The Battle of Neighborhoods:
Where to Live in Wellington, NZ?

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I. Introduction

A. Background

New Zealand's early success in crushing the curve of the coronavirus disease 2019 (COVID-19) has made waves all over the world. By July 2, 2020, New Zealand has recorded 1,180 confirmed cases of COVID-19 with only 22 deaths since its first case on February 28. The country's Director-General of Health Dr. Ashley Bloomfield said that their strategy is based on speedy testing, contract tracing and isolation, and rigorously adhering to public health guidance (WHO). Despite similar measures being enforced in other countries, the results are quite the opposite. People are generally faulting their respective governments for ineffectively handling the current crisis, and are looking at options on how not to experience this "government failure" all over again should another unprecedented crisis hit.

B. Target Audience

Since the coronavirus pandemic took hold this year, more than 250,000 Americans have investigated whether they qualify to move to New Zealand. In June alone, 112,800 more Americans visited New Zealand's immigration website compared to same time last year. This is a 160% spike and is equivalent to one American clicking on the site every 30 seconds (NZ Herald). Given the comparative statistics between the two countries, this general sentiment is not surprising.

C. Business Problem

This report aims to help people who are looking to move to New Zealand's capital, Wellington, to decide which urban district to move into based on the cost, population, and general closest venues of relevance (supermarkets, restaurants, parks, etc.), among other factors.

II. Data Preparation

- **List of Urban Areas and Population**
  - Source: Wikipedia
  - Description: This is the masterlist of the urban areas in Wellington, with their corresponding population
  - Example: Wellington, Lower Hutt, Porirua, Upper Hutt, Paraparamu
- **Median Housing Price**
  - Source: Real Estate Investar NZ
  - Description: The median housing price data here is used to compare how expensive property prices are across the districts.
  - Example: Wellington: 870K, Lower Hutt: 660K, Porirua: 850K, Upper Hutt: 662.5K
- **Nearby Venues of Interest**
  - Source: Foursquare API
  - Description: This is used to identify the closest venues for relevance.
  - Example: supermarkets, restaurants, parks

A. Create District, Population, Price, and Geocoordinate Data Frame

- Create a data frame containing Wellington's districts and population from Wikipedia
- Merge the data frame with the Median Housing Prices from Real Estate Investar
- Use the geopy library to obtain the latitude and longitude of each district

	District	Population	MedianPrice	Latitude	Longitude
0	Wellington	215,400	870,000	-41.2888	174.777
1	Lower Hutt	104,900	660,000	-41.2126	174.906
2	Porirua	55,500	850,000	-41.1355	174.840
3	Upper Hutt	41,000	662,500	-41.1241	175.070
4	Paraparaumu	28,900	655,000	-40.9145	175.006
5	Masterton	20,100	447,000	-40.9496	175.659
6	Waikanae	12,100	655,000	-40.8758	175.064
7	Carterton	5,390	495,000	-41.0243	175.526
8	Otaki	4,490	655,000	-40.7549	175.151
9	Featherston	2,480	555,000	-41.1149	175.325
10	Greytown	2,420	555,000	-41.0806	175.461
11	Paekakariki	1,830	655,000	-40.9831	174.954
12	Otaki Beach	1,780	655,000	-40.7411	175.119
13	Martinborough	1,680	555,000	-41.2183	175.459

B. Cluster Wellington's Districts

- Using Foursquare API, determine the nearby venues for each district.
- The resulting data frame contains 191 rows by 7 columns and a total of 80 venue categories. The first 5 rows are shown below:

	Neighbor-hood	Neighbor-hood Lat	Neighbor-hood Long	Venue	Venue Lat	Venue Long	Venue Cat
0	Wellington	-41.288795	174.777211	Lamason	-41.289843	174.776001	Coffee Shop
1	Wellington	-41.288795	174.777211	Waterfront	-41.288074	174.779528	Waterfront
2	Wellington	-41.288795	174.777211	Nikau Gallery Cafe	-41.288483	174.777578	Café
3	Wellington	-41.288795	174.777211	Tatsushi	-41.289690	174.775691	Japanese Restaurant
4	Wellington	-41.288795	174.777211	Fork & Brewer	-41.289270	174.775769	Gastropub

