IAT 814 - Visualization and Visual Analytics

Project Report

Understanding the Immigrant Experience in Canada

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Overview

Immigration is a dynamic process that requires regular monitoring and analysis to help make informed decisions that support Canada's social and economic development. The main objective of this project is to provide valuable insights and information to prospective immigrants who are considering settling in Canada. By analyzing various aspects of life in different regions, including urban centers and surrounding communities, we aim to offer a comprehensive understanding of what each region has to offer. This analysis can help prospective immigrants make informed decisions about where to settle in Canada based on their individual needs and preferences. Ultimately, our goal is to contribute to the successful integration and well-being of immigrants in Canada by providing them with the information they need to make informed decisions about their future.

Introduction

This project aims to equip prospective immigrants with the necessary information to make informed decisions about where to settle in Canada. With a comprehensive understanding of life in various regions, including urban centers and surrounding communities, we can provide valuable insights into the challenges and opportunities that exist in different Census Metropolitan Areas (CMAs) and provinces. CMAs are often the preferred destination for new immigrants, offering job opportunities, social networks, and resources that can aid in adjusting to life in a new country.

Our target audience is primarily immigrants who are looking to make well-informed decisions about where to settle in Canada based on their individual needs and preferences. Throughout the project, we have utilized Tableau as our primary data visualization tool. By leveraging Tableau's powerful data visualization features, we have created visually stunning dashboards that effectively communicate our findings, making it easier for prospective immigrants to navigate the decision-making process.

Questions we intend to answer

Visualizing data effectively and expressively through appropriate channels and marks can convey important insights that text alone cannot achieve. By utilizing effective visualizations and adhering to the principles of expressiveness, we aimed to create dashboards that provide valuable insights into the Canadian immigration process. Our goal was to use appropriate channels and marks to highlight key trends and patterns in the data, enabling us to answer important questions related to the challenges and opportunities faced by immigrants in Canada.

The questions were as follows:

- What is the geographic distribution of immigrants in Canada based on their mother tongue and country of birth, and how does it vary by region (CMAs)?
- What is the trend of the immigrant education level to the employment rate?
- Is housing affordable for immigrants?
- What are the social obstacles that immigrants encounter in their integration into Canadian society?

Data Sources

In our comprehensive analysis, we examined datasets encompassing a wide range of factors impacting immigrants in Canada, including census data, labor force participation, education and employment status, property ownership, and social challenges faced by these individuals.

We were able to acquire significant insights by utilizing data at the provincial and CMA (Census Metropolitan Area) levels. All of our datasets were collected from the **Statistics Canada** portal (https://www150.statcan.gc.ca/n1/en/type/data). Most of these datasets are part of the 2021 census conducted by the Canadian Government.

To explore and understand the overall immigration patterns in Canada, focusing on the country of birth and mother tongue of immigrants, we have utilized the following datasets:

1. Immigrant status and period of immigration by place of birth and citizenship: Canada, provinces and territories, and census metropolitan areas with parts

   Source: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810030201

2. Immigrant status and period of immigration by mother tongue: Canada, provinces and territories, census metropolitan areas, and census agglomerations with parts
   Source: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810030001

To analyze the relationship between visible minority status, immigrant background, and key socio-economic factors such as labor force participation, level of education, age, and gender across Canada, we have utilized the following dataset:

3. Labor force status by the visible minority, immigrant status and period of immigration, the highest level of education, age, and gender: Canada, provinces and territories, census metropolitan areas, and census agglomerations with parts
   Source: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=9810044601

To examine the patterns of residential property ownership among immigrants in Canada and understand the differences in property ownership based on immigration characteristics, we have utilized the following dataset:

4. Single and multiple residential property owners by immigration characteristics
   Source: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=4610005201

To explore the various social aspects affecting the well-being of visible minority groups in Canada, including the sense of belonging, community integration, personal networks, and loneliness, we have utilized the following datasets:

5. Sense of belonging to the local community, town, province, and Canada and trust in people, by groups designated as visible minorities and selected sociodemographic characteristics, 2020
   Source:
   https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=4310006401&pickMembers%5B0%5D=3.7

6. Feeling part of the community and neighborhood satisfaction, safety feeling and economic hardship, by visible minority and selected characteristics
   Source: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=4310005801

7. Size and composition of personal networks (local, close relatives, close friends, acquaintances), by visible minority and selected characteristics
   Source:
   https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=4310006301&pickMembers%5B0%5D=3.7&pickMembers%5B1%5D=5.1

8. Loneliness by gender and other selected sociodemographic characteristics
   Source:
   https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=4510004901

Data Cleaning and Preprocessing

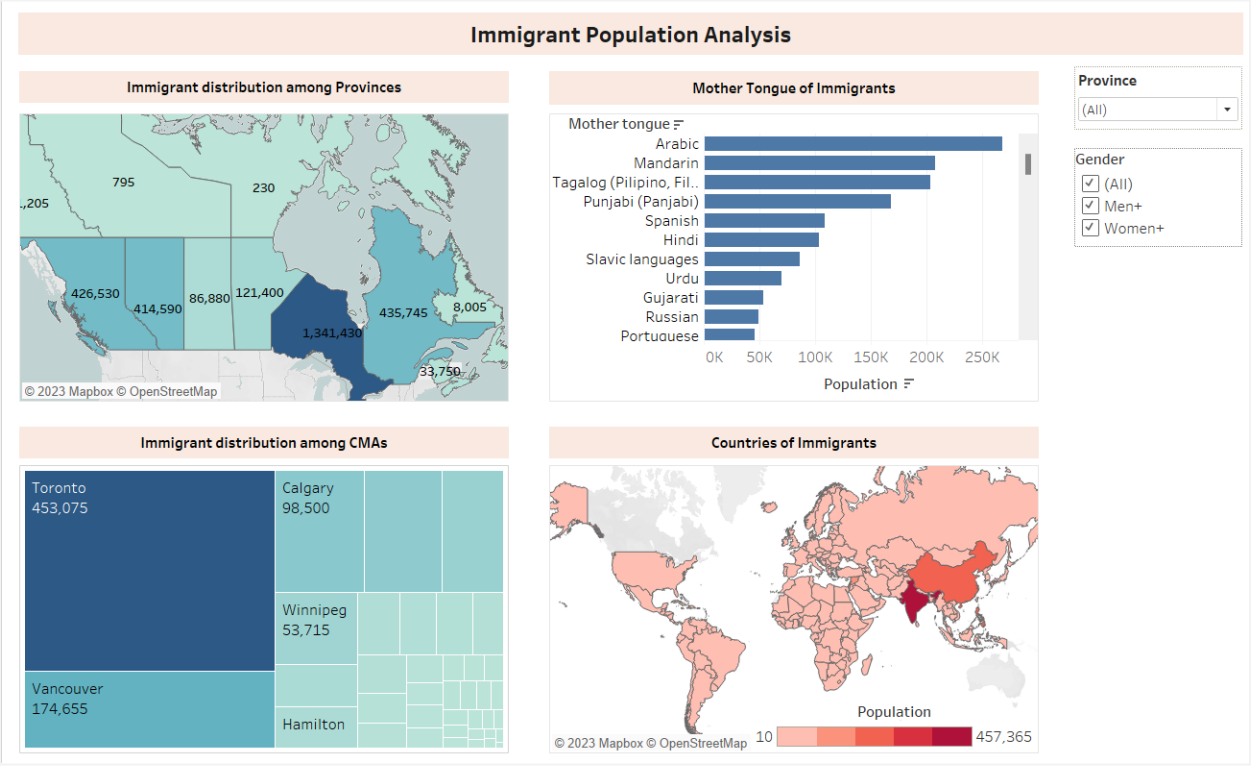
We meticulously cleaned and preprocessed the collected data to address any irregularities and outliers. This process involved identifying and eliminating null values and duplicate entries present in each dataset. In the initial phase of the project, we developed multiple Tableau sheets, where each sheet focused on a specific dataset feature and addressed a related problem statement.

