

Functional Specification of MyTrip

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1. Introduction

1.1 Overview

MyTrip is a web application for travel enthusiasts. It acts as a recommender system for people going on trips that want to experience events and activities that suit their interests.

Currently trip planning websites already exist but we find that they appeal to a very particular group of people. Most of these websites cater towards family attractions and a lot of the time they are attractions most people are already aware of. The goal of our application is to improve this experience, recommending people attractions/activities that suit their interests and filter out the ones they will dislike. Travel websites lack this USP that keeps people returning.

MyTrip plans on solving this issue by using machine learning algorithms such as content based filtering and semantic analysis to generate recommended activities based on the user's interests.

Content based filtering

User's will be able to build their profile by selecting interests and hobbies that they enjoy. They can then create a trip, providing the location. Based off of their interests in their profile, the machine learning algorithm will generate recommended activities for them in this location. The machine learning algorithm will constantly learn what a user is interested in by gathering the click information when they view the recommended activities. This data will then be used to refine the recommendations.

Semantic analysis

User's will be able to leave reviews for events or activities and semantic analysis will be used to determine if the review is positive or negative. User's will then be able to see a percentage rating associated with every event/activity based on the reviews.

1.2 Business Context

This web app could be sold to the travel and tourism industry (such as Failte Ireland) in order to increase tourism in different parts of the world and attract people to all sorts of events and attractions that people wouldn't usually go to while travelling. This would boost sales in the hospitality, tourism and entertainment industries.

1.3 Glossary

Term	Description
Event/Activity/Attraction	Any place a user might visit while on a trip
USP	Unique selling point

2. General Description

2.1 User Characteristics and Objectives

Users will be able to access MyTrip on any web browser. Our users will be those looking to plan a trip or holiday away but rather than going to the usual tourist attractions, they will be recommended places that meet their interests. The target audience for the web-app is anyone planning on going on a trip or holiday and want to find things to do while they are there.

MyTrip will be developed with a user-friendly layout. It will be intuitive for the user. We don't want our user's having to figure out how to use the app. It will be seamless and efficient for the user. It will be designed with all users in mind and therefore it will follow best design practices. For example, taking into account the size of buttons so all users will be able to press them without any hassle.

2.2 Operational Scenarios

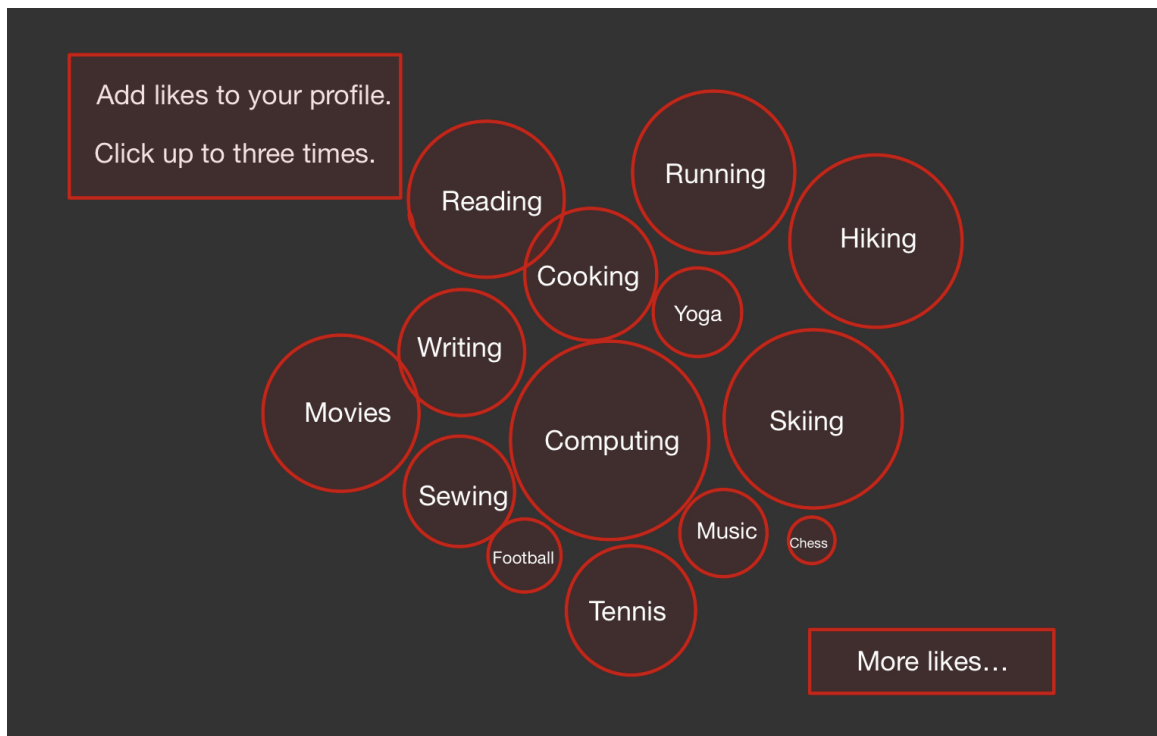
2.2.1 Creating an account

If the user does not already have an account, they will be prompted to create an account

2.2.2 Building profile

When an account has been created, they will then be asked to tell the application a little bit about themselves. This will be age, home country and most importantly they will start by manually inputting some of their likes. This will avoid a cold start of data on the user profile. They will be presented with bubbles that they can press up to three times to illustrate the amount they value a given interest/hobby. They can also remove attraction types and recommended likes.

Mock-up Profile Builder:



2.2.3 Logging in

Once the user has a profile, they will be able to log in to and use their account

2.2.4 Creating a trip

The user will then be able to create a trip. Once they create a trip, they will be asked to fill in the following information

1. Location of trip

2. Date/time of arrival
3. Duration and time of return

This will then automatically bring the user to the homepage for their trip

2.2.5 Accessing a current trip

Once the user is logged in they will be able to access a trip they are currently on. The application will class a trip as current if the start date of the trip has passed but the end date has not yet been reached.

2.2.6 Accessing a recommendation tile

On the homepage of a trip, you will be presented with a collection of recommendation tiles. These tiles will give a brief summary of the attraction/event. The tile will have the ability to be clicked, this will turn the tile over. On the back of the tile, you will get a more detailed account of the attraction/event. The details may consist of location, distance from where you are and why this tile was recommended to you (which of your likes it appeals to most). It will also contain reviews that others have left and a percentage rating showing how liked or disliked the event is.

2.2.7 Using a path that has been created for you

Alongside the collection of tiles, you will also see the "paths" section. These are a prepared collection of activities/events that the application deems appropriate to bundle together. This can vary from an afternoon out to a full day away.

2.2.8 Filter Recommendation (change preferences)

You will be able to tell the application which of your interests you would like to appeal to most at that moment in time.

2.3 Product Functions

2.3.1 Log in/Create account

When the app is launched, the user will be able to log in to their existing account. If they do not have an account, they will be prompted to create a new account.

2.3.2 Profile builder

When the user logs in for the first time, the app will prompt them to select their interests. These will appear on-screen for the user to select.

