EXPLORECAN

Interim Report

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Contents

1. Overview

"In Canada, restaurants and tourist attractions face a competitive market, with a large number of options available to customers. As a result, it can be challenging for these businesses to differentiate themselves and attract customers. This is further complicated because customers have different preferences and seek personalized recommendations. There is a need for a solution that can provide customers with relevant and personalized recommendations, while also helping restaurants and tourist attractions to understand their customers better and make informed business decisions."

The Canadian restaurant and tourist attraction industry face several challenges that need to be addressed. A recommendation system can provide a solution that benefits customers and businesses by improving customer experience, increasing sales and revenue, and offering a competitive advantage. By addressing these challenges, the industry can overcome its limitations and provide better services to its customers.

2. Vision

Our vision is to create a cutting-edge recommendation system.

That revolutionizes the way people discover Canadian restaurants and tourist attractions, providing them with a personalized and delightful experience.

3. Mission

i. Our mission is to develop a comprehensive and user-friendly recommendation system.
ii. That leverages the latest technologies, including data analysis and machine learning.
iii. To help users find the best options for their needs, leading to increased satisfaction and engagement.

4. Project Goals and Objectives

i. Improving the user experience
ii. Increasing engagement and retention
iii. Driving revenue and business growth
iv. Generating data insights

The goal of this recommendation system for Canadian restaurants and tourist attractions is to create a more personalized and enjoyable experience for users while also driving business growth and generating valuable data insights.

5. Challenges

i. Data collection and quality
    a. One of the biggest challenges we have faced is collecting and maintaining high-quality data on restaurants and tourist attractions.
ii. Cold-start problem
    a. Occurs when the recommendation system has insufficient data on new users or items.
iii. Scalability
    a. As the number of users and items in the system grows, we may face scalability challenges.
iv. User engagement
    a. If the user interface is not intuitive or visually appealing, users may be less likely to interact with the system and provide feedback on the recommendations.

6. Business Model

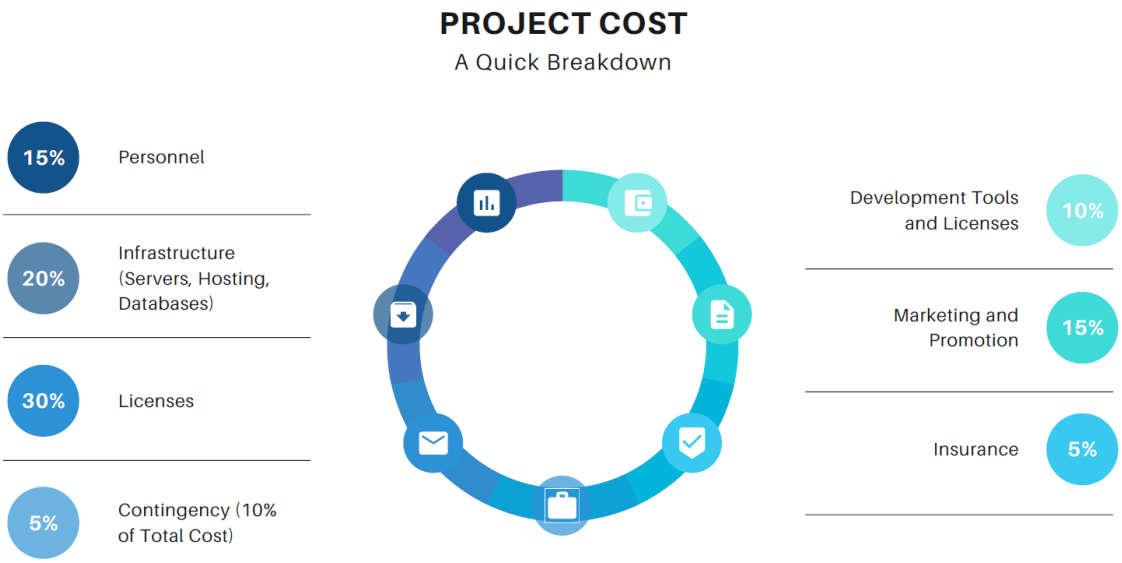
Pathways to generate our revenue.

a. Advertising: You could generate revenue by selling advertising space to restaurants or tourist attractions on your platform. For example, you could allow restaurants to promote their business to users through sponsored recommendations or featured listings.
b. Commission-based sales: You could earn a commission on sales made through your platform, such as booking a tour or making a restaurant reservation.
c. Subscription model: You could charge a subscription fee to users for access to premium features or personalized recommendations.
d. Data licensing: You could sell access to the data and insights generated by your recommendation system to other businesses or organizations, such as travel companies or food and beverage brands.
e. Partnerships: You could partner with restaurants, tourist attractions, or other businesses to offer exclusive discounts or promotions to users of your platform.

7. Cost Estimation

a. Data Collection and Preparation: This includes the cost of acquiring and cleaning the data required for building the recommendation system, which can include data from customer surveys, restaurant sales, and tourist attraction visitor numbers.
b. Development and Implementation: This includes the cost of hiring software engineers, data scientists, and other specialists to build and implement the recommendation system. This can range from a few thousand to hundreds of thousands of dollars, depending on the system's complexity.
c. Infrastructure and Hosting: This includes the cost of hosting the recommendation system on cloud-based servers, as well as any additional hardware and software required for running the system.
d. Maintenance and Upgrades: This includes the cost of maintaining and updating the system over time, including fixing bugs, adding new features, and updating the data used for recommendations.
e. The total cost of creating a recommendation system for Canadian restaurants or tourist attractions can range from tens of thousands of dollars to hundreds of thousands of dollars, depending on the scale and complexity of the system.

7.1 Cost distribution and quick break down

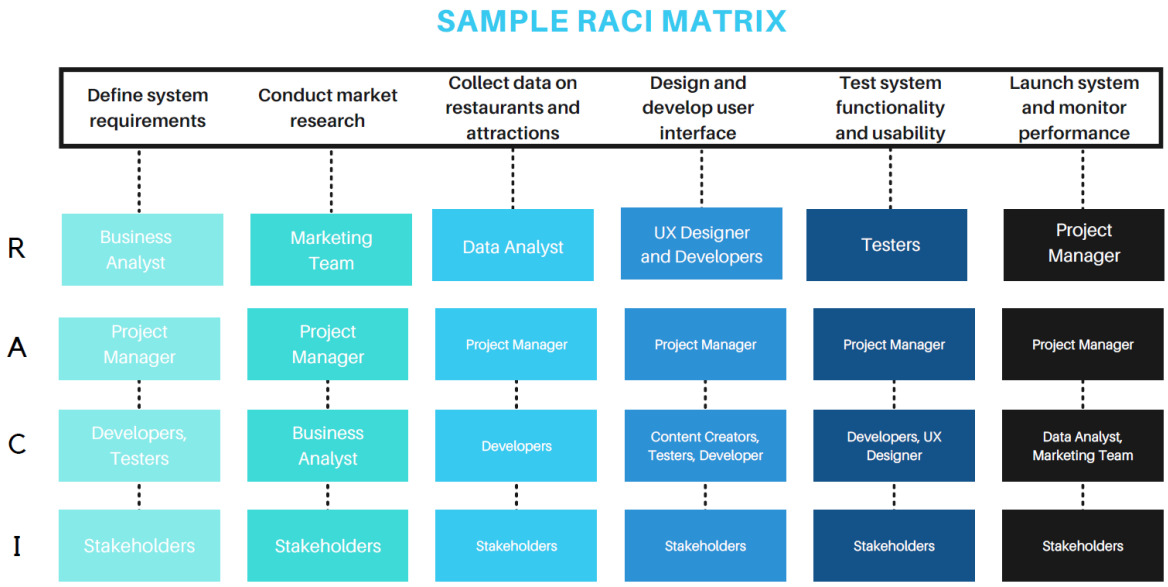


Expense	Cost
Personnel	$3,00,000
Infrastructure (Servers, Hosting, Databases	$50,000
Development Tools and Licenses	$20,000
Marketing and Promotion	$30,000
Contingency (10% of Total Cost)	$40,000
Total Project Cost	**$4,40,000**

The cost estimates are based on industry standard rates. Additionally, the cost of ongoing maintenance and support of the system is not included in this budget.