Subsequently, we combined several sheets based on the correlation between the data, resulting in an interactive and informative dashboard. To enhance user experience and augment the dashboard's functionality, we integrated interactive elements and filters. Upon completion, we published the dashboards on Tableau Public.

Visualizations

1. Immigrant Population Analysis concerning mother tongue and country of birth

https://public.tableau.com/app/profile/swaathi.sundaramurugan8450/viz/CanadianImmigrationTrends/ImmigrationPopulationAnalysis



This dashboard provides a comprehensive overview of the immigrant population in Canada, focusing on their geographic distribution, mother tongue, and settlement in Census Metropolitan Areas (CMAs) and provinces. The dashboard comprises four visualizations, each offering unique insights into different aspects of the immigrant population.

Immigrant distribution among Provinces: The map displays the population of immigrants in each province, with color intensity representing the density of the immigrant population. Users can filter the data to gain insights about a specific province.

Mother Tongue of Immigrants: This horizontal bar chart represents the mother tongue of immigrants across Canada, offering a detailed understanding of the linguistic diversity among newcomers.

Immigration distribution among CMAs: The treemap visualization depicts the population of immigrants in each CMA, with the size of each box proportional to the population size. This provides a clear picture of immigrant concentration in various urban areas.

Countries of Immigrants: The final visualization showcases the immigrant population in Canada based on their country of origin. This world map offers a global perspective on the diverse backgrounds of immigrants settling in Canada by representing the density of the population with color intensity.

The dashboard is designed to be interactive, allowing users to explore data for specific provinces, CMAs, and languages and to observe how the visualizations adjust accordingly. By default, the dashboard displays data for the entire country, offering a comprehensive view of Canada's immigrant landscape.

Design Choices

- The first visualization employs a choropleth map with a color intensity channel to represent the immigrant population density in each Canadian province. This choice adheres to the expressiveness principle, as it effectively conveys quantitative data through color intensity. The map is well-suited for displaying location-based information.
- The second visualization features a horizontal bar chart displaying the mother tongue of immigrants. This chart uses the position on a common scale on the y-axis to represent the number of people in each language category, adhering to the expressiveness principle. The horizontal layout allows for easy readability of language labels, especially when dealing with longer names. Additionally, this design choice aligns with Munzner's effectiveness principle, ensuring an effective and accurate representation of the data.

- The third visualization is a treemap showcasing the CMAs and their respective immigrant populations. The size of the rectangles represents the immigrant population, which is quantitative data, following the expressiveness principle. The treemap provides a clear overview of the distribution of immigrant populations across CMAs.
- The fourth visualization is a world map highlighting the immigrant population in Canada based on their country of origin. This map employs color intensity to represent population density by adhering to the expressiveness principle.

Interactions

There are several interactions employed in this dashboard to aid prospective immigrants in analyzing the best place to settle down.

Tooltip: Every visualization is equipped with a tooltip display to provide clear information about the data points that might not be visible right away.

Sorting: The dashboard also allows the user to sort the data points of the visualization that represents the mother tongue of the immigrants.

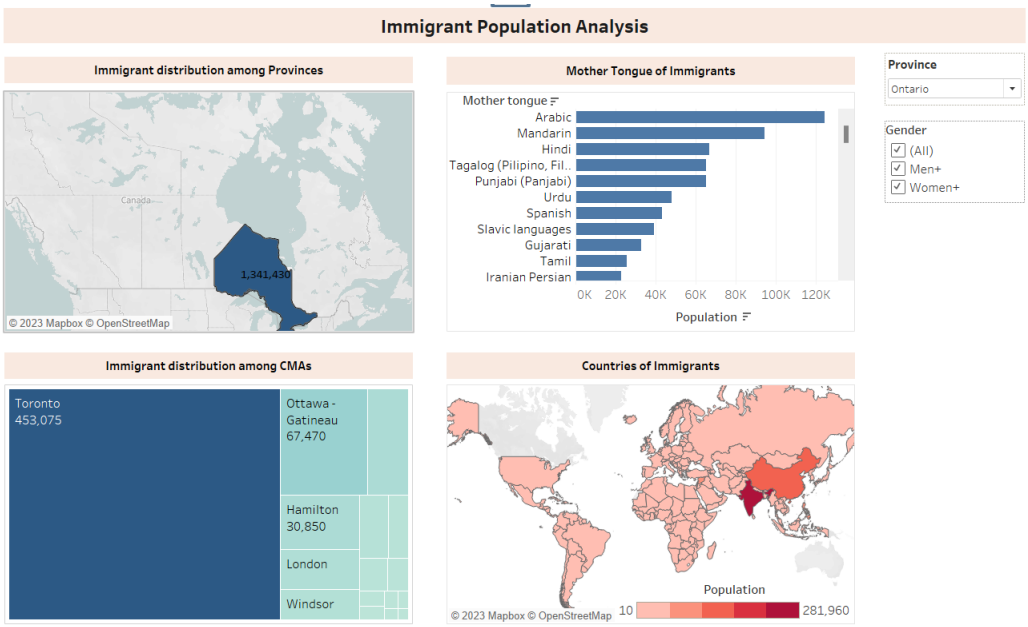
Zooming and Panning: The map visualizations contain zooming and panning options to focus on specific areas.

