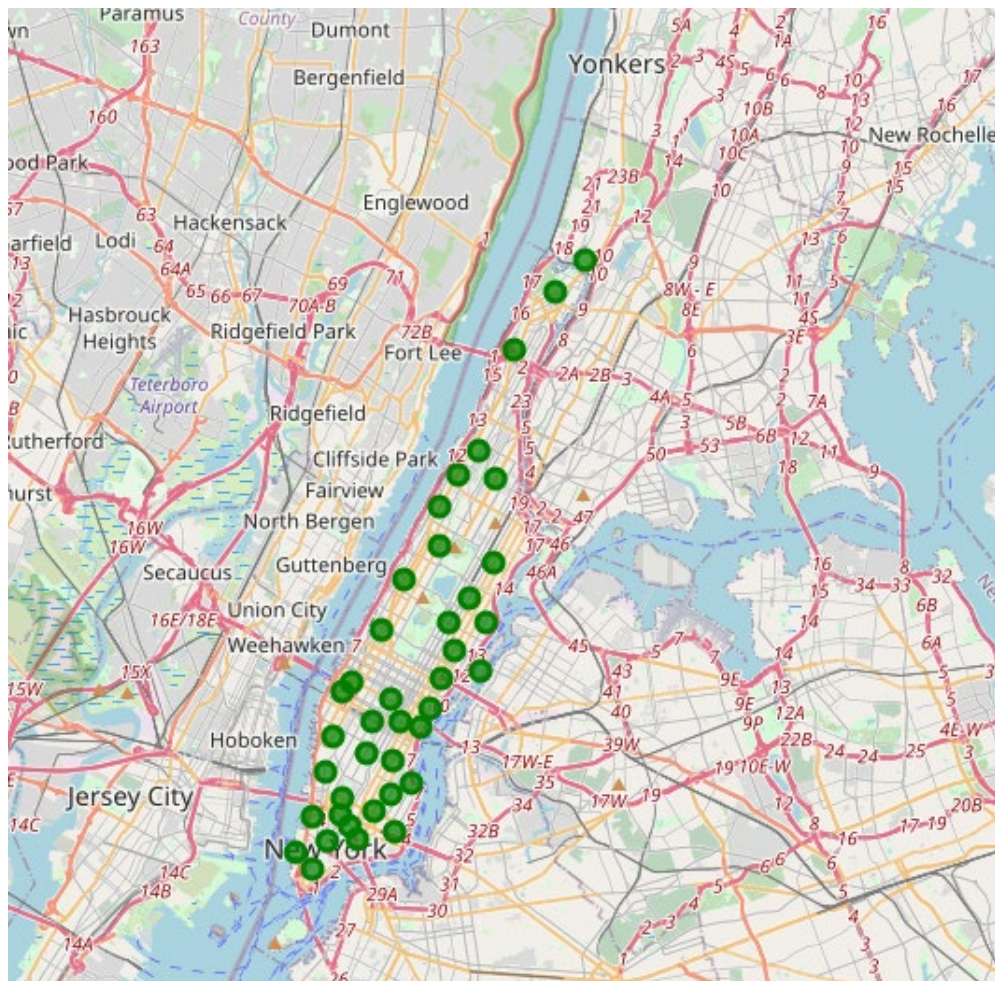
We use the Foursquare API to explore Manhattan. College & University. The ID for this category is: 4d4b7105d754a06372d81259

1. Methodology

The Latitude and the longitude was added to every Neighborhood as it is shown in the following picture:

	Borough	Neighborhood	Latitude	Longitude
0	Bronx	Wakefield	40.894705	-73.847201
1	Bronx	Co-op City	40.874294	-73.829939
2	Bronx	Eastchester	40.887556	-73.827806
3	Bronx	Fieldston	40.895437	-73.905643
4	Bronx	Riverdale	40.890834	-73.912585

