GeotagAR

Stage 3 - Progress Report

30.03.2023

—

Mint Solutions
F29PD - Group 11
Heriot-Watt University

Student Declaration of Authorship

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PROJECT OUTLINE / INTRODUCTION

AIM

To develop an online social media platform, which enables users to connect, create and share Augmented Reality (AR) based digital content.

OBJECTIVES

The objectives are as follows:

1. To provide a safe alternative to the metaverse.
2. Enable users to share content in an Augmented Reality format.
3. Enable people of different groups to discover shared areas of interest with other like minded people.
4. Enable users to place an AR model at a certain location for other users to view.
5. Enable users to interact with other users' content.
6. Enable users to explore and discover new places.
7. To act as a source of information about landmarks such as museums, monuments, Heritage centers, natural sites and even restaurants.

SCOPE

There is one system being developed - GeoTagAR. GeoTagAR will be developed in the form of an application, providing users with a way to connect and share AR-based content. The system will function as a scrapbooking platform, allowing users to capture moments in image, audio, or video format. These moments will be geotagged when shared. Additionally, users can select specific categories to be part of, which will consist of geocachers and historians. Each category provides users with extra features developed specifically for that category.

The Database(s) will store (but not limited to) –

- User information, media, analytics, likes, comments, achievements, group information and coordinates.

The primary purpose of the application is to act as an AR-based social media platform. Additionally, a promotional website for GeoTagAR will be developed.

ASSUMPTIONS

1. The app will have the user's login to place items in certain locations.

2. Users can see the comments left behind on their AR Memories despite not being at the location.

    2.1. Everyone can see messages left behind i.e., no age restrictions.

3. Once an account is set to a certain user type e.g., geocacher & historian, it cannot be changed.

4. If you delete your account, then all the AR memories placed are removed too.

5. Users will need to provide precise location data for the app to work.

6. Users can share locations to memories via a GPS marker.

DEFINITIONS, ACRONYMS AND ABBREVIATIONS

Can be found in the Appendix

Acronym	***Description***
FR	Functional Requirement
NFR	Non-Functional Requirement
F - UR	Functional - User Requirement
NF - UR	Non-Functional - User Requirement
F - SR	Functional - System Requirement
NF - SR	Non-Functional - System Requirement
App	Application

FUNCTIONAL REQUIREMENTS

Provided below are the FR/NFRSs we developed during Stage-1 of the project. Next to each requirement, we have placed checkboxes to depict all the functionalities that we have been

able to implement so far.

ID	Description	Priority	**Implemented**

F-UR-1	**ACCOUNT CREATION**
	
	F-UR-1.1 - The user must be able to create an account after providing the following details:
	
	- First name (optional)
	- Last name (optional)
	- Username (mandatory) -linked to NF-SR-1
	- Password (mandatory) - linked to NF-SR-1
	- Password confirmation (mandatory)
	- Phone number (optional)
	- Email address (mandatory)
	- Date of birth (mandatory)
	- Gender (optional)
	- Account category selection (mandatory) - linked to NF-SR-18
	  - Geocacher
	  - Historian
	  - General user
	
	F-UR-1.3- The user is sent an email verification link which is sent to their email – Linked to **NF-SR7.9**
		M	☑

F-UR-2	The user must be able to login using the following credentials: 1. Email (mandatory) 2. Password (mandatory)	M	☑
F-UR-3	The user should be able to log out of the system.	M	☑

F-UR-4	**MEMORIES** **F-UR-4.1 -** *The user must be able to create a memory.* **F-UR-4.2 -** The user must be able to edit the following in a memory - Title - Filters - Captions - Delete the memory **F-UR-4.3 -** *The user must be able to share content (photos or videos) as a Memory*	M	☑
F-UR-5	**SCRAPBOOKS** **F-UR-5.1 -** The user must be able to add/remove selected memories to a Scrapbook. **F-UR-5.2 -** The user must be able to create a scrapbook. **F-UR-5.3 -** The user must be able to edit/modify a scrapbook. **F-UR-5.4 -** The user must be able to delete a scrapbook.	M	☑
F-UR-6	**GROUPS** **F-UR-6.1 –** The user must be able to create groups/communities for like-minded people **F-UR-6.2 –** The user must be able to join a group **F-UR-6.3 –** The user must be able to leave a group **F-UR-6.4 –** The user must be able to modify a group - The user must be able to set the created group to public or private - The user must be able to switch group type to public or private - The user must be able to add members to a group **F-UR-6.5** - The user must be able to delete a group created by them	M	☑
F-SR-1	The system must be connected to the internet	M	☑
F-SR-2	The system must have access to the GPS location of the user	M	☑

F-SR-3	The system must have access to the camera	M	☑
F-SR-4	The system must filter inappropriate and illegal content	M	☑
F-SR-5	The system should produce summary reports for platform managers concerning overall platform usage.	M	☐
F-SR-6	The system should enable memories to be grouped and organized based on: 1. Physical Location 2. Groups that users can create	M	☑
F-SR-7	The system must save any changes made by user in the database	M	☑
F-SR-8	The system must geotag Scrapbooks and Memories on the Map.	M	☑

NON-FUNCTIONAL REQUIREMENTS

ID	Description	Priority	Implemented
NF-UR-1	**FEEDBACK** ***NF-UR-1.1*** *The user must be able to provide feedback/comments to posted memories.* ***NF-UR-1.2*** *The user must be able to view and add derivative annotations*	M	☑
NF-UR-2	*The user should be able to report messages if they deem it to be fake news or offensive.*	S	☑

NF-UR-3	***PROFILE MODERATION*** **NF-UR-3.1 -** *The user must be able to change the following account details* - Profile picture. - Account Username - Account password - First name - Last name - Phone number - E-mail - Date of Birth - Gender **NF-UR-3.2** *The user must be able to add a bio/sub-description.* **NF-UR-3.3** *The user must be able to set their preferred visibility on their profile.* - Visible to all - Visible to friends only	M	☑
NF-UR-4	*The user must be able to delete their memories*		☑
NF-UR-5	*The user must be able to add and remove other users as a "friend"*	M	☑
NF-UR-6	*The user must be able to block other users.*	M	☐
NF-UR-7	*The user must be able to schedule the date and time for posting a memory.*	M	☐

NF-SR-1	The system must allow users to create an account only if: - The username is unique - The username is 6 – 30 characters long - The username only consists of letters, numbers, and special characters like '('and ')'. - The password is 6 - 20 characters long - The password contains an uppercase character, a number, and a special character. - The password doesn't contain the first name, last name, or the username of the user - The password matches with the entered confirm password - The user agrees to the terms and conditions of the system.	M	☑
NF-SR-2	*The system must allow users to report misinformation and issues.*	M	☑
NF-SR-3	*The system must let the user edit/modify media (memories and scrapbooks) posted by them.*	M	☑
NF-SR-4	*The system should be able to suggest tips to users when the user is creating or modifying a scrapbook.*	S	☐
NF-SR-5	**USABILITY** ***NF-SR5.1*** *The system must provide an interface for the users to operate with minimum difficulty (user-friendly).* ***NF-SR5.2*** *The system must provide introductory annotations to familiarise the new users with the functionality of the system.*	M	☑

NF-SR-6	**PORTABILITY AND COMPATIBILITY** ***NF-SR6.1*** *The system should be fully responsive across the following web browsers:* 1. Google Chrome 2. Mozilla Firefox 3. Apple Safari 4. Microsoft Edge ***NF-SR6.2*** *The system should be able to run on different devices (mobile, laptop etc.)*	M	☑
NF-SR-7	**SECURITY** ***NF-SR7.1-*** *The system should provide 2 factor authentication* ***NF-SR7.2-*** *The system shall store the user's personal data in a database* ***NF-SR7.3-*** *The system shall encrypt and store the passwords in a database* ***NF-SR7.4-*** *The databases should be accessible only by the database administrators.* ***NF-SR7.5-*** *The system should block login to an account after a certain number of login attempts.* ***NF-SR7.6-*** *The system should use the HTTPS protocol while communicating to the client.* ***NF-SR7.7-*** *The system should be able to detect and prevent attempts at SQL injection by performing input validation, parameterized queries, prepared statements etc.* ***NF-SR7.8-*** *The system should lock an account after 3 failed login attempts.* ***NF-SR7.9-*** *The system should send an email to verify whether the user owns the email they signed up with (Email Verification).*	S	☑
NF-SR-8	**AVAILABILITY AND RELIABILITY** ***NF-SR8.1*** *The system should be available 99.99% of the time, annually* ***NF-SR8.2*** *The system should suffer at most 4 minutes and 22 seconds of downtime per month*	S	☑
NF-SR-9	*The system could recommend platform users about nearby scrapbooks and contacts.*	C	☐