Filters: The dashboard has two filters (Province and Gender) that can be applied to all the visualizations. These multi-select filters can be used to compare groups of provinces and gender.

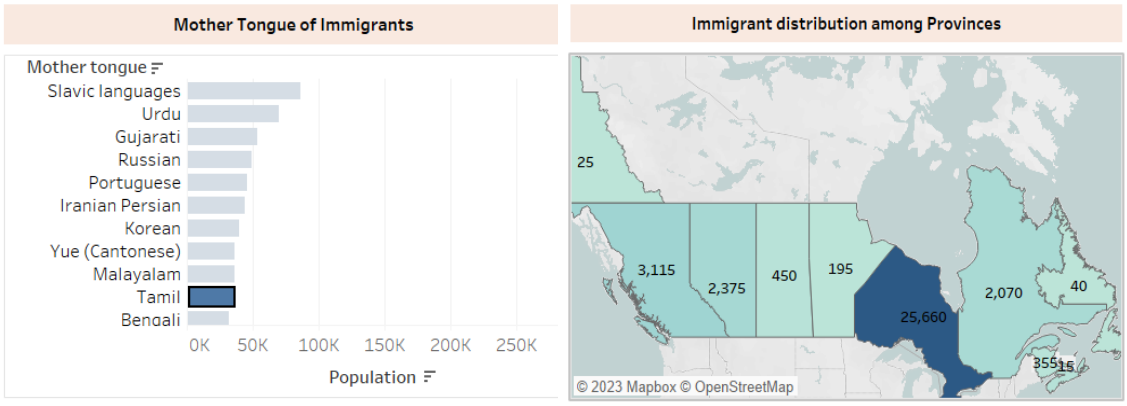
Brushing and Linking: This dashboard incorporates three different interactions that support brushing and linking.

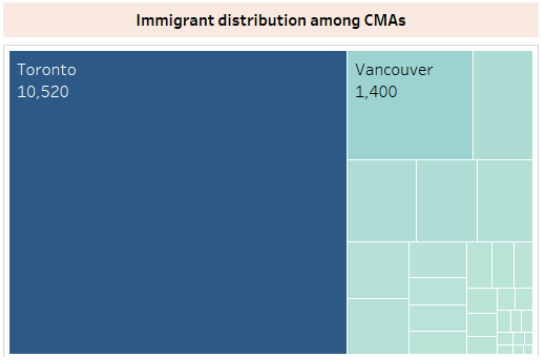
1. When a user selects a province, the visualizations representing mother tongues, CMAs, and countries of birth adjust according to the data points for the chosen province. This

feature enables potential immigrants to analyze the population distribution within the CMAs of their preferred province, and it also provides valuable insight into the existing communities in that area.

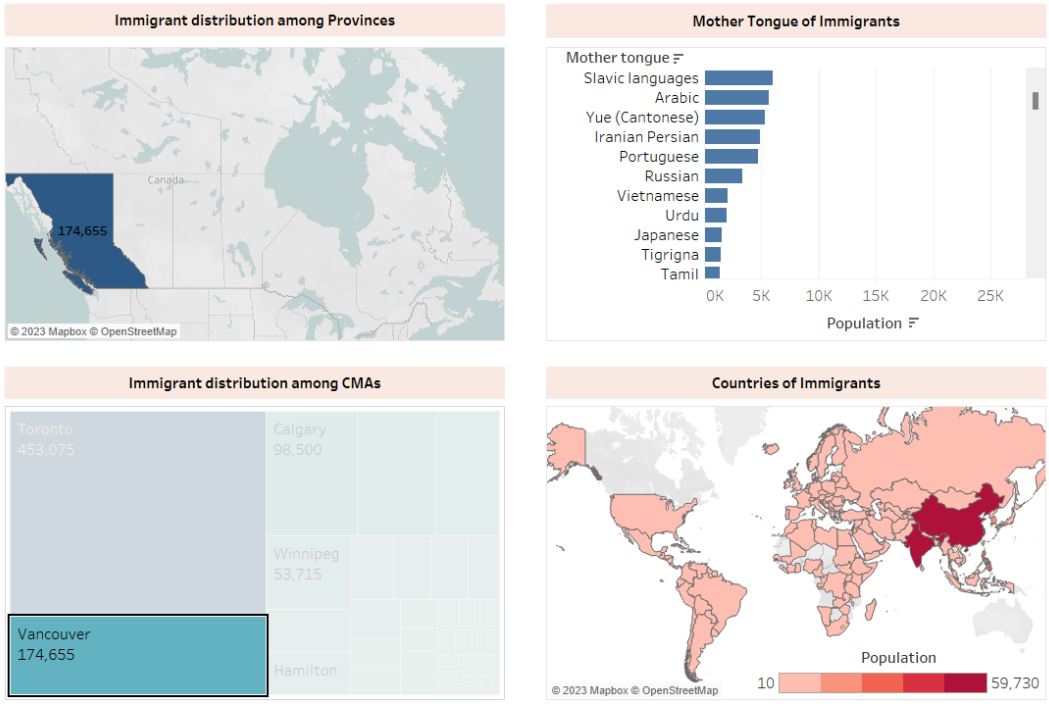


2. For some immigrants, selecting a province as a whole to explore their options may not be sufficient. They might be more interested in discovering communities that speak their native language. To accommodate this preference, users can choose a language from the second visualization, which will then modify the population distribution data for various provinces and their CMAs. This feature assists immigrants in finding a place to settle that feels more like home, providing a sense of comfort and familiarity.





3. Prospective immigrants may be interested in exploring various communities within a specific CMA where they plan to settle down. To facilitate this, users can select a CMA from the third visualization, which will then display the distribution of communities based on language and country of birth. This feature provides valuable insights for immigrants to better understand the cultural landscape of their potential new home.