2.3.3 Forgot password

If a user forgets their password, they will be able to retrieve their password using this password recovery option

2.3.4 Create trip

The app will allow users to create a trip. This will involve inputting the destination of where they are planning on going. The user can then specify what day they are arriving and how long they plan to go on this trip for. The machine learning model will then generate a list of recommended events/attractions for the user based on their interests in their profile, the events/attractions they have previously clicked on, the location of where they are going and the date they will be arriving.

2.3.5 Current Trip

This displays a user's current trip. They can view this to show them all the recommended places they might like to visit while on their holiday and from here they can also create a path.

2.3.6 Getting user click information

The system will have to be able to get and store the user's click information when they are viewing their current trip. Whatever events/attractions they view will be regarded as an interest to the user. This information will then be used to recommend more events/attractions.

2.3.7 Profile settings

The user will be able to access their profile settings. This will include the profile builder so they can change their preferences whenever they like. It will also include the option to delete their account.

2.3.8 Activity/attraction description & percentage rating

The app will describe the activity in more detail for the user. It will show reviews of what other's thought of it and also give a percentage rating showing if people liked or disliked it. Semantic analysis will be used to determine if a user's review is positive or negative and the percentage rating will then be associated with the event/attraction.

2.3.9 Create Path

Within the current trip section of the app, a user can create a path. If a user submits specified parameters such as the times they would like to eat or when they would like to return home for, the application will build them a day to best suit their needs based off of the recommended activities generated by the machine learning model.

2.3.10 Delete trip

The app will allow a user to delete a trip if they decide to cancel or if they didn't input any of the details they wanted correctly.

2.3.11 Delete Account

If a user no longer wants to use the app, they can delete their account.

2.4 Constraints

2.4.1 Machine Learning:

As neither of us have dealt with machine learning before, it will take time to learn about how we will implement the machine learning model for both the recommender system and the semantic analysis. Large amounts of data will also be needed. Currently, we don't know what datasets will be used.

2.4.2 Recommender System:

The recommended events/activities that a user sees will be generated using this machine learning algorithm. It needs to accurately return the recommended events/attractions that best suit the user's needs. This will be quite difficult to implement as every user's interests will be different and the algorithm will have to recommend accordingly.

2.4.3 Semantic Analysis:

The semantic analysis algorithm will be the other challenging machine learning aspect of the project. The user reviews will have to be broken down and understood by the system to accurately return the rating associated with an event/attraction. These events/attractions will rely on the semantic analysis algorithm to work correctly in order to display the correct rating.

2.4.4 Database/Dataset storage:

Large amounts of data will be needed to train our machine learning model. We will therefore need to find an efficient dataset storage solution to store our machine learning datasets.

2.4.5 Time:

The project is due in April 2022. This gives us only a couple of months to build the entire system. Getting all of this done in such a short space of time will be challenging.

3. Functional Requirements

3.1 Create Account:

Description:

This is the first interaction a user has with the web app. The user Clicks on "Create account" and this redirects them to a form that will have to be filled out. The form will ask the user to fill in their name, email address and password. This email and password will allow them to

log back into the app to access their account. Once the form has been submitted, they will receive an email confirmation.

Criticality:

This is essential for the users to do. They must create an account or they will not have access to the web app. Without an account a user can't create a trip or see recommended places.

Technical Issues:

All the login data needs to be stored correctly in the database. Each login must be unique to that user.

Dependencies:

Without this function, a user will not be able to login to the web app and access its features.

3.2 Login:

Description:

If a user has already created an account, they will be able to login using their email address and password that they registered with. Once they login, the users will have access to the web app.

Criticality:

Logging in to the app is essential. A user has to login in order to access the app and all its features.

Technical Issues:

Ensuring the user's details are retrieved from the database correctly.

Dependencies:

The user must have created an account in order to log in. Otherwise, they will not have access to any features of the web app.

3.3 Forgot Password:

Description:

If a user can't remember their password, they can retrieve it using this option.

Criticality:

This is essential as a user will need to be able to login to access all the features of the app

Technical Issues:

Ensuring that the user can recover their password

Dependencies:

This relies on a user creating an account.

3.4 Profile Builder:

Description:

When a user creates an account, they will fill out information about themselves. This will include their country and their interests/hobbies.

Criticality:

This is very critical to the web app. If we don't have initial information such as interests/hobbies then the app won't be able to recommend anything to the users when they first login. It needs to avoid this cold start.

Technical Issues:

The app will need data in order to recommend places for the users to visit. We need to avoid a cold start and make sure this data is available to our recommendation system.

Dependencies:

The user must be logged in to access the profile builder.

3.5 Create trip:

Description:

When a user is going on a trip, they can select "Create Trip". They will fill out the following:

1. Location of trip
2. Date/time of arrival
3. Duration and time of return

These parameters, along with the user's interests set in their profile and the events/attractions they have previously clicked on will be passed to the machine learning model. This will

generate recommended activities for the user based on all this data and bring the user to the homepage of their trip.

Criticality:

This is essential for the web app to work correctly. In order for the system to recommend events/attractions for the user, it will need this data to be able to function.

Technical Issues:

The app will have to get the correct information to display to the user. It must cater towards the parameters the user specifies and the user's previously clicked on items. The implementation of our recommender machine learning model will be critical for this function to work. It needs to accurately return the recommended events/attractions that best suit the user's needs.

Dependencies:

The user must be logged in and select "Create Trip".

3.6 Current Trip

Description:

This displays a user's current trip. This shows the user all the recommended activities generated by the machine learning model they might like to visit while on their trip. The app will classify it as a current trip if the start date has passed but the end date hasn't been reached yet. It will give the user a description of all the events/attractions listed, reviews and a percentage rating showing how liked or disliked the event is by other users.

Criticality:

This feature is very important as once a user creates a trip, they need a way to view all the events/attractions recommended to them and the descriptions of each. This feature will rely on our machine learning recommender model in order to recommend the user the most relevant events/attractions to them.

Technical Issues:

Need to ensure that the current trip is displayed with the correct recommendations. This relies heavily on our recommender machine learning model. We need to implement this correctly in order for the user to see the most recommended events/attractions that best suit them.

Dependencies:

The user must have logged in and created a trip in order to view this.

3.7 Getting user click information

Description:

When a user interacts with the web app (by clicking on recommended events/attractions), the system must gather this data to be stored for later processing by the machine learning model. Whatever events/attractions they view will be regarded as an interest to the user. This data will then be used to recommend other similar events/attractions that a user might be interested in.

Criticality:

This is essential to the app. We want to recommend activities for our users based on what they are interested in. Not only will this data come from their profile, but it will also come from the user's clicks when they view their current trip.

Technical Issues:

Storing the user's click information could cause trouble. Cookies might be used.

Dependencies:

The user must have logged in, created a trip and be viewing their current trip in order for the system to gather this information.

3.8 Activity/Attraction rating

Description:

Every event/attraction that a user can select can have reviews left by other people. If an event/attraction has reviews, it allows our system to perform semantic analysis on the reviews and give back a percentage rating as to how liked or disliked the event/attraction is.

Criticality:

This feature is essential to the app. By having a percentage rating associated with every event/attraction, a user won't have to read all the reviews to get an understanding if they would like the activity.

Technical Issues:

This will rely heavily on our semantic analysis machine learning algorithm. Our implementation will need to understand the words in a review and associate the words with either a user liking or disliking an activity. This will then be used to try and accurately display a percentage rating for that event/attraction. A lot of review data will be needed in order to accurately train the semantic analysis machine learning model.