NF-SR-10	*The system must provide additional features for creating and modifying media (such as photo filters etc.).*	M	☐
NF-SR-11	*The system must allow users to recover their passwords by clicking on "forgot password".*	M	☑
NF-SR-12	**SCALABILITY** ***NF-SR 12.1*** *System should be able to adapt to growing demand to manage additional data.* ***NF-SR 12.2*** *System must be able to maintain its optimization even with the growing number of users*	M	☑
NF-SR-13	**RESPONSIVENESS** ***NF-SR 13.1*** *System must be able to save state and return to the same state/page if the user is interrupted by a call* ***NF-SR 13.2*** *System must be responsive to user input*	M	☑
NF-SR-14	**PERFORMANCE** ***NF-SR14.1*** *System mustn't take more than 3 seconds to load the initial screen* ***NF-SR 14.2*** *System must be optimized to use less data when users are on cellular data*	M	☑
NF-SR-15	**NETWORK COVERAGE** ***NF-SR 15.1*** *Basic system functions should be able to work with low/poor internet connectivity* ***NF-SR15.2*** *System should be able to automatically switch to mobile network in case of poor Wi-Fi if the user allows it*	S	☑
NF-SR-16	**ACCESSIBILITY** ***NF-SR16.1*** *System could have a voiceover feature for the visually impaired (Color blind)* ***NF-SR16.2*** *System could have a "Speech" option to choose different voiceover accents to help the user understand better* ***NF-SR16.5*** *System could have an option "Color Filters" to help users who are color blind differentiate colors and help those having difficulty reading text* ***NF-SR16.3*** *System could have an option to change language* ***NF-SR16.4*** *System could have an option to change text formatting from right to left*	C	☐

NF-SR-17	**ACCOUNT TYPES** ***NF-SR-17.1 - General Users*** ***NF-SR-17.1.1*** *- The system should enable users to create their own filters with interactive fictional characters/objects and share them so that other users can use them at that geographic location.* ***NF-SR17.2 - Geocacher Account*** ***NF-SR17.2.1 -*** *The system should award achievements/badges to user to display them in their personal profiles based on* - The number of quests completed - Creates a record time for completing a quests ***NF-SR17.3*** **- Historian Account** ***NF-SR-*** **17.3.1 -** The system should allow users to create Self-Guided Tour Scrapbooks at a particular location. ***NF-SR-*** **17.3.2 -** The system should allow users to create Trivia or similar quizzes related to a historic site.	S	☑
NF-SR-18	*The system should automatically filter profanity in places such as:* 1. Group Names 2. Posts 3. Comments 4. Annotations 5. Usernames	M	☑
NF-SR-19	*The system must support facilities and provide separate interfaces for the different potential users:* 1. Such as generating analytics for data scientists 2. Allow programmers to use APIs that interact with the system	S	☑
NF-SR-20	*The system must allow users to download photos and videos only related to their account/ only from their account.*	M	☐

MARKETING ANALYSIS AND STRATEGY

COMPANY AND PRODUCT BACKGROUND

BACKGROUND

Mint Solutions, a start-up tech company, aims to deliver services at their best by providing solutions and catering to your technical needs with a refreshing touch. We develop applications that are efficient and user-friendly.
Our latest product – GeoTagAR, which is an Augmented Reality based social media platform application, was created by a team of 8 Undergraduate 3rd-year Computer Science students as a project to meet the requirements posed by Mr. Radu-Casian Mihailescu and Mr. Ubaid Abbasi – professors at Heriot-Watt University, Dubai.
GeoTagAR aims to bring people together and allow them to feel closer to each other by capturing and sharing memories they cherish as posts or scrapbooks on a virtual platform. This application will be subjected to periodic updates and bug fixes to enhance user experience and interaction.
At Mint Solutions we prioritize the privacy and security of user data and ensure customer satisfaction in any services we provide, hoping to have a good reputation in the field we expertise in, further strengthening and expanding in the years to come.

PRODUCT

Our application – GeotagAR, serves as an augmented reality scrapbooking platform, a safe alternative to the metaverse, where people can document, organize, annotate, and share memories. This is achieved through the integration and overlay of real-world content.
It also allows people to create scrapbooks to journal their memories and geotag them on the map based on the location where they were captured which can be viewed not just by friends and family but also by people all around the world if their account visibility status was set to public. People capturing and sharing memories at the same location can add them to the pre-existing scrapbooks there or can add them to their personal scrapbooks. This gives people an opportunity to share their perspective of the places they travel to and discover which in turn enhances community interaction as people can leave messages and reactions and share their experiences with the world.

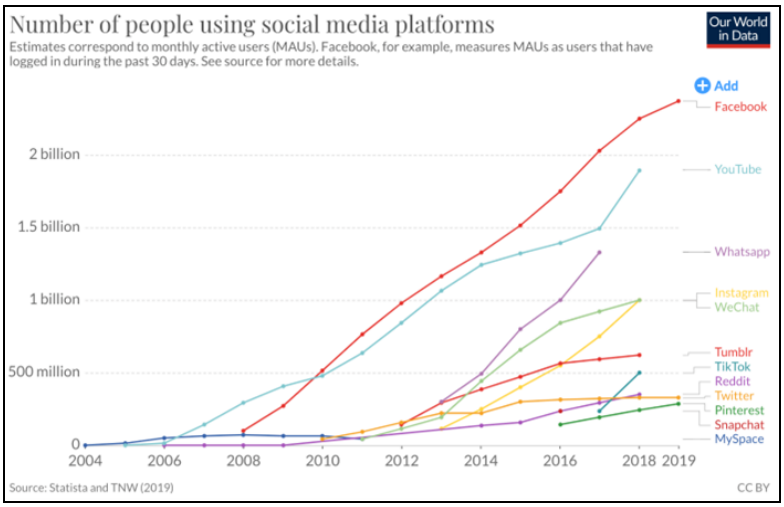
MARKET BACKGROUND

MARKET SIZE

There are approximately 4.2 billion social media users (accounting to around 59.4 % of the worldwide population) around the world. The social media market is expected to grow to $434.87 billion in 2027 at a CAGR(Compound Annual Growth Rate) of 17.1%.
The Rising penetration of mobile, tablet, and other electronics and rising data consumption will drive the social media market by leading to an increase in time spent on social media websites.
The Global Augmented Reality Market size is projected to reach USD 88.4 billion by 2026, growing at a CAGR of 31.5% between 2023 to 2026.
The COVID – 19 lockdown period has led to a notable increase in online and digital activities. There was a massive rise in the adoption of emerging technologies such as artificial intelligence, machine learning, natural language processing, and augmented reality.
Such an increase in the adoption and development is expected to create ample opportunities for the global market growth. 3D image context with augmented reality-based features of social media is refueling the business needs.
Also, considering the pent-up desire for travel and adventure after spending months indoors during the lockdown period, the travel and tourism industry has also experienced a sharp incline in the post lockdown period.
Hence, we hope that our app will gain popularity in an era of escalation in usage of social media and tourism.

MARKET TRENDS

The number of social media users globally grew from 4.2 billion in January 2021 to 4.62 billion in January 2022. This accounts for a 10.1% growth YOY (year-over-year growth) of global social media usage. In comparison, January 2023 saw a modest 3% growth of +137 million users.
The increase in demand is not only because of the millennials but also widespread usage by people of all ages. Social media became a crucial platform for communication during social isolation and restricted contact with others. Furthermore, social networking sites have increased significantly due to increased demand from businesses that use the platforms for marketing purposes.
People have turned to social media to keep up their relationships and access entertainment to pass the time since they were asked to stay at home. The global social networking market is expected to register a CAGR of 39.7% during the forecast period.

