Design Document

Team: 4

Project: UniLyfe

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1. Purpose

The recent outbreak of COVID-19 has undoubtedly transformed everyday life. The shift from regular college campus life to an online/hybrid experience has left students feeling disconnected from their peers and their university campus. Due to these circumstances, online and first-year students lack a comprehensive understanding of everything their college campus has to offer.

Reddit is a social network of communities based on people's interests. Users can filter posts by specific tags, allowing them to view posts relating to their interests. Yelp is an online review site where users share their experiences, helping others make informed decisions about restaurants, auto-repair shops, and more. Many college students will turn towards these apps in an attempt to get in touch with their campus. The issue is that these sites don't focus on college life alone and can be confusing to navigate through.

Unlike Reddit and Yelp, UniLyfe will be geared solely towards college students. Students can make the best of their college experience by finding the best places to eat, study, or socialize—all based on recommendations from peers. Users can keep track of high-density COVID-19 clusters on campus to stay safe during these times. UniLyfe's overall goal is to help students feel more connected with campus.

1.1 Functional Requirements

1. **User Account**

   As a user,

   a. I would like to create a new account with a username and password
   b. I would like to log in using my college email account through Google or Office 365.
   c. I would like to log in using my Purdue Career Account (if time allows)
   d. I would like to be able to edit certain elements of my profile.
      i. I would like to add information such as my age, major, current classes, residence hall, interests, etc

   As a developer,

   a. I would like to access and store the username and password data for each user.

2. **User's View**

   As a user,

   a. I would like an information button or tutorial with explanation of each feature in the app
   b. I would like to easily access the different subsections of the application making the app user friendly.
   c. I would like to view all the posts I have ever liked.
   d. I would like to view my comment history.
   e. I would like to indicate whether or not I thought a review was helpful.
   f. I would like to be able to report users for inappropriate content (racism/ hate speech)

3. **Making a Post** (**General**)

   As a user,

a. I would like to post reviews (picture, text, video, etc.) highlighting my experience in locations near Purdue University.
b. I would like to create polls to gather feedback, in any post channel.
c. I would like to rate places based on my personal experience.
d. I would like to add comments regarding my experiences at certain places.
e. I would like to add information about events happening on campus.
f. write reviews on residence halls and nearby apartments (if time allows).

4. **Viewing a Post (General)**

As a user,

a. I would like to read reviews posted by others regarding their experiences in locations near Purdue University.
b. I would like to see all recent posts on my home feed/general news feed.
c. I would like to view all the posts for a certain location once I click on the building on the map
d. I would like to read reviews on residence halls so that I know the most popular places to live (if time allows).
e. read reviews on residence halls and nearby apartments (if time allows).
f. I would like to explore places which only Purdue students know (ex: top of Lawson).
g. I would like to filter posts on my home feed by reviews, ratings, or polls.
h. I would like to filter locations based on how high their ratings are.
i. I would like to be able to search for keywords across all posts on the app.
j. I would like to see a completely randomized post/event/comment/location (if time allows)

As a developer,

a. I would like to access and analyze information that users upload about themselves for their profile.
b. I would like to filter out possibly harmful words in the comments/posts
c. I would like to filter out inappropriate photos users have posted.

5. **Making Friends**

   As a user,

   a. I would like to add pictures of/information about myself so I can easily get matched to people.
   b. I would like to make friends with those who have similar interests, taking the same/similar classes, and those who are in the same/similar clubs/extracurricular activities as me.
   c. I would like to access and analyze information that users upload about themselves for their profile.

6. **Covid Information**

   As a user,

   a. I would like to know where COVID hotspots are located graphically on a map.
   b. I would like to avoid COVID hotspots on/near campus which are displayed by red dots on the map by seeing a list of these locations.
   c. I would like to anonymously log the places I have visited recently on the app if I have tested positive for COVID.
   d. I would like to see how many people who have tested positive for COVID
   e. I would like to see how many people with COVID have been in a certain building recently.

   As a developer,

   a. I would like to access the locations the users have visited with Covid
   b. I would like to access the data inputted by the user to display it properly

7. **Realtime Notifications**

   As a user,

   a. I would like to be notified whenever someone makes a post about a certain topic
   b. I would like to be notified when another user interacts with my post.

c. I would like to be notified about the current trending posts.
d. As a user, I would like to add topics I am interested in to my wishlist which can be used to get notifications or/and make new friends

8. **Incentives**

As a user,

a. I would like to earn points by posting on the app and interacting with people on the app.
b. I would like to redeem points for possible incentives (i.e. coupons)

1.2 Non Functional Requirements

1. **Client Requirements**

As a developer,

a. I want the application to be used on Android devices and iOS devices.

2. **Server Requirements**

As a developer,

a. I want Dart and Firebase to handle network requests and handle data for users
b. I want Firebase to hold the information of users who log into the app
c. I want to host the Flutter mobile app to the Apple App store or Android Google Play
d. I want to make this app platform independent
e. I want to join the frontend and backend together so that I will be able to deploy and update the app at the same time

3. **Performance Requirements**

As a developer,

a. I want the server to be able to handle all the users
b. I want the application to be working properly for all users
c. I want to handle errors and failures gracefully

4. **Appearance Requirements**

As a developer,

a. I would like to implement a functional and frictionless UI to maximize usability by clients.
b. I want the app to be user friendly which could be done by divided into subcategories

5. **Security Requirements**

As a developer,

a. I want to ensure the user's information is secure
b. I want to implement a system to ensure users only have access to parts of the app they are supposed to
c. I want to add a feature where the users will confirm that the app has permission to hold their information

2 Design Outline

2.1 Components

Our project is a system that provides users information regarding places to visit, places to study, places to eat food, etc. To allow users to interact with each other, we will implement a Client-Server model. The server will access the database to store user information and to retrieve user information.