Dependencies:

A trip will have to be successfully created. The events/ attractions will have to have some reviews in order to generate the percentage rating.

3.9 Activity/attraction description

Description:

On the homepage of a trip, a user will be presented with a collecting of recommendation tiles. These tiles will give a brief summary of the attraction/event. The tile will have the ability to be clicked. This will give a more detailed account of the attraction/event. The details may consist of location, distance from where you are and why this tile was recommended to you (which of your interests it appeals to most). It will also show reviews of what other's thought of it and a percentage rating informing the user how liked or disliked the event/activity was for other people based on their reviews.

Criticality:

This is an essential feature for the app. The users need to be able to see the recommended list of events/attractions in more detail to give them a better idea if they would like to go. The reviews provide our system with data in order to perform semantic analysis. This gives our system the percentage rating for all the events/attractions a user might like to go to.

Technical Issues:

Every event/attraction will have to display a description, reviews and a percentage rating. The description and reviews will have to be accurately gathered from the database and the percentage rating will rely on the semantic analysis machine learning algorithm. These will need to be implemented correctly in order to return the correct results to the user.

Dependencies:

This relies on a trip being created and a user viewing their current trip.

3.10 Create Path

Description:

If a user selects to create a path, the system use the recommended events/attractions that were generated and will build them a day of events that they can go to. The user can select a timeframe and the app will generate a list of places they might like to go to.

Criticality:

This feature isn't essential to the app. It makes the user's experience easier and provides them with things to do while on their trip without them having to manually select them.

Technical Issues:

The app will have to generate a list of places based on the user's interests and the selected parameters. Getting relevant data to the user could be an issue.

Dependencies:

This relies on the user having a current trip.

3.11 Filter Recommendation (change preferences)

Description:

A user can manage their profile interests (hobbies/interests) whenever they want by clicking into their profile.

Criticality:

This is essential to the app, as we would like our users to be able to select or de-select their interests on the fly. If a user realizes that a particular activity isn't for them, they can de-select it and select something new instead. This will then change their recommendations that they will see when they create a new trip.

Technical Issues:

N/A

Dependencies:

The user must be logged in to access the filter preferences

3.12 Delete Trip

Description:

The app must be able to handle deleting trips whenever the user doesn't want to proceed with the current trip.

Criticality:

This is essential to the app as deleting trips will save space in the database.

Technical Issues:

Ensuring the correct trip is deleted and completely removed from the database

Dependencies:

The user must be logged in and have created a trip in order for them to delete it.

3.13 Delete Account

Description:

A user must be able to delete their account if they want to stop using the web app.

Criticality:

This is essential to the app as deleting accounts will save space in the database.

Technical Issues:

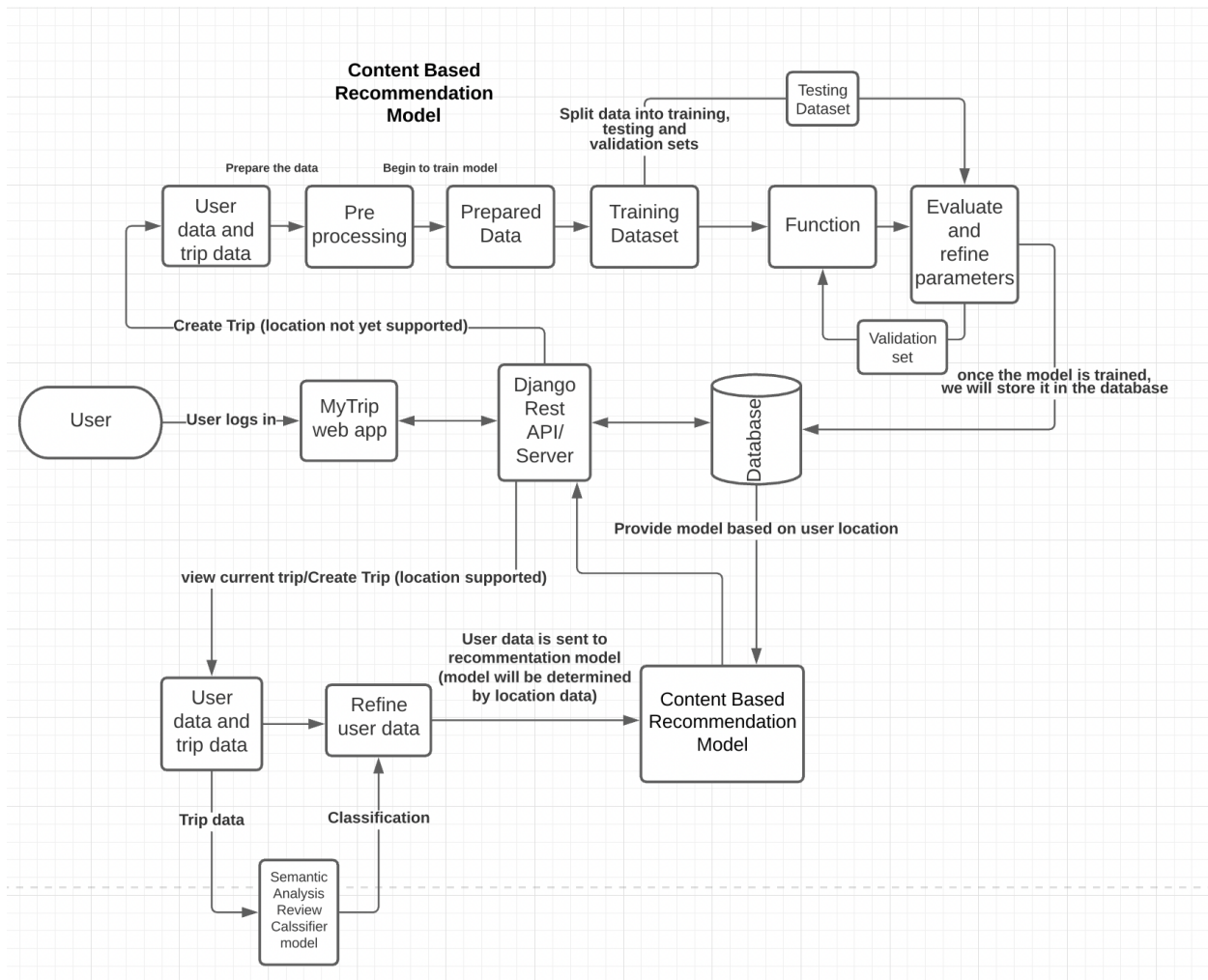
Ensuring the correct user is deleted and completely removed from the database

Dependencies:

The user must be logged in to delete their account.