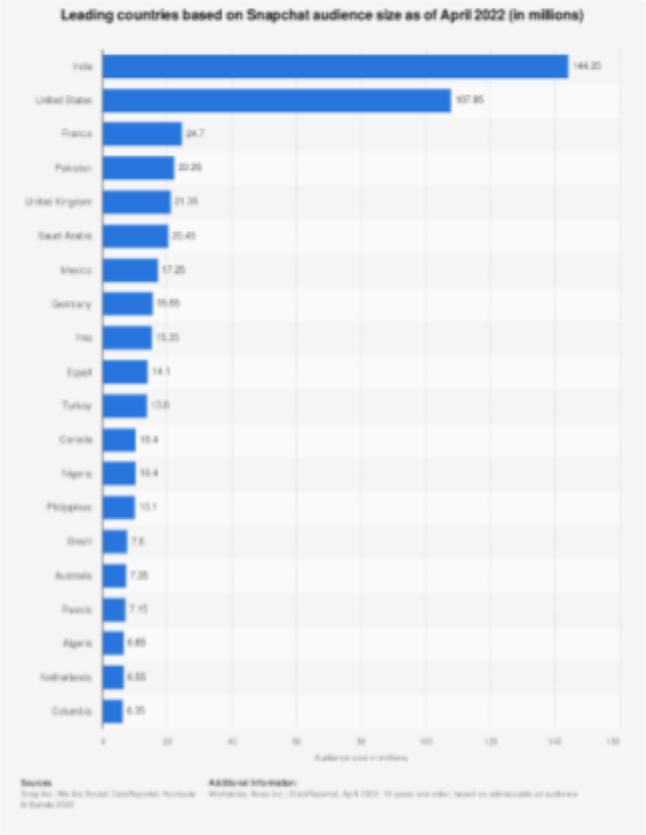


MAIN COMPETITORS

SNAPCHAT

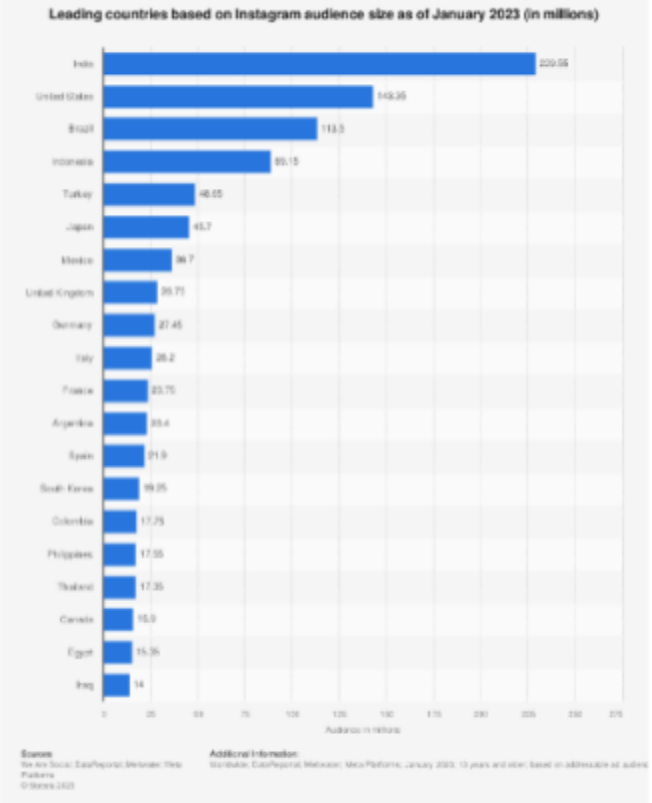
The company defined itself as a camera company that enables users to generate content through AR and filters. A key feature of this app is that it allows you to share photos with your friends and across various platforms, create stories, interact with other users, and create and share content. Major brands use Snapchat for marketing campaigns. Its business model moves across 3 industries: social media, content marketing, AR. Snapchat Has 363 million Daily Active Users Worldwide.

This is an increase from the third quarter in 2021, which had 306 million. Snapchat's revenue model is based on advertising. Provided below are the statistics of the worldwide usage of Snapchat based on the audience size.



INSTAGRAM

This is a photo and video sharing social networking service that allows users to upload media that can be organized by hashtags and geographical tagging. It is used by businesses as a platform to build an audience and for marketing purposes.
In 2021, there were 1.21 billion monthly active users of Meta's Instagram, making up over 28 percent of the world's internet users.
Instagram revenue model is based on visual advertising, influencer marketing and affiliate programs.
Provided below are the statistics of the worldwide usage of Instagram based on the audience size.



STAKEHOLDERS

The stakeholders of our product have been classified into two categories – Internal and External stakeholders.

INTERNAL STAKEHOLDERS

The stakeholders who are dependent on direct employment, ownership or investment are the internal stakeholders.
For our application they are as follows:

- Our team of developers, manufacturers, and suppliers who have contributed to this project.
- Owners of the application – Radu-Casian Mihailescu, Ubaid Abbasi, and Heriot Watt University

EXTERNAL STAKEHOLDERS

These are the stakeholders outside our company who aren't directly connected to the development or management of our application. The external stakeholders for our application are as follows:

- Our target audience i.e., the different types of users we aim to provide the application to. Our final product – GeoTagAR serves 3 different types of users:
    - General users
    - Geocachers
    - Historians
- Future investors or shareholders who have a further interest in investing in our application or having a tie-up with our company
- Creditors i.e., banks and bondholders who will support our application and company financially in case of any financial assistance required in the future
- Competitors of our application, for example – Facebook, Instagram, Twitter, Reddit, Snapchat, etc.
- The government

The major stakeholders for our application are the professors at Heriot Watt University.

MARKETING ANALYSIS

SWOT ANALYSIS

Strengths

- Allows users to place and view items at a location virtually using Augmented Reality with the camera-based and map-based AR feature. (USP of our brand)
- Users can chat, form groups, have different types of user accounts and share content i.e., all the features of a basic social media application (for example – Instagram, Facebook, etc.) are merged with maps (for example - Snapchat) and augmented reality to provide an all-round experience.
- Availability of different types of user accounts.

Weaknesses

- Our application and company is new and upcoming which might make it hard for users to trust, which might result in less of a database and lack of reputation. For this, we have multiple marketing strategies discussed later on.
- Heavy reliance on WiFi and access to the Internet.

- Possibility that the product's quality and services don't meet the user needs, requirements, and expectations.

Opportunities

- About 4.76 billion people are using social media as of January 2023 and the numbers are expected to increase to 6 billion by 2027. This means there are a huge number of people willing to use social media platforms – both old and new.
- Availability of user reviews and rating to provide feedback which can be used to improve our product.
- Possibility of an affiliation or tie-up with big-scale companies like Meta which is involved in augmented and virtual reality apart from its primary focus being social technology and application building.

Threats

- Competition in the market from other reputable competitors providing similar services and facilities in the near future could result in users preferring them over our product; any small change in the focus of a large competitor can erase any market position we hold.
- Concerns regarding safety and privacy online which might steer users away from using GeoTagAR.
- Users might not like Augmented Reality and with their lack of interest in AR and abundance of basic social media platforms available already, our product might not be used much.

PESTLE ANALYSIS

Political factors

- Can affect and shape the public opinion regarding the politics, politicians, and the government if the platform is used to promote agendas, discuss politics and spread rumors and provide misinformation.

Economic factors

- A new federal corporate tax system will be implemented in the United Arab Emirates applicable from June 1st, 2023. This is the lowest corporate income tax rate within the GCC at a standard rate of 9% only. This will impact the profits we make in the future.

- The global Augmented Reality market size is projected to grow from USD 6.12 billion in 2021 to USD 97.76 billion in 2028. This means that more users are going to get acquainted with AR and use it, therefore using our application too.
- Labor and environmental laws may have an impact on the production and various other company and product procedures.
- Any economic disturbance can make us reduce our marketing and advertising budget, which in turn will reduce our company and product income.
- Our product being free for use for anyone in the specified age limit might make it grow quickly.

Social factors

- An estimate of 6 billion people are going to be using social media by 2027.
- Spending a lot of time on social media can result in depression, anxiety, and cyberbullying.

Technological factors

- Technology is continuously developing, making social media and AR more popular, easy, and fun to use which is going to allow more users to benefit from the services our application provides.

Legal factors

- Data protection and privacy laws need to be followed and further changes in these laws will affect how the information provided by a user is stored and used by the company and the application.

Ecological factors

- GeoTagAR is a web-based social media platform because of which it has a small carbon footprint. It mainly requires electronic devices and the Internet which in turn consume energy for functioning and manufacturing.

UNIQUE SELLING POINT (USP)

Our application provides users with a Camera-based and Map-based AR feature enabling them to place and download AR anchors with one touch.
GeoTagAR also allows posts to be pinned on the map as pins which can be viewed by other users according to the account visibility status.

MARKETING STRATEGIES

We have used the following Marketing Strategies to promote our application:

TRADITIONAL MARKETING

- Posters
- Flyers
- Business cards
- Merchandise
- Pricing - Our app is free, i.e., users don't have to pay at all to use any of our services.
- Word of the mouth

DIGITAL MARKETING

- Company website
- Social Media marketing - We have used different platforms for promoting our application.

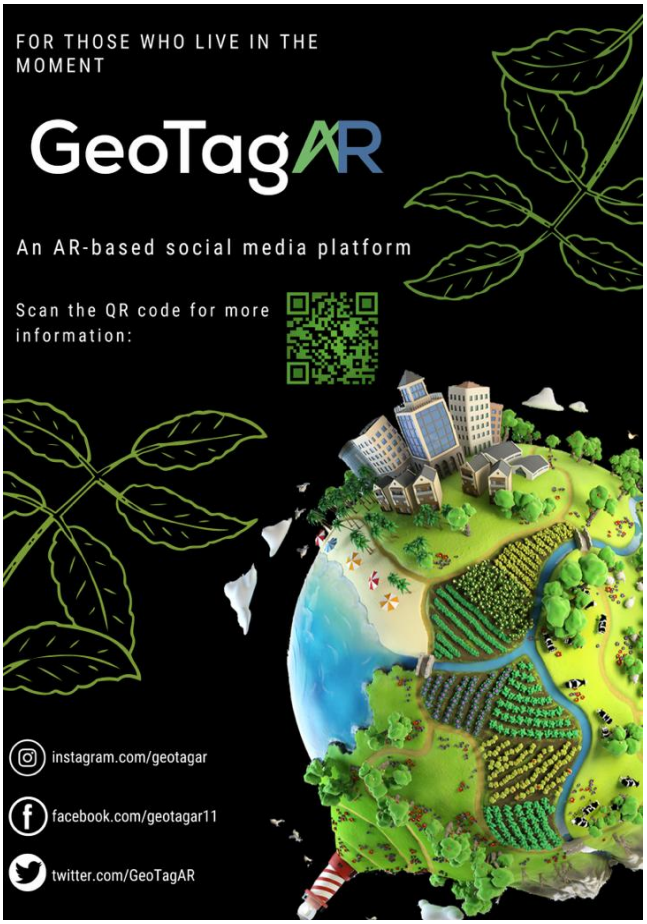
  - Platforms -
    - Netlify - iOS and Windows
    - Apk file - Android
    - Web

Due to our application being digital based, we have heavily relied on digital marketing as our main medium of promotion.
Considering the fact that our company is a start-up with a new product out in the market, digital marketing proved to be cost-effective with a negligible cost and minimum budget. It also allows our product to be widely recognized as a large number of people use different social media platforms resulting in more engagement and interaction.