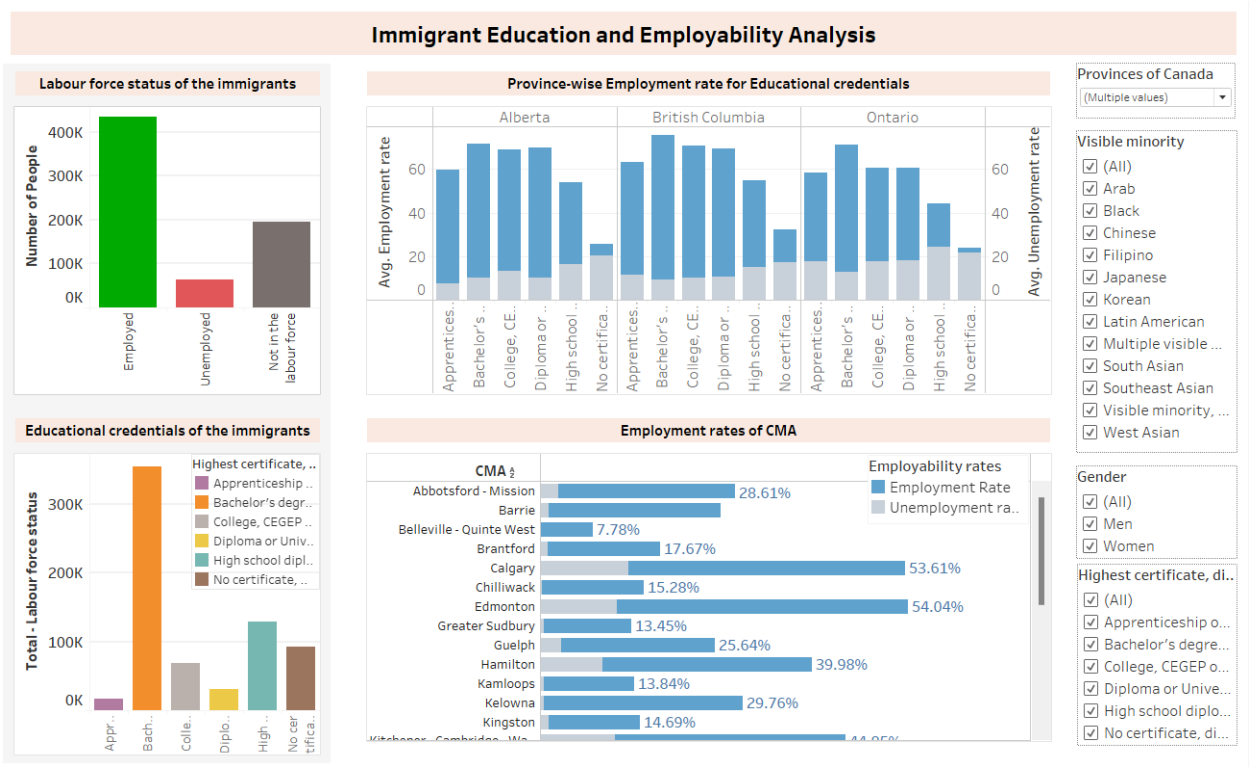
Key Takeaway

This dashboard serves as a valuable tool for prospective immigrants, allowing them to analyze the distribution of immigrant populations based on countries of origin and languages spoken across various provinces and CMAs in Canada. A key insight derived from the dashboard is that

Ontario is a popular destination for immigrants, with Toronto being the most populous CMA. Additionally, it's interesting to note that Ontario features a higher number of CMAs compared to other provinces.

2. Immigrant Education and Employability Analysis

https://public.tableau.com/app/profile/swaathi.sundaramurugan8450/viz/CanadianImmigrantEducationandEmploymentTrends/ImmigrantEducationandEmployability2



This dashboard presents a comprehensive analysis of immigrant education and employability in Canada, focusing on labor force status, provincial employment rates by educational credential, distribution of educational credential, and employment rates in Census Metropolitan Areas (CMAs). The dashboard comprises four visualizations, each providing unique insights into various aspects of the immigrant population's education and employment.

Labor Force Status of Immigrants: This bar chart displays the labor force status of immigrants in Canada, with different colors representing employed, unemployed, and not in the labor force categories.

Provincial Employment Rates by Educational Credential: This dual-axis bar chart showcases the employment and unemployment rates for each province based on different educational credentials, such as Bachelor's degrees, high school diplomas, and certificates. Users can select a specific credential using the filter, and the chart will adjust accordingly.

Distribution of Educational Attainment: This bar chart illustrates the number of immigrants with various types of educational credentials. Each category is depicted by a different color, providing a clear visual representation of the distribution.

Employment Rates of CMA: The final visualization displays the employment and unemployment rates of CMAs for the selected provinces. Users can filter the data by province, visible minority, gender, and educational credential to explore specific scenarios.

The dashboard is designed to be interactive, enabling users to customize the data displayed according to their interests or research questions. By default, the dashboard presents data for the entire country, providing a comprehensive view of Canada's immigrant education and employment landscape.

Design Choices:

- The first visualization employs a bar chart to represent the labor force status of immigrants. Using different colors for each category adheres to the expressiveness principle and aligns with Munzner's effectiveness principle, ensuring an effective and accurate representation of the data.

- The second visualization features a dual-axis bar chart, effectively showcasing employment and unemployment rates for each province based on different educational credentials. The expressiveness principle is followed by using position on a common scale and color to differentiate between the two rates.

- The third visualization utilizes a bar chart to display the distribution of educational credentials among immigrants. This design choice follows the expressiveness principle, with different colors representing each category and position on a common scale for the number of immigrants.

- The fourth visualization is a bar chart that highlights the employment and unemployment rates in CMAs for the selected provinces. Adhering to the expressiveness principle, this design choice uses color to differentiate between employment and unemployment rates and position on a common scale to represent the data accurately.

- All visualizations can be filtered by province, visible minority, gender, and educational credential, allowing users to tailor the dashboard to their specific interests or questions.

This interactivity enhances the user experience and provides a more in-depth understanding of the data.