4. System Architecture

4.1 Application architecture with Content Based Recommendation Model



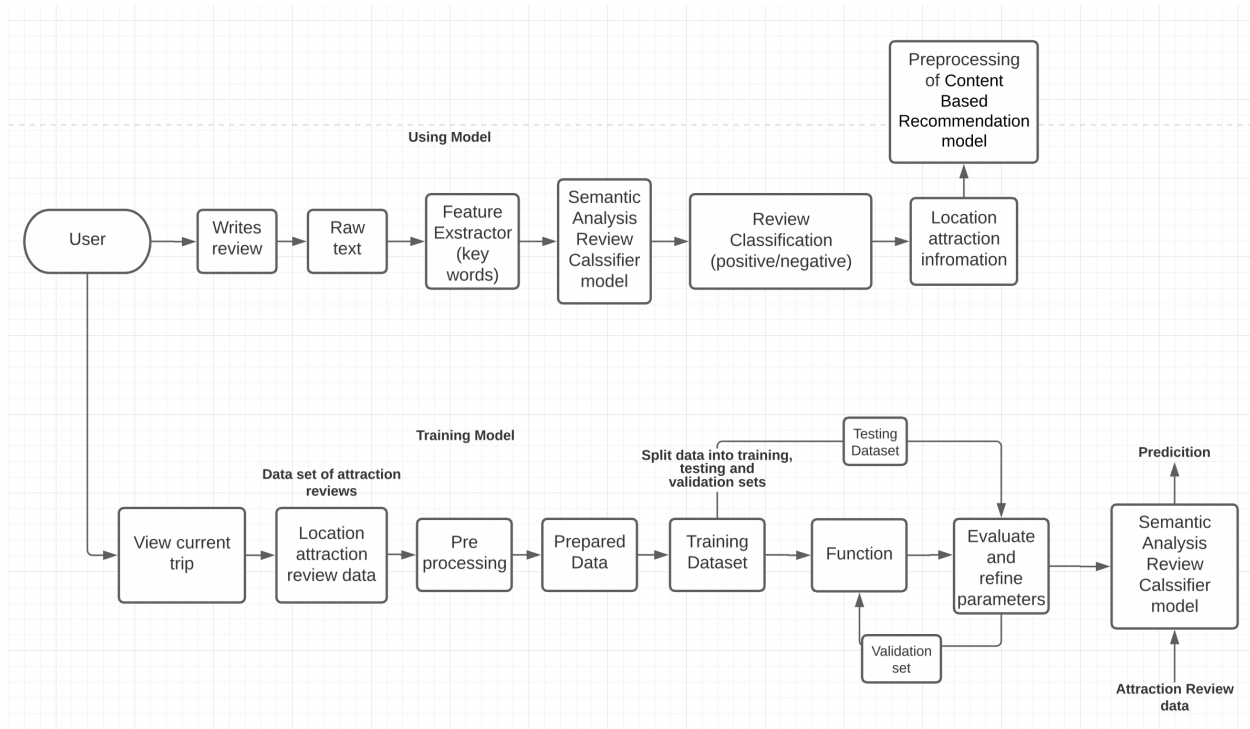
In the above diagram, the application offers the user two options once they log in. The first of these is to create a trip.

Create a trip functionality can work one of two ways.

1. The location they wish to plan a trip for exists in the database. If this is true, we then retrieve this model from the database of existing models. The users information is then prepared and the model is used to create a collection of suitable recommendations.
2. The location they wish to plan a trip for **doesn't** exist in the database. If this is true, we then begin to train a model for this given location. We pre-process the user data, the location data and mock review data (as no user will have been able to leave a review on a location that is not yet supported). Once the model is created and successfully trained, it will be added to the database for the system. It will then be returned to the current user and future users as a

supported location. The model will then be used and the user will be presented appropriate recommendations based on their profile.

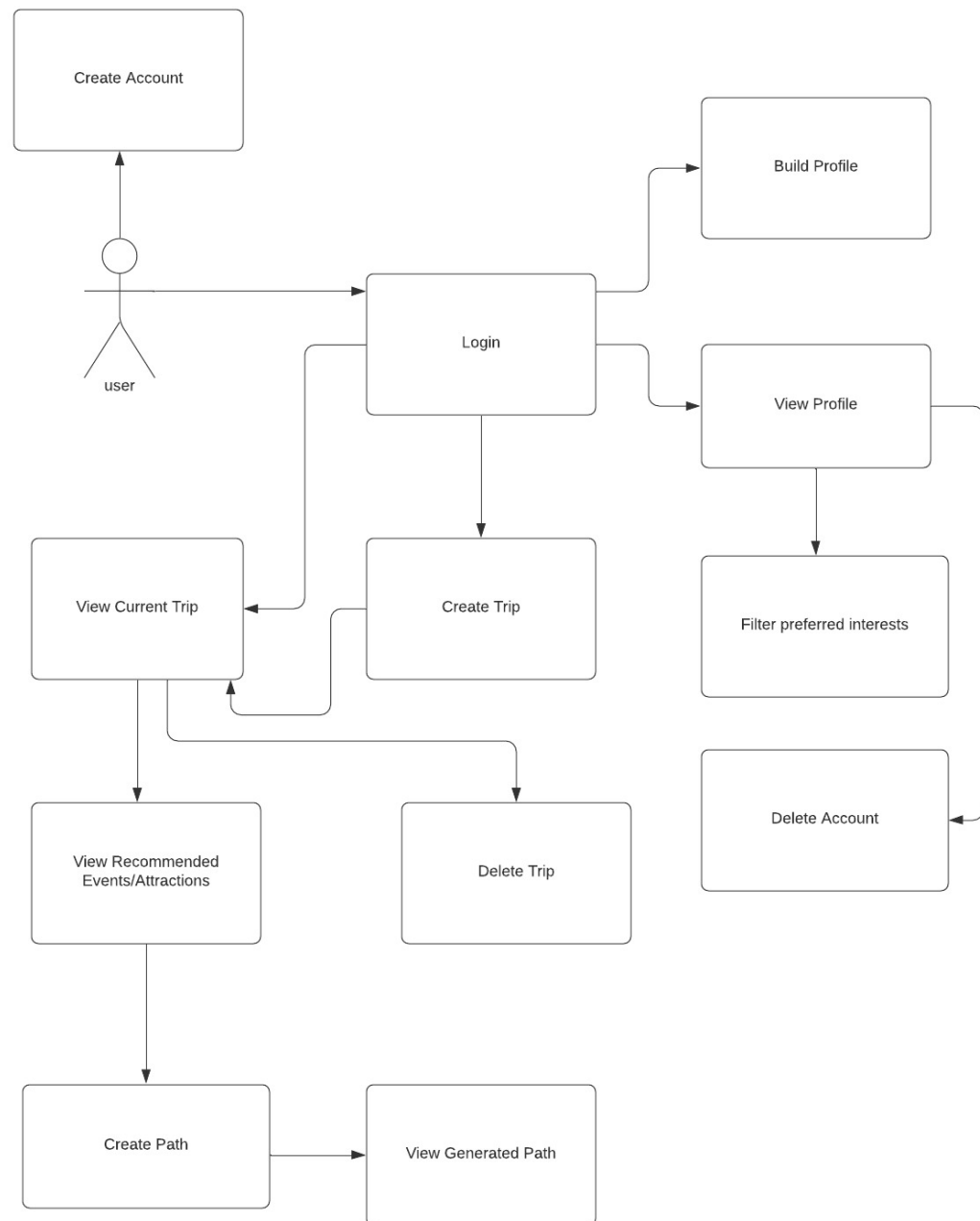
4.2 Semantic analysis model architecture



For semantic analysis, you can either create the model for a given location, or used a trained model for a given location. The trained model works by taking in a user submitted review and using a feature extractor to isolate words/phrases that we can use to determine if a review is positive/negative. The output will be this classification of positive or negative review.

5. High Level Design

5.1 User web application overview



This diagram is an overview of all the possible actions a user can have while using this web app.

