

# Introduction

The aim of this project is to develop an android application that will enable a person to easily plan a one day city tour for their desired location, that allows them to best utilize their time according to their interest and preferences.

the constraints of the planned tour are derived from the users selections and preferences expressed for the tour. for instance, what types of sites they want to see, what meals they will like to try out, physical activities of interest etc.

The World Tourism Organization defines tourism as comprising “the activities of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited.”

Oxford English Dictionary defines tourism as “travel for pleasure or business; also the theory and practice of touring, the business of attracting, accommodating, and entertaining tourists, and the business of operating tours.”

From these definitions it can be taken that tourism involves people visiting different places, with varying proximity to their home and varying period of time, for purposes ranging from pleasure to business.

For the purpose of this study, we will assume that the tourist have gotten to their destination and want to explore what that city has to offer within a limited time.

The internet has revolutionized the way people experience different locations.

there are applications and platforms available that offer various solutions in regards to activities, tours and attractions for different locations.

A Lot of work has been done in the area of tourism and travelling to help people best utilize their time and have meaningful interesting experiences as they travel to different locations.

Travellers are often presented with a curated list activities to perform, sights to see, meals to try out, places to shop while on their tour.

Though a lot has been done in this area of tourism and the internet has rich resources and

applications to help users make best use of their time during their explorations, many users still consult private tour planners to help create an itinerary for them.

One of the reasons for this being that though these platforms present the users with solutions on how to best utilize their time and enjoy their tours in different locations, these recommendations are not based on the personal preference of the tourists

There are a number of online applications that connect travellers with specialist tour planners to help plan their stay at certain locations using their preferences so they can better enjoy their time with custom tour itinerary planned for them.

This project will eliminate the need for human specialist tour planner.

The users will express their interest and preferences into the application, and with this information, the application will plan and output a custom 24 hour itinerary for the user.

the application will give users an itinerary and tour plan that is based on what they like to do and how they enjoy spending their time as rather than presenting users with an auto-generated tour plan based on metrics unknown to them.

This system will take away the human layer that comes with personal tour planners and in doing so it:

- Reduce feedback time between the planner and the tour as the application will respond in an automated manner
- Reduce cost for the tourist as they don't pay to hire a personal planner
- Make changes to their itinerary in a timely manner as the plans offered by the system are editable.

In all, it will save time and money for the tourist while offering them itinerary and plans that are customized to their needs on their trip.

These preferences can also be re-used by the user for different locations or they can choose to create a new one for each tour.

This project will also develop to learn more about the user, based on their interaction with the initial provided tours, thereby using their data as they go on multiple tours to plan tours for them in future.

# Motivation

People go on tours to have experiences outside their normal day-to-day lives, meet new people, learn about different cultures and destinations, to do business amongst others.

Touring, though it has its benefits, often requires a lot of planning to ensure they get the best of it and enjoy their time. This plan entails tourists take into consideration how much time they have planned, their budget, their personal preferences and other details that make the tour enjoyable.

There are platforms and services available on the internet to automate this planning processes for the tourist. These solutions range from booking flights, hotels, planning itinerary to as far as suggesting locations and spots to tourists in their city or location of interest.

In the area of touring and exploring different locations, a lot has also been done as we have various applications and platforms that work to provide a curated list of activities to the user to explore and experience while on their tour.

While these solutions are helpful, they leave out a very important aspect of tourism, which is customization and user preference.

Showing most popular activities to users based on location alone, does not take into account the users preferences, their budget neither does it consider the time they have planned for their visit.

These platforms do not consider what is important to the user while showing the listings and activities in their location of interest.

This lack of personalized listings is the primary reason experts believe that almost half of all travel bookings still come through offline channels.

Using this available data on open APIs and getting more details about the tourist, City tour planner can create a personalized one-day tour for the tourists. This tour will meet the restrictions defined by user profile, start and end locations, time, their dietary preferences, showing them what they can eat where while on their tour.

The application built from this project will enable users to plan their tours and eliminate the need for offline consultations or the hiring of a personal tour planner or spend time spend time planning personalized tours themselves.