III. Methodology

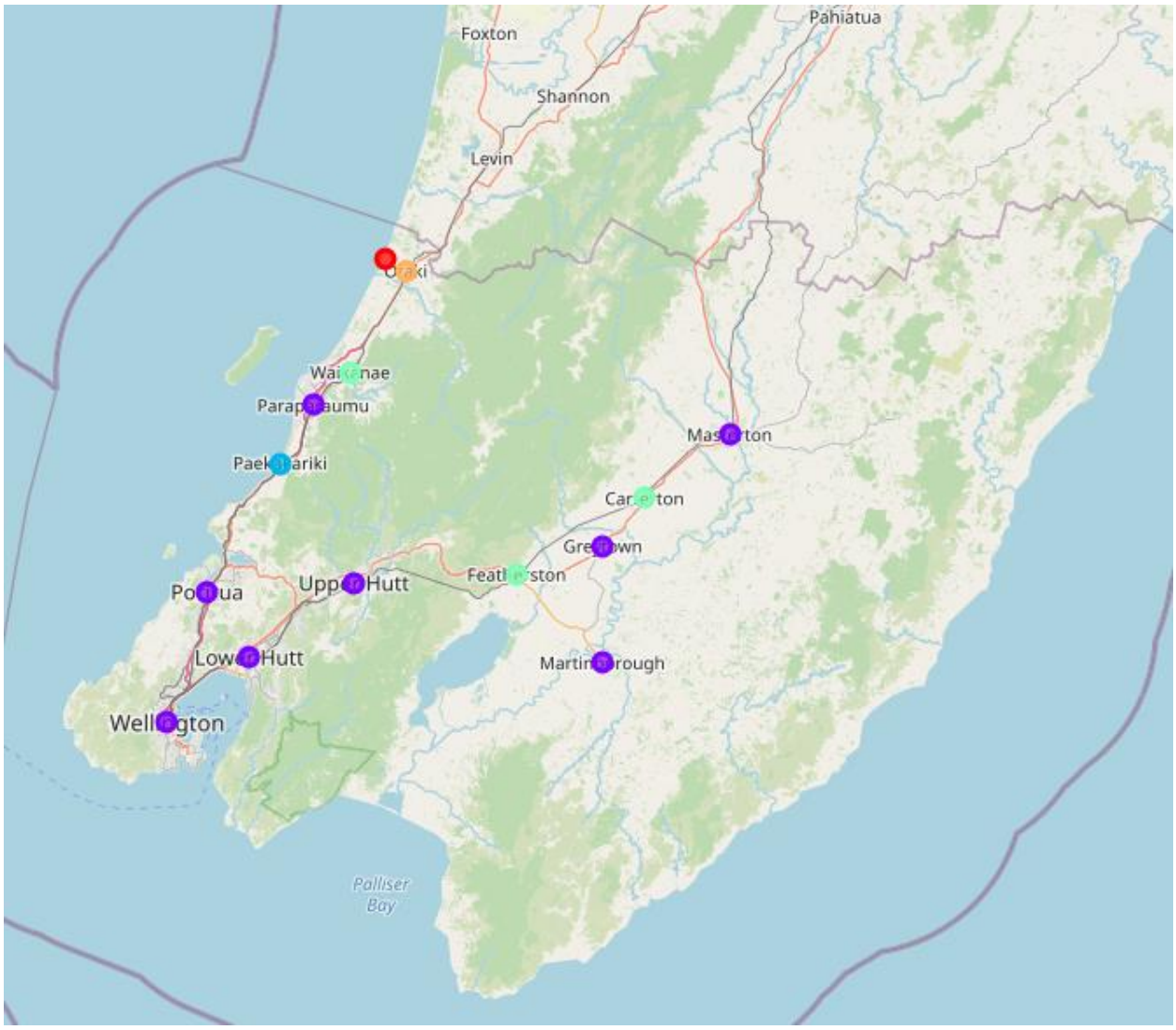
A. Analyze Each Neighborhood

- Using one hot encoding and a series of data processing techniques, create a table summarizing the top 10 most common venues by district. The first 5 rows are shown below:

	Neighbor-hood	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
0	Carterton	Café	Train Station	Playground	Grocery Store	Creperie	Cheese Shop	Chinese Restaurant	Chocolate Shop	Coffee Shop	Convenience Store
1	Featherston	Cheese Shop	Deli / Bodega	Train Station	Café	Grocery Store	Beer Garden	Chinese Restaurant	Chocolate Shop	Coffee Shop	Convenience Store
2	Greytown	Café	Restaurant	Arts & Crafts Store	Grocery Store	Bakery	Hotel Bar	Deli / Bodega	Wine Shop	Chocolate Shop	Coffee Shop
3	Lower Hutt	Café	Coffee Shop	Supermarket	Japanese Restaurant	Plaza	Portuguese Restaurant	Fast Food Restaurant	Mobile Phone Shop	Sandwich Place	Shopping Mall
4	Martinborough	Café	Hotel	Supermarket	Fish & Chips Shop	Plaza	Indie Movie Theater	Deli / Bodega	Grocery Store	Wine Shop	Diner

B. Cluster Neighborhoods

- Using K-Means clustering and Folium map, create a map showing the neighborhoods according to their cluster (set at 5):