8. RACI Matrix

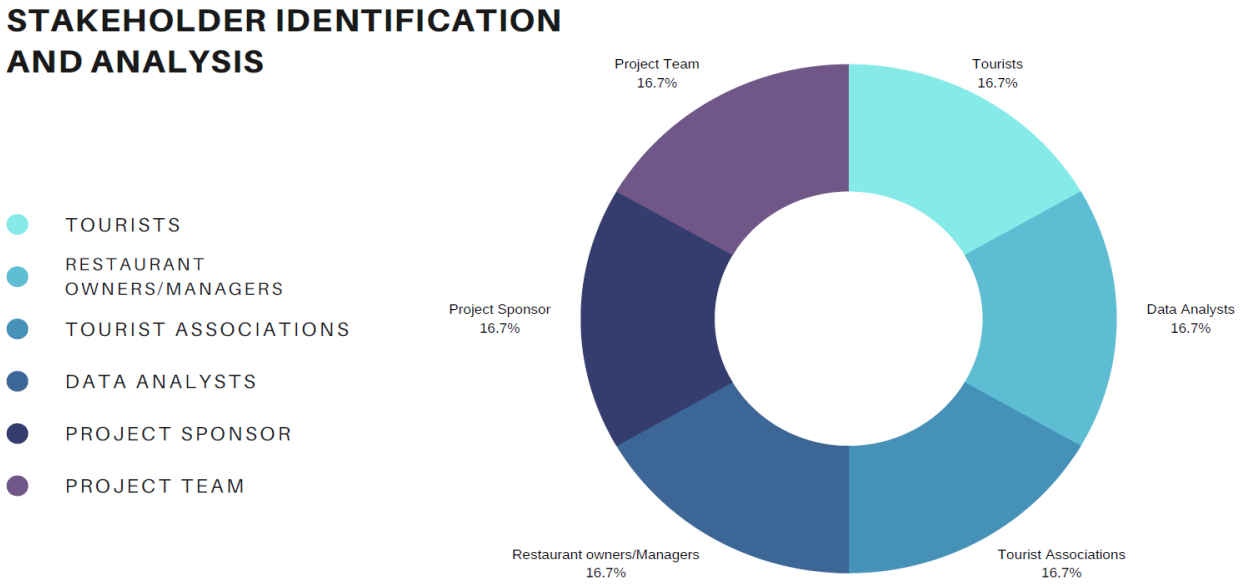
A RACI matrix can be a useful tool for creating a recommendation system for Canadian restaurants and tourist attractions by ensuring that everyone on the project team understands their roles and responsibilities, improving communication, increasing accountability, identifying potential bottlenecks, and facilitating project management.



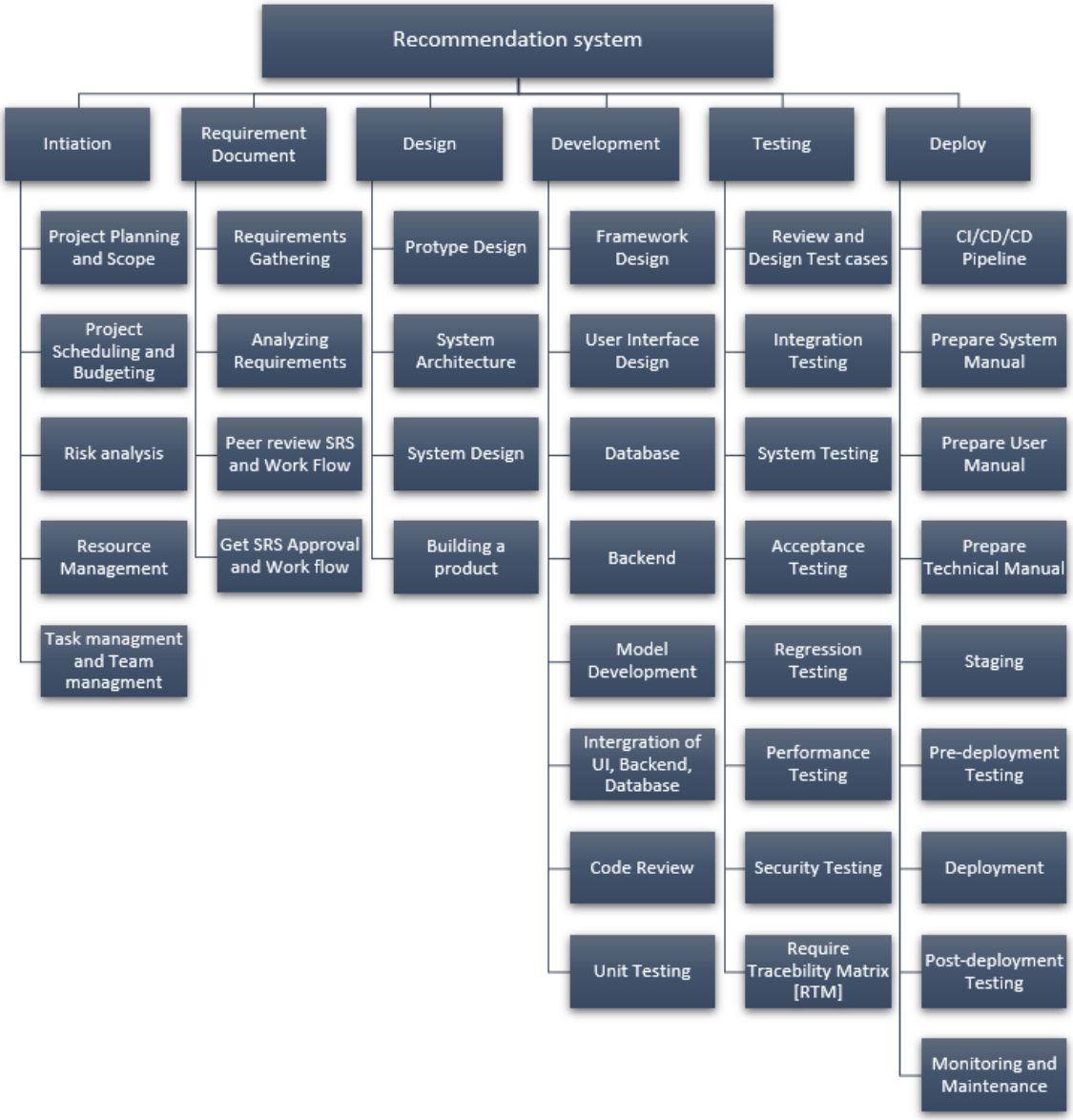
9. Stakeholders Identification and analysis

a. Restaurants and Tourist Attractions: The primary stakeholders, as they will be the ones using the recommendation system and benefiting from increased sales and improved customer experience.
b. Customers: Another vital stakeholder, as they will be the ones receiving the recommendations and providing feedback to improve the system.
c. Technology Vendors: These companies provide the technology and resources required to build and maintain the recommendation system.
d. Data Scientists and Engineers: These professionals are responsible for building and implementing the recommendation system and ensuring that it provides accurate and relevant recommendations.
e. Investors: If the recommendation system is being developed as a commercial product, investors may be involved to provide funding for development and growth.

f. Regulators: Depending on the data being used for recommendations, regulators such as privacy protection agencies may be involved to ensure that the data is being used responsibly and ethically.