# Aims and Objectives

The aim of this project is to develop an Android application that will enable a person to easily plan a one-day city tour, that allows her to best utilise her time, according to her interests.

For the application to achieve this, it should be able to do the following:

- Allow a user to sign up/login
- Allow a user to update their profile with personal details like gender, age, nationality etc
- Allow the user to create a new tour
  - The user needs to enter location to create a tour or allow the app to auto-detect location by enabling it in their system preferences (if it is not enabled already)
  - Ask the user specific questions to understand their preferences for this tour. These questions allows the user to express their preferences for the tour
  - If this is not the first tour of the user, the application should provide user with the option to use or update previous preferences for a past tour or decide to answer the questions for this specific tour
- Normalize user information for the tour created to make it usable for open APIs
- Retrieve data from open APIs using the normalized user information
- Analyze this data from APIs using time and the proximity constraint to create an itinerary for the user tour
- Return this itenary to the user
  - Itenary should include start and end locations
  - Stops for food during the tour
  - Time between each stop location on the tour

- Allow user to edit the itenary generated
- Allow user to view this itenary on a map or a list
- Store the user and trip data to provide better experience and recommendations for future tours
- Store the user tour data to provide better experience for next tour using recommendations and learning from this tour
- Allow user share their tour itenary as a URL link
- The tours must be bound in time to 24 hours
- Output the plan to the user

# Scope

The scope of the work being carried by this project is limited to building an android application creates a 24-hour city tour plan for a user using their preferences, time.

This project does not cater for group tours, where more than one person is touring a location. It can be extended in the future for this behavior but that is not in the current scope.

This project employs open and free APIs for its data collection, and the language of content and communication on the app will be the English language.

While applications should be built for accessibility and wide user reach, the scope of this project does not allow for it to cater to people with certain disabilities such as blindness, as it does not have the resources needed for users with such conditions to enter or read information



# Related Work

This Section describes existing work in the area of tourism as it relates to tourists and travellers exploring destinations and having interesting experiences in different locations with the aid of technology, both offline and online.

**RoadTrippers:** A web and mobile application, is a road trip planning application that helps users discovers items such as accommodations, restaurants, attractions and culture, outdoor and recreation activities, entertainment and nightlife, shopping, sports and motoring along the route of their road trip. It does this in the following steps:

- users select start and stop locations for their trip
- the application generates a map showing the users items such as , that is available on the route of their trip from start to stop locations
- users can select any of the items, adjust the budget setting (if it applies to that item category) and add to their trip.
- Users can then save trip by creating an account and it is the trip is available on their profile

RoadTrippers boasts database includes millions of the world's most fascinating places, making planning the unexpected easier for its users.

RoadTrippers has its own set of places APIs, Boone (available for use at a price), that it uses to

serve the application Backend. some of the endpoints are:

- Search: The Search endpoint powers discovery of the most interesting travel and tourism places.

It takes a coordinate center and a search radius, as well as a list of optional tags (see Standard Tags to

pull a currently available list) and returns a list of relevant places.

- Place Details: Return name, address, hours, photos, reviews, tags, and more about any place in the Boone database

With these endpoints built around the database, RoadTrippers returns items along a route for a start and stop location within a specified radius to its users.

**Tripit:** A web application, plans the itinerary for the user with their booking details. Tells them where to be when, alerts them on next moves, shows nearby places etc.

Users can book their trip on TripIt supported booking sites and share the booking details with Tripit,

Tripit then plans an itinerary for them for when they arrive at the airport to their final destination.

Tripit also alerts users on time to their next action on the itinerary and for discounts for nearby events or things to do.

**Musement:** An online platform offers to help travellers get the "best" from destinations by providing a great choice of local tours and attractions bookable on multiple devices.

As seen on the website, they offer a range of services that includes temporary, exclusive, hidden-gem and even free activities for multiple locations.

some of its service offerings include: book guided tours online

- buy entrance tickets
- register to join bus tours
- day trips and excursions etc.