  - Target audience - We target the users belonging to a specific age range and of particular types who would resonate and be more interested in our application.
    - Audience from the ages 18-65
    - Categories of users:
      - General users
      - Geocachers
      - Historians

MARKETING MATERIALS

POSTER (Product)



FLYER (Company)

BUSINESS CARD (Company)

MERCHANDISE (Product)

Given below is the product merchandise -

COMPANY WEBSITE

The link provided below redirects to our promotional company website - Mint Solutions, which gives an overview of the company, its product - GeoTagAR, and our team.
https://mintsolutions.wixsite.com/tech

SOCIAL MEDIA ACCOUNTS

Company Social Media Accounts

- Gmail → mintsolns@gmail.com
- Instagram → https://www.instagram.com/mintsolutions11/
- Twitter → https://twitter.com/MintSolutions11
- Reddit → https://www.reddit.com/user/MintSolutions

Product Social Media Accounts

- Gmail → geotagar11@gmail.com
- Instagram → https://www.instagram.com/geotagar/
- Twitter →https://twitter.com/GeoTagAR
- Facebook →https://www.facebook.com/geotagar11

MARKETING GOALS

Increasing product awareness

More individuals should be familiar with our product and should think of it when social media is brought up. Due to its uniqueness and special features, GeoTagAR can out best its competitors by providing users an augmented reality scrapbooking platform with cloud anchoring features.
Our aim is to increase awareness and user engagement for which we are present on multiple social media platforms such as Instagram, Twitter, Reddit, Facebook, etc. We also have a company website through which users can get to know more about the latest application updates and details. Through this we meet customer needs and provide better quality service to our users in comparison to our competitors.

Acquiring new customers and users

Since GeoTagAR is free, it will attract more users, persuading them to use it more often and get well acquainted with its features. These users will inform more people which will fulfil our aim to have an increase in the number of new users.

Increase customer value

Current users would receive early access to new updates and features. We aim to have loyal customers who trust us and continue to make the best of the services we provide and help us give a better user experience by satisfying their needs and addressing their suggestions to keep them happy in the long run rather than solely focusing on new customers and leaving our regulars unattended. By giving regular users the privileges they deserve, we hope they help in promoting our product, thus aiding in spreading product awareness and establishing product authority.

MARKETING MIX

Our application serves 3 categories of people, namely, general users, geocachers and historians, and provides additional features exclusive to each of these categories.
For instance, the historians can create, and post quizzes related to an archaeological site or monument, geocachers can get a geocaching experience by unlocking locked posts geotagged on the map and winning batches marking their achievements.

7 Ps OF MARKETING

Product

Our product - GeoTagAR, an augmented reality scrapbook platform that encourages users to share and relive the memories and moments is a mobile and web-based application. We aim to work continuously for updating the app, its features, and correct bug fixes to provide a better user experience to our customers.

Price

GeoTagAR is completely free for our customers to use. We aim to deliver the best of our services to the customers without compromising the product positioning while keeping up with the market competition. If the application gains popularity and is used a lot by our targeted audience in the future, we might incorporate additional features that require in-app purchases to access them. Advertising and sponsorship are two more techniques which could financially boost our company.

Place

The product will be available for use on iOS and Web using Netlify, Android using an APK, and Windows using a web app. The Front-end and Back-end code for the application and its database will be available on our GitHub repository which has been made public for users to access and build the application on their own personal devices.

Promotion

Posters and flyers are created as a part of traditional marketing with social media accounts on Instagram, Facebook, Twitter, and Reddit as the digital ways of marketing to promote our product. We have a company website which serves as a perfect introduction to our company, the team behind Mint Solutions, our aims and objectives, terms and conditions, privacy policy, and our product. Lastly, we have company business cards and product merchandise to boost the customer interest in our product.

People

Regular meetings were held (both online and in-person) to discuss the individual progress on the roles taken by the members. The problems faced during the task implementation were discussed and solutions were provided for the same. We also set future dates to organize the meetings according to the availability and convenience of all members, enabling them to work efficiently.

Process

The UI and design of the application were made simple to allow ease of navigation for a user new to our product. It consists of 5 main sections which can be navigated through the navigation bar located at the bottom of the screen.

Physical evidence

The logo of GeoTagAR is a green globe. It represents globalism, connectivity, and communication. We maintain a green and white theme for our marketing materials to embrace environmentalism. The word 'GeoTagAR' is a combination of 2 words – Geotag and AR, which are the two essential components of our product.

FINAL APPLICATION DESIGN AND IMPLEMENTATION

PRODUCT SCOPE

The scope of the project is a fully functional mobile application where it includes a database and a stand alone promotional website. The application is an online social scrapbooking platform for users to interact and share with one another by using Augmented Reality (AR). Initially the application was planned to be working for the targeted operating systems which are Android and IOS, due to limited resources with the MacOS, it was decided to first implement a working and a functional application for the Android systems.

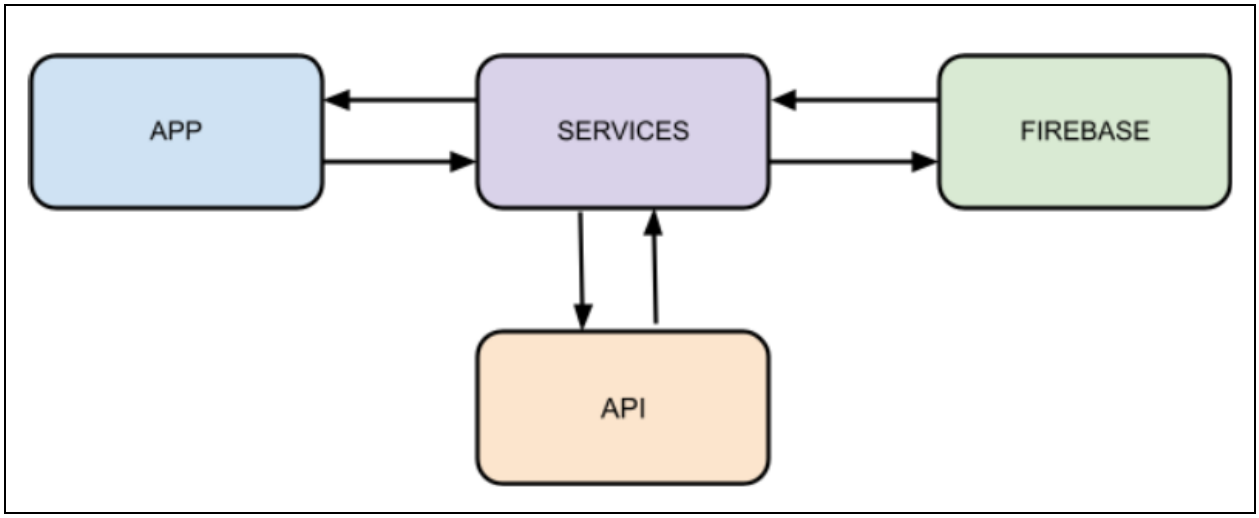
The mobile application should contain an interactive user interface to allow users an easy experience. The main aim is to focus more on the functionality of the application with AR being utilised in order to develop the app, this was discussed from our client as some functionalities felt it should be worked on more in our previous working prototype. The primary target is for the general users to be able to utilise the functionalities of the application. The system should also provide a clean user interface to promote user friendliness and engagement.

The database should currently store all the relevant information about the user, media with the amount of likes and comments. The promotional company website built is strictly made to promote for marketing purposes and involve more public exposure for the application. The website will also provide a link for users outside the team to gain access to the application when it is ready for the users to use which will help for future usability evaluations and feedback.

DESIGN METHODOLOGY

APPLICATION ARCHITECTURE

The application architecture consists of 3 layers - App, Services, Firebase. The data retrieved from the database (Firebase) is relayed to and displayed in the App. The user interacts with the App component/ layer of the architecture. The Services layer consists of JSON queries and makes use of API calls which relay requests and responses between the App and Firebase. Some calls also go to APIs such as Google Maps and spatial anchors. Firebase is a cloud-hosted NoSQL database that enables storing and syncing data between the users in real time.