1. **Flutter**
    a. Platform Views will be used to host Android views and iOS views in our Flutter App.
    b. Flutter will retrieve the data to the server using the JSON Serialization Method.
    c. Flutter will format the data retrieved as strings.
    d. Flutter also has an http package which can be used to retrieve and send data to firebase. The http package is supported by Android, iOS, and the web.

2. **Database**
    a. The data will be stored using Firebase.
    b. The database provides services such as cloud storage, crash reporting, machine learning, remote configuration and hosting for files.
    c. The data which will be stored is posts, comments, reviews, user information (such as classes, username, etc) and COVID-19 related data.

3. **API Server**
    a. The API Server is provided in Flutter
    b. The API Server simplifies the development of REST based applications
    c. The http class provides functionality to all http requests

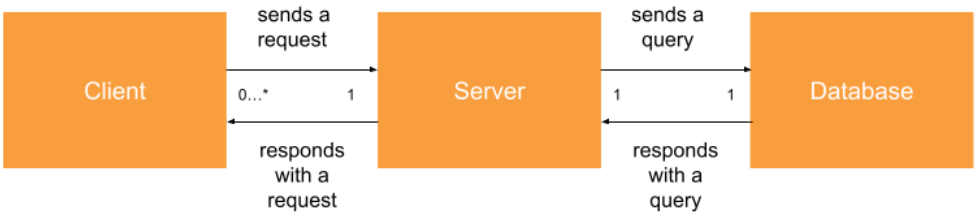
d. The API server will accept http requests through Dart map
e. The API Server will request the server and retrieve information back using the async/await pattern.

2.2 High Level Overview

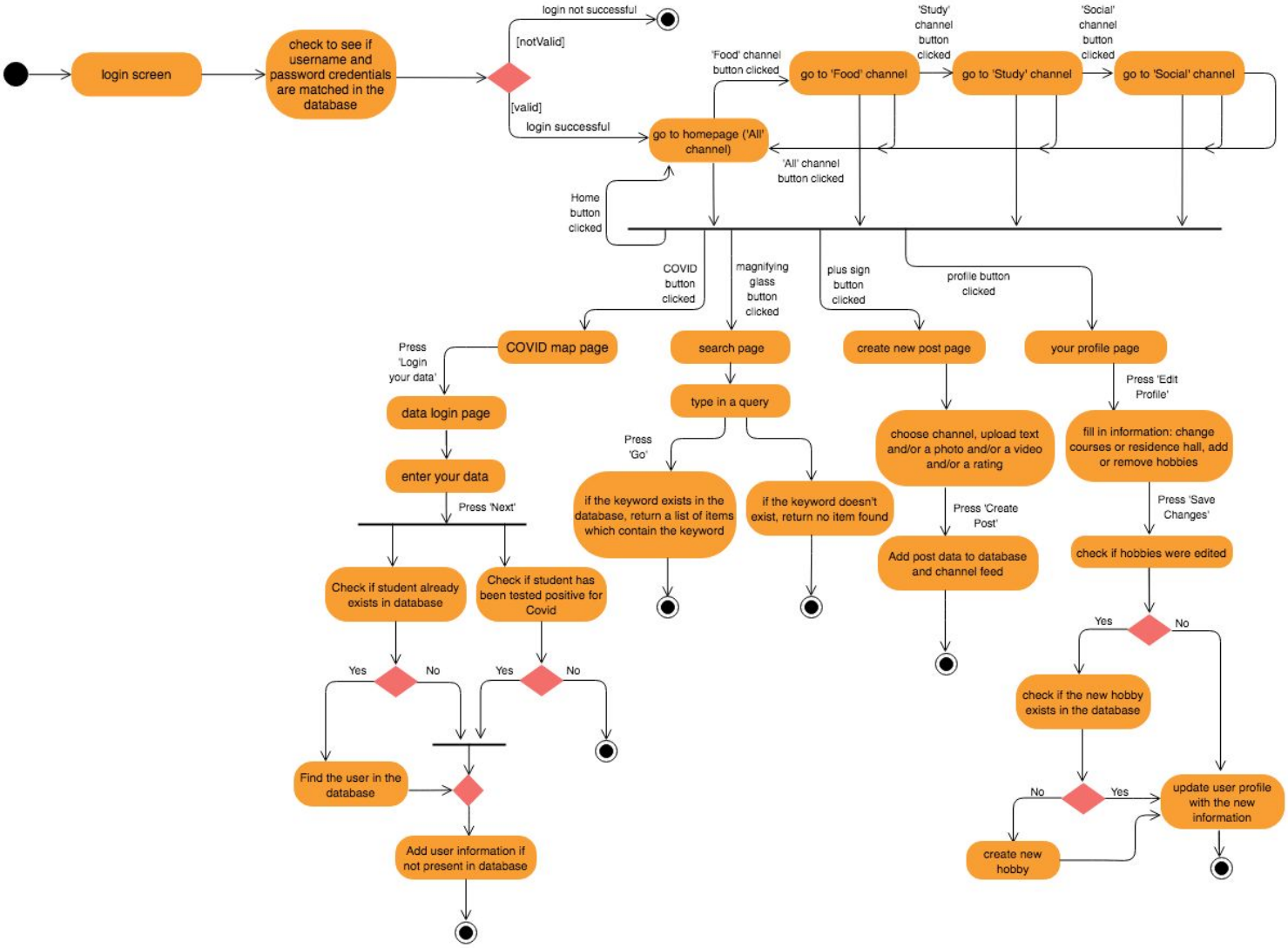
How do the client/server/database interact? And a diagram

- The server handles many users at once
- The client's data request will be sent to the server
- The server retrieves the information from the database
- Server is intermediary and the end goal is to reach the database, where the information is stored

Flutter provides the developers an http package which will allow the API Server to handle many clients simultaneously. When the client has a request, the server collects and retrieves the response. Later, the server will respond back in an async and await pattern. Similarly when the client requests data from the server, the server sends the requested information to the database. The server retrieves the requested information from the database, and the information is relayed back to the server and then to the client.