**Blink Travel:** This is another online platform for tourist offers the users curated cards of "best" attractions and experiences.

the user can schedule things to see or do by viewing the card and making their schedules its card categories include: top attractions, what to eat, the best things to see and the best things to do amongst other things

While there are multiple platforms on the internet with automated solutions to help users get the best experience on their trips, travels and tours, there are also applications that offer physical consultation and experts online to guide the tourists and travellers in making the best from their trips as well.

**Personal-Trip-Planning-Service:** This is a service on **Adventurelink** where tours are planned personally for the tourist.

Tourist answer questions that help the platform create a personal itinerary for them to use on their trip.

The questions asked include:

- What's the purpose of your trip?
- What's your preferred trip?
- What would you like to do?

And the aim for these questions is to get more details about the tourists preferences and needs for their tour.

**Journey:** is an online application that helps travellers plan their trips by connecting them with a personal trip designer.

It works in the following steps:

- Users share their travel preferences by filling out a questionnaire about how they like to travel and things they would like to do on their trip. these includes questions about travellers budget, dietary restrictions, interests etc
- Users get paired with a personal trip designer that works with them to review and plan their trip via email and chat on the application.
- users receive a customized itinerary with activity bookings and restaurant reservations, which they can access by the application or by web browser.

With platforms like Musement, Triplt etc, it is a wonder why the likes of GoJourney still have millions of user base.

As a user on GoJourney put it:

"I found Journey after already getting an itinerary from a typical travel agency. Simply put, Journey's recommendations blew theirs out of the water. Every concierge we worked with really listened to what we wanted as travelers and led us to the off-the-beaten-path sights we were looking for. Plus, the process is super smooth and easy!"

The key words to note in the user review are: "worked with them" and "listened to what they wanted". This is one of the key selling features of the Journey platform.

While there are multiple platforms on the internet with solutions around how a tourist can enjoy their time in a location or have a planned itinerary, the recommendations from these platforms are not based on personal preference of the tourists.

People want to be listened to and want their input to be taken into consideration when a tour is being planned, but the existing platforms do not offer a solution for this challenge.

This creates the need to have an online platform application that works with tourists/users to get the profile, know their needs and discuss their preferences for their tours.

City Tour Planner gives users an itinerary and tour plan that is based on what they like to do and how they enjoy spending their time. It does not offer an auto generated itinerary to the users based on metrics unknown to them.

This system will take away the human layer that comes with personal tour planners and in doing so it:

- Reduce feedback time between the planner and the tour as the application will respond in an automated manner

- Reduce cost for the tourist as they don't pay to hire a personal planner

- Make changes to their itinerary as the plans offered by the system are editable.

In all, it will save time and money for the tourist while offering them itinerary and plans that are customized to their needs on their trip.

The need for personal tour plan is one of the major reasons why offline travel agency and tour planners still have thousands of users.

This project will also develop to learn more about the user, based on their interaction with the initial provided tours, thereby using their data as they go on multiple tours to plan tours for them in future.

# System Functionality specification

To achieve its objectives, the system will be implemented using a set of technologies.

This section discusses how this project will be developed and the various components built to achieve the set project objectives.

## **System Architecture and Components breakdown**

The system will be broken down into two components

- The Backend
- The Android app (front-end)

### **The Backend**

This component will be built using Nodejs as the server side framework, relational database (MySQL) to store user and tour data.

The backend will integrate with HERE and FourSquare REST APIs to retrieve the following datasets

- Places categories data: this fetch the categories of places available the tour location entered by the user.

These categories will be further used to make other calls to these external APIs to fetch data that match user selection under these categories.

**NB:** For the scope of this project and time limitation, user will be provided with a list of cities to select from.

- Places data: this will fetch the places and venues for the user selection under the places categories.

After a user has expressed their preferences for a tour, these values will be used to fetch Places data matching the queries expressed by user preferences.

The fetching of places from these external APIs will be done to get the best reviewed top results matching these queries.