MVC Architecture

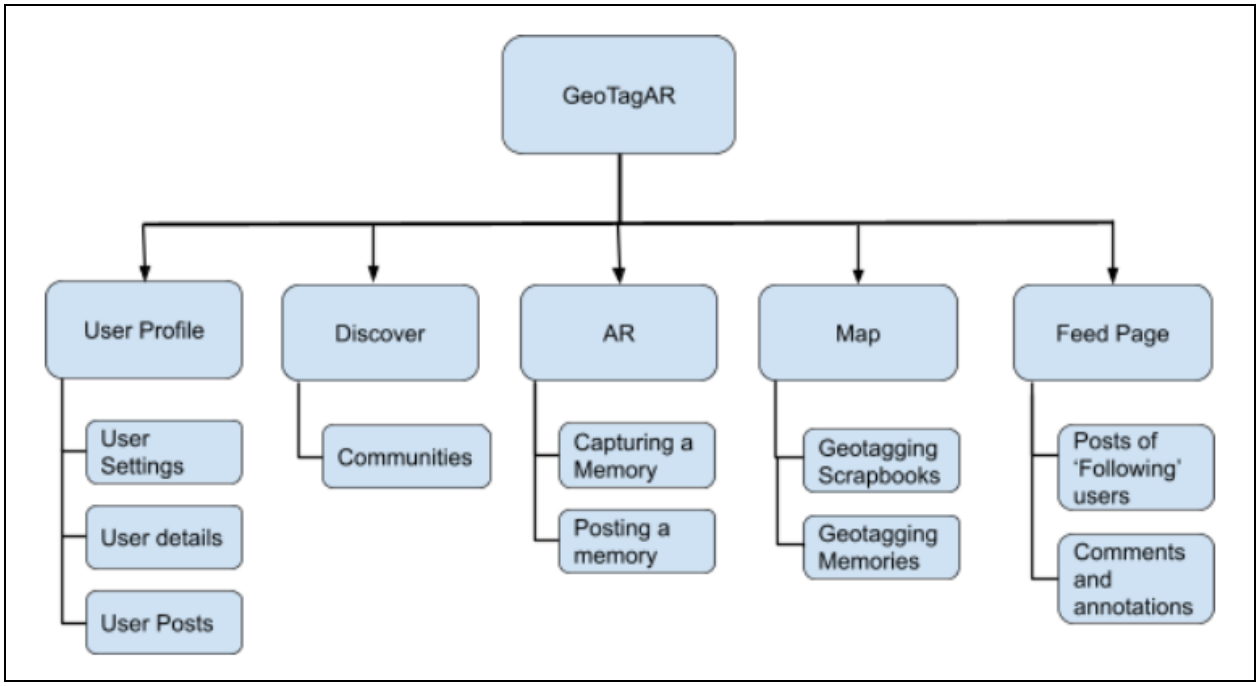
The **Model-View-Controller (MVC)** Framework is a design pattern that separates an application into three main logical components - Model, View and Controller. This design pattern is used to mitigate the problem of controlling large and complex data by splitting a large application into sections, each having its own specific purpose. It not only makes the code easier to maintain and modify but also allows testing of each component separately. All the components are independent of each other.

The user interacts with the **View** component. It represents the UI of the application. It only interacts with the controller.

The **Model** component deals with the data stored in the database. It can add or fetch (retrieve) data from the database. It interacts with the database and supplies the data as requested to the controller, hence, it acts as a middleman between the controller and the database.

The **Controller** component responsible for the communication between View and Model. Any data modification is sent to the Model by the Controller. It is responsible for transporting data fetched by the Model to be displayed by the View component.

INFORMATION ARCHITECTURE / COMPONENTS



The above Information Architecture diagram gives us a blueprint of the design structure of the application. The Application consists of **5 main blocks** - User Profile, Discover, AR, Map and Feed Page.

The **User Profile** displays the user details and allows the user to update these details by visiting the User Settings. The User posts are the Memories and Scrapbooks posted by the User.

The **Discover page** contains the communities the user is a part of. A user can send messages/interact within the communities they are a part of.

The **AR** section allows the user to capture and post a memory.

The **Map page** displays the geotagged scrapbooks and memories captured and posted by the users. AR and the Map are the primary focuses of our application.

The **Feed page** contains the posts by the people that the user follows. The user can also comment and annotate on the posts by other users.

FRONT-END APPLICATION DEVELOPMENT

Flutter was chosen as the go-to framework for the application development primarily due to its:

- UI consistency
- Performance
- Hot Reload Feature
- Customization
- Plugin support

UI Consistency

A major factor for choosing flutter was its UI consistency. In other frameworks such as React Native, the rendering of the UI relies on native components, which can result in inconsistencies between the Cross platform versions of the application i.e., Android & iOS.

On the other hand, flutter's widgets are rendered through the *Skia* graphics engine i.e., an open source 2D graphics library. Skia enables the UI to be rendered in the same manner regardless of platform, thus resulting in UI consistency across platforms.

Performance and Hot Reload

Flutter's *dart* language allows indirect compilation to native machine code in comparison to React, which requires a JavaScript bridge. This enhances the user experience by providing smoother animations/transitions.

Furthermore, Flutter's hot reload feature has proven to be greatly beneficial. It allows developers to see UI changes in real-time without restarting the application. Due to this, the application's UI development process has been greatly sped up and enhanced, i.e., making minute changes in the UI does not require restarting the entire application.

Customization

Pre-built, customizable widgets offered by flutter have allowed in creating a visually appealing UI in addition to engaging the user and retaining their attention. The widgets prove to be quite valuable in providing users with a user-friendly interface.

Plugin Support

Google's immense support for the framework has resulted in plugins setting a remarkably high bar for their quality and consistency. The pub.dev package manager allows in finding the best plugins based on their maintenance, popularity and quality. This has resulted in significantly enhancing the front-end development process. Additionally, the plugins have cross-platform compatibility in comparison to React Native plugins, which sometimes require platform specific code, thus resulting in potential inconsistencies.

WEB SUPPORT

Code developed in Flutter also works on web browsers without needing to change anything other than the layout of elements. This allows endless possibilities and one such possibility explored in this project is the creation of an Admin Panel in Flutter itself. On resolutions >600px, the application's mobile layout transforms into a web-based layout. If the current user satisfies the condition of being an Admin, their feed is switched with a collection of all reported posts, which they can choose to either *delete* or *mark as safe*.

USER INTERFACE

The UI has been developed with a focus on usability, accessibility, and lastly, aesthetics. Furthermore, significant emphasis has been placed on delivering a smooth and captivating user experience.
The navigation bar has clear and intuitive icons, allowing users to access tabs with ease.
Relevant information is displayed to the users in a visually appealing manner.
Material Design principles have been utilised in order to ensure a clean and visually appealing UI, thus striving to provide an enjoyable user experience.