10. Work Break Down Structure



WBS: Project Initiation

S.no	Activity Name	Description	Mapping Activity	Estimated Cost	Person Responsible	Risk	Success Criteria
1.	**Initiation**	Project Initiation communication starts with Project Manager and Stakeholder. Will do the Feasibility Study	Business Case	-	Project Manager		Project Goal should be clear
1.1.	**Project Planning and Scope**	Prepared the Project Scope and Charter	Project Charter/Review the Scope	-	Project Manager and Business Analyst		Scope should be clear
1.2.	**Project Scheduling/Budgeting**	Based on the Project Scope, Project Manager will decide the Cost and Time	Project Scope	-	Project Manager, Business Analyst		Scope Finalized

1.3.	**Risk analysis**	Identify all the Internal and External Risks and keep track of those Risks into Documents	Project Charter/Project Scope	-	Project Manager, Business Analyst, Stakeholders		Risks should be documented
1.4.	**Resource Management**	Identify the Resources headcounts to this project	Finalizing Scope	-	Project, Development and Testing Manager		Utilizing the available resources efficiently
1.5.	**Task and Team Management**	A solid communication plan is setup to resolve bottlenecks quickly.	All templates ready and Team members onboarded	-	Project Manager and Project Charter		Task Assessment and Task Division

WBS: Requirement Document

S.no	Activity Name	Description	Mapping Activity	Estimated Cost	Person Responsible	Risk	Success Criteria
2.	**Requirement Document**	This is the phase where we document all high-level and low-level Requirement in detail	All templates ready & Scope Finalized	-	Project Manager, Business Analyst		Final Version of End Product will be good
2.1.	**Requirements Gathering**	Note down all the Stakeholders Requirement	All Requirement templates ready & Scope Finalized	-	Business Analyst		List assumptions and requirements are ready
2.2.	**Analysing Requirements**	Team will analyze all Requirement and discussed with all Stakeholders to add or update anything in the requirement document	All Requirement templates ready & Identify the Requirement	-	Project Manager and Business Analyst		List assumptions and requirements are ready
2.3.	**Draft SRS and Workflow**	Prepare the Draft version of the Specification Requirement document and draw the flow diagram	All Requirement templates ready & Identify the Requirement	-	Business Analyst		Keep Track of all Requirement and understand the end-to-end flow to get more understanding for development
2.4.	**Peer review SRS (Software Requirement Specifications) and Workflow**	Based on the Project Scope, Project Manager will decide the Cost and Time	Requirement Draft version needs to be ready	-	Project Manager, Business Analyst		Avoid Misunderstanding in requirement beginning

2.5.	**Get SRS Approval and Workflow Approval**	Identify all the Internal and External Risks and keep track of those Risks into Documents	All Requirement ready & approved	-	Project Manager, Business Analyst, Stakeholders		Will not deviate from the project

WBS: PROJECT DESIGN

S.no	Activity Name	Description	Mapping Activity	Estimated Cost	Person Responsible	Risk	Success Criteria
3.	**Design**	The Design phase models the way a software application will work	Functional requirement documents	-	Software Architect		Development phase will be smooth and Final Version of End Product will be good
3.1.	**Protype Design**	Users evaluate the developer's proposals and test them before implementation. This helps the user understand specific needs that the developer may not have considered when designing the product	Functional requirement documents	-	Software Architect		Development phase will be smooth and Final Version of End Product will be good
3.2.	**System Architecture**	System architecture describes its main components, connections (structures) and how they interact with each other.	End to End Flow Diagram in SRS	-	Software Architect		Development phase will be smooth and Final Version of End Product will be good
3.3.	**System Design**	It includes the design of application, network, database, user interface and computer interfaces	End to End Flow Diagram in SRS	-	Software Architect		Development phase will be smooth and Final Version of End Product will be good
3.4.	**Building a product and Getting Stakeholders approval**	Final approval from the stakeholders about design of product before development phase starts	All Design documents completed	-	Stakeholders		Development phase will be smooth and Final Version of End Product will be good

WBS: PROJECT DEVELOPMENT

S.no	Activity Name	Description	Mapping Activity	Estimated Cost	Person Responsible	Risk	Success Criteria
4.	**Development**	Development of the application by keeping in mind with system design & architecture	Prototype, System Design and Functional Document	-	Development Manager		All functionalities should be implemented

4.1.	**Framework Design**	A framework used by development teams to create high-quality software in an efficient and cost-effective manner.	End to End Flow Diagram in SRS, Identify Reusable Functions and Application pages	-	Development Manager		Easy to Use and Less Complicated while debugging
4.2.	**User Interface Design**	System architecture describes its main components, connections (structures) and how they interact with each other.	End to End Flow Diagram in SRS	-	Development Team		Development phase will be smooth and Final Version of End Product will be good
4.3.	**Database**	It includes the design of application, network, database, user interface and computer interfaces	End to End Flow Diagram in SRS	-	Development Team		Development phase will be smooth and Final Version of End Product will be good
4.4.	**Backend**	Final approval from the stakeholders about design of product before development phase starts	End to End Flow Diagram in SRS, Identify Reusable Functions and Application pages	-	Development Team		Development phase will be smooth and Final Version of End Product will be good
4.6.	**Model Development**	Developing the model which is accurate for our business case	End to End Flow Diagram in SRS, Identify Reusable Functions and Application pages	-	Development Team		Fault Tolerance and Response time will be good
4.7.	**Integration**	Integrating the frontend & backend code to make the application work	End to End Flow Diagram in SRS, Identify Reusable Functions and Application pages	-	Development Team		Fault Tolerance and Response time will be good
4.8.	**Code Review**	Review the code with the team lead to make sure following coding principles	Code needs to be completed	-	Development Manager		Less Defects and cover all the functionality
4.9.	**Unit Testing**	Write classes for all components for testing the functionality	Code needs to	-	Development Team		Cover all the functionality, requirement,

			be reviewed				testing end to end from development side

WBS: Testing

S.no	Activity Name	Description	Mapping Activity	Estimated Cost	Person Responsible	Risk	Success Criteria
5.	**Review and Design Test cases**	Cover all the Positive and Negative Scenarios of all the Functional and End to End Requirements	Code should be Ready	-	Testing Team, Testing Manager		Cover all the Requirement and Maximum Coverage so that testing team should not miss any requirement while doing testing
5.1.	**Integration Testing**	In this phase, the different units or modules of code are tested together to ensure they function correctly as a whole. This phase helps detect any issues or conflicts between the various modules of the software.	All the Functional components should be tested	-	Testing Team		Cover all the Requirement
5.2.	**System Testing**	This phase involves testing the entire system to ensure it meets the requirements and specifications outlined in the project plan. System testing typically involves using both manual and automated testing tools and techniques to identify any potential issues or bugs.	Functional components should be tested independently	-	Testing Team		Cover all the Requirement
5.3.	**Acceptance Testing**	In this phase, the software is tested by the client or end-user to ensure that it meets their expectations and requirements. This phase involves testing the software in a real-world	All the testcases should be executed based on the acceptance criteria	-	Testing Team		Cover all the Requirement

		environment, and it helps ensure that the software is ready for deployment.					
5.4.	**Regression Testing**	This phase involves retesting the system or application after any changes or modifications have been made to the code to ensure that there are no negative impacts on existing functionality.	All Functional Testing should be performed	-	Testing Team		Existing functionalities should stable
5.6.	**Performance Testing**	This phase involves testing the software's performance under different workloads and conditions to ensure that it can handle the expected load and traffic.	All Functional Testing should be performed	-	Testing Team		Cover all the Requirement
5.7.	**Security Testing**	This phase involves testing the software's security features to ensure that it is secure from unauthorized access and potential cyber-attacks.	All Functional Testing should be performed	-	Testing Team		Cover all the Requirement
5.8.	**Require Traceability Matrix**	Mapp all the testcases with the requirements.	Testing should be done	-	Testing Team		Maximum Coverage so that testing team should not miss any requirement while testing
5.9.	**Final Approval**	Final approval on all the testing Environment and ready for deployment	Testing should be done with minimum defect leakage or no critical and major defects		Testing Manager, Project Manager		All the functionalities are tested and ready for Live

WBS: Project DEPLOY

S.no	Activity Name	Description	Mapping Activity	Estimated Cost	Person Responsible	Risk	Success Criteria
6.	**Deploy**	It covers the work required to deploy the final	Testing should be completed	-	Dev-ops Team		Application deploys without any

		solution to target production environments.					hindrance and user use the application without having any issues
6.1.	**CI/CD/CD Pipeline**	A series of steps to follow to deliver a new version of the software. CI/CD/CD introduces monitoring and automation to improve processes	Production Environment should be ready	-	Dev-ops Team		Successfully running the build
6.2.	**Prepare System Manual**	It is a system-specific hybrid document that includes an operating manual, a maintena nce manual, and additional information.	Production Environment should be ready and clear understandin g of all the Requirement s	-	Testing Team		Easy to use for users
6.3.	**Prepare User Manual**	In this phase, the software is tested by the client or end-user to ensure that it meets their expectations and requirements. This phase involves testing the software in a real-world environment, and it helps ensure that the software is ready for deployment.	Production Environment should be ready and clear understandin g of all the Requirement s	-	Testing Team		Easy to use for users
6.4.	**Prepare Technical Manual**	This phase involves retesting the system or application after any changes or modifications have been made to the code to ensure that there are no negative impacts on existing functionality.	Production Environment should be ready and clear understandin g of all the Requirement s	-	Testing Team		Easy to use for users
6.5.	**Staging**	In this phase, the project is deployed to a staging environment that closely mimics the production environment. This environment is used to test the deployment process and ensure that everything is working as expected.	Production Environment should be ready and clear understandin g of all the Requirement s	-	Testing Team		Cover all the Requireme nt
6.6.	**Pre-deployment Testing**	Once the staging environment has been set up, the project is tested to ensure that it is fully functional and meets the requirements and expectations of the client or end-user.	Production Environment should be ready and clear understandin g of all the Requirement s	-	Testing Team		Cover all the Requireme nt