2.3 State/Activity Diagram



3 Design Issues

3.1 Functional Issues

1. **Issue**: Should users log in to use our application?
    - Option 1: Users do not log in.
    - Option 2: Users create an account with a username and password unique to our service.
    - Option 3: Users log in through their Google or Office 365 accounts

    Choice: Option 3

    Justification: Setting up an account is an essential part to making the app experienced more personalized. Furthermore, logging in with Google or Office 365 is a secure two-factor authentication method. This is an effective method to sign in so users do not have to reuse the same passwords from their other services. Lastly, from a developer standpoint, it is beneficial when users log in using Google because we can easily store and retrieve their information using the "Firebase" database.

2. **Issue:** How should locations be displayed in the feed?
    - Option 1: Locations are split into 4 categories: food, study, social and the last category displays all locations near University campus.
    - Option 2: All locations are listed in alphabetical order.
    - Option 3: Users manually search for the locations that they want visible in their feed

    Choice: Option 1

    Justification: For organizational purposes, it is best to split up all the locations near campus into 3 sections. For example, if a user wants to see reviews on a specific food place, they can click on the "food" section which provides the user a list of all the food places and the user can narrow their search from there. However, if the user wants flexibility, we provide them with a fourth category -

"all" which allows them to view all locations near University campus. With no categories, there lacks structure to the application.

3. **Issue:** How should COVID hotspots be displayed in the campus map?
    - Option 1: A location pin represents where the case was recorded and different shades of red represent the number of cases recorded at that location.
    - Option 2: A red dot represents a case and as more cases start coming, the size of the dot increases.
    - Option 3: A red dot represents a single case and as more cases start coming, more dots appear at that location on the map

    Choice: Option 1

    Justification: For clarity, it is best to have a location pin represent where a case was recorded and different shades of red represent the number of cases recorded at that location. For example, if a location has 2 recorded cases, it will be a light red color. If another location has 45 recorded cases, it will be a dark red color. If we implement option 2 and 3, the map can quickly get filled up with red dots. This cluttered look will not allow users to clearly identify which locations are hotspots.

4. **Issue:** What type of reviews can a user post?
    - Option 1: Image
    - Option 2: Text
    - Option 3: Rating (out of 5 stars)
    - Option 4: All the above

    Choice: Option 4

    Justification: Users can gain a more comprehensive understanding of a certain location if we don't limit them to what type of reviews they can post. For some people, it might be beneficial to see pictures of certain foods at a restaurant. For

other people, it might be beneficial to read a text review about the food at that location.

3.2 Non Functional Issues

1. **Issue:** What software/framework are we going to use to develop the front end of our application?
    - Option 1: React Native
    - Option 2: Flutter

    Choice: Option 2

    Justification: Flutter is relatively easy to learn and use because there are numerous documentations and tutorials available on the internet for us to reference. Compared to React Native, Flutter is easy to install and get running. Also, since Flutter is cross-platform, we can use the same code base for both iOS and Android apps and this is perfect because we aim to make the app platform independent.

2. **Issue:** What programming language are we going to use to develop the back end of our application?
    - Option 1: Dart
    - Option 2: JavaScript
    - Option 3: C/C++

    Choice: Option 1

    Justification: Dart is a programming language that is relatively easy to learn because of its robustness and flexibility. Moreover, we plan to use Flutter to develop the front end of our application and Dart is the programming language used to code Flutter apps. Furthermore, Dart is an object oriented programming language which is a benefit because we can reuse some facilities rather than rebuilding it.
3. **Issue:** What database should we use to store and sync data between our users?
    - Option 1: MongoDB

- Option 2: Firebase

Choice: Option 2

Justification: Firebase is more popular for smaller applications, while MongoDB is used more for large data and high-performance use cases. Furthermore, a Firebase Authentication SDK will allow users to sign in with their Google account. Also, Firebase is the best choice for social networking apps and that's perfect because our app resembles a social networking app.

4. **Issue**: How are we going to manage the number of users that the app can hold at once without it overloading?
    - Option 1: Shard the data using Firebase
    - Option 2: Ensure that app does not exceed 200,000 simultaneous connections

    Choice: Option 1

    Justification: It will be most efficient if we can shard our data across multiple databases according to our app's specific needs. For reference, a few databases that our app will hold include the list of locations near university campus, COVID data, user information, posts created by users, etc. Though it is possible to build this app with less than 200,000 simultaneous connections or 1,000 write operations/second, with a long term goal in mind, it will be best to create multiple database instances and map our data to multiple databases.

