h17alebe

Lab 4 Report

Suitable locations for building IKEA

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Introduction

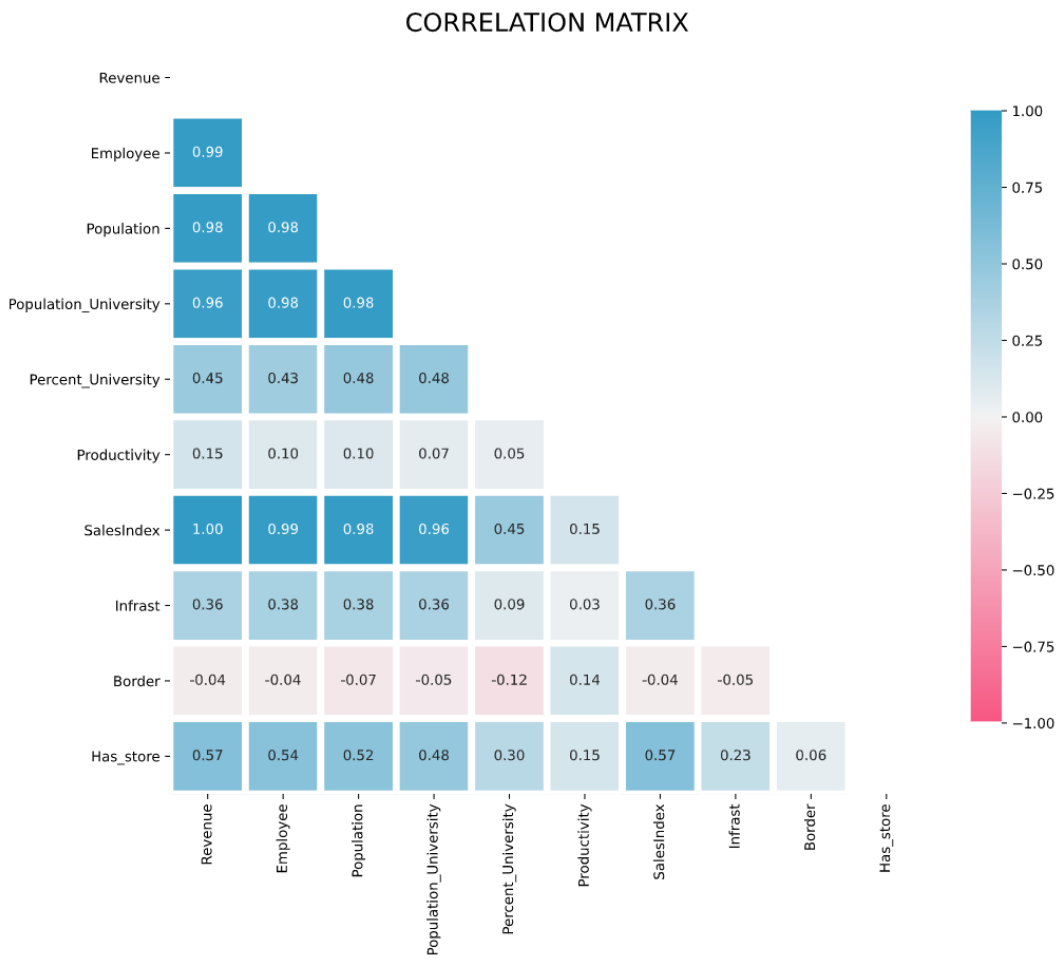
IKEA is a Swedish company that designs and sells ready-to-assemble furniture, kitchen appliances and home accessories among other useful goods. It is the largest company in the world in this segment. As of 2019 IKEA has 433 stores operating in 52 countries.

Problem definition

IKEA has 20 stores in Sweden and would now like to expand. By using data mining methods we can find new locations in Sweden that might be suitable for building a new IKEA department store.

Methodology

K-means clustering has been used to find the best city suitable for building a new IKEA store. Since IKEA is a profit-driven organization important factors such as revenue and population was used to find fitting cities. Below is a heatmap explaining the correlation between the factors.