### The System Models:

The database will store the following tables:

- User: this is the user's basic profile information.
- Tour: This is all the tours created by the user. It has fields for userId, city and an Object that contains the final tour itinerary.
- Preference: This is the user preference for each tour, this preference can be reused for different tours.

There is a 1:M relationship between the Tour and the User as there is also between the Preference and the User models.

This means a user can have multiple trips and multiple preferences created on their account.

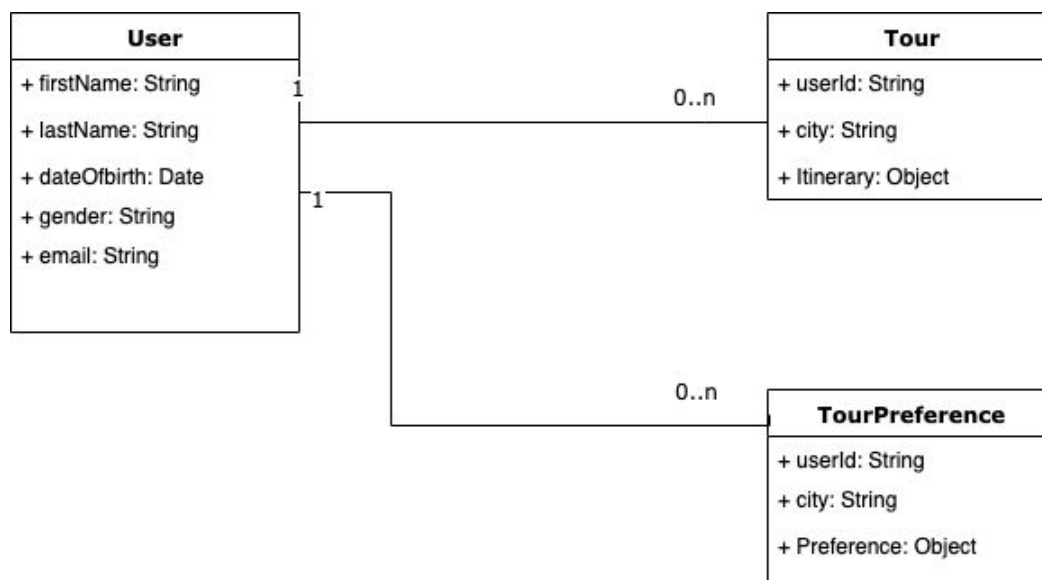


Figure 1: This Entity-Relationship diagram for the application models.