5. **Issue:** What API should we use to access location data?
    - Option 1: OsmAnd
    - Option 2: Mapbox
    - Option 3: Google Maps API

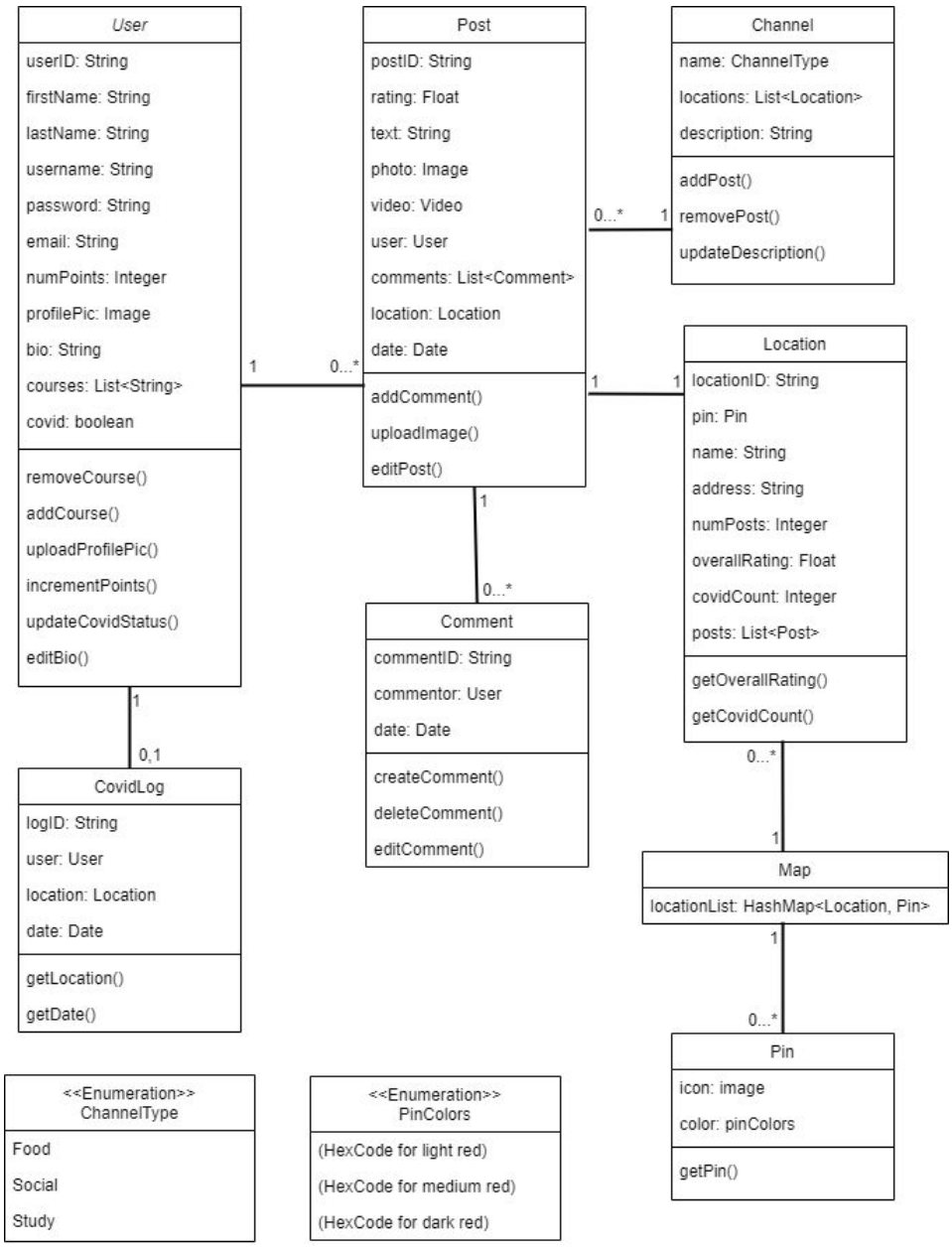
    Choice: Option 3

    Justification: The Google Maps API would be the best choice to access location data especially because we plan to use Flutter to develop the application and there exists a Flutter plugin that provides a Google Maps widget. This plugin is

easily accessible regardless of the operating system we are using. In contrast to OsmAnd (OpenStreetMap), the Google Maps API is free to use (with the Flutter plugin). Furthermore, compared to Mapbox, the Google Maps API is superior as it allows for Street View and user-generated corrections.