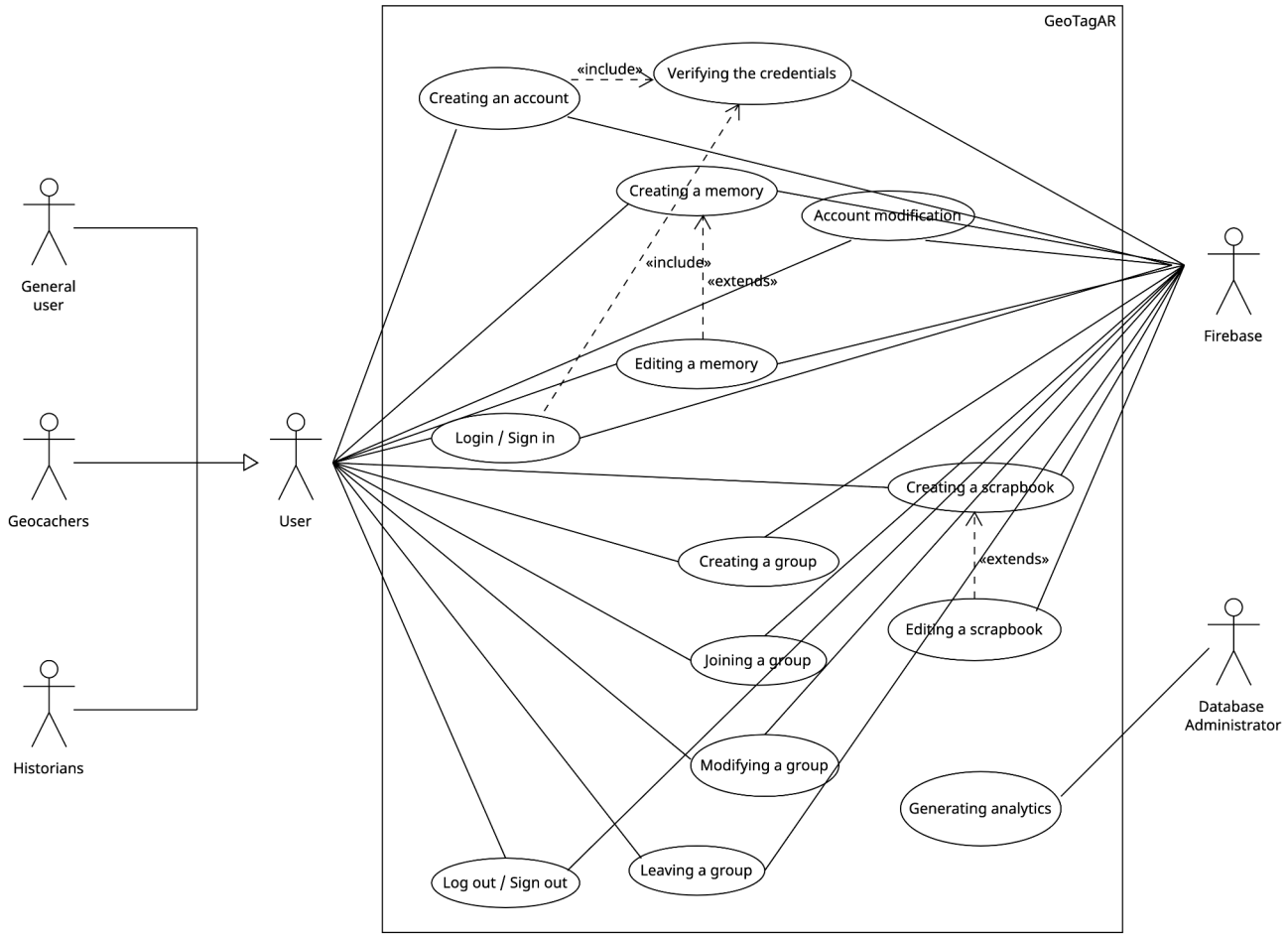
FRONT-END DEVELOPMENT PROCESS

The UI was created using an iterative development process in accordance with Agile methodology. The development process was in-line with the SCRUM framework, thus allowing in the breakdown of the project into smaller tasks. These tasks were later completed in the development sprints.

UML DIAGRAMS

USE CASE DIAGRAM

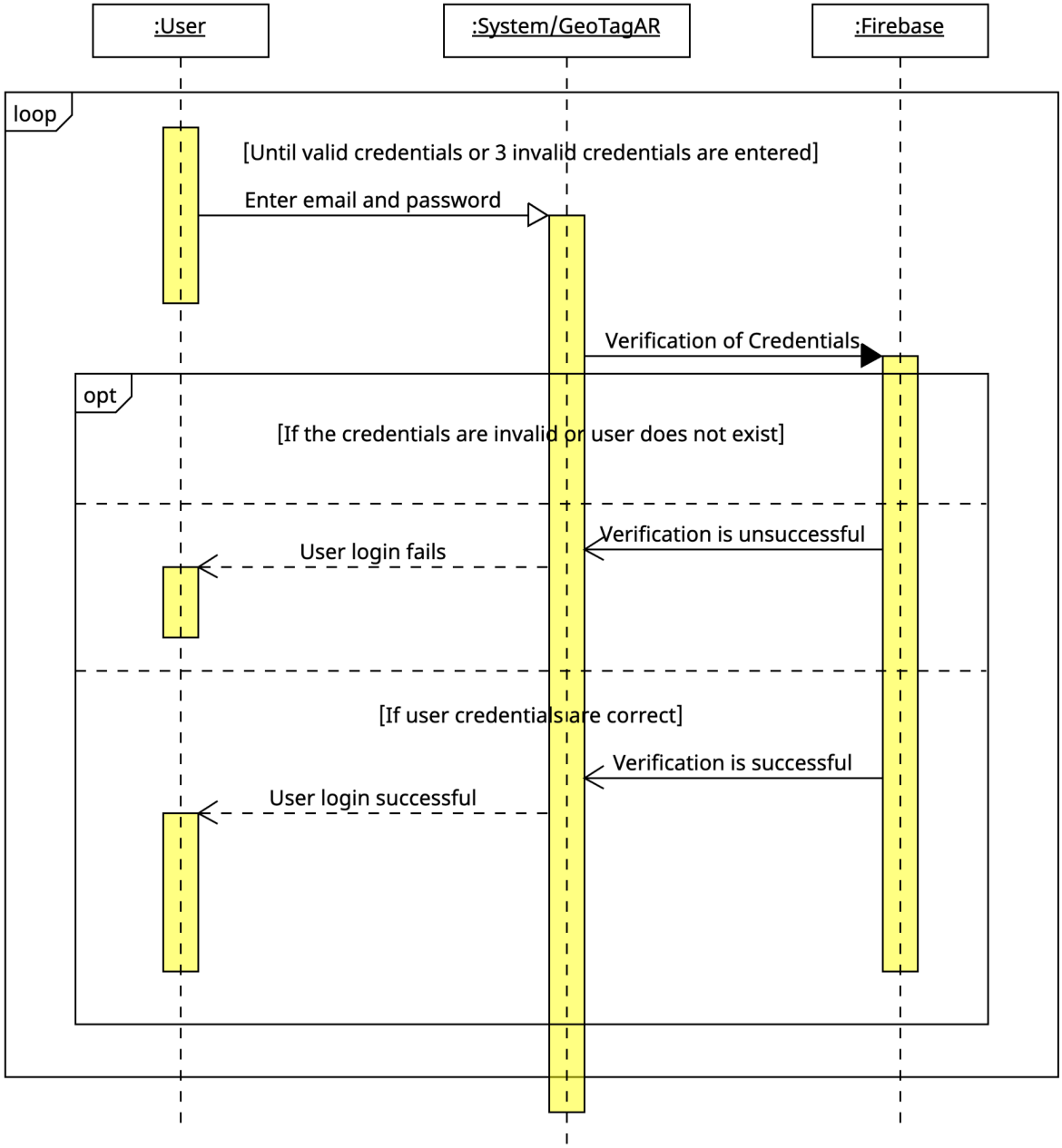
The following Use Case diagram covers the functionalities that we achieved by the end of the project:



SEQUENCE DIAGRAMS

User Login

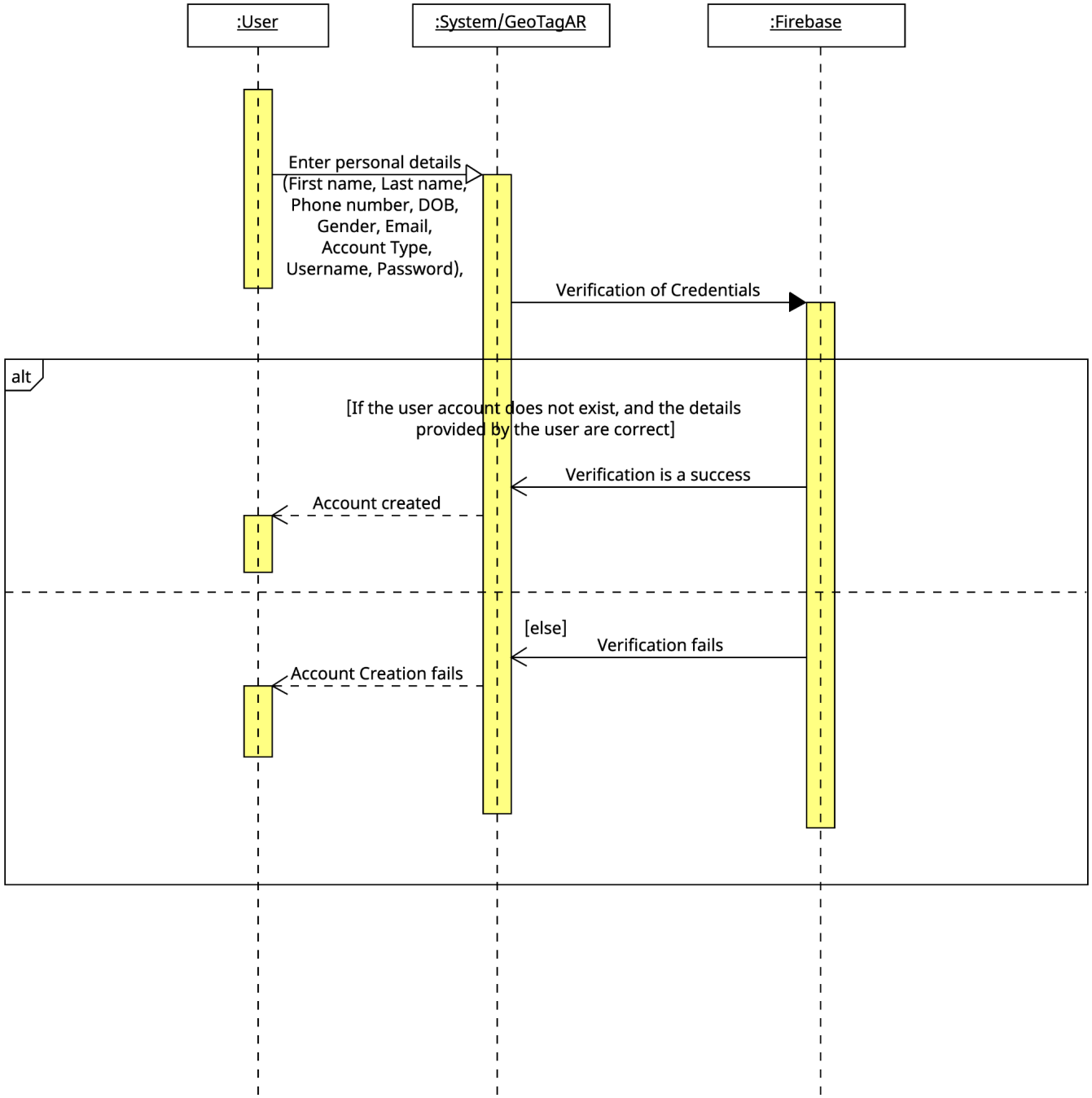
The user has to log in into their account in order to use the functionalities and services offered by the app. The diagram below represents the login process of the application. The user is asked to enter their registered email and password to log in into their account. The user is given 3 attempts to enter the correct credentials. The user account will be blocked after 3 invalid login attempts.