6.7.	**Deployment**	In this phase, the project is deployed to the production environment. This typically involves using automated deployment tools or scripts to ensure that the deployment process is efficient and error-free.	Testing should be done	-	Testing Team		Successfully Deploy the build in all platforms
6.8.	**Post-deployment Testing**	Once the project has been deployed to the production environment, it is tested again to ensure that everything is working correctly. This testing is typically done in a production-like environment to ensure that the project is ready for use by end-users.	Testing all the functionalities		Testing Manager, Project Manager		Successfully Deploy the build in all platforms
6.9.	**Monitoring and Maintenance**	Once the project has been deployed, it is important to monitor its performance and ensure that it is running smoothly. Any issues or problems that arise should be addressed immediately to minimize downtime and ensure that the project is available to end-users.	Application should be on Production		Support Team		Application running smoothly

11. Individual Technical Approach

i. The purpose is to provide a detailed overview of the approach that will be taken to create a recommendation system for Canadian restaurants and tourist attractions.
ii. The system aims to provide personalized recommendations to users based on their preferences, past behaviour, and other relevant factors.
iii. The system will utilize machine learning algorithms and data analysis techniques to make accurate predictions and improve over time based on user feedback.
iv. This document outlines the technical approach for developing, testing, and deploying the recommendation system, including the tools and technologies to be used, the development process, and the testing methodologies.

11.1System Architecture

i. Data Ingestion and Pre-processing

This component will be responsible for collecting data from various sources such as restaurant and tourist attraction websites, social media platforms, and user feedback. The data will be pre-processed to remove any duplicates, missing values, or inconsistent data.

ii. Data Storage and Management

The pre-processed data will be stored in a cloud-based database such as Amazon Web Services (AWS) or Microsoft Azure. The database will be designed for high scalability and performance, with data partitions and replication to ensure high availability.

iii. Machine Learning Models

The recommendation system will use various machine learning models such as collaborative filtering, content-based filtering, and hybrid models to generate recommendations. These models will be trained on the pre-processed data and will utilize algorithms such as K-Nearest Neighbours (KNN), Singular Value Decomposition (SVD), and Neural Networks.

iv. Recommendation Engine

The recommendation engine will be responsible for generating personalized recommendations for each user based on their preferences and past behaviour. The engine will consider factors such as location, cuisine, price, ratings, and popularity.

v. User Interface

The user interface will be designed to be user-friendly and intuitive, with features such as search, filters, and recommendations. The interface will be developed using modern web technologies such as ReactJS and NodeJS.

vi. Deployment and Monitoring

The system will be deployed on a cloud-based platform such as AWS or Microsoft Azure. The system will be monitored using tools such as CloudWatch and Azure Monitor, and any issues or errors will be addressed promptly.

11.2Data Collection

We will describe the process of collecting data from various sources, including tourist attraction websites, restaurant booking websites, social media platforms, and other relevant sources. It will also explain how we plan to clean and pre-process the data to make it suitable for recommendation generation.

i. Data collected from various sources using the following:
    a. Web scraping: You can use web scraping tools, such as Beautiful Soup or Scrapy, to extract data from websites that list Canadian restaurants or tourist attractions, such as TripAdvisor, Yelp, or Google Maps.
    b. APIs: You can use APIs provided by websites that list Canadian restaurants or tourist attractions, such as TripAdvisor or Yelp, to access their data directly. You will need to sign up for an API key and follow their API usage guidelines.
    c. User-generated data: You can collect user-generated data by allowing users to rate and review Canadian restaurants or tourist attractions through your website or mobile app.
    d. Public datasets: You may also find public datasets that contain information on Canadian restaurants or tourist attractions, such as open data portals or data-sharing platforms.
    e. Manually collected data: You can also manually collect data by researching Canadian restaurants or tourist attractions and recording their information, such as their name, location, and rating.

ii. Entities for creating the chatbot.

    a. Name of the restaurant or attraction
    b. Location (address, city, province)
    c. Type of cuisine or attraction (e.g., Italian restaurant, outdoor attraction)
    d. User ratings and reviews
    e. Price range
    f. Opening and closing times
    g. Amenities offered (e.g., parking, wheelchair accessibility)
    h. Images or photos
    i. Historical visitor data (e.g., number of visitors, peak season)
    j. Popularity or trending information

iii. Various types of datasets

a. Yelp Open Dataset: A large dataset containing information on businesses, including Canadian restaurants and tourist attractions, as well as user reviews and ratings. The data can be accessed for free through the Yelp website.
b. TripAdvisor Dataset: A dataset containing information on tourist attractions and restaurants around the world, including Canada. The dataset includes information on location, ratings, and reviews.
c. Canadian Tourism Commission Data: The Canadian Tourism Commission provides data on Canadian tourist attractions and destinations, including information on visitor numbers and popular attractions.
d. Statistics Canada: Statistics Canada provides a range of data on Canadian businesses and tourism, including data on restaurants and tourist attractions.
e. OpenData.gc.ca: The Government of Canada's open data portal contains a range of datasets related to tourism and travel in Canada, including data on restaurants and tourist attractions.
f. It's important to note that while these datasets can provide valuable information for your recommendation system, you may need to combine or supplement the data with other sources to ensure that you have a comprehensive and up-to-date dataset.

iv. Finalized Datasets

a. Candian_resturant.xlsx

i. Has the following entities:

1. Restaurant Name
2. Cuisine Type
3. Address
4. City
5. Province/State
6. Country
7. Postal/Zip Code
8. Phone Number
9. Price Range (per person)
10. Average Rating (out of 5)
11. Number of Reviews

b. Candian_places.xlsx

1. Longitude
2. Latitude
3. Name
4. Place_type
5. Phone
6. dates_open
7. amenities
8. state
9. State Name
10. City
11. Province/State

c. Candian_Provinces.xlsx

1. Longitude
2. Latitude
3. state
4. City
5. Province/State

11.3Data Pre-Processing

This section will describe the techniques that we plan to use for pre-processing the data, including data normalization, outlier removal, and feature selection. It will also explain the tools and technologies that we plan to use for data pre-processing.

i. Data cleaning: This involves removing or correcting any inaccurate, incomplete, or irrelevant data. For example, removing duplicates or filling in missing values.
ii. Data normalization: This technique involves scaling the data to a common range to ensure that each attribute is given equal weight. For example, scaling the ratings of different restaurants on a scale of 1 to 10.
iii. Data transformation: This technique involves converting the data into a suitable format for analysis. For example, converting categorical data such as cuisine type or location into numerical data using one-hot encoding.
iv. Data reduction: This technique involves reducing the dimensionality of the data by selecting only the most relevant features or attributes. For example, selecting only the most frequently visited tourist attractions.
v. Outlier detection: This technique involves identifying and removing any data points that are significantly different from the others. For example, removing a restaurant with an unusually high rating compared to other restaurants in the same category.

11.4 Feature Extraction

This section will describe the features that we plan to extract from the pre-processed data. It will explain the techniques that we plan to use for feature extraction, including text mining, sentiment analysis, and image processing.

i. Bag of Words (BoW): This technique involves representing the text data as a collection of words without considering the order in which they appear. It can be used to extract features from customer reviews or descriptions of restaurants and tourist attractions.
ii. Term Frequency-Inverse Document Frequency (TF-IDF): This technique is used to weigh the importance of words in a document based on their frequency and how frequently they appear in other documents. It can be used to identify the most important features in a corpus of text data, such as customer reviews or descriptions of restaurants and tourist attractions.
iii. Collaborative Filtering: This technique is based on the idea that users who have similar preferences in the past are likely to have similar preferences in the future. It can be used to identify patterns in customer behaviour and preferences based on their past interactions with the system, such as their ratings or reviews of restaurants and tourist attractions.