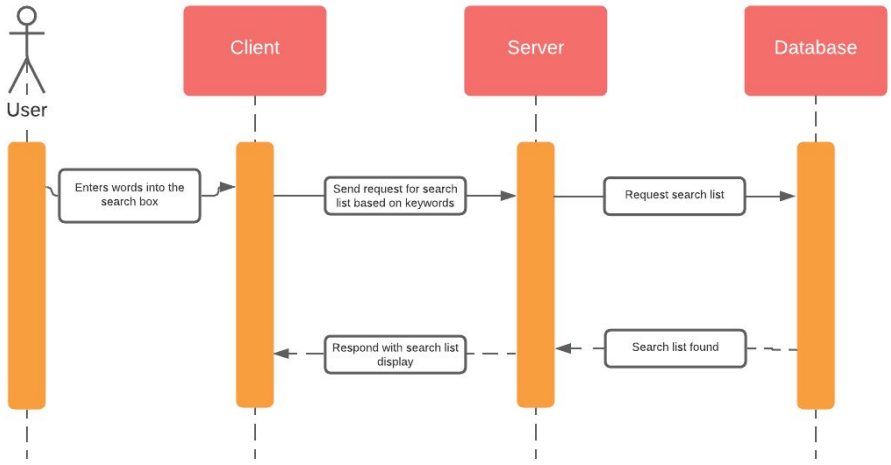
4 Design Detail

4.1 Data Classes Diagram

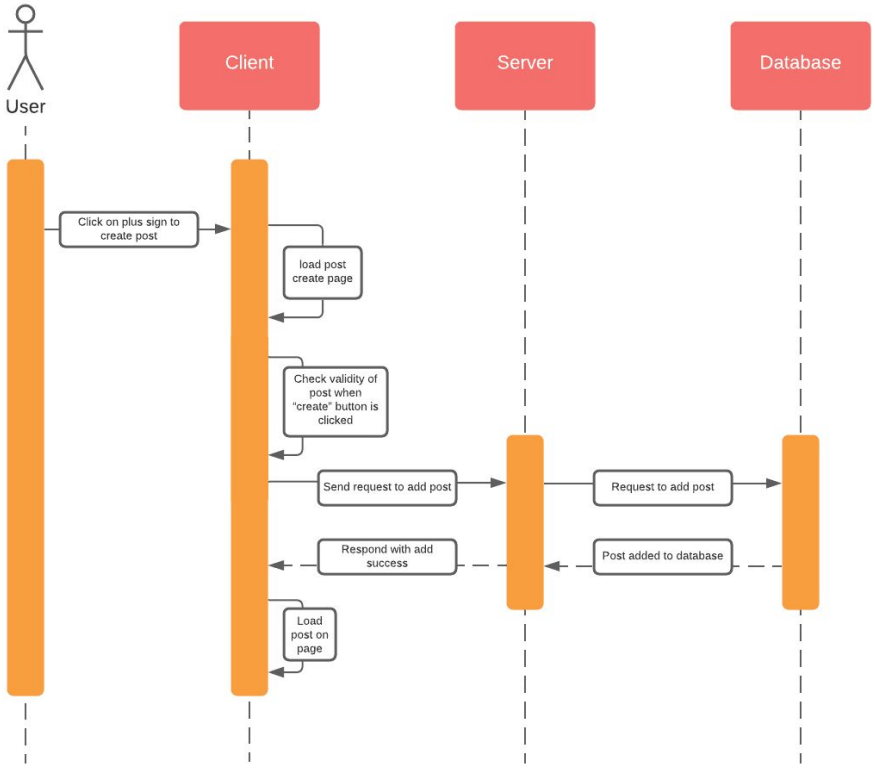


4.2 Sequence Diagrams

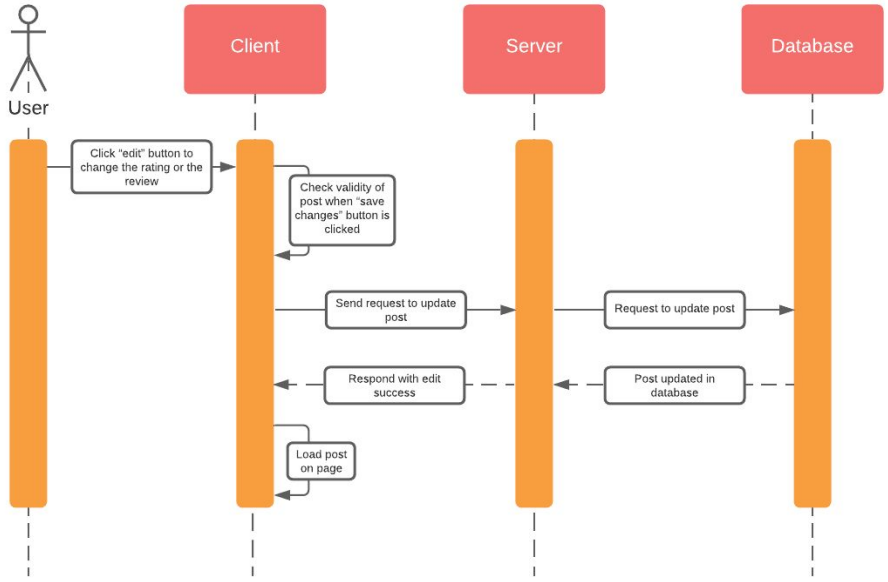
- Request and retrieve posts that match with the search queries



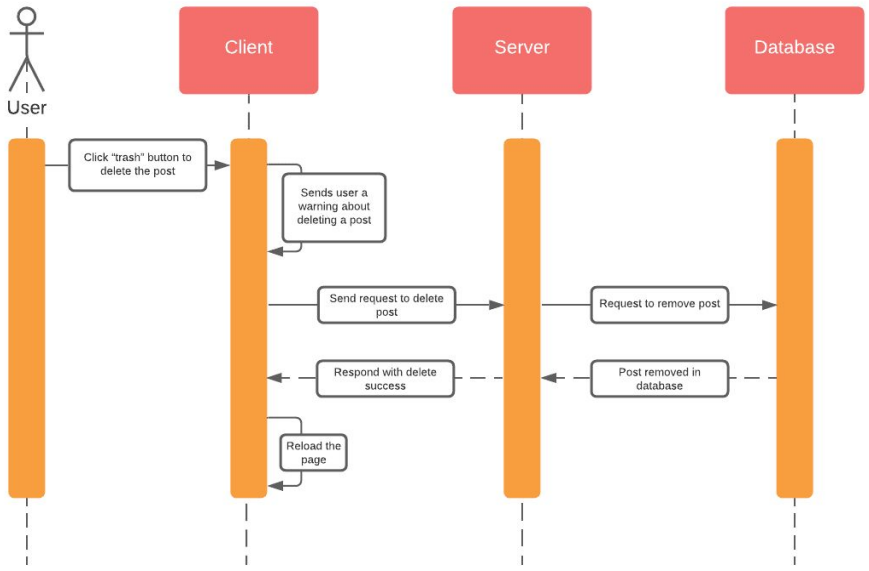
- Create a post and add it to the database



