

UBC LED

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Evaluation Goal: What are the five most common business types in each local area in Vancouver? How has this changed in the last 15 years?

Introduction

Our original plan was to build a machine learning application that would predict the type of the business based on its name. To do this, we first put all of the business names from the given CSV files into a bag of words. We treat this as a classification problem, using the business names to predict the business types. However, there are more than 60,000 businesses, and there are more than 40,000 words in our bag of words. Thus, we will need to make a matrix of size 60,000 by 40,000 to accommodate for such data. Based on such a big matrix, it takes approximately 19GB of RAM to run, which our computers cannot handle. In addition, since we are using Matlab, we cannot make good use of IBM's Data Scientist Workbench.

As a result, we approached another goal: Of each of the local areas in Vancouver, what are the five most common business types? How has this changed in the last 15 years? To answer these, we looked at data from years 1999, 2003, 2007, 2011, and 2015.

Evaluation Method

Here is a rundown of our program:

- 1) For each CSV file, we retrieve the local area and business type columns.
- 2) We clean and remove any empty rows or cells and businesses operating outside of Vancouver
- 3) We count the number of business types located in each local area
- 4) We then sort the business types based on their frequencies
- 5) Finally, we record these results in separate CSV files

Findings

We observed that in 2015, Vancouver is dominated by offices and residential business types. In West End, we noticed that in 1999, historic dining lounges were in the top 5 business types; however, there has been an increase in apartments over the decade. In 1999, there are 13 areas in Vancouver with one-family dwellings as their top business type. In 2015, there are only 8 one-family dwellings as their top business type, and other areas have secondary suites as their top business type. These trends tell us that residential areas are expanding, and the increase of secondary suites could imply that, with regards to the escalating prices of real estate, more people are opting for less expensive housing.

We also noticed that there are less computer services in 1999, but they became more prominent as the years went by, which could be an indication of the growing computer software startup industry.

The Five Most Common Business Types in Vancouver Local Areas – Year 2015

Local Areas	Business Types				
	Top 1	Top 2	Top 3	Top 4	Top 5
<i>West End</i>	Office	Apartment House	Restaurant Class 1	Retail Dealer	Apartment House Strata
<i>Central Business/Downtown</i>	Office	Retail Dealer	Financial Services	Restaurant Class 1	Computer Services
<i>Strathcona</i>	Office	Wholesale Dealer	Manufacturer	Retail Dealer	Retail Dealer - Food
<i>Grandview-Woodland</i>	Apartment House	Office	One-Family Dwelling	Multiple Dwelling	Retail Dealer
<i>Hastings-Sunrise</i>	One-Family Dwelling	Secondary Suite - Permanent	Contractor	Office	Retail Dealer
<i>West Point Grey</i>	One-Family Dwelling	Office	Retail Dealer	Secondary Suite - Permanent	Apartment House
<i>Kitsilano</i>	Apartment House	Office	Multiple Dwelling	Retail Dealer	Health Services
<i>Fairview</i>	Office	Health Services	Retail Dealer	Apartment House	Restaurant Class 1
<i>Mount Pleasant</i>	Office	Apartment House	Retail Dealer	Multiple Dwelling	Duplex
<i>Dunbar-Southlands</i>	One-Family Dwelling	Office	Contractor	Secondary Suite - Permanent	Retail Dealer
<i>Arbutus Ridge</i>	One-Family Dwelling	Office	Health Services	Apartment House	Retail Dealer
<i>Shaughnessy</i>	Office	One-Family Dwelling	Multiple Dwelling	Contractor	Apartment House
<i>South Cambie</i>	One-Family Dwelling	Health Services	Office	Duplex	Secondary Suite - Permanent
<i>Riley Park</i>	Secondary Suite - Permanent	One-Family Dwelling	Office	Retail Dealer	Restaurant Class 1
<i>Kensington-Cedar Cottage</i>	Secondary Suite - Permanent	One-Family Dwelling	Retail Dealer	Office	Contractor
<i>Renfrew-Collingwood</i>	One-Family Dwelling	Secondary Suite - Permanent	Office	Contractor	Retail Dealer
<i>Kerrisdale</i>	Office	One-Family Dwelling	Apartment House	Health Services	Retail Dealer
<i>Oakridge</i>	Health Services	Office	Retail Dealer	One-Family Dwelling	Contractor
<i>Sunset</i>	Secondary Suite - Permanent	One-Family Dwelling	Contractor	Retail Dealer	Office
<i>Victoria-Fraserview</i>	One-Family Dwelling	Contractor	Secondary Suite - Permanent	Office	Health Services
<i>Killarney</i>	One-Family Dwelling	Contractor	Office	Secondary Suite - Permanent	Retail Dealer
<i>Marpole</i>	Apartment House	Office	One-Family Dwelling	Contractor	Wholesale Dealer