11.5 Recommendation Generation

This section will describe the techniques that we plan to use for recommendation generation. It will explain the algorithms that we plan to use for recommendation generation, including collaborative filtering, content-based filtering, and hybrid approaches.

i. Collaborative Filtering: This technique involves analysing user behaviour and preferences to identify patterns and similarities between users. It can be used to recommend restaurants and attractions that similar users have enjoyed. For example, if User A and User B both enjoyed a particular restaurant, the system might recommend that restaurant to User C who has similar preferences.
ii. Content-Based Filtering: This technique involves analysing the attributes and characteristics of restaurants and attractions to make recommendations based on user preferences. For example, if a user has indicated that they prefer vegetarian restaurants, the system might recommend vegetarian restaurants in the area.
iii. Hybrid Techniques: These techniques combine collaborative and content-based filtering to improve the accuracy of recommendations. For example, the system might use collaborative filtering to identify similar users, and then use content-based filtering to recommend restaurants and attractions that are likely to appeal to those users.
iv. Matrix Factorization: This technique involves breaking down large data sets into smaller, more manageable components to make recommendations. For example, the system might break down

the data into user-item matrices, and then use matrix factorization to identify patterns and make recommendations based on those patterns.

v. Deep Learning: This technique involves using neural networks to make recommendations based on large amounts of data. For example, the system might use a deep learning algorithm to analyse user behaviour and preferences and make personalized recommendations based on that analysis.

11.6 User Interface

This section will describe the user interface that we plan to develop for the recommendation system. It will explain the design principles that we plan to follow and the tools and technologies that we plan to use for developing the user interface.

i. Responsive design: This technique allows the user interface to adapt to different screen sizes and devices, making it easy to use on desktops, tablets, and smartphones.
ii. Interactive design: Interactive elements such as sliders, buttons, and animations can make the user interface more engaging and intuitive.
iii. Personalization: Personalization techniques can be used to customize the user interface for each user based on their preferences, location, and other factors.
iv. Visual design: A visually appealing and well-designed interface can help attract and retain users and make the system more user-friendly. This includes the use of colours, typography, and imagery.
v. Navigation: The user interface should have clear and intuitive navigation to make it easy for users to find what they're looking for. This can include menus, search bars, and filters.
vi. Feedback: The user interface should provide feedback to the user on their actions and provide clear error messages when needed.

11.7 Evaluation metrics

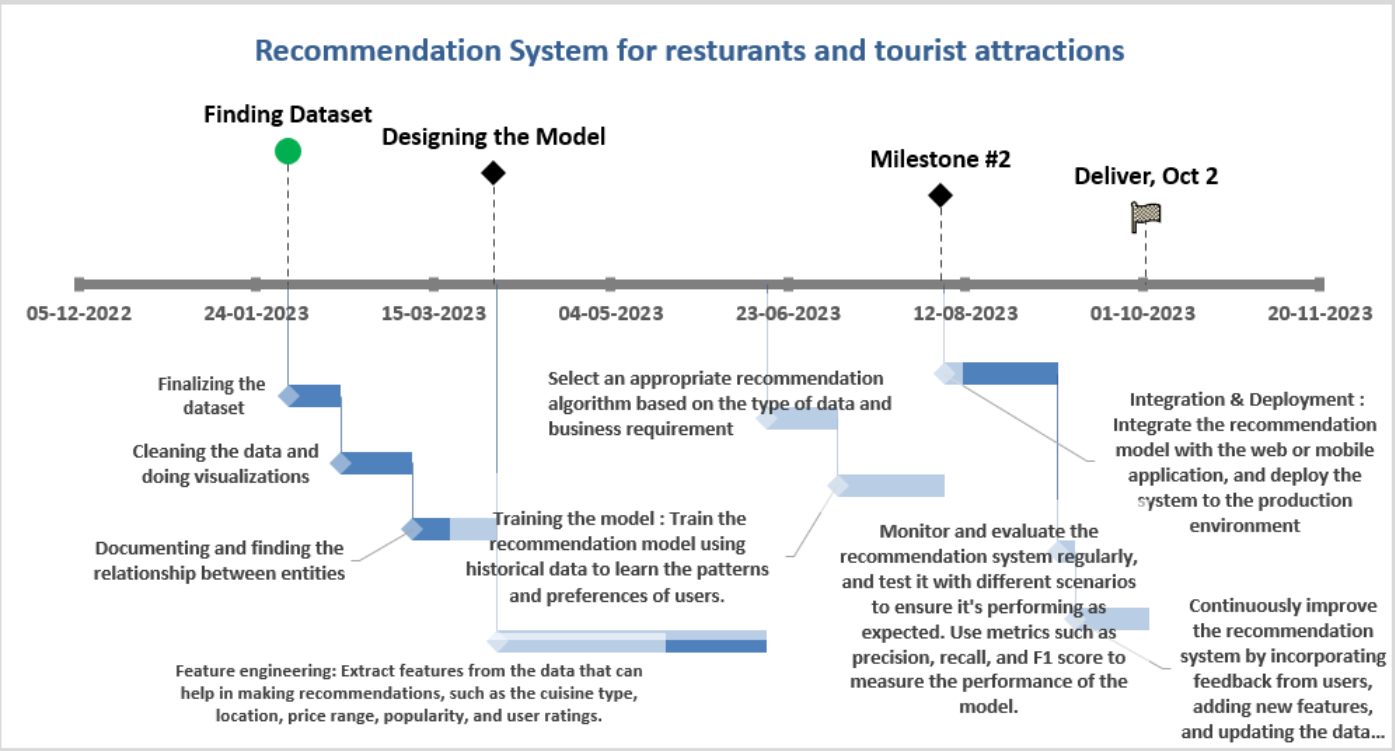
This section will describe the evaluation metrics that we plan to use for evaluating the performance of the recommendation system. It will explain the different metrics that we plan to use, including precision, recall, F1 score, and mean average precision.

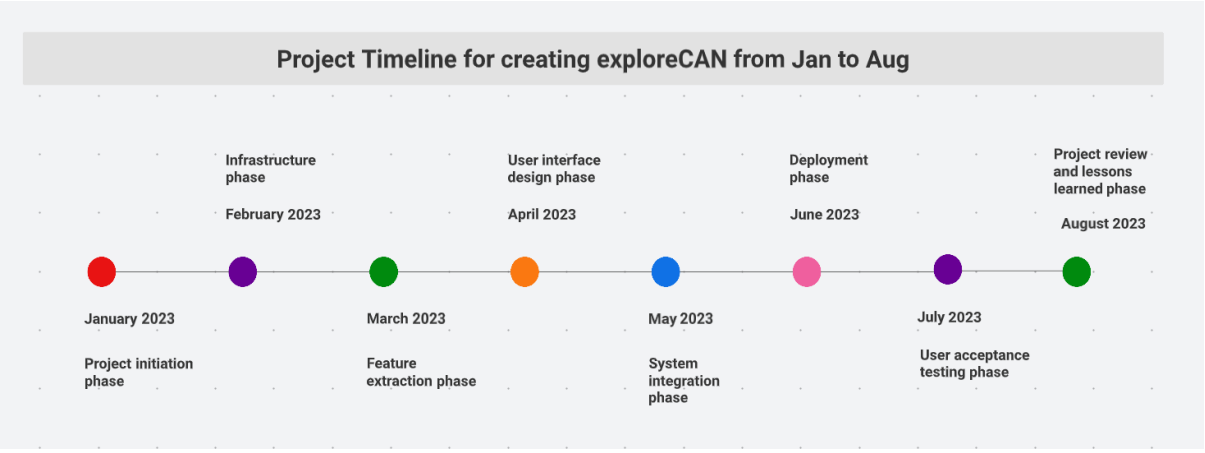
i. Precision and Recall: Precision is the proportion of relevant items recommended, while recall is the proportion of relevant items that were recommended out of the total number of relevant items. For example, if the recommendation system recommends 10 items and 7 of them are relevant, the precision is 0.7 and the recall is 0.58.
ii. Mean Absolute Error (MAE): MAE is the average difference between the predicted rating and the actual rating given by the user. For example, if the predicted rating for a restaurant is 4.5 and the actual rating given by the user is 4, the MAE is 0.5.
iii. Root Mean Squared Error (RMSE): RMSE is the square root of the average of the squared differences between the predicted rating and the actual rating given by the user. For example, if the predicted rating for a restaurant is 4.5 and the actual rating given by the user is 4, the squared difference is 0.25, and the RMSE is 0.5.
iv. Mean Average Precision (MAP): MAP is the average precision across all users. For example, if the precision for User A is 0.8 and the precision for User B is 0.6, the MAP is (0.8+0.6)/2 = 0.7.
v. Normalized Discounted Cumulative Gain (NDCG): NDCG measures the quality of the recommendation list by assigning higher scores to relevant items that are ranked higher in the list. For example, if a user is interested in Italian restaurants and the recommendation system recommends 5 Italian restaurants in the following order: A, B, C, D, E, the NDCG score would be higher if A and B were ranked higher than C, D, and E.
vi. Mean Reciprocal Rank (MRR): MRR is the average of the reciprocal ranks of the first relevant item in the recommendation list. For example, if the first relevant item in the recommendation list for a user is ranked 3rd, the reciprocal rank is 1/3, and the MRR is the average of all reciprocal ranks for all users.