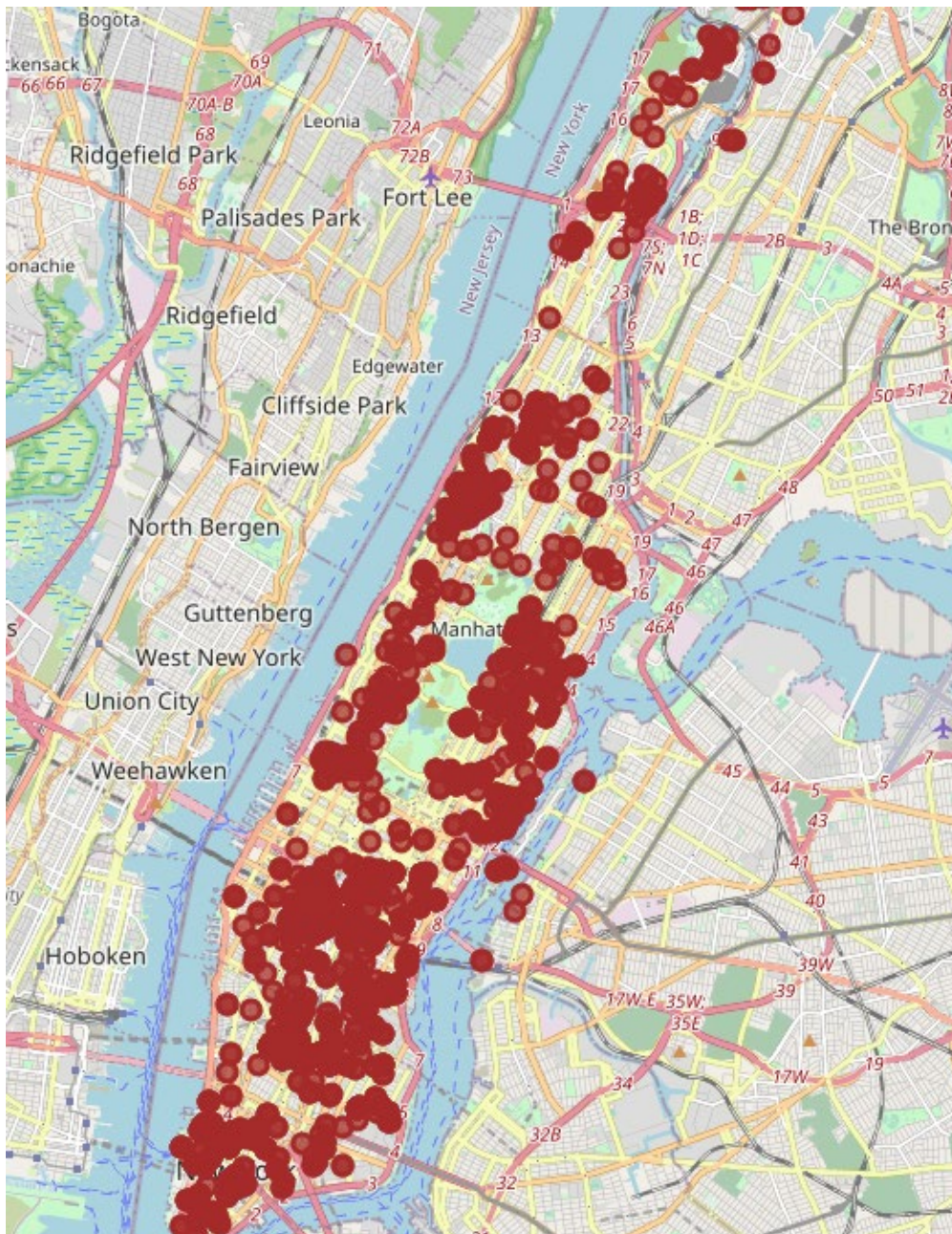
In the following picture it is shown the map of Manhattan with its different Boroughs:



Then we use the Foursquare API to show the College & University category for the Neighborhoods in Manhattan. In the following picture, it is shown the table with the data:

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Marble Hill	40.876551	-73.91066	IN-Tech Academy	40.879101	-73.911026	High School
1	Marble Hill	40.876551	-73.91066	Columbia University Medical	40.876950	-73.901602	Medical School
2	Marble Hill	40.876551	-73.91066	Robert K. Kraft Field	40.872951	-73.916023	College Football Field
3	Marble Hill	40.876551	-73.91066	Lawrence A. Wien Stadium	40.872543	-73.915749	College Stadium
4	Marble Hill	40.876551	-73.91066	Wein Stadium	40.872599	-73.916518	College Stadium

And from the data we can show the map of the different Colleges and Universities in Manhattan:



As we can see in the picture, there are a lot of Universities and Colleges in the city of New York, so this work will help knowing which the best area to set up our business is.

Then we create a table with the numbers of Universities and Colleges in Manhattan:

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Battery Park City	48	48	48	48	48	48
Carnegie Hill	47	47	47	47	47	47
Central Harlem	48	48	48	48	48	48
Chelsea	45	45	45	45	45	45
Chinatown	48	48	48	48	48	48
Civic Center	49	49	49	49	49	49
Clinton	45	45	45	45	45	45
East Harlem	47	47	47	47	47	47
East Village	50	50	50	50	50	50
Financial District	46	46	46	46	46	46
Flatiron	50	50	50	50	50	50
Gramercy	49	49	49	49	49	49
Greenwich Village	50	50	50	50	50	50
Hamilton Heights	50	50	50	50	50	50
Hudson Yards	46	46	46	46	46	46
Inwood	25	25	25	25	25	25
Lenox Hill	49	49	49	49	49	49
Lincoln Square	50	50	50	50	50	50
Little Italy	50	50	50	50	50	50
Lower East Side	48	48	48	48	48	48
Manhattan Valley	46	46	46	46	46	46
Manhattanville	50	50	50	50	50	50
Marble Hill	26	26	26	26	26	26
Midtown	44	44	44	44	44	44
Midtown South	45	45	45	45	45	45
Morningside Heights	50	50	50	50	50	50
Murray Hill	47	47	47	47	47	47
Noho	50	50	50	50	50	50
Roosevelt Island	47	47	47	47	47	47
Soho	50	50	50	50	50	50
Stuyvesant Town	50	50	50	50	50	50
Sutton Place	47	47	47	47	47	47
Tribeca	49	49	49	49	49	49
Tudor City	46	46	46	46	46	46
Turtle Bay	40	40	40	40	40	40
Upper East Side	43	43	43	43	43	43
Upper West Side	43	43	43	43	43	43
Washington Heights	48	48	48	48	48	48

Then use this feature to group the neighborhoods into clusters K-means clustering algorithm will be use to complete this task. And also, the Folium library to visualize the neighborhoods in Manhattan and its emerging clusters.