The Five Most Common Business Types in Vancouver Local Areas – Year 2011

Local Areas	Business Types				
	Top 1	Top 2	Top 3	Top 4	Top 5
<i>West End</i>	Office	Apartment House	Retail Dealer	Restaurant Class 1	Apartment House Strata
<i>Central Business/Downtown</i>	Office	Retail Dealer	Financial Services	Restaurant Class 1	Ltd Service Food Establishment
<i>Strathcona</i>	Office	Wholesale Dealer	Manufacturer	Retail Dealer	Retail Dealer - Food
<i>Grandview-Woodland</i>	Apartment House	One-Family Dwelling	Retail Dealer	Multiple Dwelling	Office
<i>Hastings-Sunrise</i>	One-Family Dwelling	Secondary Suite - Permanent	Office	Contractor	Retail Dealer
<i>West Point Grey</i>	One-Family Dwelling	Office	Retail Dealer	Secondary Suite - Permanent	Health Services
<i>Kitsilano</i>	Apartment House	Office	Retail Dealer	Multiple Dwelling	Duplex
<i>Fairview</i>	Office	Health Services	Retail Dealer	Apartment House	Restaurant Class 1
<i>Mount Pleasant</i>	Apartment House	Retail Dealer	Office	Multiple Dwelling	Wholesale Dealer
<i>Dunbar-Southlands</i>	One-Family Dwelling	Office	Secondary Suite - Permanent	Retail Dealer	Contractor
<i>Arbutus Ridge</i>	Office	One-Family Dwelling	Retail Dealer	Health Services	Apartment House
<i>Shaughnessy</i>	Office	One-Family Dwelling	Multiple Dwelling	Apartment House	Contractor
<i>South Cambie</i>	One-Family Dwelling	Office	Health Services	Duplex	Retail Dealer
<i>Riley Park</i>	One-Family Dwelling	Retail Dealer	Secondary Suite - Permanent	Office	Duplex
<i>Kensington-Cedar Cottage</i>	One-Family Dwelling	Secondary Suite - Permanent	Retail Dealer	Office	Contractor
<i>Renfrew-Collingwood</i>	One-Family Dwelling	Secondary Suite - Permanent	Office	Contractor	Retail Dealer
<i>Kerrisdale</i>	Office	One-Family Dwelling	Retail Dealer	Health Services	Apartment House
<i>Oakridge</i>	Retail Dealer	Office	Health Services	One-Family Dwelling	Contractor
<i>Sunset</i>	One-Family Dwelling	Secondary Suite - Permanent	Contractor	Retail Dealer	Office
<i>Victoria-Fraserview</i>	One-Family Dwelling	Secondary Suite - Permanent	Contractor	Office	Retail Dealer
<i>Killarney</i>	One-Family Dwelling	Contractor	Office	Secondary Suite - Permanent	Retail Dealer
<i>Marpole</i>	Apartment House	Office	One-Family Dwelling	Wholesale Dealer	Duplex