A user creates an account and logs in. Once they log in, they have access to all the functionalities of the web app.

The first time they log in, they will have to build their profile. This will involve selecting their preferred interests.

Upon logging in any other time, users can:

View their profile and filter their preferred interests. They can also delete their account from here

Create a trip. This will generate a list of events/attractions for the user, based on their interests, in the destination that they provide

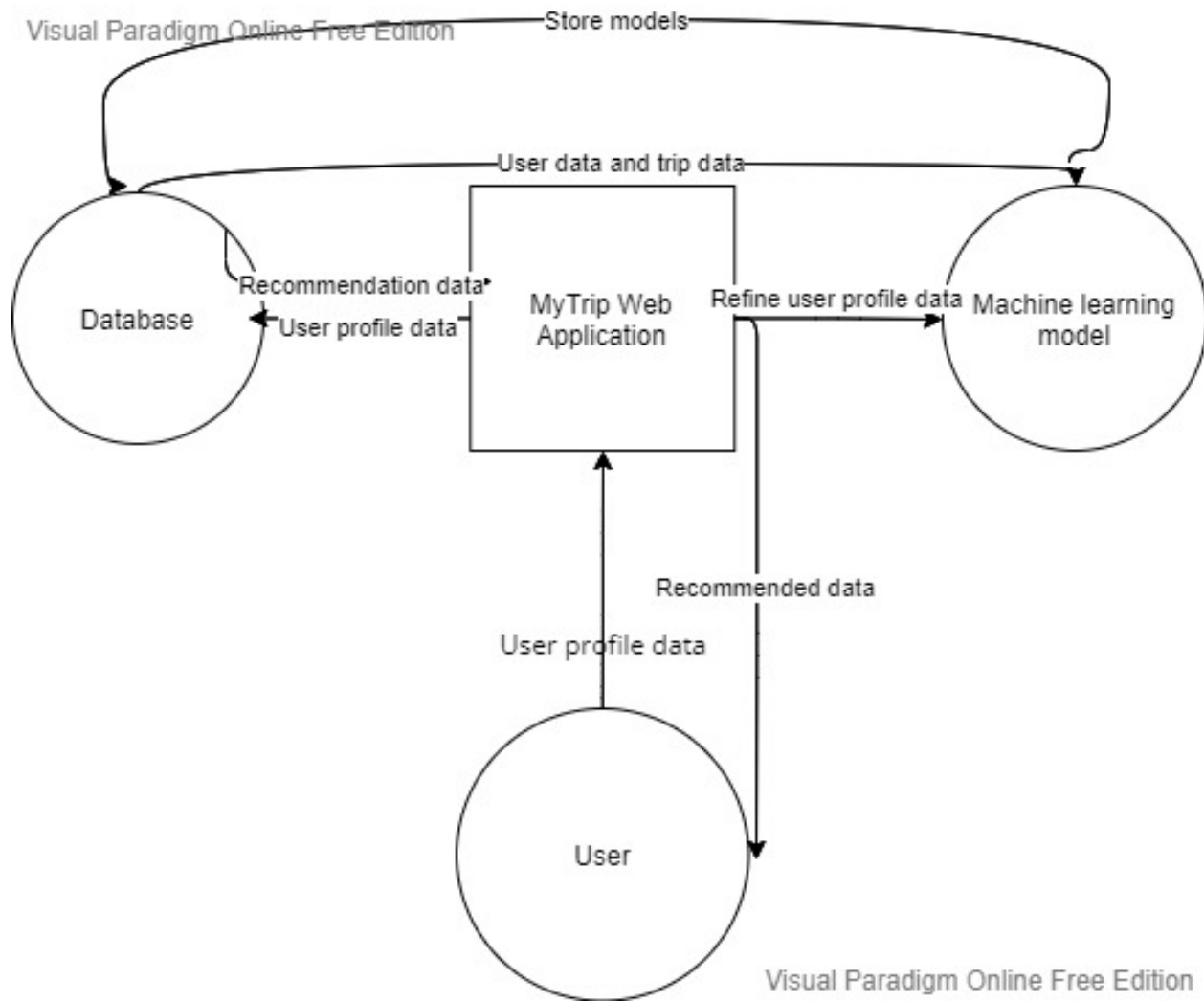
Once a user creates a trip, they can view it. This will allow them to view the recommended events/attractions

While viewing a trip, a user can create a path. This will generate a select number of events/attractions a user should go to based on the recommended activities and user selected parameters

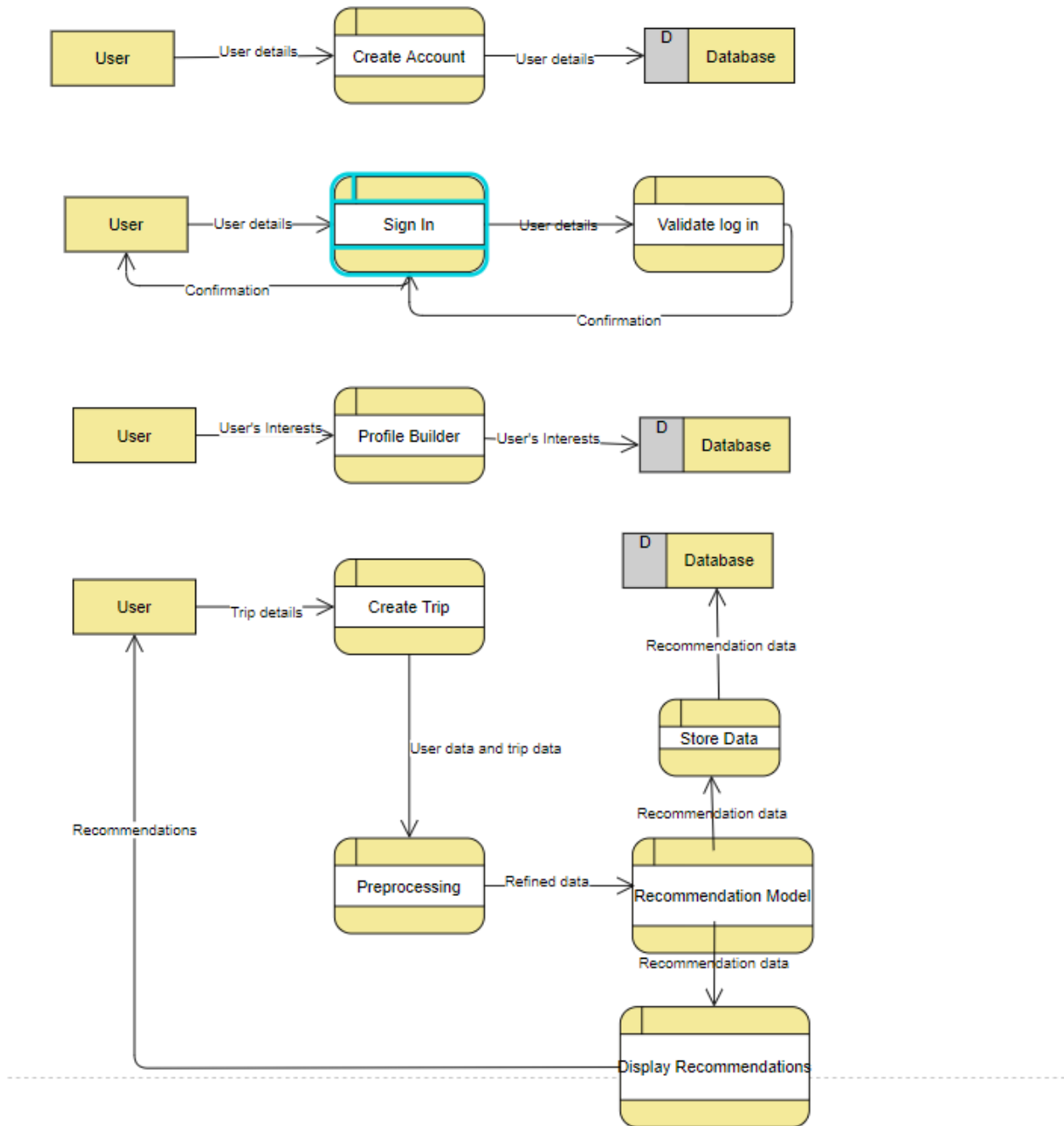
While viewing a trip, a user can also delete the trip from there