C. Examine Each Cluster

Cluster 1: Beach

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Beach	Food Truck	Coffee Shop	Bistro	Campground	Deli / Bodega	Chinese Restaurant	Chocolate Shop	Convenience Store	Cosmetics Shop

Cluster 2: Cafes

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Café	Coffee Shop	Restaurant	Vietnamese Restaurant	Burger Joint	Plaza	Beer Bar	Chinese Restaurant	Art Gallery	Cambodian Restaurant
Café	Coffee Shop	Supermarket	Japanese Restaurant	Plaza	Portuguese Restaurant	Fast Food Restaurant	Mobile Phone Shop	Sandwich Place	Shopping Mall
Café	Grocery Store	Gas Station	Portuguese Restaurant	Burger Joint	Men's Store	Mobile Phone Shop	Gym	Movie Theater	Noodle House
Fast Food Restaurant	Café	Supermarket	Pool	Department Store	Furniture / Home Store	Coffee Shop	Indian Restaurant	Mobile Phone Shop	Burger Joint
Grocery Store	Movie Theater	Fast Food Restaurant	Coffee Shop	Supermarket	Bar	Pool	Bookstore	Wine Shop	Cosmetics Shop
Café	Modern European Restaurant	History Museum	Supermarket	Bakery	Sandwich Place	Wine Shop	Creperie	Chinese Restaurant	Chocolate Shop
Café	Restaurant	Arts & Crafts Store	Grocery Store	Bakery	Hotel Bar	Deli / Bodega	Wine Shop	Chocolate Shop	Coffee Shop
Café	Hotel	Supermarket	Fish & Chips Shop	Plaza	Indie Movie Theater	Deli / Bodega	Grocery Store	Wine Shop	Diner

Cluster 3: Parks

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Park	Train Station	Deli / Bodega	Campground	Cheese Shop	Chinese Restaurant	Chocolate Shop	Coffee Shop	Convenience Store	Cosmetics Shop

Cluster 4: Shops

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Grocery Store	Cambodian Restaurant	Train Station	BBQ Joint	Brewery	Deli / Bodega	Chinese Restaurant	Chocolate Shop	Coffee Shop	Convenience Store
Café	Train Station	Playground	Grocery Store	Creperie	Cheese Shop	Chinese Restaurant	Chocolate Shop	Coffee Shop	Convenience Store
Cheese Shop	Deli / Bodega	Train Station	Café	Grocery Store	Beer Garden	Chinese Restaurant	Chocolate Shop	Coffee Shop	Convenience Store

Cluster 5: Recreation

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Golf Course	Athletics & Sports	Pub	Wine Shop	Deli / Bodega	Chinese Restaurant	Chocolate Shop	Coffee Shop	Convenience Store	Cosmetics Shop

D. Compare Housing Median Prices, Population, and Cluster Type across Districts

- Using NumPy and Seaborn libraries, plot all the information gathered thus far to generate insights:

IV. Results

The final plot above shows three very important information:

- What is the median housing price per district
- What is the population per district
- Which districts are similar in terms of nearby venues

Based on the population distribution, people in Wellington generally live in neighborhoods categorized under the "Cafe" Cluster (Wellington, Lower Hutt, Porirua, etc.), followed by the "Shops" Cluster (Waikanae, Featherston, Carterton). For each cluster, the median housing prices are directly correlated to the population. It is interesting to note that despite several neighborhoods having very similar nearby venues, the variances in the population and median housing prices are quite large.

V. Discussion

There is no "best" or "right" answer on where to move to -- it all depends on a person's preference and willingness to accept certain tradeoffs.

As an example, Wellington district is clearly the hub, being the most populated district in Wellington, and as well as having the most expensive median housing prices. If Wellington district is too crowded already, then Porirua is also an option. In terms of housing prices, Porirua is a close second, but its population is just around a quarter compared to that of Wellington District's.

If you are looking to relocate to Wellington District due to its nearby venues but find its housing prices too high, then Greytown, Martinborough, and Masterton are good alternatives, as they belong to the same cluster but have significantly lower median housing prices.

If you find the average Wellington District's housing prices acceptable, but want a more laid back and less crowded setting and with more parks and recreational spaces, then Paekakariki and Otaki are perfect alternatives.

VI. Conclusion

For someone who wants to move into Wellington, there are certainly a lot of options, each with its unique setting and attributes to offer. From the analysis above, we have shown that one need not live in a highly populated or extremely expensive district just to enjoy nearby venues of interest. It all depends on the person's preference and willingness to accept certain tradeoffs.

Future Expectation:

- **Features**: The analysis above only uses a limited set of variables in identifying similar neighborhoods. One can add more variables other than nearby venues to make the comparison more robust.
- **Geographical Scope**: The analysis is only limited to Wellington, the capital of New Zealand. Once can extend this analysis to cover other cities and regions in the country for more options.