11.8Conclusion

The conclusion section will summarize the technical approach that we plan to follow for developing the recommendation system for Canadian restaurants and tourist attractions. It will also mention the challenges that we anticipate and the future work that we plan to undertake to improve the system.

12. Project Timeline





Jan 2023

i. Project initiation phase: Develop project charter, define scope and objectives, identify stakeholders.
ii. Requirements gathering phase: conduct user interviews, identify data sources, define user requirements.

Feb 2023

i. Infrastructure phase: select and set up hardware and software environment, implement security measures.
ii. Data pre-processing phase: collect and clean data, perform exploratory data analysis.

Mar 2023

i. Feature extraction phase: extract relevant features from the pre-processed data.

ii. Recommendation generation phase: develop recommendation algorithms and test their performance.

April 2023:

i. User interface design phase: develop wireframes and prototypes, design user interface.
ii. Evaluation metrics selection phase: select appropriate evaluation metrics, design testing procedures.

May 2023:

i. System integration phase: integrate recommendation algorithms and user interface into a single system.
ii. Testing and quality assurance phase: conduct thorough testing, ensure system meets user requirements and quality standards.

June 2023:

i. Deployment phase: deploy the system in a production environment, monitor its performance and user feedback.
ii. Training and documentation phase: develop user training materials and system documentation.

July 2023:

i. User acceptance testing phase: conduct user acceptance testing, gather user feedback, and make necessary improvements.
ii. Finalize project deliverables and close out phase: finalize all project documentation and deliverables, obtain sign-off from stakeholders.

August 2023:

i. Project review and lessons learned phase: conduct a project review, identify areas for improvement, and document lessons learned.

13. Technologies and Tools

i. Programming Languages: Python

Usage: These programming languages are commonly used for developing machine learning models and implementing data processing pipelines.

ii. Machine Learning Libraries: TensorFlow, PyTorch, Scikit-learn.

Usage: These libraries can be used for developing and training machine learning models for recommendation generation.

iii. Big Data Processing Frameworks: Apache Spark, Hadoop

Usage: These frameworks can be used for processing and analysing large datasets of user and item interactions.

iv. Database Systems: MySQL

Usage: These systems can be used for storing and managing the recommendation system's data, such as user profiles, item metadata, and interaction logs.

v. Web Development Frameworks: Flask, Django, React

Usage: These frameworks can be used for developing the recommendation system's user interface and deploying it as a web application.

vi. Version Control Systems: Git, SVN

Usage: These systems can be used for managing the recommendation system's source code and collaborating with team members.

vii. Cloud Platforms: Amazon Web Services (AWS), Microsoft Azure, Google Cloud Platform (GCP)

Usage: These platforms can be used for deploying the recommendation system in a scalable and cost-effective manner, as well as for managing and monitoring its infrastructure.

14. Current State of Project:

i. User interface:

Front-end landing page designed using HTML/CSS/Bootstrap

ii. Database has been designed using Ms-SQL

```
Select * from dbo.Restaurants
```

107 %

Results Messages

	Restaurant_Name	Cuisine_Type	Address	City	Province_State	Country	Postal_Zip_Code	Phone_Number	Price_Range_per_person	Average_Rating_out_of_5	Number_of_Reviews
1	The Keg	Steakhouse	123 Main St	Toronto	Ontario	Canada	M5V 1J1	(416) 555-1234	$40-$60	4.5	500
2	Joe's Pizza	Italian	456 7th Ave	New York	New York	Canada	10001	(212) 555-5678	$10-$20	4	1000
3	Sushi Garden	Japanese	789 5th St	Vancouver	British Columbia	Canada	V5T 1C6	(604) 555-9012	$20-$30	4.2	300
4	La Belle Province	Fast Food	987 Rue Sainte-Catherine	Montreal	Quebec	Canada	H2L 2G2	(514) 555-3456	$5-$10	3.5	200
5	The Cheesecake Factory	American	321 Magnolia Blvd	Burbank	California	Canada	91502	(818) 555-6789	$30-$50	4.3	800
6	Tres Camales Taqueria	Mexican	10119 100a St	Edmonton	Alberta	Canada	T5J 0R5	(780) 555-2345	$15-$25	4.6	150
7	Le Garde-Manger	French	408 Rue Saint-Francois-Xavier	Montreal	Quebec	Canada	H2Y 2S9	(514) 555-7890	$40-$60	4.8	100
8	The Fish Counter	Seafood	3825 Main St	Vancouver	British Columbia	Canada	V5V 3P1	(604) 555-5678	$20-$30	4.4	400
9	The Halal Guys	Middle Eastern	1015 South Figueroa St	Los Angeles	California	Canada	90015	(213) 555-1234	$10-$20	4.1	600
10	Momofuku Noodle Bar	Asian Fusion	190 University Ave	Toronto	Ontario	Canada	M5H 0A3	(416) 555-9012	$20-$30	4.7	250
11	The Green Olive	Mediterranean	123 Main St	Toronto	Ontario	Canada	M5V 3V5	(416) 555-1234	$30-$50	4.2	350
12	The Blue Crab	Seafood	456 7th Ave	Vancouver	British Columbia	Canada	V5L 1C8	(647) 123-4567	$20-$40	4.3	125
13	The Red Tomato	Italian	789 5th St	Montreal	Quebec	Canada	H3C 1T4	(604) 555-7890	$10-$30	4.5	586
14	The Yellow Submarine	Sandwiches	987 Rue Sainte-Catherine	Qubec City	QC	Canada	G1R 3Y7	(780) 555-4321	$20-$30	2.5	369
15	The Purple Eggplant	Italian	321 Magnolia Blvd	Calgary	Alberta	Canada	T2V 0X2	(514) 555-2468	$5-$10	5	756
16	The Orange Peel	Juice Bar	10119 100a St	Edmonton	Alberta	Canada	T5J 0E8	(902) 555-1357	$25-$65	3.5	248
17	The White Rabbit	French	408 Rue Saint-Francois-Xavier	Montreal	QC	Canada	H2Y 2S9	(613) 555-8642	$15-$35	4.6	359
18	The Black Sheep	Gastropub	3825 Main St	Vancouver	British Columbia	Canada	V5V 3N8	(306) 555-9701	$20-$40	4.1	300
19	The Golden Goose	French	1015 South Figueroa St	Toronto	Ontario	Canada	M5E 1N1	(905) 555-2233	$10-$30	3.7	250
20	The Silver Spoon	Italian	190 University Ave	Ottawa	Ontario	Canada	K1N 6N5	(902) 555-8712	$30-$50	4.9	550
21	The Rusty Bucket	Pub Food	5678 Yonge St	Toronto	Ontario	Canada	M2M 3V2	(778) 555-6677	$20-$30	4.4	630
22	The Copper Kettle	British	987 Queen St	Ottawa	Ontario	Canada	K1P 5E4	(306) 555-4433	$5-$10	4.6	120
23	The Wooden Spoon	Comfort Food	123 Main St	Vancouver	British Columbia	Canada	V6A 2S5	(902) 555-6654	$30-$60	4	348
24	The Brick Oven	Pizza	456 7th Ave	Calgary	Alberta	Canada	T2G 0H5	(613) 555-9187	$15-25	1.5	751
25	The Stone Grill	Steakhouse	789 5th St	Qubec City	Qubec City	Canada	G1R 3Z9	(416) 555-3456	$30-50	2.6	150
26	The Iron Chef	Japanese	987 Rue Sainte-Catherine	Montreal	Quebec	Canada	H2L 2G6	(587) 555-9887	$5-15	4.3	350
27	The Spice Box	Indian	321 Magnolia Blvd	Edmonton	Alberta	Canada	T6R 0S4	(450) 555-6789	$10-$20	2.3	450
28	The Sweet Spot	Desserts	10119 100a St.	Vancouver	British Columbia	Canada	V6Z 1N6	(902) 555-9812	$40-$60	4.5	930
29	The Bitter End	Bar Food	408 Rue Saint-Francois-Xavier	Qubec Citv	Qubec Citv	Canada	G1K 4W8	(519) 555-7261	$10-$20	4	100


```
Select * from dbo.Restaurants
```