2. Results

Using K-mean to clustering data area with less number of Universities and Colleges:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	
	9	Yorkville	University	College Classroom	Student Center	Trade School	College Academic Building	Sorority House	School	College Administrative Building	College Lab	College Auditorium
	14	Clinton	Trade School	College Academic Building	University	College Classroom	Student Center	College Bookstore	College Lab	College Quad	College Theater	College Residence Hall
	15	Midtown	College Academic Building	University	General College & University	College Classroom	Trade School	College Administrative Building	College Lab	Doctor's Office	Fraternity House	College Theater
	17	Chelsea	University	College Academic Building	General College & University	College Classroom	Trade School	College Arts Building	College Auditorium	College Lab	College Theater	College Residence Hall
	33	Midtown South	University	College Academic Building	Student Center	Trade School	College Administrative Building	College Classroom	College Lab	College Theater	College Quad	College Library
	39	Hudson Yards	University	Trade School	College Academic Building	College Classroom	College Administrative Building	College Bookstore	College Quad	College Residence Hall	College Theater	Student Center
[25]:	manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 2, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]											
[25]:	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	
	5	Manhattanville	College Academic Building	University	College Quad	College Administrative Building	College Library	College Residence Hall	College Cafeteria	College Science Building	College Arts Building	General College & University
	18	Greenwich Village	College Academic Building	University	College Cafeteria	Student Center	College Arts Building	College Auditorium	Law School	College Residence Hall	College Library	College Gym
	19	East Village	College Academic Building	College Administrative Building	University	College Residence Hall	Student Center	College Arts Building	College Cafeteria	General College & University	School	College Auditorium
	22	Little Italy	College Academic Building	College Administrative Building	University	Law School	College Gym	College Library	College Lab	College Cafeteria	College Auditorium	College Classroom
	23	Soho	College Academic Building	Law School	College Library	College Cafeteria	College Administrative Building	College Residence Hall	Student Center	College Lab	College Arts Building	College Gym
	24	West Village	College Academic Building	Law School	University	College Library	College Cafeteria	College Auditorium	College Residence Hall	Student Center	Performing Arts Venue	General College & University
	26	Morningside Heights	College Academic Building	College Residence Hall	University	College Library	General College & University	College Quad	College Administrative Building	College Cafeteria	College Engineering Building	College Science Building
	31	Noho	College Academic Building	Student Center	College Cafeteria	College Arts Building	College Residence Hall	College Library	Law School	College Administrative Building	College Auditorium	College Gym
	38	Flatiron	College Academic Building	University	College Cafeteria	General College & University	College Arts Building	College Auditorium	College Residence Hall	College Administrative Building	College Classroom	College Library
[25]:	manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 3, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]											
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	38	Flatiron	College Academic Building	University	College Cafeteria	General College & University	College Arts Building	College Auditorium	College Residence Hall	College Administrative Building	College Classroom	College Library
[26]:	manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 3, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]											
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	25	Manhattan Valley	College Residence Hall	General College & University	College Library	Fraternity House	College Academic Building	Student Center	College Cafeteria	University	College Classroom	College Administrative Building
	27	Gramercy	College Residence Hall	College Academic Building	University	College Administrative Building	Student Center	College Library	Medical School	College Theater	College Science Building	College Auditorium
	37	Stuyvesant Town	College Residence Hall	College Lab	College Academic Building	Student Center	College Library	Fraternity House	College Arts Building	Medical School	College Quad	General College & University
[27]:	manhattan_merged.loc[manhattan_merged['Cluster Labels'] == 4, manhattan_merged.columns[[1] + list(range(5, manhattan_merged.shape[1]))]]											
[27]:	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	
	10	Lenox Hill	College Academic Building	Medical School	College Lab	College Library	General College & University	College Science Building	University	College Administrative Building	Student Center	College Cafeteria
	11	Roosevelt Island	Medical School	College Lab	University	College Library	College Administrative Building	College Science Building	College Quad	General College & University	College Academic Building	College Gym
	16	Murray Hill	College Academic Building	University	College Classroom	College Residence Hall	Medical School	College Lab	Student Center	General College & University	College Library	College Administrative Building
	34	Sutton Place	College Academic Building	Medical School	General College & University	University	College Lab	College Science Building	College Library	College Classroom	College Administrative Building	College Gym

3. Discussion

According with the analyzed data, the best areas of Manhattan for setting up a business are Washington Heights and East Harlem. Moreover, the worse areas are low town and mid-town. In addition, West Harlem is not recommended; in this area are two main Universities: Columbia University and NYU University.

4. Conclusion

Even though there are many Colleges and Universities, we were able to find the best spot for setting up a business in the educational system. This work could be improved if we aim the study to a specific business such us a High School, Academia, Law School, etc.