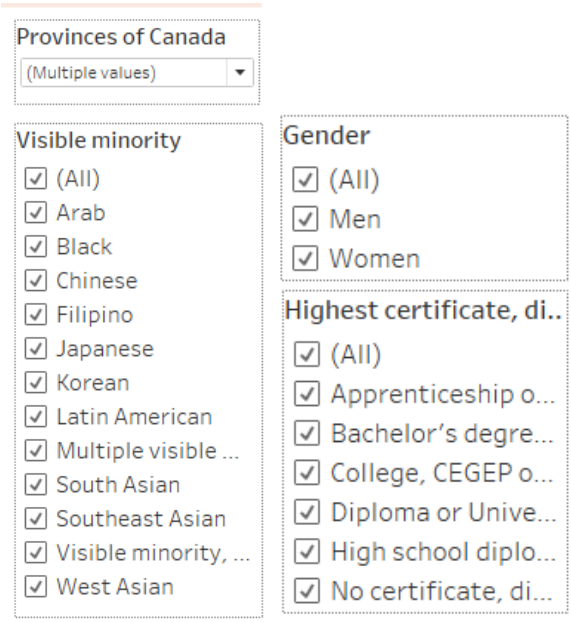
Interactions

There are several interactions employed in this dashboard to aid the prospective immigrants in analyzing the employability for various educational credentials.

Tooltip: Every visualization is equipped with a tooltip display to provide clear information about the data points that might not be visible right away.

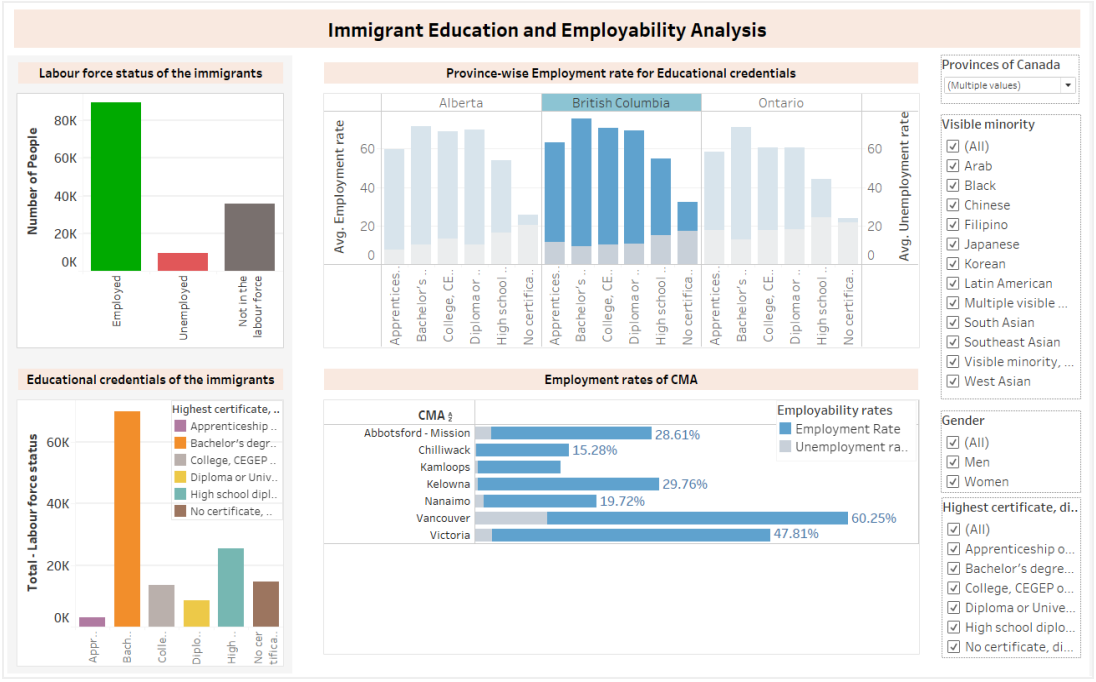
Sorting: The dashboard also allows the user to sort the datapoints of the visualization that represents Employment rates and Educational credential distribution of CMAs and provinces.

Filters: The dashboard has four filters (Province, Visible Minority, Gender and Educational credentials) that can be applied to all the visualizations. These multi-select filters can be used to compare how visible minority groups are thriving in terms of employment and education.



Brushing and Linking: This dashboard incorporates an interaction that supports brushing and linking. When a user selects a province in the Province-wise Employment rate for Educational Credentials visualization, the visuals representing labor force, CMAs, and educational credentials adjust according to the data points for the chosen province. This feature enables

potential immigrants to analyze the employability and distribution of educational credentials within the CMAs of their preferred province.