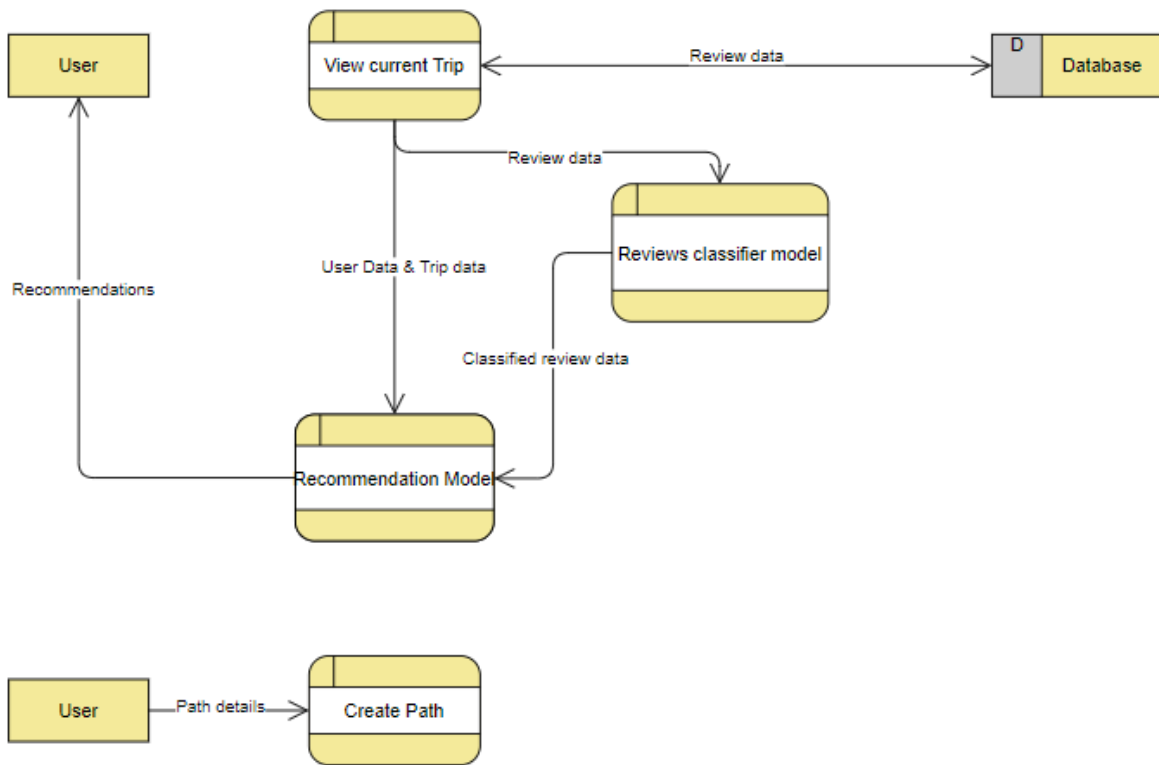
5.2 Context Diagram

This is referred to as a level 0 data flow diagram. A context diagram gives a general overview of the application, showing how processes interact with external entities. We can see in the diagram below, the relationship between the user, the database, the machine learning model and the web application.