User Registration

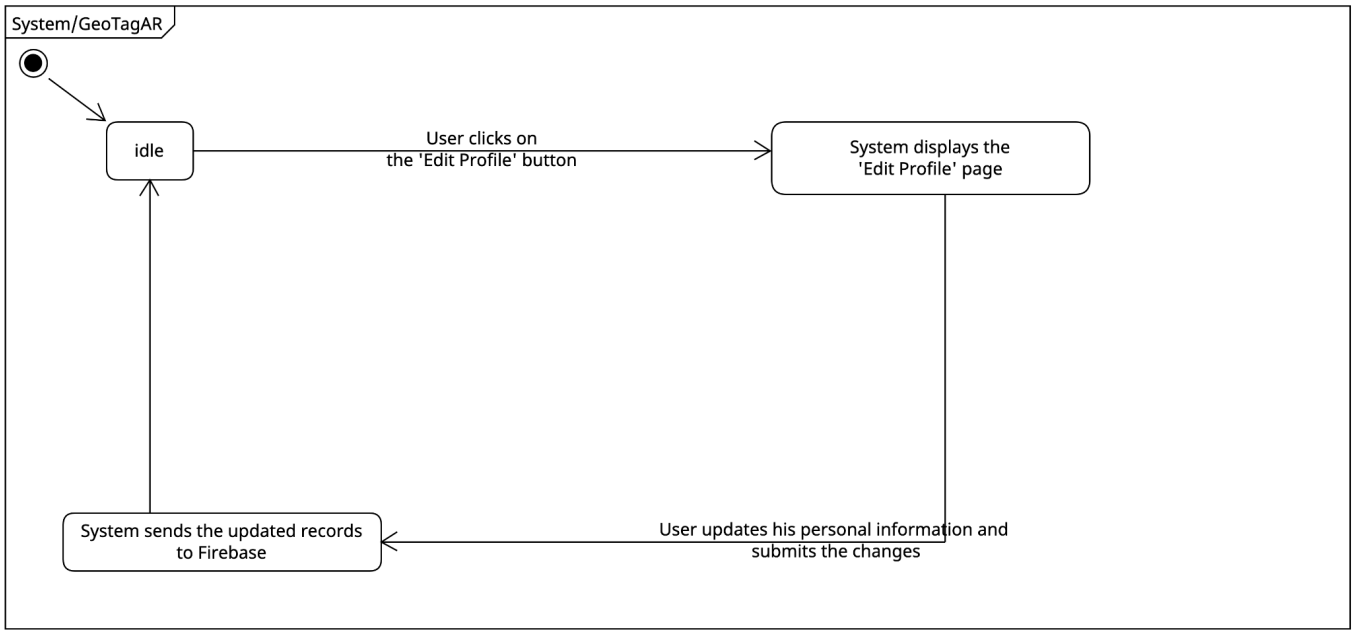
The diagram below represents the User registering process. The user is required to provide

their name, phone number, date of birth, gender, and email and set a valid username and password. If the credentials are verified, account creation and user registration is successful, or else it fails.



STATE MACHINE DIAGRAM

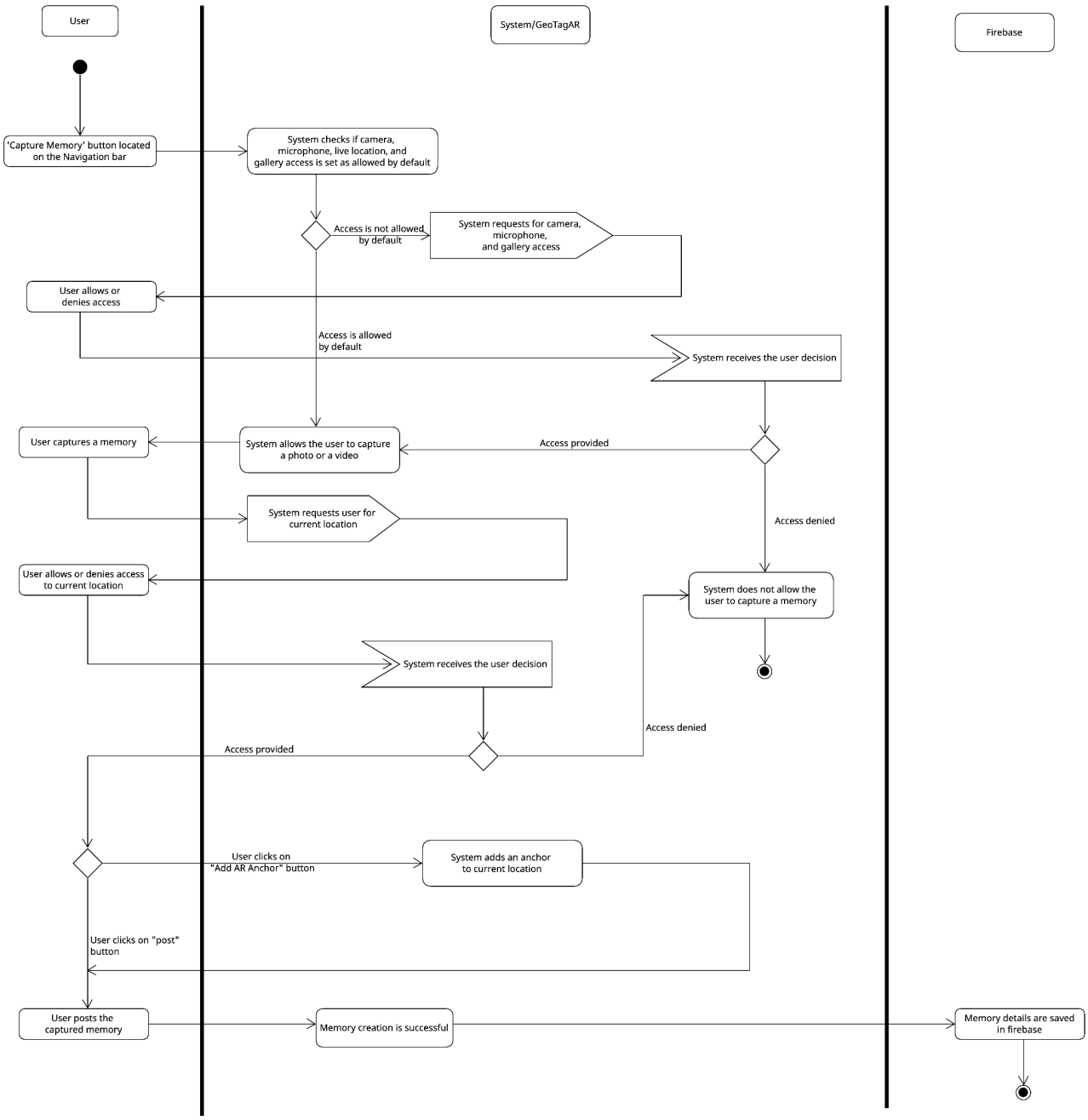
The diagram below represents the change in state of the application during the process of updating the User Profile. The idle state represents the user at the User Profile page which can be found using the Navigation bar at the bottom of the screen in the application.