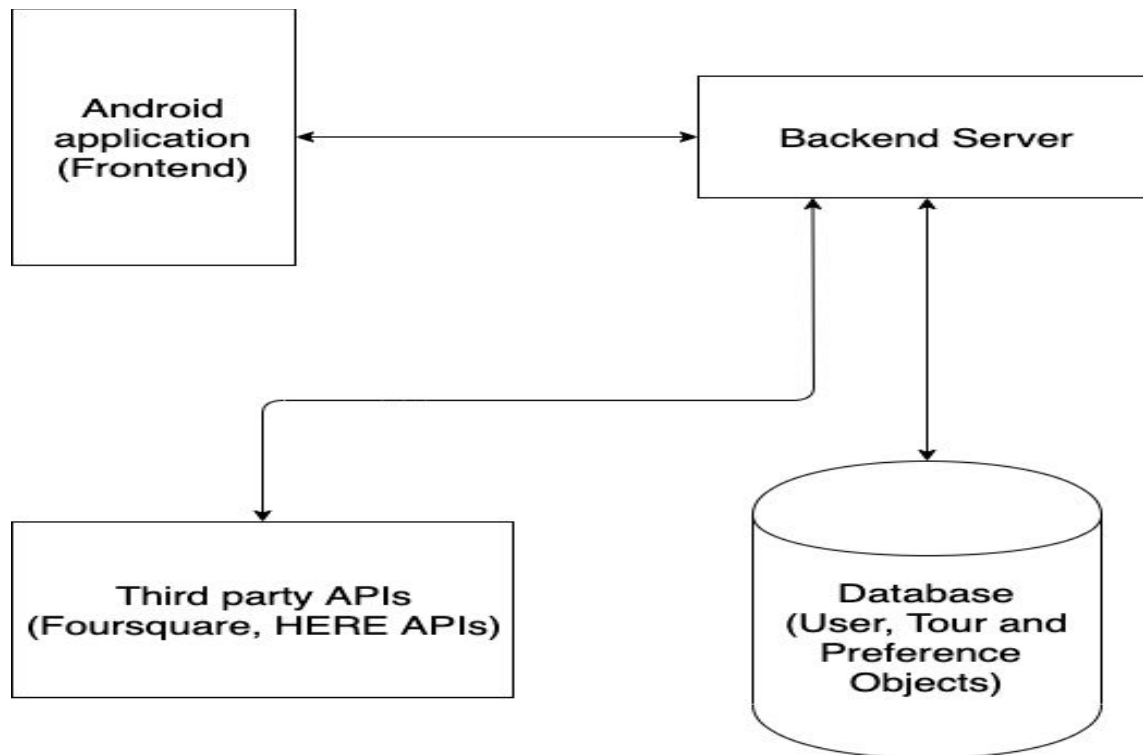


Figure 2: System architecture diagram

## REST API

the backend will expose REST APIs for the frontend use.

the API endpoints will include:

- authentication endpoint: this will authenticate a user and returns a token that can be used to make requests by this user. This token will have TTL and when it expires, the frontend will call the authentication endpoint again
- user profile: this endpoint will return a user's profile
- user tours: this endpoint will return all user tours
- location categories: this will return the categories of places for a provided location
- itenary: this will return a tour itenary to the user. this itinerary is generated with the preferences expressed the user, sent through the frontend.



**Question:** how will the itenary changes be received in backend and updated?

### **The frontend**

The frontend is the point of user interaction with the application and allows the user to perform the following actions:

- sign-up/login
- update and view profile settings
- create new tour itenary
- view created tours
- share tour itenary

The frontend for this project will be an android mobile app with different screens, each screen presenting a user different types of actions to perform.

The screens will include:

- sign-up/login
- profile screen: view and update
- tours screen: where all tours for user will be displayed.
- create a tour screen: where a user can create a tour. this will also have other screens attached to this action, such as the categories display and selection screens.
- the itenary display edit screen
- itenary list screen
- itenary map screen
- itenary item detail screen
- tour overview screen
- itenary share screen

This will be built with the Android framework, the authentication token from the backend

will be stored in the mobile local storage for making request to the backend. APIs calls will also be cached on mobile for requests that are not changing, to help the app frontend work faster.

### **The Questionnaire:**

The system will present q questionnaire to the user to help them express their preferences for the tour. the questions have sub questions that will help the system better understand the users preferences.

The following questions will be included in the questionnaire:

- Please select the things you would like to do on your tour:
  - categories present:
    - Arts & Entertainment (Museum/Art)
      - what kind of museums do you like?  
options: History, science, art, design, war
    - Events  
Question and options: <To be developed>
  - Food & Beverages
    - which cuisines will you like to have for breakfast and lunch?
    - which price category will you like have overall?  
options: Inexpensive, moderate, pricey
    - do you have any preferred dining environments?
    - do you have any dietary constraint?
  - Outdoors and Recreation
    - what outdoors and recreational activities interest you?  
options: <To be developed>
  - Shopping
    - what is your shopping budget?
    - what type of stores will you like to shop at?  
options: <To be developed>
  - Sports

- feeling sporty? what will you like to do?  
options: <To be developed>
- Nightlife  
Question and options: <To be developed>
- performing arts  
Question and options: <To be developed>
- Historical buildings  
Question and options: <To be developed>
- Spa and Wellness
  - what Spa treatments will you like to have?  
options: facial, massage, yoga, bath house

When the user completes the questionnaire, the system should better understand their preference, and with these be able to generate a tour itinerary that matches their needs.

## **Challenges faced:**

Over the course of the implementation of the project's objectives, the following are the challenges that were faced:

- **Questionnaire development:** considering the time constraint in developing the itinerary, it is challenging to develop the questions in an optimal way so the user has a few questions to answer and can have an itinerary that they will be able to complete.