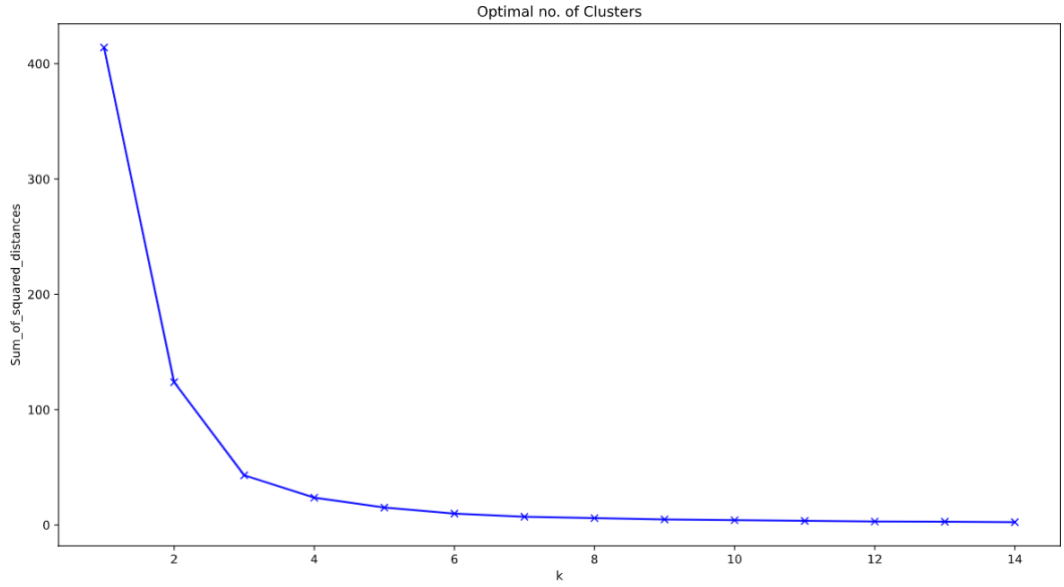
Heatmap for the attributes.

Before using the elbowing method to find the optimal clusters the data set was checked for anomalies. By looking at the attributes below it is evident that the data had to be scaled since it shows it is skewed.

	Revenue	Employee	Population	Population_University	Percent_University	Productivity	SalesIndex	Infrast	Border	Has_store
count	207.000000	207.000000	207.000000	207.000000	207.000000	207.000000	207.000000	207.000000	207.000000	207.000000
mean	1031.801932	523.038647	34543.396135	4660.106280	0.097461	91.454002	106.315583	0.048309	0.038647	0.057971
std	2694.889549	1463.194427	66882.499740	14403.495784	0.040760	27.960867	277.678055	0.214939	0.193220	0.234255
min	11.000000	2.000000	3672.000000	174.000000	0.046142	19.898880	1.133426	0.000000	0.000000	0.000000
25%	110.000000	64.500000	10785.500000	788.500000	0.069015	74.700910	11.334262	0.000000	0.000000	0.000000
50%	252.000000	142.000000	16515.000000	1598.000000	0.086601	90.457050	25.965765	0.000000	0.000000	0.000000
75%	825.500000	435.000000	37922.000000	4073.500000	0.112085	104.008805	85.058490	0.000000	0.000000	0.000000
max	32897.000000	18795.000000	847073.000000	191585.000000	0.269646	275.636330	3389.665819	1.000000	1.000000	1.000000

Describe the data

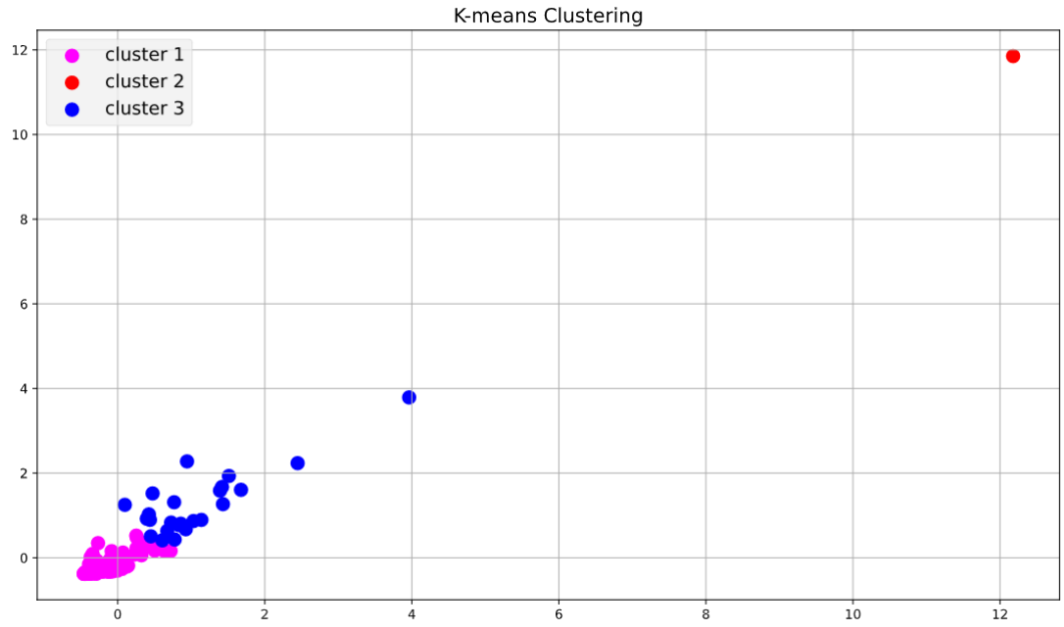
After scaling the data, elbowing method was used and it shows that the optimal number of clusters are 3. However, as the analysis continues it will come to light that cluster 2 is an outlier since Stockholm already has IKEA and highest values of all parameters so it was excluded from further analysis. Only cluster 1 and 3 was analyzed.