The Five Most Common Business Types in Vancouver Local Areas – Year 2007

Local Areas	Business Types				
	Top 1	Top 2	Top 3	Top 4	Top 5
<i>West End</i>	Office	Apartment House	Retail Dealer	Restaurant Class 1	Dining Lounge *Historic*
<i>Central Business/Downtown</i>	Office	Retail Dealer	Financial Services	Restaurant Class 1	Ltd Service Food Establishment
<i>Strathcona</i>	Office	Wholesale Dealer	Manufacturer	Retail Dealer	Retail Dealer - Food
<i>Grandview-Woodland</i>	Apartment House	One-Family Dwelling	Duplex	Multiple Dwelling	Retail Dealer
<i>Hastings-Sunrise</i>	One-Family Dwelling	Retail Dealer	Office	Secondary Suite - Permanent	Contractor
<i>West Point Grey</i>	One-Family Dwelling	Office	Retail Dealer	Health Services	Apartment House
<i>Kitsilano</i>	Apartment House	Retail Dealer	Office	Multiple Dwelling	Duplex
<i>Fairview</i>	Office	Health Services	Retail Dealer	Apartment House	Restaurant Class 1
<i>Mount Pleasant</i>	Apartment House	Retail Dealer	Multiple Dwelling	Office	Wholesale Dealer
<i>Dunbar-Southlands</i>	One-Family Dwelling	Office	Retail Dealer	Contractor	Secondary Suite - Permanent
<i>Arbutus Ridge</i>	One-Family Dwelling	Office	Retail Dealer	Apartment House	Health Services
<i>Shaughnessy</i>	One-Family Dwelling	Office	Multiple Dwelling	Retail Dealer	Apartment House
<i>South Cambie</i>	One-Family Dwelling	Office	Health Services	Duplex	Apartment House
<i>Riley Park</i>	One-Family Dwelling	Retail Dealer	Office	Secondary Suite - Permanent	Duplex
<i>Kensington-Cedar Cottage</i>	One-Family Dwelling	Retail Dealer	Secondary Suite - Permanent	Office	Duplex
<i>Renfrew-Collingwood</i>	One-Family Dwelling	Office	Secondary Suite - Permanent	Contractor	Retail Dealer
<i>Kerrisdale</i>	One-Family Dwelling	Office	Retail Dealer	Apartment House	Health Services
<i>Oakridge</i>	Retail Dealer	One-Family Dwelling	Office	Health Services	Ltd Service Food Establishment
<i>Sunset</i>	One-Family Dwelling	Secondary Suite - Permanent	Retail Dealer	Contractor	Office
<i>Victoria-Fraserview</i>	One-Family Dwelling	Contractor	Retail Dealer	Secondary Suite - Permanent	Office
<i>Killarney</i>	One-Family Dwelling	Office	Contractor	Retail Dealer	Apartment House Strata
<i>Marpole</i>	Apartment House	One-Family Dwelling	Office	Wholesale Dealer	Retail Dealer

The Five Most Common Business Types in Vancouver Local Areas – Year 2003

Local Areas	Business Types				
	Top 1	Top 2	Top 3	Top 4	Top 5
<i>West End</i>	Office	Apartment House	Retail Dealer	Restaurant Class 1	Dining Lounge *Historic*
<i>Central Business/Downtown</i>	Office	Retail Dealer	Financial Services	Ltd Service Food Establishment	Restaurant Class 1
<i>Strathcona</i>	Office	Wholesale Dealer	Manufacturer	Retail Dealer - Food	Retail Dealer
<i>Grandview-Woodland</i>	Apartment House	One-Family Dwelling	Retail Dealer	Duplex	Manufacturer
<i>Hastings-Sunrise</i>	One-Family Dwelling	Office	Retail Dealer	Secondary Suite - Phase Out *Historic*	Contractor
<i>West Point Grey</i>	One-Family Dwelling	Office	Retail Dealer	Health Services	Secondary Suite - Phase Out *Historic*
<i>Kitsilano</i>	Apartment House	Office	Multiple Dwelling	Retail Dealer	One-Family Dwelling
<i>Fairview</i>	Office	Health Services	Retail Dealer	Apartment House	Restaurant Class 1
<i>Mount Pleasant</i>	Apartment House	Multiple Dwelling	Retail Dealer	Office	Duplex
<i>Dunbar-Southlands</i>	One-Family Dwelling	Office	Retail Dealer	Health Services	Contractor
<i>Arbutus Ridge</i>	One-Family Dwelling	Office	Retail Dealer	Apartment House	Health Services
<i>Shaughnessy</i>	One-Family Dwelling	Office	Multiple Dwelling	Apartment House	Retail Dealer
<i>South Cambie</i>	One-Family Dwelling	Duplex	Office	Health Services	Retail Dealer
<i>Riley Park</i>	One-Family Dwelling	Retail Dealer	Office	Duplex	Secondary Suite - Phase Out *Historic*
<i>Kensington-Cedar Cottage</i>	One-Family Dwelling	Retail Dealer	Secondary Suite - Phase Out *Historic*	Duplex	Office
<i>Renfrew-Collingwood</i>	One-Family Dwelling	Secondary Suite - Phase Out *Historic*	Office	Retail Dealer	Contractor
<i>Kerrisdale</i>	One-Family Dwelling	Office	Retail Dealer	Apartment House	Health Services
<i>Oakridge</i>	One-Family Dwelling	Retail Dealer	Office	Health Services	Ltd Service Food Establishment
<i>Sunset</i>	One-Family Dwelling	Secondary Suite - Phase Out *Historic*	Retail Dealer	Office	Wholesale Dealer
<i>Victoria-Fraserview</i>	One-Family Dwelling	Office	Contractor	Secondary Suite - Phase Out *Historic*	Retail Dealer
<i>Killarney</i>	One-Family Dwelling	Office	Retail Dealer	Contractor	Secondary Suite - Phase Out *Historic*
<i>Marpole</i>	One-Family Dwelling	Apartment House	Office	Wholesale Dealer	Duplex