107 %

Results Messages

	Restaurant_Name	Cuisine_Type	Address	City	Province_State	Country	Postal_Zip_Code	Phone_Number	Price_Range_per_person	Average_Rating_out_of_5	Number_of_Reviews
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5	The Cheesecake Factory	American	321 Magnolia Blvd	Burbank	California	Canada	91502	(818) 555-6789	$30-$50	4.3	800
6	Tres Camales Taqueria	Mexican	10119 100a St	Edmonton	Alberta	Canada	T5J 0R5	(780) 555-2345	$15-$25	4.6	150
7	Le Garde-Manger	French	408 Rue Saint-Francois-Xavier	Montreal	Quebec	Canada	H2Y 2S9	(514) 555-7890	$40-$60	4.8	100
8	The Fish Counter	Seafood	3825 Main St	Vancouver	British Columbia	Canada	V5V 3P1	(604) 555-5678	$20-$30	4.4	400
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10	Momofuku Noodle Bar	Asian Fusion	190 University Ave	Toronto	Ontario	Canada	M5H 0A3	(416) 555-9012	$20-$30	4.7	250
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15	The Purple Eggplant	Italian	321 Magnolia Blvd	Calgary	Alberta	Canada	T2V 0X2	(514) 555-2468	$5-$10	5	756
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22	The Copper Kettle	British	987 Queen St	Ottawa	Ontario	Canada	K1P 5E4	(306) 555-4433	$5-$10	4.6	120
23	The Wooden Spoon	Comfort Food	123 Main St	Vancouver	British Columbia	Canada	V6A 2S5	(902) 555-6654	$30-$60	4	348
24	The Brick Oven	Pizza	456 7th Ave	Calgary	Alberta	Canada	T2G 0H5	(613) 555-9187	$15-25	1.5	751
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29	The Bitter End	Bar Food	408 Rue Saint-Francois-Xavier	Qubec Citv	Qubec Citv	Canada	G1K 4W8	(519) 555-7261	$10-$20	4	100

iii. Tableau Dashboard Analysis

```
Select * from dbo.Things_To_Watch
```

107 %

Results | Messages

	longitude	latitude	code	name	type	phone	dates_open	amenities	state	State_Name	city
1	-114.353	53.675	ALBE	Alberta Beach Family RV Park	CP	780.924.2333	mid may-late sep	WES	AB	Alberta	Alberta Beach
2	-112.332	53.88	ANDR	Andrew RV Park	CP	780.365.3687	mid may-late aug	WES	AB	Alberta	Andrew
3	-113.962	52.034	ANTH	Anthony Henday	CP	403.318.3508	mid may-mid oct	E DP SH RS	AB	Alberta	Innisfail
4	-110.59	52.75	ARML	Arm Lake Rec Area	CP	780.842.4727	mid may-mid oct	WE	AB	Alberta	Wainwright
5	-117.164	58.49	ASPE	Aspen Ridge	CP	780.926.4540	All Year	WES	AB	Alberta	High Level
6	-116.073	52.396	AYLM	Aylmer Provincial Rec Area	PP	403.845.8349	All Year	NR	AB	Alberta	NULL
7	-113.532	54.733	BAPT	Baptiste Lake	CP	NA	mid may-mid sep	NH	AB	Alberta	Athabasca
8	-112.463	50.787	BASS	Bassano Homecoming Trailer Park	CP	403.641.3788	mid may-late oct	WE	AB	Alberta	Bassano
9	-110.027	49.652	BATT	Battle Creek - Cypress Hills Interprov. Park	PP	403.893.3833	All Year	NR	AB	Alberta	Elkwater
10	-114.167	52.966	BATT	Battle Lake Park	CP	780.586.0722	all year	DP SH	AB	Alberta	Wetaskiwin
11	-116.158	53.74	BEAR	Bear Lake	CP	780.693.2479	mid may-mid sep	NH	AB	Alberta	Edson
12	-114.1	49.413	BEAU	Beauvais Lake Provincial Park	PP	403.382.4097	All Year	E NR	AB	Alberta	Pincher Creek
13	-110.294	49.658	BEAC	Beaver Creek - Cypress Hills Interprov. Park	PP	403.893.3833	All Year	WE RS	AB	Alberta	Elkwater
14	-114.797	50.857	BEAF	Beaver Flats - Elbow Falls Provincial Rec Area	PP	403.949.4261	All Year	NH NR	AB	Alberta	Bragg Creek
15	-111.881	54.758	BEAL	Beaver Lake Provincial Rec Area	PP	780.623.9222	All Year	E RS	AB	Alberta	Lac La Biche
16	-114.298	49.367	BEAM	Beaver Mines Lake Rec Area	PP	403.563.5395	All Year	NR	AB	Alberta	NULL
17	-116.01	52.489	BEAD	Beaverdam Provincial Rec Area	PP	403.845.8349	All Year	NR	AB	Alberta	NULL
18	-119.434	55.214	BEAV	Beaverlodge Pioneer	CP	780.354.2201	mid may-late sep	WES DP SH	AB	Alberta	Beaverlodge
19	-113.529	51.387	BEIS	Beiseker Municipal	CP	403 888.9730	mid may-mid oct	WES	AB	Alberta	Beiseker
20	-112.152	54.105	BELL	Bellis Beach Lake	CP	780.656.3037	mid may-mid oct	NULL	AB	Alberta	Smoky Lake County
21	-113.685	49.025	BELL	Belly River - Waterton Lakes National Park	CNP	NA	All Year	NH NR	AB	Alberta	Waterton Park
22	-115.581	53.733	BETA	Beta Lake	CP	780.723.4800	mid may-mid oct	NH	AB	Alberta	Nojack
23	-118.365	53.756	BIGB	Big Berland Provincial Rec Area	PP	780.827.1382	All Year	NR	AB	Alberta	NULL

iv. Accuracy has been tested for the restaurants data.

```
X = df_num.drop('Average Rating (out of 5)', axis=1)
y = df_num['Average Rating (out of 5)']
```

```
X_train, X_val, y_train, y_val = train_test_split(X, y, test_size=0.2)

rf = RandomForestRegressor(n_estimators=100, n_jobs=-1, oob_score=True)

rf.fit(X_train, y_train)

rf.score(X_train, y_train)
```