Elbowing method to find the optimal number of clusters

Clusters

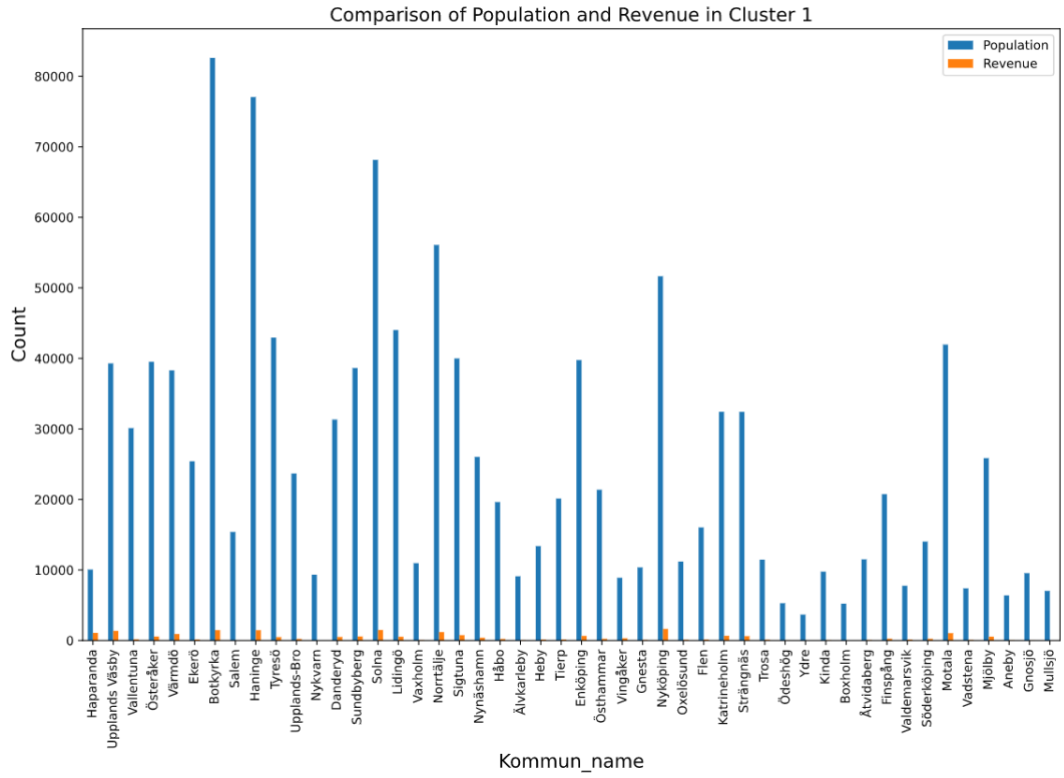
This scatterplot shows that datapoints grouped into clusters. Cluster 3 has a higher population and revenue. Cluster 2 a clear outlier.



Scatterplot of the clusters

Cluster 1

The clusters were divided into groups. Below is a bar plot of the best cities in cluster 1 where a store could be built.