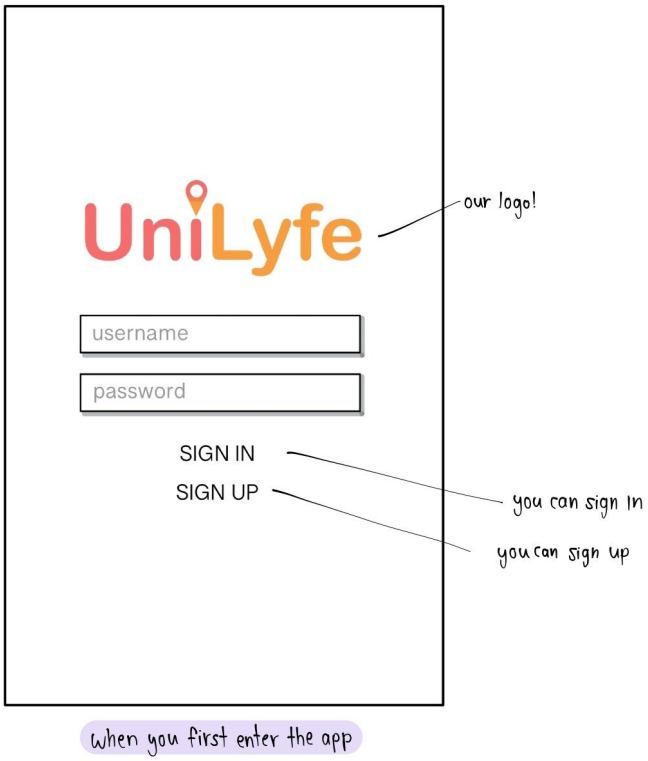
- Edit a post and update it in the database



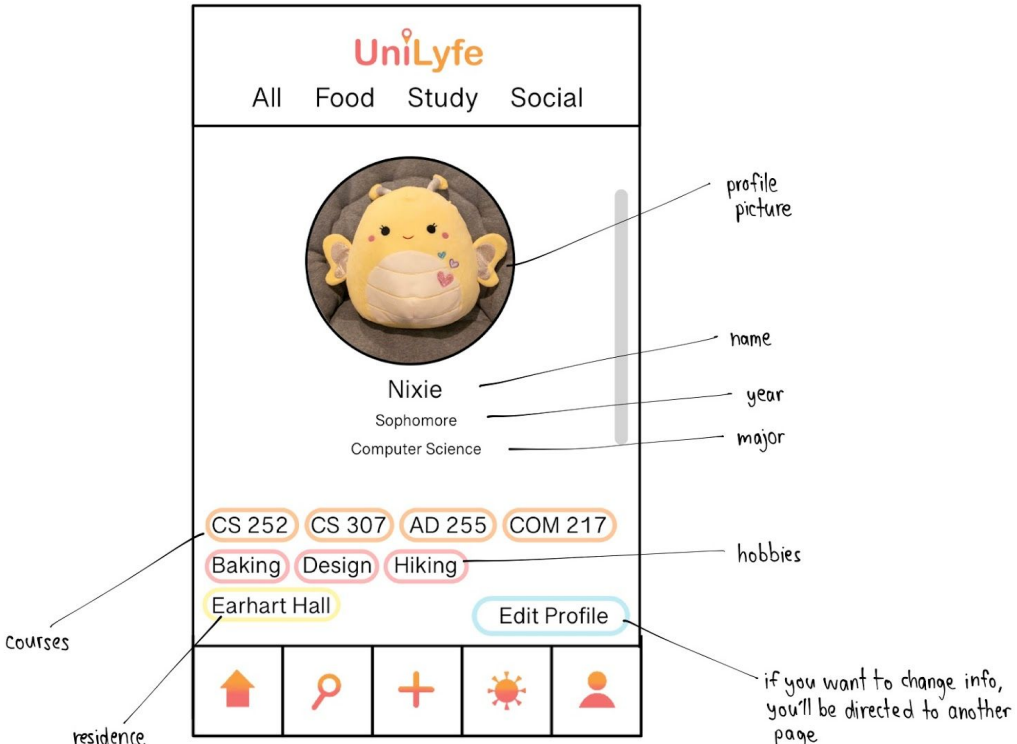
- Remove a post and take it away from the database