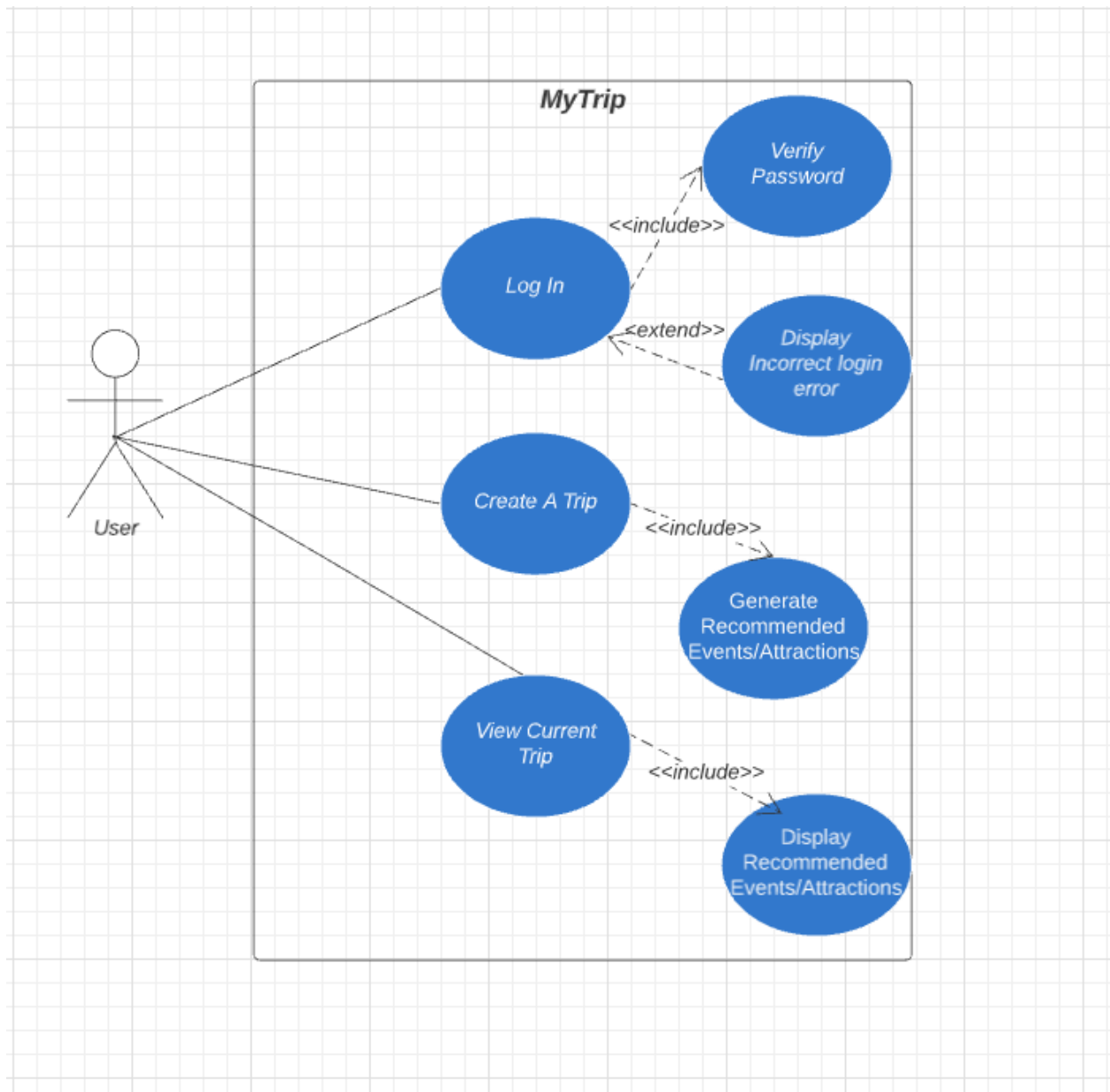
5.3 Data Flow Diagram



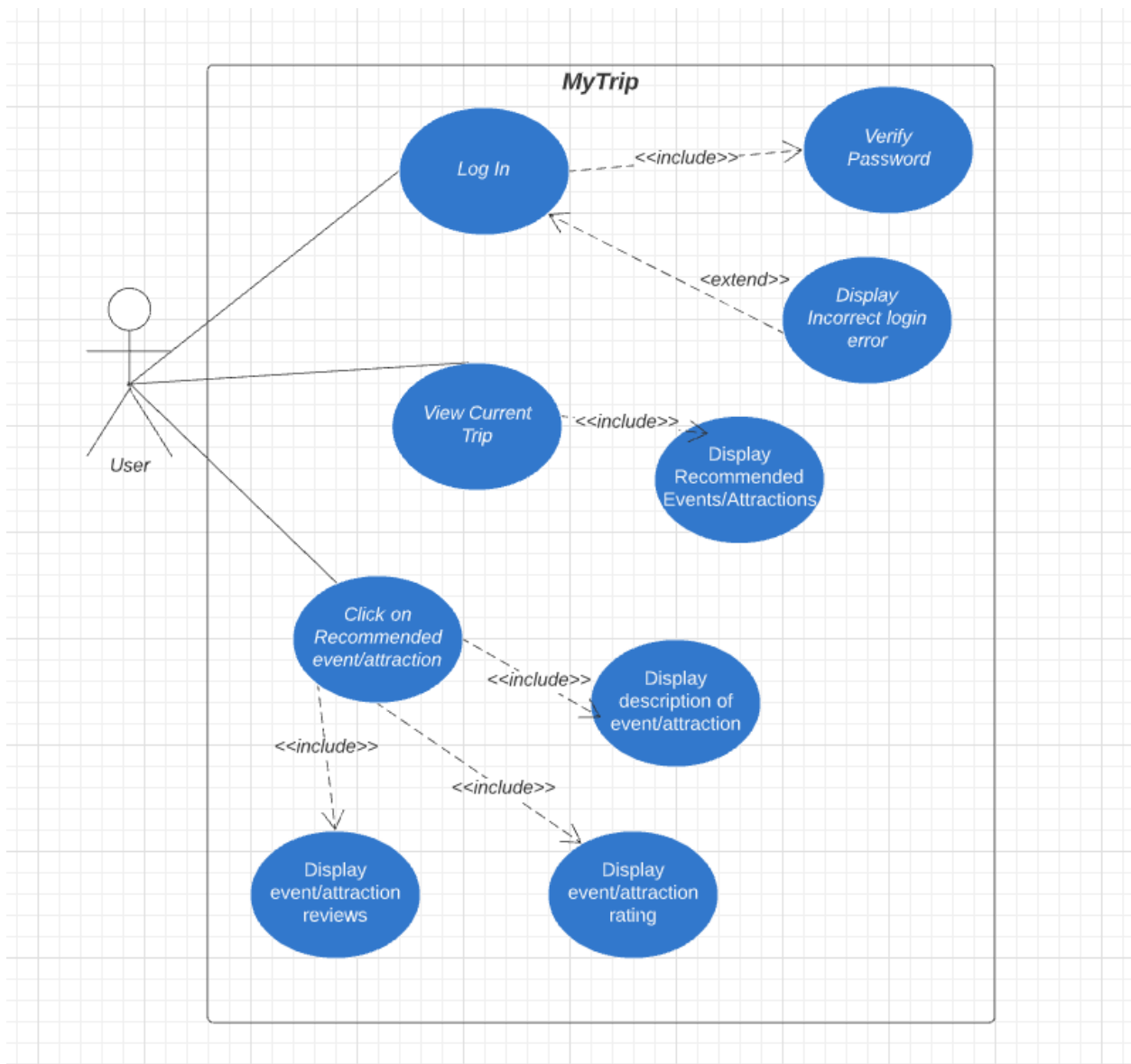


This data flow diagram (DFD) describes the flow of information in our system. It shows the various inputs and outputs of each component and processes and gives us an understanding of how our system will operate. It takes into account entities such as a user, processes such as "create trip" and datastores which is our database.

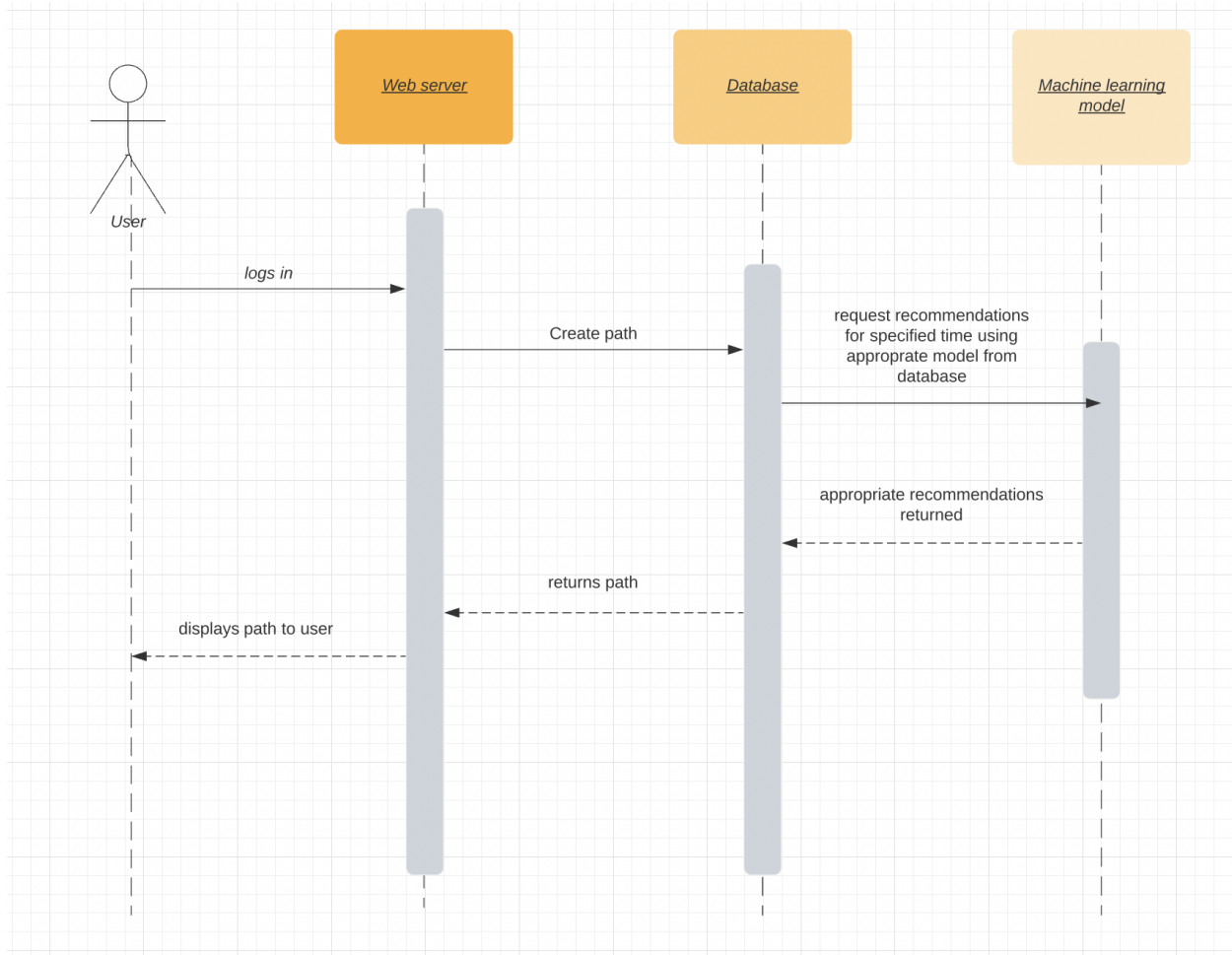
5.4 View Current Trip - Use Case Diagram:



5.5 View a recommendation tile - Use Case Diagram:

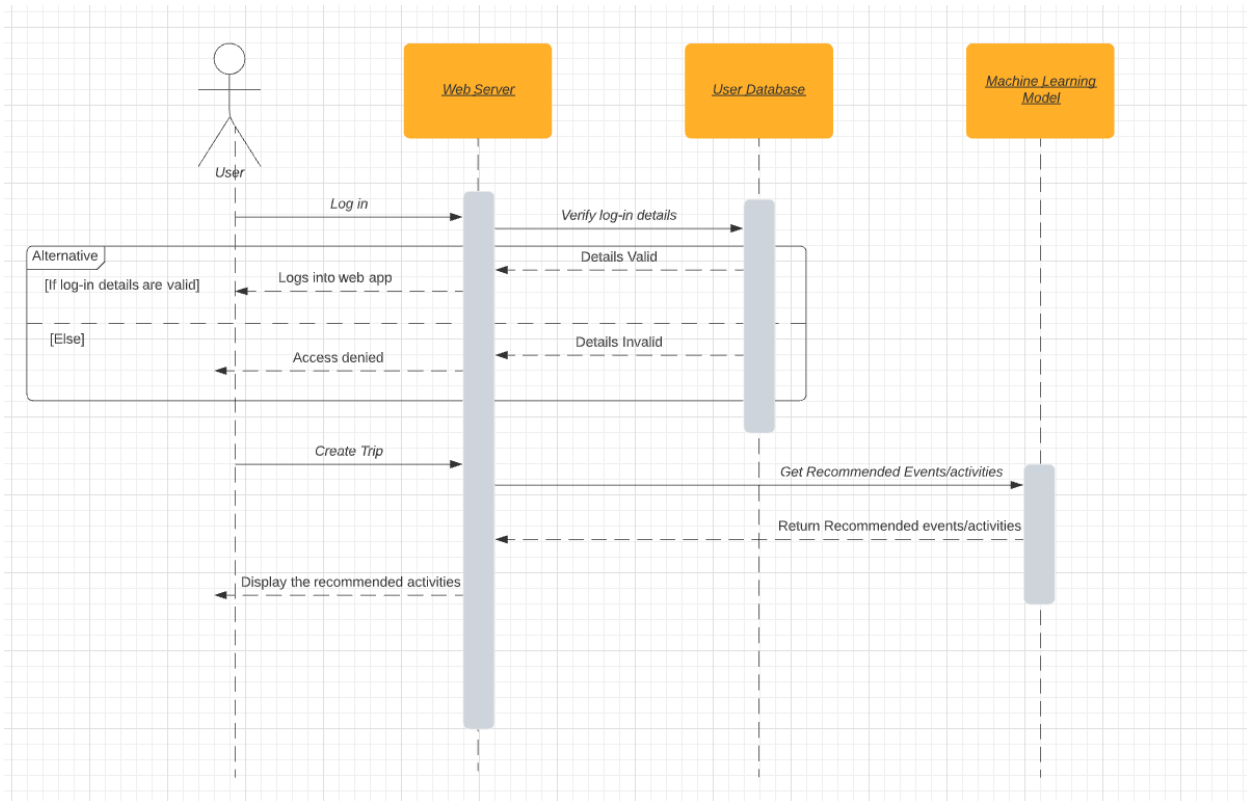


5.6 Create Path Sequence case diagram:



The above diagram assumes that the user is already in the current trip, as this is the only place that the user can create a "path".

5.7 Create Trip Successfully - Sequence Diagram



If a user wants to create a trip, they log in to the web app. The web server will check with the database if they provided correct login details. If they did, they will be granted access to the app, otherwise they will have to try again.

Once they have been logged in, the user selects "create trip". This will trigger the recommender machine learning algorithm to generate a list of recommended events/attractions for the user. These recommendations will then be returned to the web server and from here, displayed to the user.

6. Software, Hardware and development tools that will be used

Development environment	Visual Studio code
Database	MySQL
Frontend development	JavaScript/HTML/CSS
Backend development	Python/Django
Dataset management	Hadoop

7. Preliminary Schedule

Sprint	Start Date	Task to Complete	Person Assigned
1	10/01/2022	Database Design	James
1	10/01/2022	UI Design	Alex
2	17/01/2022	User Login	James
2	17/01/2022	Profile Builder	Alex
3	24/01/2022	Create Trip (Include machine learning model)	James
3	24/01/2022	Create Trip (Include machine learning model)	Alex
4	31/01/2022	Create Trip (Include machine learning model)	James
4	31/01/2022	Create Trip (Include machine learning model)	Alex
5	07/02/2022	Activity/Attraction rating (including semantic analysis)	James
5	07/03/2022	Activity/Attraction rating (including semantic analysis)	Alex
6	28/02/2022	Activity/Attraction rating (including semantic analysis)	James
6	28/02/2022	Activity/Attraction rating (including semantic analysis)	Alex
7	14/02/2022	View Current Trip	James
7	14/02/2022	Create Path	Alex
8	07/02/2022	Activity/Attraction Description	James
8	07/03/2022	Filter recommendation	Alex
9	14/03/2022	Delete Trip, Delete Account, Forgot Password	James
9	14/03/2022	Software Testing	Alex
10	28/03/2022	Software Testing	James
10	28/03/2022	Software Testing	Alex
11	04/04/2022	Bug Fixing	James
11	04/04/2022	Bug Fixing	Alex
12	11/04/2022	Semester 2 exams	James
12	11/04/2022	Semester 2 exams	Alex
13	18/04/2022	Semester 2 exams	James
13	18/04/2022	Semester 2 exams	Alex
14	25/04/2022	Semester 2 exams	James

14	25/04/2022	Semester 2 exams	Alex
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