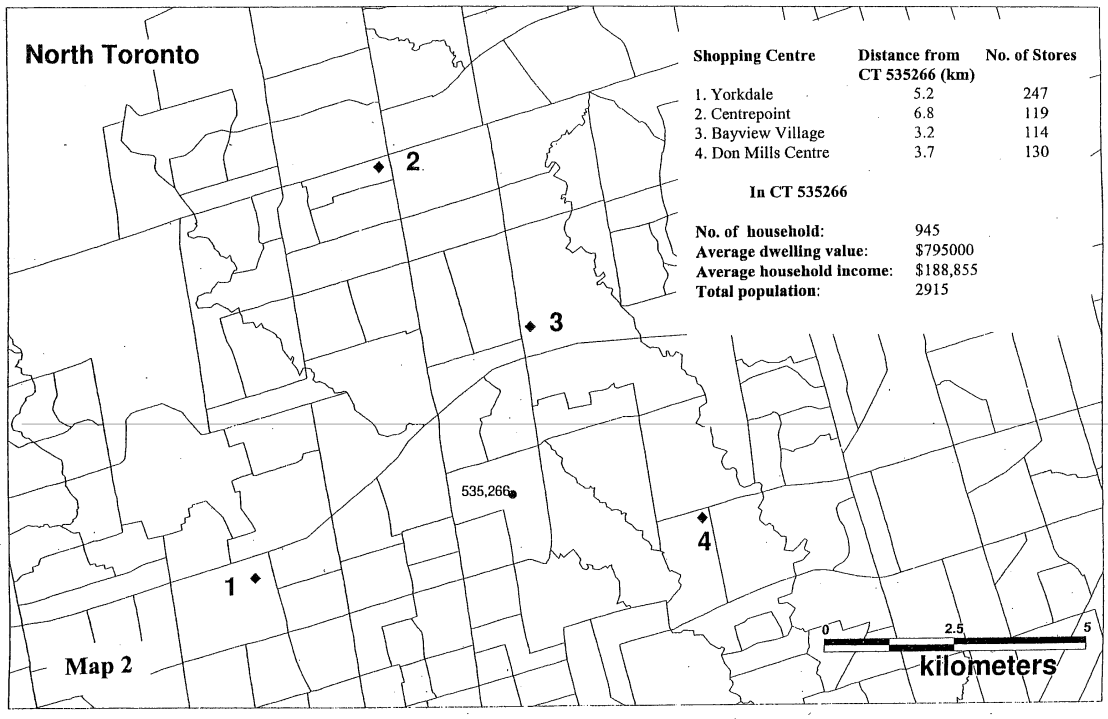
SA8912 Spatial Technologies in Strategic Planning

Assignment 2:
Part 1 Application of the Huff Model in trade area analysis (25 marks)

Tasks

1. Write a literature review of the Huff Model (3-4 pages, double spaced) (5 marks)

2. The map below shows the northern part of the City of Toronto. This area is served by 4 regional shopping centers. Estimate sales potential in Census Tract 535,266 for Yorkdale Shopping Centre (A customer survey reveals that 15% of household income is spent on goods and services in regional shopping centers. Using $\lambda = 2$ in your estimation) (5 marks)



Shopping Centre	Distance from CT 535266 (km)	No. of Stores
1. Yorkdale	5.2	247
2. Centrepoint	6.8	119
3. Bayview Village	3.2	114
4. Don Mills Centre	3.7	130

In CT 535266

No. of household:	945
Average dwelling value:	$795000
Average household income:	$188,855
Total population:	2915

3. Examine how the addition of Vaughan Mills Mall to the retail landscape of the Toronto CMA has impacted the market areas of Promenade, Yorkdale, and Square One shopping centers. (15 marks)

To complete this part of the assignment, you need to perform the following tasks:

(1) Calculate the probabilities that residents in each census tract patronize each of the three existing regional shopping centers: Promenade, Yorkdale and Square One (using the file of "shoppingcenter12", which does not contain Vaughan Mills Mall). Using the calculated probabilities to estimate sales potentials for each of the three shopping centers.

(2) Re-calculate the probabilities that residents in each census tract patronize each of the same three regional shopping centers, this time, using "shoppingcenter13" (which includes Vaughan Mills Mall), and using the same set of coefficients that you choose.

(3) Discuss and explain how the addition of Vaughan Mills Mall (which was opened in the Fall of 2004) has altered (i.e., impacted) the trade area penetration of the other three major shopping centers in the CMA.

Impact can be described with reference to changes in market share as measured by sales potential and by the number of CTs in their primary ($p \geq 0.6$) and secondary ($0.6 > p \geq 0.4$) trade areas. (Also map the two trade areas.)

Sales potential in each trade area is calculated using the following formula:

Sales Potential = (number of census families * average family income * percent of family income spent on goods-services purchased in the mall * probability)

Percent of family income spent on goods-services purchased in the mall is to be estimated from the Survey of Household Spending.

Using the following template to summarize your calculations and facilitate your analysis and comparison

Trade area		Yorkdale		Promenade		Square one	
		Without VM	With VM	Without VM	With VM	Without VM	With VM
Primary	# of CT						
	Sales potential ($ million)						
Secondary	# of CT						
	Sales potential ($ million)						

4. Also briefly explain what other attractiveness variables you may choose to improve the calculation of probabilities.

Before applying the Huff Model, you must create a new "(composite) *attractiveness*" variable. In this particular case, the new variable is created using four shopping center attributes: **floor space, number of stores, number of fashion stores, and number of department stores**.