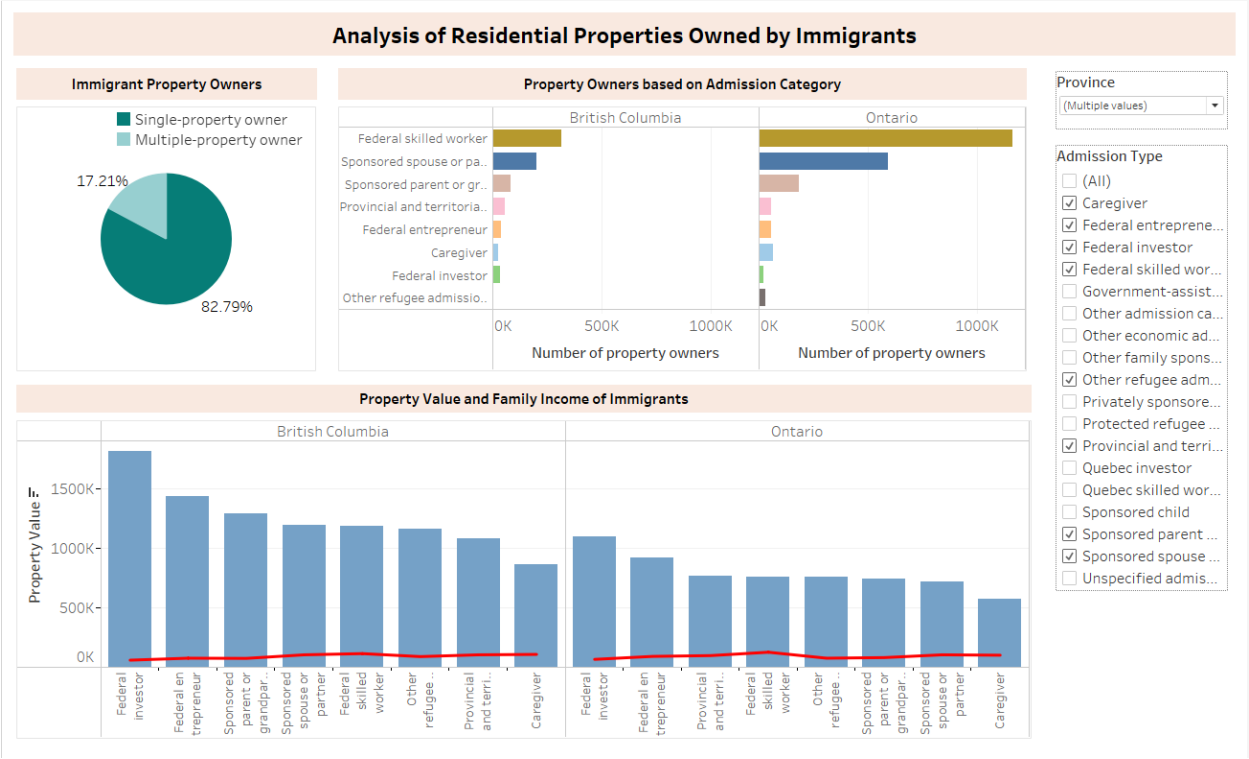


Key Takeaway

This dashboard serves as a valuable resource for prospective immigrants, enabling them to examine the relationship between educational credentials and employment rates across various provinces and CMAs in Canada. One crucial observation from the dashboard is that higher educational credentials often correspond to increased employability, but regional differences should also be taken into consideration. Furthermore, it highlights the importance of considering factors such as visible minority groups and gender when evaluating employment opportunities, emphasizing the need for a comprehensive understanding of the Canadian labor market landscape.

3. Analysis of Residential Properties owned by Immigrants

https://public.tableau.com/app/profile/swaathi.sundaramurugan8450/viz/CanadianImmigrantPropertyOwnersTrends/AnalysisofResidentialPropertiesOwnedbyImmigrants



This dashboard offers a comprehensive analysis of residential properties owned by immigrants in Canada, focusing on property ownership distribution, admission categories, and the relationship between property values and family income. The dashboard comprises three visualizations, each providing unique insights into various aspects of property ownership among the immigrant population.

Distribution of Property Owners: The pie chart displays the distribution of property owners who are immigrants, categorized into single and multi-property owners. Each category is represented by a distinct color, enabling easy differentiation and understanding of the data.

Property Owners by Admission Category: This horizontal bar chart compares the number of property owners belonging to various admission categories across different provinces. Users can select multiple provinces and admission types from the filters, allowing for a tailored analysis of property ownership among immigrants.

Property Value and Family Income of Immigrants: The dual-axis bar and line chart visualization depict the relationship between property value and average family income for immigrant property owners based on admission categories. Users can compare multiple provinces by selecting them from the filter. The admission categories are not represented by different colors for better readability, while the family income line chart contrasts the bar chart for enhanced visibility.

Design Choices:

- The pie chart effectively represents the proportion of single and multi-property owners among immigrants, adhering to the expressiveness principle. Different colors are used to distinguish between the two categories, which is an appropriate choice for nominal data.

- The horizontal bar chart employs the position on a common scale on the y-axis to represent the number of property owners in each admission category. This design choice adheres to the expressiveness principle and allows for easy comparison across provinces. The use of distinct colors for each admission category enhances the visualization's readability and facilitates the identification of patterns.

- The dual-axis bar chart and line chart adhere to the expressiveness principle, accurately displaying the relationship between property value and family income for immigrant property owners. The choice of a contrasting color for the family income line chart ensures visibility and aids in the interpretation of the data.

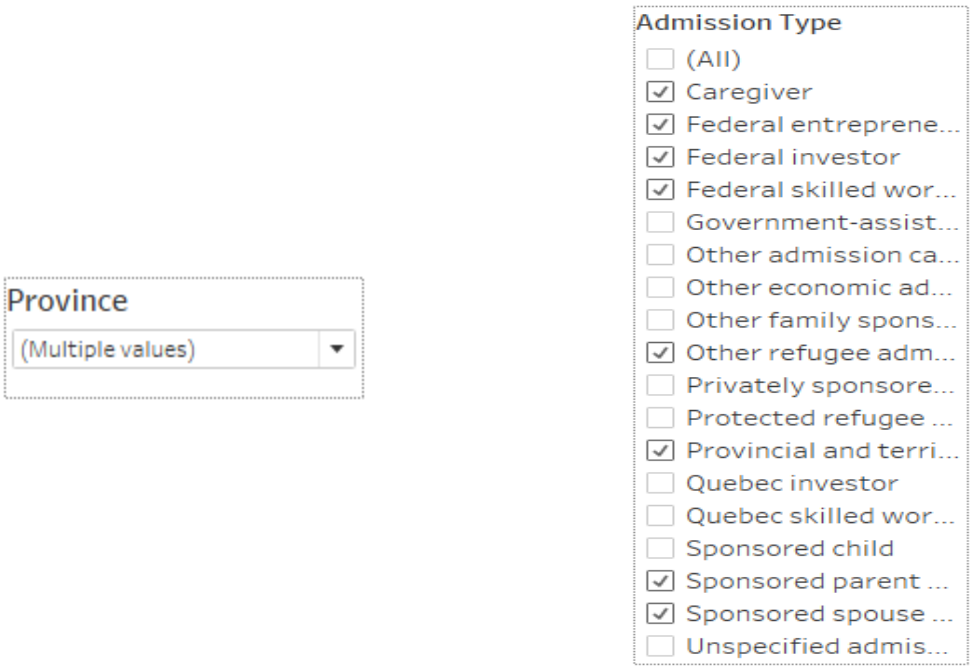
Interactions

There are several interactions employed in this dashboard to aid the prospective immigrants in analyzing the affordability of properties.

Tooltip: Every visualization is equipped with a tooltip display to provide clear information about the data points that might not be visible right away.