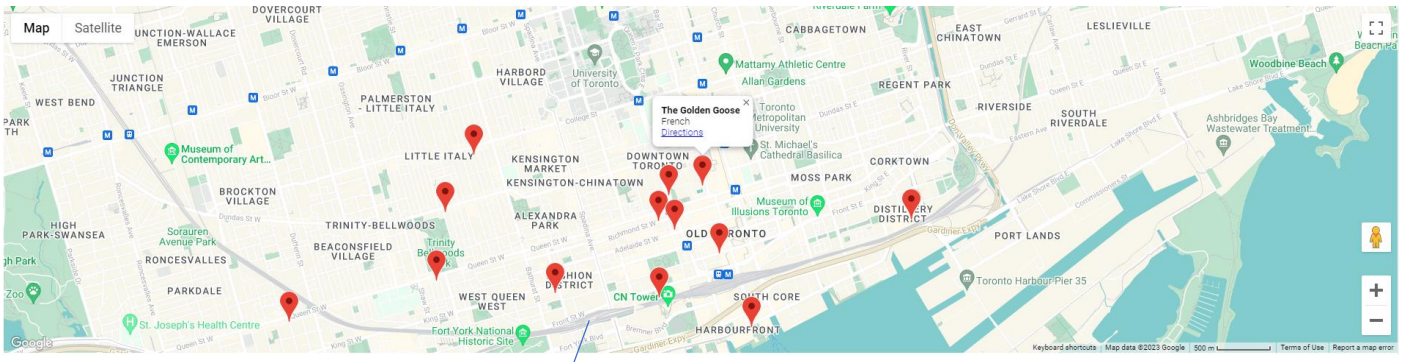
```
0.807523124401537
```

v. Backend Code for UI and Database connection to filter restaurants.

```
const mysql = require('mysql');

// Create a connection to the MySQL database
const connection = mysql.createConnection({
  host: 'RAHUL/RAHUL NIKKI',
  user: 'localhost',
  password: '',
  database: 'ExploreCAN'
});

// Establish the connection
connection.connect((err) => {
  if (err) {
    console.error('Error connecting to the database: ' + err.stack);
    return;
  }
  console.log('Connected to the database');
});

// Define the search function
function search(query, callback) {
  const filteredQuery = filterQuery(query);

  // Perform the SQL query
  const sql = `SELECT * FROM restaurants WHERE city = 'Toronto';`;
  connection.query(sql, (err, results) => {
    if (err) {
      console.error('Error executing the search query: ' + err.stack);
      callback(err);
      return;
    }
    callback(null, results);
  });
}

// Function to filter out SQL queries
function filterQuery(query) {
  const filteredQuery = query.replace(/[^a-zA-Z0-9]/g, '');

  return filteredQuery;
}
```

vi. Google Maps API code

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <link rel="stylesheet" href="style.css" />

      <style>
        *{
            margin: 0;
            padding: 0;
        }
        #map{
            height: 500px;
            width: 100%;
        }
      </style>
    <title>ExploreCan</title>
</head>
<body>
    <div id="map">
        <script>
            function initMap(){
                var location = {lat: 43.653225, lng: -79.383186}
                var map = new google.maps.map(document.getElementById("map"),{
                    zoom: 4,
                    center: location
                });
            }
        </script>
        <script async defer src="https://maps.googleapis.com/maps/api/js?key=AIzaSyBtoyMymbAaEn007chUXHRLzcVNdoD4TFE&callback=initMap"></script>

    </div>
</body>
</html>
```




```sql
SELECT * FROM restaurants WHERE city = 'Toronto';
```

107 %

Results | Messages

	Restaurant_Name	Cuisine_Type	Address	City	Province_State	Country	Postal_Zip_Code	Phone_Number	Price_Range_per_person	Average_Rating_out_of_5	Number_of_Reviews
1	The Keg	Steakhouse	123 Main St	Toronto	Ontario	Canada	M5V 1J1	(416) 555-1234	$40-$60	4.5	500
2	Momofuku Noodle Bar	Asian Fusion	190 University Ave	Toronto	Ontario	Canada	M5H 0A3	(416) 555-9012	$20-$30	4.7	250
3	The Green Olive	Mediterranean	123 Main St	Toronto	Ontario	Canada	M5V 3V5	(416) 555-1234	$30-$50	4.2	350
4	The Golden Goose	French	1015 South Figueroa St	Toronto	Ontario	Canada	M5E 1N1	(905) 555-2233	$10-$30	3.7	250
5	The Rusty Bucket	Pub Food	5678 Yonge St	Toronto	Ontario	Canada	M2M 3V2	(778) 555-6677	$20-$30	4.4	630
6	The Funky Chicken	Southern	3825 Main St	Toronto	Ontario	Canada	M4C 1J6	(905) 555-8876	$20-$30	4.2	120
7	Ay Caramba	Mexican	123 Main St, Toronto, ON	Toronto	Ontario	Canada	M4C 1S5	(902) 555-4123	$10-$15	4.5	174
8	El Catrin	Mexican	18 Tank House Lane, Toronto, ON	Toronto	Ontario	Canada	M5A 3C4	(613) 555-6543	18-30	4.1	315
9	Fishbone By The Lake	Seafood	235 Queen St W, Toronto, ON	Toronto	Ontario	Canada	M5V 1Z4	(780) 555-5432	20-33	4.2	178
10	Grand Electric	Mexican	1330 Queen St W, Toronto, ON	Toronto	Ontario	Canada	M6K 1L4	(902) 555-1234	22-36	4.5	401
11	Honest Weight	Seafood	277 Front St W, Toronto, ON	Toronto	Ontario	Canada	M5V 2X4	(416) 555-9876	24-39	5	307
12	Lee Restaurant	Asian Fusion	601 King St W, Toronto, ON	Toronto	Ontario	Canada	M5V 1M5	(506) 555-4567	28-46	3.7	392
13	Bistro 1060	French	1060 Yonge	Toronto	Ontario	Canada	M4T 2Z6	905-555-1234	33-45	1.5	155
14	Canoe	Canadian	66 Wellington St W	Toronto	Ontario	Canada	M5J 2N6	613-555-7890	39-42	4.2	355
15	Black Hoof	Charcuterie	928 Dundas St W	Toronto	Ontario	Canada	M6J 1W8	519-555-6543	41-44	4.3	132
16	Miku	Japanese	10 Bay St #105	Toronto	Ontario	Canada	M5V 3M5	778-555-9876	44-47	4.4	163
17	Lee	Asian Fusion	601 King St W	Toronto	Ontario	Canada	M5V 2V4	250-555-4321	47-50	4.5	167
18	Pure Spirits Oyster House & Grill	Seafood	17 Tank House Ln	Toronto	Ontario	Canada	M5A 1K3	902-555-7890	$20-$30	3.5	371
19	Bymark	Canadian	66 Wellington St W	Toronto	Ontario	Canada	M5J 2H7	604-555-3210	$5-$10	4.3	387
20	Bar Raval	Spanish	505 College St	Toronto	Ontario	Canada	M6J 2Z7	902-555-3456	$40-$60	4.4	147
21	Oyster Boy	Seafood	872 Queen St W	Toronto	Ontario	Canada	M6J 1W8	902-555-1234	$10-$20	4.7	214

All the restaurants of Toronto displayed in this map.

15. Challenges

i. Data availability and quality:
   a. The quality and quantity of data available can greatly affect the accuracy and effectiveness of the recommendation system.
   b. There may also be challenges in acquiring relevant data, especially for new or small businesses that may not have a significant online presence.

ii. Privacy concerns:
   a. Collecting and using personal data to make recommendations can raise concerns around privacy and data security.
   b. It will be important to ensure that the system is designed in compliance with relevant laws and regulations and that users are fully informed about the use of their data.

iii. User diversity:
   a. Tourists and locals may have different preferences and requirements when it comes to restaurants and attractions, making it difficult to create a one-size-fits-all recommendation system.
   b. Additionally, cultural differences and language barriers may also pose a challenge.

vii. Scalability:
   a. As the number of businesses and users increases, it can become challenging to maintain the speed and efficiency of the recommendation system.
   b. This may require the adoption of more robust technologies and infrastructure.

viii. Integration with existing systems: Integrating the recommendation system with existing booking or reservation systems used by businesses may be a challenge, especially if the systems are not compatible.

16. Conclusion

In conclusion, the creation of a recommendation system for Canadian restaurants and tourist attractions has been progressing well. The project charter was created, and the project team is following a well-defined timeline. The data cleaning, pre-processing, and feature extraction phases have been completed, and we are currently in the recommendation generation and user interface design stages.

We have faced some technical and logistical challenges, such as the collection of reliable and diverse data, ensuring the scalability of the system, and dealing with potential privacy concerns. However, we have implemented appropriate techniques and strategies to address these challenges, such as adopting cloud-based technologies, using advanced machine learning algorithms, and following ethical guidelines.

Our team is continually striving to improve the system's accuracy, performance, and usability. We will conduct thorough testing and evaluation to ensure that the system meets the project goals and objectives. Additionally, we will maintain effective communication with stakeholders and users to gather feedback and incorporate their suggestions into the system.

Overall, we are optimistic about the project's progress and believe that the final system will provide valuable recommendations for Canadian restaurants and tourist attractions, benefiting both locals and tourists alike.

17. References

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