The calculation of the new variable is computerized for you; however, it is educational for you to be informed of how it is calculated. The process is as the following:

1. Re-scale (i.e., standardize) each attribute variable first, by dividing each value by the lowest value of that variable (using the *mini score method*). Take "floor space" for example, the standardized "floor space" for Bramalea becomes: 1052430 /743900 = 1.41; the standardized "floor space" for Eaton Centre becomes: 1723220 /743900 = 2.32; etc.
2. Create the new (composite) Attractiveness variable, using the formula:
   Attractiveness = (floor space * weight) + (number of stores *weight) + (number of fashion stores *weight) + (Number of department stores *weight)

   Choose a weigh between 1 and 3, based on your knowledge and judgment of the relative importance of the shopping center attributes.

Table 1 Major Regional Shopping Centers in the GTA

Shopping center	Floor space	N0 of stores	No of dept stores	No of fashion stores
Bramalea City Centre	1052430	305	2	65
Eaton Centre	1723220	250	2	87
Erin Mills Town Centre	743900	170	2	55
Fairview Mall	894400	185	1	82
Markville Shopping Centre	968000	174	3	59
Pickering Town Centre	800875	193	1	64
Scarborough Town Centre	1085750	250	2	65
Sherway Gardens	1182000	217	3	69
Square One	2200000	360	3	112
The Promenade	901925	159	0*	61
Upper Canada Mall	820000	250	1	68
Yorkdale Shopping Centre	1845725	250	3	72
Vaughan Mills	1400000	271	0*	95
Suggested weight	2	3	1	2.5

*The Promenade and Vaughan Mill Mall do not have traditional department stores. In the data files, however, the number of department stores in these two malls is assigned to 1. This is because standardization of the original variables (using the Minimum Score" method cannot be executed with a "0" in the denominator.

Data sets you need

- Shoppingcenter12
- Shoppingcenter13
- TORCMA-Census_2016-Project

Toronto CMA 2016 Census Variable Definitions

Database Field	Original Field
ctuid	Census tract ID
total_pop	Total population
Can_cz	Canadian citizens
im	Immigrants
Im_11_16	Recent immigrants who arrived between 2011 and 2016
Tot_vm	Total visible minority population
VM_SA	South Asian
VM_CHI	Chinese
VM_BLK	Black
VM_PILI	Filipino
VM_LA	Latin American
VM_arab	Arab
VM_SEA	Southeast Asian
VM_WA	West Asian
VM_KOR	Korean
VM_JAP	Japanese
unempl	Number of unemployed persons
Unemp_rate	Unemployment rate
owner	Home owner
renter	Home renter
Avg_val	Average value of dwellings
subsid	% of tenant households in subsidized housing
med_inc	Median personal income $
avg_inc	Average personal income $
med_hh_inc	Median household total income $
avg_hh_inc	Average household total income $
Total_HH	Total number of private household
hti_und5k	Under $5,000
hti5_10k	$5,000 to $9,999
hti10_15k	$10,000 to $14,999
hti15_20k	$15,000 to $19,999
hti20_30k	$20,000 to $29,999
hti30_40k	$30,000 to $39,999
hti40_50k	$40,000 to $49,999
hti50_60k	$50,000 to $59,999
hti60_80k	$60,000 to $79,999
hti80_100k	$80,000 to $99,999
hti100_125	$100,000 to $124,999

hti125_150	$125,000 to $149,999
hti150kov	$150,000 and over
pop_prv	Prevalence of low income household in 2015 based on after-tax low-income measure (%)
pop_25_64	Total population aged 25 to 64 years
Post_bach	population aged 25 to 64 years with University certificate, diploma or degree above bachelor level
bach_DEG	population aged 25 to 64 years with Bachelor's degree

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Assignment 2: Part 2

Site Selection and Trade Area Analysis Using Location-Allocation Modeling

Case Study Description:

A retail company plans to open five (5) supermarkets in the City of Brampton. Instead of using the "gut feeling" approach, the Location-Allocation method is used to assist in selecting the sites. The sites are to be selected in such a way that service to the local population is maximized **or** total (weighted) travel distance is minimized.

Methodology:

The location-allocation dynamics are determined by the spatial relations between demand and supply. **Max Cover** and **Min Distance** are two most commonly used Location-Allocation models. The former is used to determine the proposed sites that serve the maximal demand with a pre-defined number of candidate sites. The latter is used to determine the proposed sites that minimize the total weighted travelled distance from the points of demand to the proposed sites.

Data required:

- Centroids of 2016 census tracts (representing points of demand)
- Centroids of land parcels zoned for commercial use (with square footage of the parcels; representing candidate sites)
- Brampton road network (for establishing connectivity between points of demand and candidate sites)
- 2016 census (with census data for calculating sales potential and CT boundaries for mapping)

(all provided in shape files)

- A list of existing supermarkets in Brampton (you need compile this list)

Software to be used:

- ESRI ArcGIS (ArcGIS Pro/ArcMap, ArcCatalog, Network Analyst)

Tasks and report content

- Write a literature review on location-allocation modeling (3-4 pages double spaced)
- Determine the potential sites for the five (5) proposed supermarkets using both **Max Cover** and **Mini Distance** models
- Calculate the sales potentials for the five (5) sites (i.e., total demand for **groceries and household goods** in the trade area of each of the five proposed supermarkets)
- Conduct competition analysis
- Evaluate the five sites by considering existing competition, accessibility, and visibility
- Compare the results of the two models: **Max Cover** and **Mini Distance**. (Note: the five sites identified by the two methods may be identical, but their trade areas could still be different. If the five sites and their trade areas are identical, you only need to interpret one set of results.)