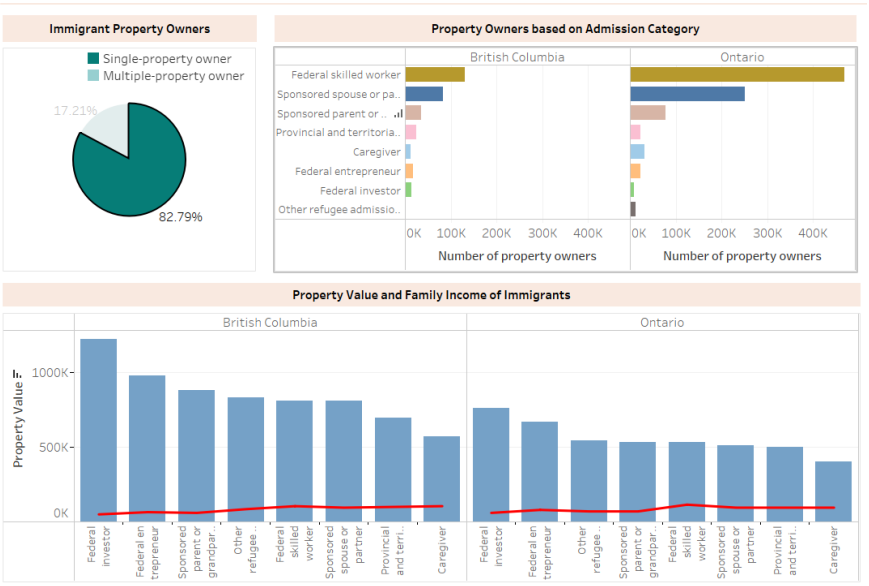
Sorting: The dashboard also allows the user to sort the datapoints of the visualizations that represent property owners distribution of provinces and property values.

Filters: The dashboard has two filters (Province and Admission type) that can be applied to all the visualizations. These multi-select filters can be used to compare how people of various admission categories are thriving in terms of property affordability.

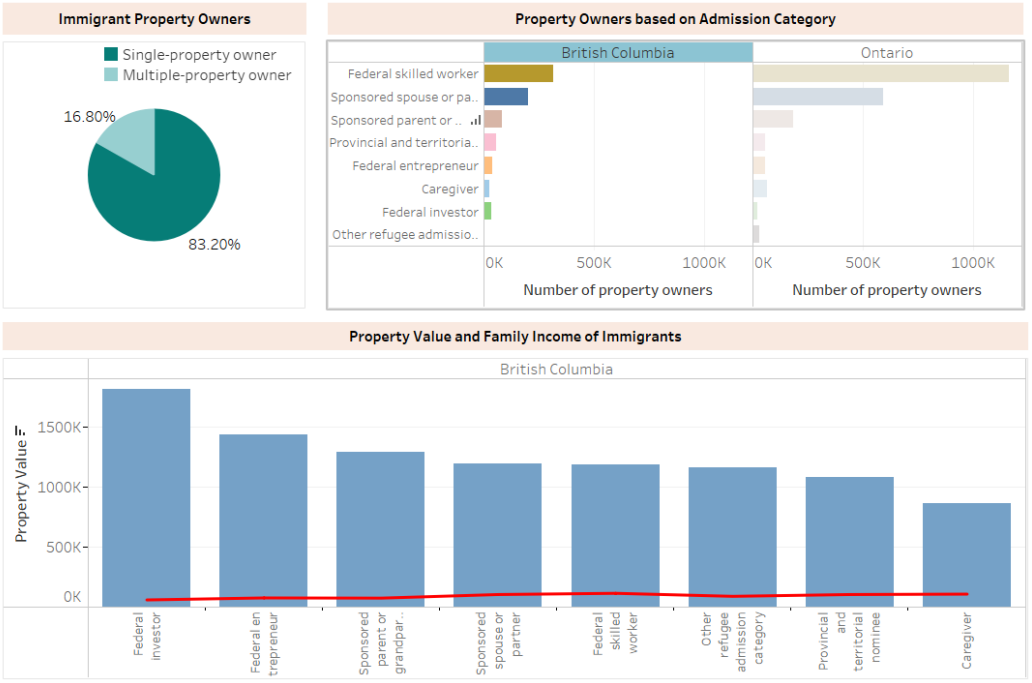


Brushing and Linking: This dashboard incorporates two interactions that support brushing and linking.

1. When a user selects the type of property owner (single or multi) from the Immigrant Property Owners visualization, all other visuals in the dashboard adjust according to the data points associated with the number of properties an immigrant owns. This feature aids immigrants to understand the affordability of properties in Canada.



2. When a user selects a province in the Property owners based on Admission category visualization, the visuals representing immigrant property owners, and property value to the average family income of immigrants adjust according to the data points for the chosen province. This feature enables potential immigrants to analyze the property owner distribution and affordability of their preferred province.

