**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.

In three key local areas we examined (West End, Central Business/Downtown, Kitsilano), we can observe a similar trend. The number of restaurants has slightly increased in trend over the years as population and economy grows. The number of computer services, on the other hand, has grown rapidly over the years from 1999 to 2015. This trend of computer services becoming more prominent could be an indication of the growing computer software startup industry. The number of wholesale dealers has gradually gone down over the years. Central Business/Downtown is the area that exhibits the most abrupt changes.

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

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

Changes in the Quantity of Three Key Business Types from 1999 to 2015