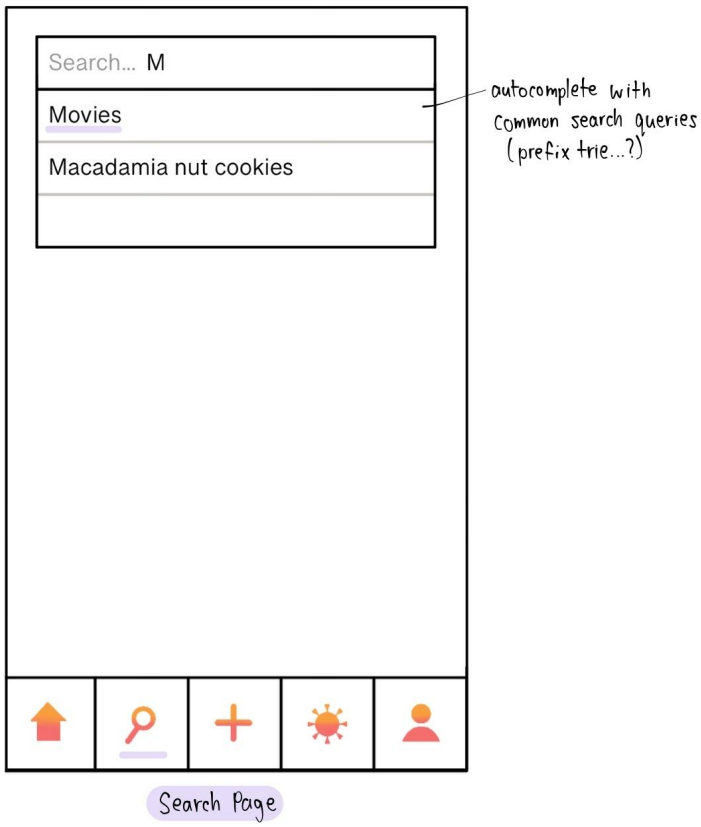
4.3 UI Mockups

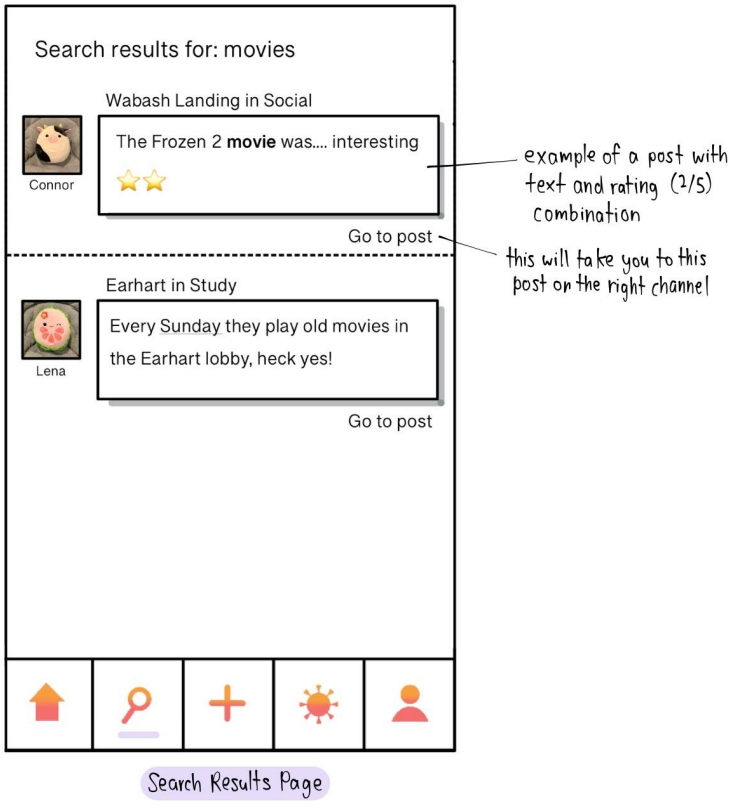


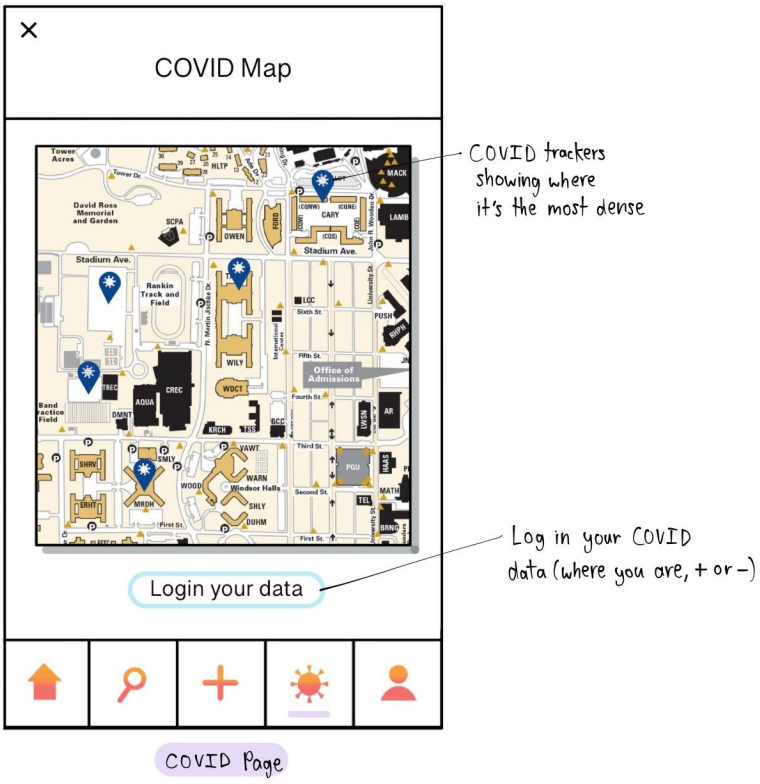
when you first enter the app

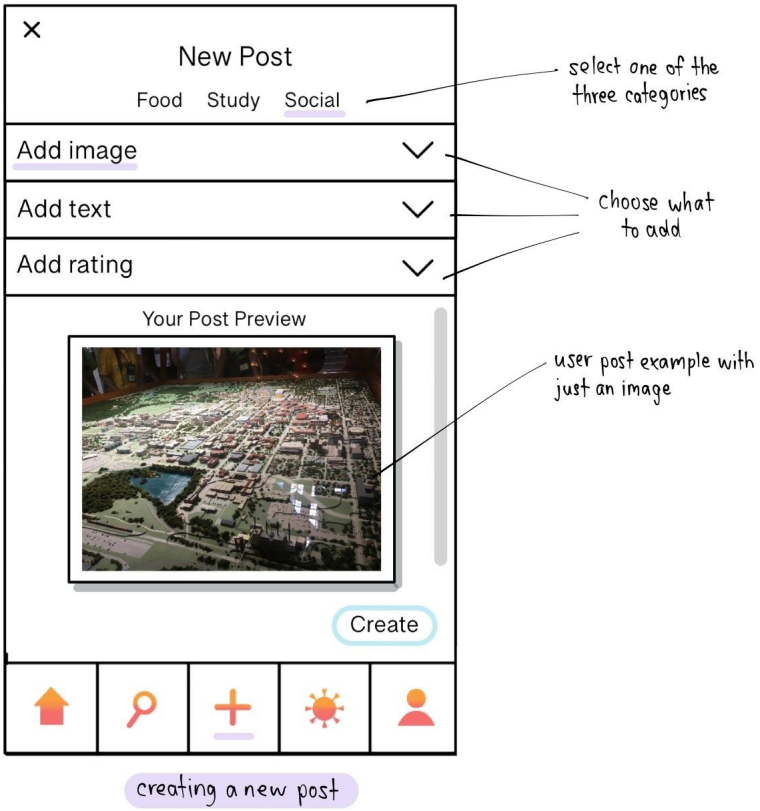


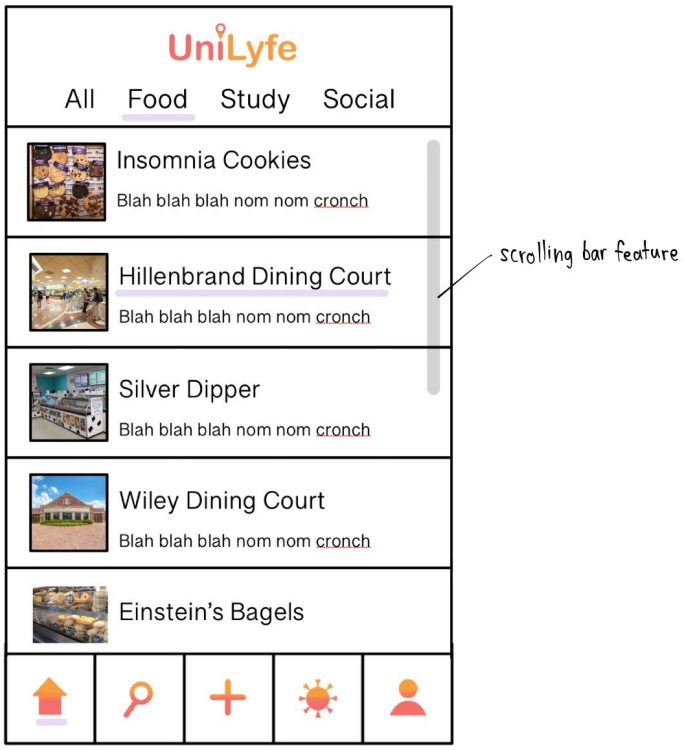
what a user's profile might look like


Search... M
Movies
Macadamia nut cookies
autocomplete with common search queries (prefix trie...?)
Search Page

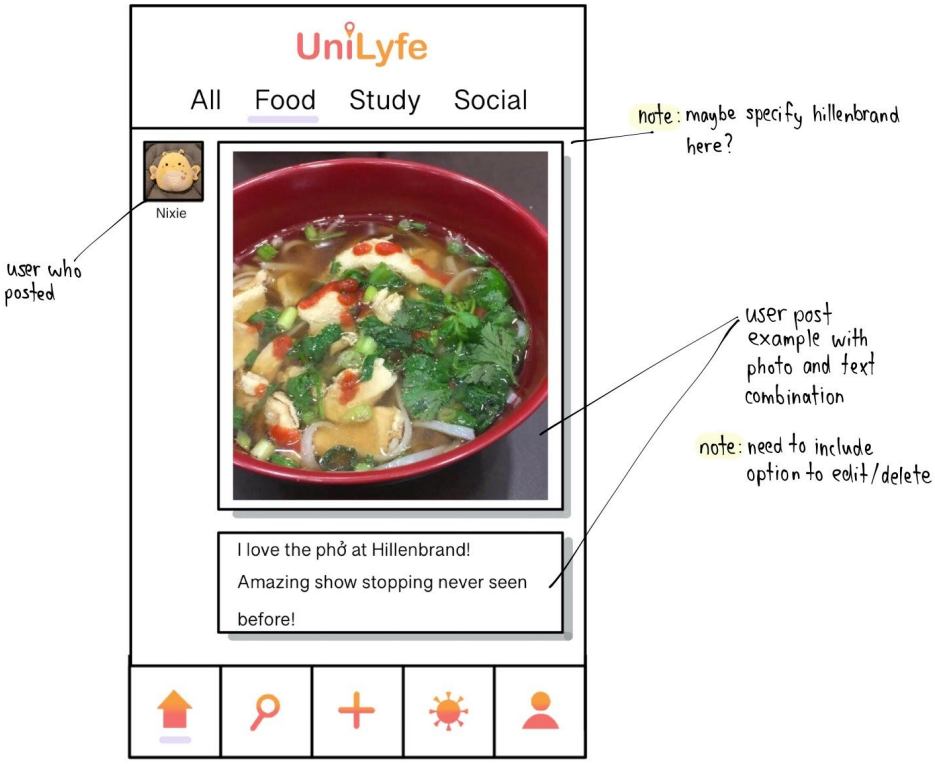

Search results for: movies
Wabash Landing in Social
Connor
The Frozen 2 movie was.... interesting
Go to post
Earhart in Study
Lena
Every Sunday they play old movies in the Earhart lobby, heck yes!
Go to post
example of a post with text and rating (2/5) combination
this will take you to this post on the right channel
Search Results Page


COVID Map
COVID trackers showing where it's the most dense
Log in your COVID data (where you are, + or −)
Login your data
COVID Page


New Post
Food Study Social
select one of the three categories
Add image
Add text
Add rating
choose what to add
Your Post Preview
user post example with just an image
Create
creating a new post



example of food channel



after we click Hillenbrand