The approach used is to retrieve the best set of results for each category under the questionnaire, reminding the user of time constraint and asking them to delete items from the itinerary they think they won't have the time for during the day.

This is where the edit itinerary functionality comes in to help the user optimize their tour and delete items from it

- **Lack of more endpoints options:** FourSquare API used for development currently does not provide category of venues for selected locations. Its categories API provides all the categories in hierarchies.

HERE API provides this API endpoint to query venue categories by location, but they have a different categories naming.

Due to the difference in the categories API provided and naming between HERE and FourSquare API, the system decided to Adopt FourSquare as it has a richer set of categories to help users express their preferences better but with this, there is the assumption that these categories from foursquare is available for all locations, which might not always be the case.

# Progress:

At this point in the development of the project, these APIs are available on the backend service:

- /users/: This is a http POST endpoint that allows for users to create an account on the app
- /users/login: This is a http POST endpoint that logs an existing user into the backend. It accepts email and password of the user as request body, validates the user and generates a JWT token. This JWT token is returned by this endpoint and is valid for one week after which the user has to authenticate their account again to use the app.
- /users/profile: This is a http GET endpoint that returns the profile of the authenticated user. It is a protected endpoint that accepts the JWT token generated as authentication bearer token.
- /users/:id: This is a http PUT endpoint that is used to update user profile. The request body will contain the user attribute key that needs to be updated and its new value. It returns the updated user object.
- /tour/: This a POST endpoint that takes the user interest as a body and connects to external API to get venues for the user based on these preferences. These preferences are also saved on the user's profile so that it can be reused if they want on new tours, but this is out of the scope of this project.

On the frontend of the application, the user can do the following operations:

- Create account on the application
- Singin with an existing account
- User can update their profile
- Sign out of the application
- User can select a city they want to tour. Currently, the application only provides a list of six cities. For improvements on the project,

these cities can be derived from an external API to give the user more options

- Users can express their preference for the tour by selecting items from the categories made available on the app. For the scope of the project, only eight categories are made available to the user.
- User can see list of venues for each category they selected, and can then select what venues they want to include in their tour.

## **Remaining work:**

On the frontend, the work to be done include:

- User should be able to enter start location for their tour
- User should be able to select time range for their tour
- The application should sort the tour itinerary based on their proximity to the start location entered by the user
- User should view the generated itinerary as list and map. User should also be able to view a venue detail on the tour by clicking on it
- User should be able to share their tour itinerary as a link that can be viewed on web

# Updated Plan:

Due to the challenge of internationalization, where a user might be a native speaker of a language the application is not available, the application will not add meals to the tour plan. Breakfast, lunch and dinner will be not be included in the tour itinerary.

Also, 24 hours is a whole day between 12:00 AM and another 12:00 AM, most venues in cities are open between 9 AM to 6 PM and as such users will not have any activity to do at times when venues are closed.

To give the users the best experience for a day tour, the app will make the following changes to the original description:

- Users can select a time range for their tour, different time range have different number of venues the user can see. The time options include:
  - **9 AM to 6 PM:** Here the user tour starts at 9AM and ends at 6PM. This option avails the user the option to visit a maximum number of seven (7) venues. This takes into consideration commute time between the venues.
  - **9 AM - 3 PM:** Here the user tour starts at 9AM and ends at 3PM.  
This option avails the user the option to visit a maximum number of five (5) venues
  - **9 AM - 12 PM:** Here the user tour starts at 9AM and ends at 12PM.  
This option avails the user the option to visit a maximum number of three (3) venues

**Nightlife:** Nightlife venues are open at night and as such, the time options above does not include nightlife option. If a user wants to have the nightlife option, this will be included in the itinerary outside of the time frame provided above, but also, as part of the tour plan.

## References:

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- The World Tourism Organization definition of tourism: [https://en.wikipedia.org/wiki/World\\_Tourism\\_Organization](https://en.wikipedia.org/wiki/World_Tourism_Organization)
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