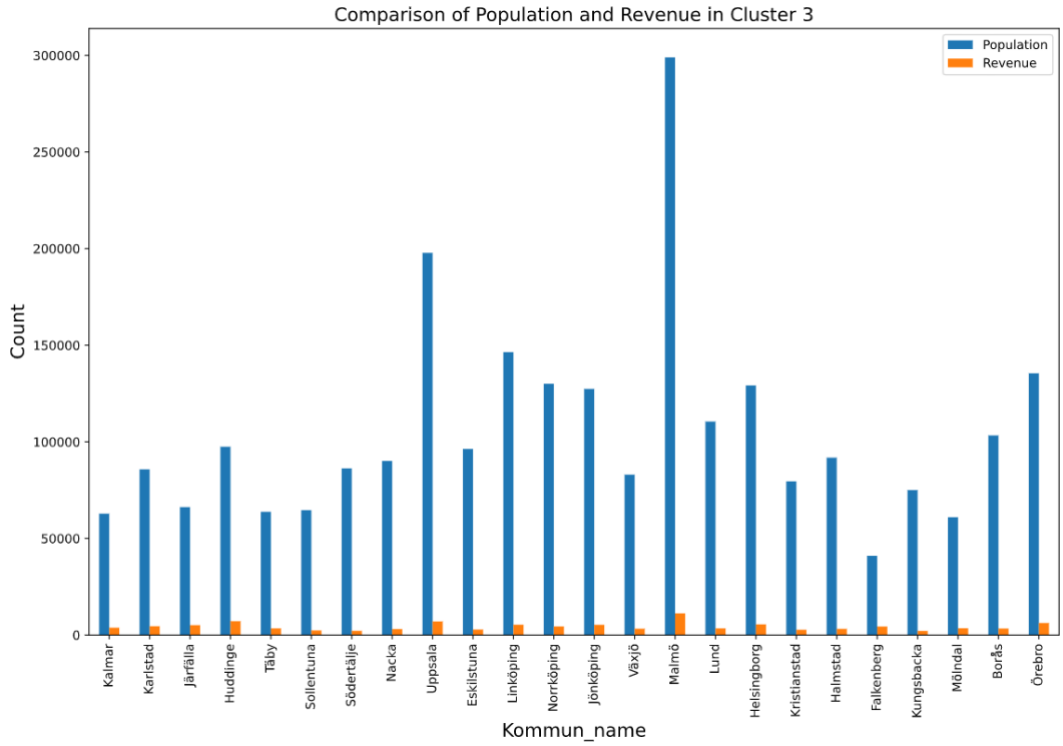
Bar plot of cluster 1

Cities with an IKEA are excluded. Following cities were chosen based on population and revenue:

1. Haninge
2. Nyköping
3. Norrtälje
4. Motala

Cluster 3

Underneath is a bar plot of the best cities in cluster 3.



Bar plot of cluster 3

Cities with an IKEA are excluded. Based on revenue and population following cities are best fit for a new store:

1. Falkenberg
2. Kungsbacka
3. Eskilstuna
4. Norrköping
5. Nacka
6. Södertälje
7. Halmstad
8. Kristianstad

Conclusion

The best cities to build a new IKEA department store are listed below. Cities in cluster 3 are proven to be the best in following order based on revenue and population. We might reason that locations closest to Stockholm are the best locations since locations such as Huddinge, Haninge, Solna, Sollentuna are all in the Stockholm region with high number of population.

	Kommun_name	Population	Revenue	clusters
0	Norrköping	130050	4438	2
1	Lund	110488	3438	2
2	Borås	103294	3365	2
3	Huddinge	97453	7153	2
4	Eskilstuna	96311	2844	2
5	Halmstad	91800	3196	2
6	Nacka	90108	3104	2
7	Södertälje	86246	2191	2
8	Växjö	83005	3268	2
9	Botkyrka	82608	1469	0
10	Kristianstad	79543	2739	2
11	Haninge	77054	1459	0
12	Kungsbacka	75025	2139	2
13	Solna	68144	1491	0
14	Järfälla	66211	5119	2
15	Sollentuna	64630	2393	2
16	Karlskrona	64032	2037	0
17	Täby	63789	3441	2
18	Mölndal	60973	3512	2
19	Varberg	58084	1639	0
20	Gotland	57269	1542	0
21	Norrtälje	56080	1191	0
22	Trollhättan	55248	2004	0
23	Uddevalla	51868	2309	0
24	Nyköping	51644	1642	0
25	Skövde	51402	2438	0
26	Hässleholm	50107	1243	0
27	Motala	41955	1040	0