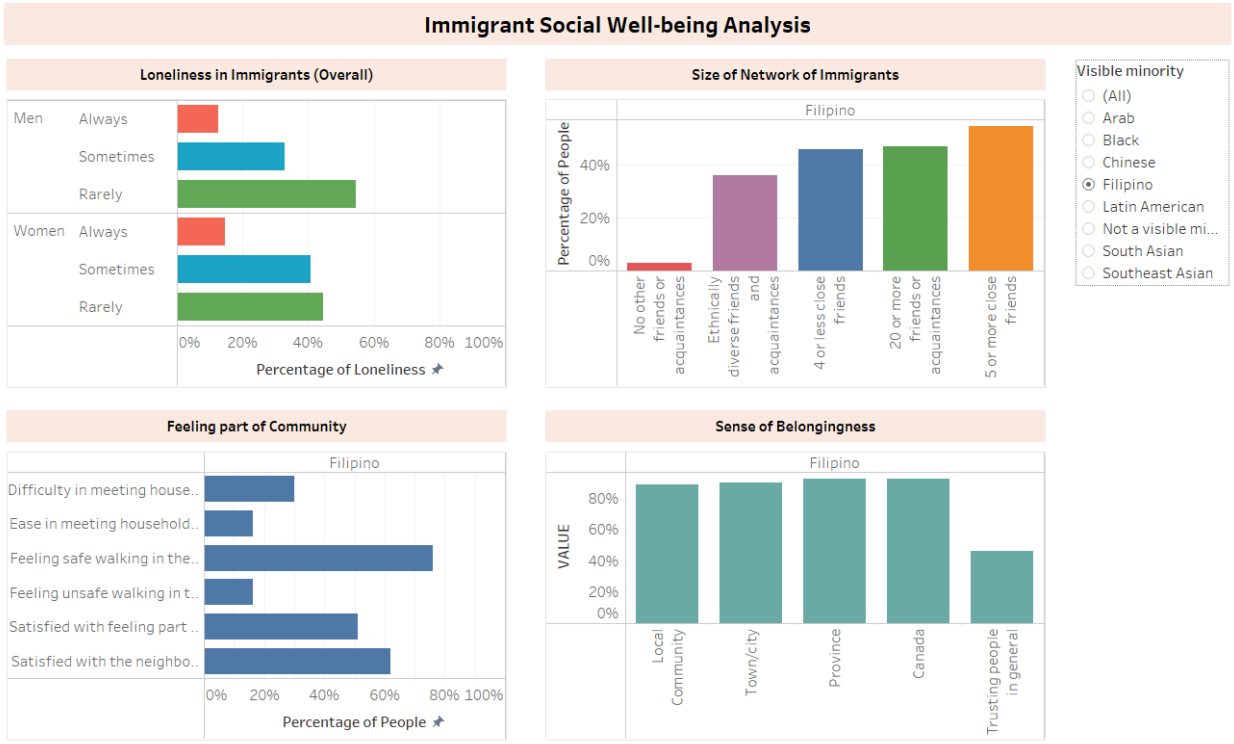


Key Takeaway

This dashboard serves as an insightful resource for understanding the residential property ownership landscape among immigrants in Canada. It sheds light on the distribution of single and multi-property owners, the role of various admission categories, and the correlation between property value and family income. A notable observation from the dashboard is that immigrants in the Federal Skilled Worker admission category account for the largest number of property owners. This highlights the significant contribution of skilled workers to the Canadian housing market, as they establish themselves in their new country.

4. Immigrant Social Well-being Analysis

https://public.tableau.com/app/profile/swaathi.sundaramurugan8450/viz/CanadianImmigrantSocialBarriers/ImmigrantSocialWell-beingAnalysis



This dashboard offers an in-depth analysis of the social well-being of immigrants in Canada, focusing on aspects such as loneliness, size of social networks, feelings of community involvement, and sense of belongingness. The dashboard comprises four visualizations, each providing unique insights into various facets of the immigrant social experience.

Loneliness in Immigrants: The horizontal bar chart represents the loneliness experienced by immigrants, categorized by gender and further divided into always, sometimes, and rarely feeling lonely. Each category is represented by a distinct color, allowing for easy differentiation and understanding of the data.

Size of Social Networks of Immigrants: The bar chart showcases the various sizes of social networks among immigrants, divided into five categories. Each category is represented by a different color, providing clear differentiation and facilitating the interpretation of the data.

Feeling Part of the Community: The horizontal bar chart illustrates the extent to which immigrants feel a part of their community. It consists of six categorical values, all represented by the same color to maintain visual simplicity while still effectively conveying the information.

Sense of Belongingness: The bar chart displays the sense of belongingness experienced by immigrants. Although it is a categorical visualization, the same color is used for all categories to ensure visual simplicity, while the values are displayed as percentages.

Design Choices:

- Loneliness in Immigrants: The horizontal bar chart adheres to the expressiveness principle, effectively conveying categorical data using distinct colors for each loneliness category. The gender-wise categorization allows for an in-depth analysis of the loneliness experienced by immigrant men and women.

- Size of Social Networks of Immigrants: The bar chart follows the expressiveness principle, accurately representing the various sizes of social networks among immigrants using different colors for each category. This design choice allows for easy comparison and identification of patterns among immigrants' social networks.

- Feeling Part of the Community: The horizontal bar chart adheres to the expressiveness principle. By using the same color for all categories, the visualization maintains visual simplicity while still providing the necessary information.

- Sense of Belongingness: The bar chart follows the expressiveness principle. The choice of using the same color for all categories ensures visual simplicity and aids in the interpretation of the data.

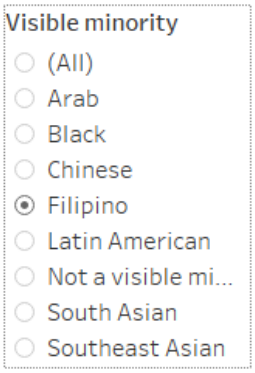
Interactions

There are several interactions employed in this dashboard to aid prospective immigrants in analyzing the social well-being of immigrants.

Tooltip: Every visualization is equipped with a tooltip display to provide clear information about the data points that might not be visible right away.

Sorting: The dashboard also allows the user to sort the data points of the visualizations that represent loneliness, the size of networks, feeling part of the community, and a sense of belongingness.

Filters: The dashboard has a filter (Visible Minority) that can be applied to all the visualizations. These single-select filters can be used to understand how an immigrant from a particular minority community feels about the social setup of Canada.



Key Takeaway

This dashboard serves as a valuable resource for understanding the social experience of immigrants in Canada, shedding light on factors such as loneliness, social network size, community involvement, and sense of belongingness. A notable observation from the dashboard is the variation in social experiences among immigrants, highlighting the importance of fostering inclusive and supportive communities.

Conclusion

This project is focused on providing prospective immigrants with a comprehensive understanding of the opportunities and challenges they may face in different regions of Canada. We created dashboards that follow the principles of expressiveness, effectiveness, and good visualization practices learned in the IAT 814 course. By comparing communities within each province using CMA data, we provide a nuanced understanding of life in Canada, assisting potential immigrants in making informed decisions about their future. Our goal is to help immigrants make well-informed decisions and to contribute to building a more inclusive and prosperous society for everyone.

Future Work

The current analysis focused on a few key datasets related to immigration, employment, and housing.

- Incorporating additional datasets on topics such as healthcare, education, and social services could provide a more comprehensive picture of life for immigrants in different regions of Canada. For example, we could include data on healthcare access, crime rates, and social services to gain a more comprehensive picture of life in different regions of Canada.
- The current dataset to represent population demographics only had information about mother tongue and country of birth. In the future, we would prefer to acquire a dataset that contains information on immigrants, their admission category into Canada, age, marital status, and year of migration including the features of the existing dataset. This would aid the prospective immigrants to get an even more clear understanding of Canada.

Acknowledgments

We would like to thank **Dr. Lyn Bartram** and the teaching assistant **Mohammad Rajabi Seraji** for providing us with extensive guidance and insightful suggestions throughout the course. Their expertise has helped us gain a deeper understanding of the latest visualization techniques and methodologies through this course.

Project Video Link:

https://youtu.be/eRRtz5qAb6U

GitHub project link:

https://github.com/swaathi317/canadian-immigration-analysis

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