The Five Most Common Business Types in Vancouver Local Areas – Year 1999

Local Areas	Business Types				
	Top 1	Top 2	Top 3	Top 4	Top 5
<i>West End</i>	Office	Apartment House	Retail Dealer	Restaurant Class 1	Dining Lounge/Room *Historic*
<i>Central Business/Downtown</i>	Office	Retail Dealer	Financial Services	Restaurant Class 1	Ltd Service Food Establishment
<i>Strathcona</i>	Manufacturer	Retail Dealer - Food	Retail Dealer	Wholesale Dealer	Office
<i>Grandview-Woodland</i>	Apartment House	One-Family Dwelling	Duplex	Retail Dealer	Office
<i>Hastings-Sunrise</i>	One-Family Dwelling	Secondary Suite - Phase Out *Historic*	Retail Dealer	Office	Contractor
<i>West Point Grey</i>	One-Family Dwelling	Office	Retail Dealer	Health Services	Secondary Suite - Phase Out *Historic*
<i>Kitsilano</i>	Apartment House	Office	Retail Dealer	Multiple Dwelling	One-Family Dwelling
<i>Fairview</i>	Office	Health Services	Retail Dealer	Apartment House	Restaurant Class 1
<i>Mount Pleasant</i>	Apartment House	Office	Retail Dealer	Multiple Dwelling	Duplex
<i>Dunbar-Southlands</i>	One-Family Dwelling	Office	Retail Dealer	Secondary Suite - Phase Out *Historic*	Contractor
<i>Arbutus Ridge</i>	One-Family Dwelling	Office	Retail Dealer	Apartment House	Health Services
<i>Shaughnessy</i>	One-Family Dwelling	Office	Multiple Dwelling	Retail Dealer	Apartment House
<i>South Cambie</i>	One-Family Dwelling	Health Services	Office	Duplex	Apartment House
<i>Riley Park</i>	One-Family Dwelling	Retail Dealer	Office	Duplex	Apartment House
<i>Kensington-Cedar Cottage</i>	One-Family Dwelling	Retail Dealer	Office	Duplex	Secondary Suite - Phase Out *Historic*
<i>Renfrew-Collingwood</i>	One-Family Dwelling	Office	Secondary Suite - Phase Out *Historic*	Retail Dealer	Wholesale Dealer
<i>Kerrisdale</i>	One-Family Dwelling	Office	Retail Dealer	Apartment House	Health Services
<i>Oakridge</i>	One-Family Dwelling	Retail Dealer	Office	Health Services	Ltd Service Food Establishment
<i>Sunset</i>	One-Family Dwelling	Retail Dealer	Secondary Suite - Phase Out *Historic*	Wholesale Dealer	Office
<i>Victoria-Fraserview</i>	One-Family Dwelling	Office	Secondary Suite - Phase Out *Historic*	Retail Dealer	Contractor
<i>Killarney</i>	One-Family Dwelling	Office	Retail Dealer	Contractor	Secondary Suite - Phase Out *Historic*
<i>Marpole</i>	One-Family Dwelling	Apartment House	Office	Wholesale Dealer	Duplex