ACTIVITY DIAGRAMS

Creating a memory

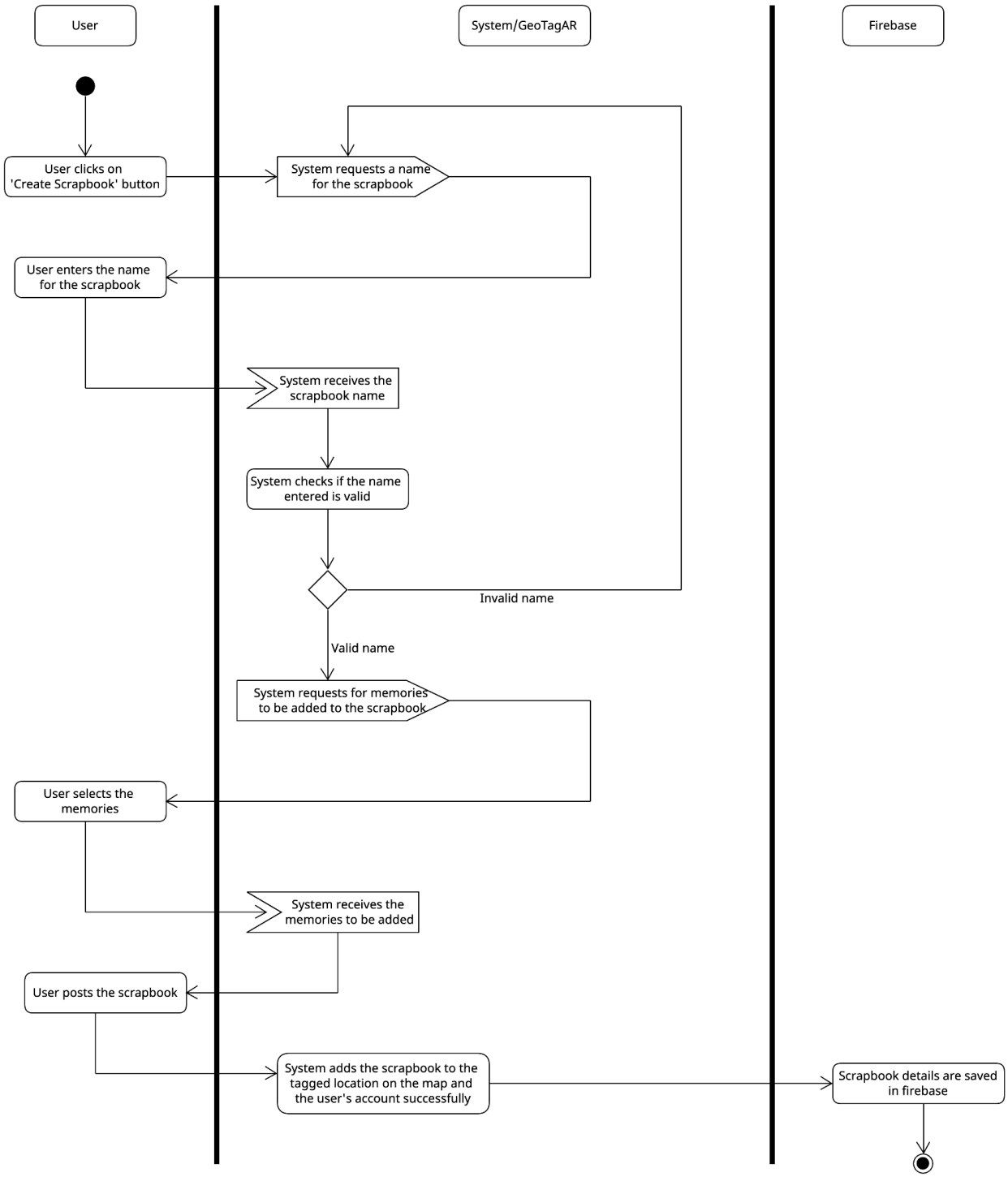
The diagram below represents the process of creating a memory. The features of capturing a memory, adding an AR anchor (optional), posting the memory and geotagging the memory to the user's current location are involved in the process.



Creating a scrapbook

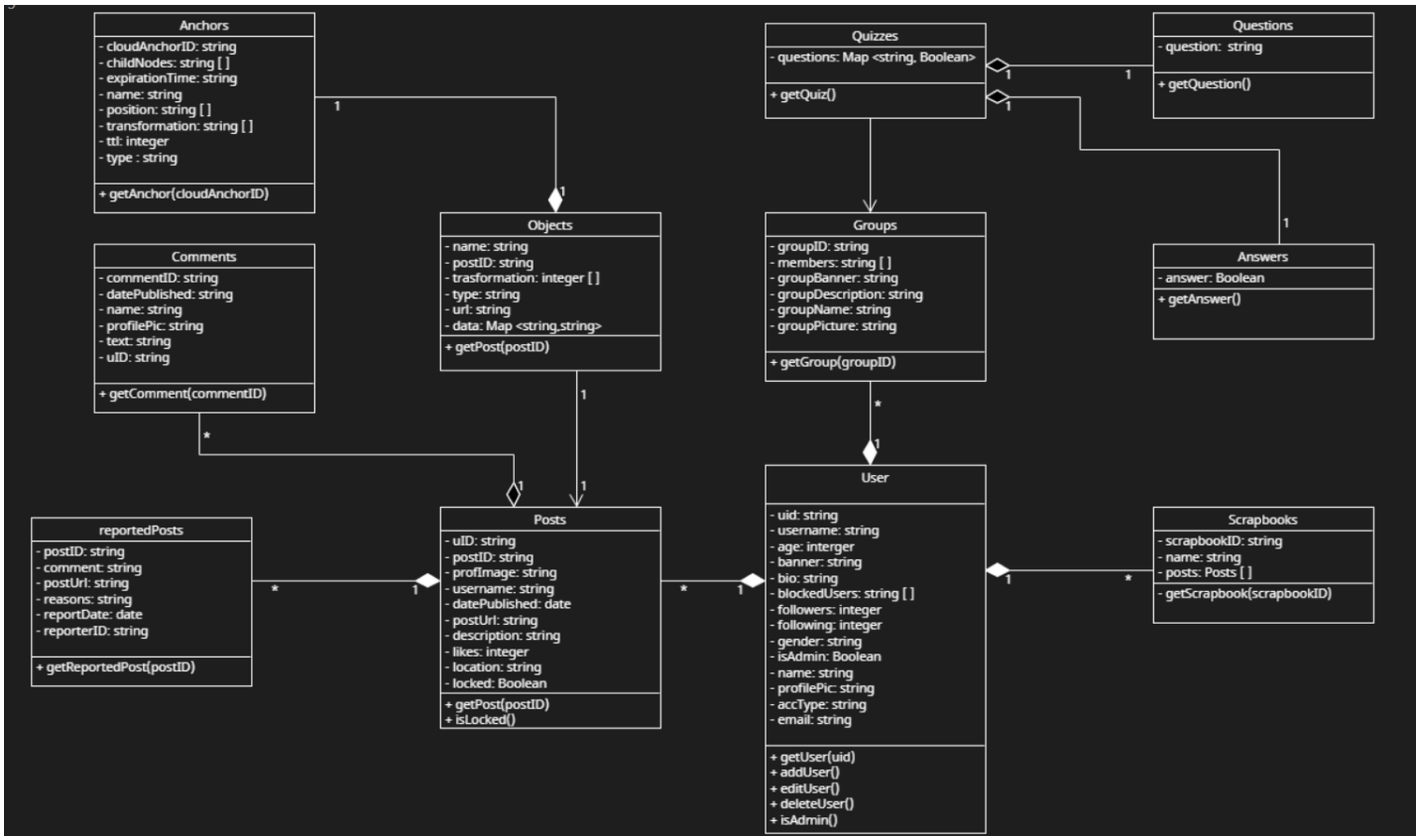
The diagram below represents the process of creating a scrapbook. The features of adding

memories to a scrapbook and geotagging the scrapbook on the map are involved in the process.

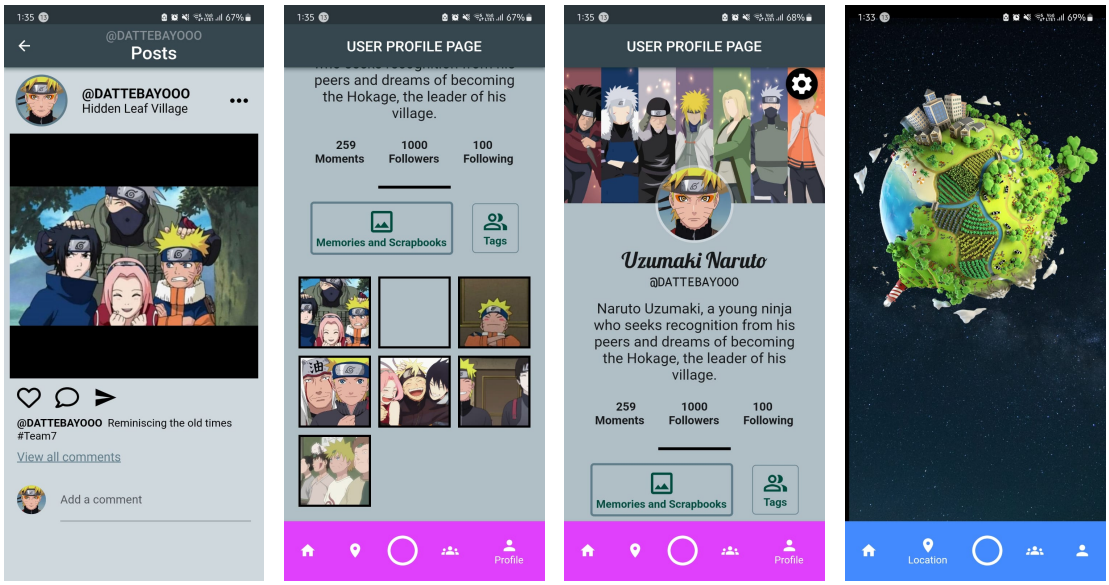


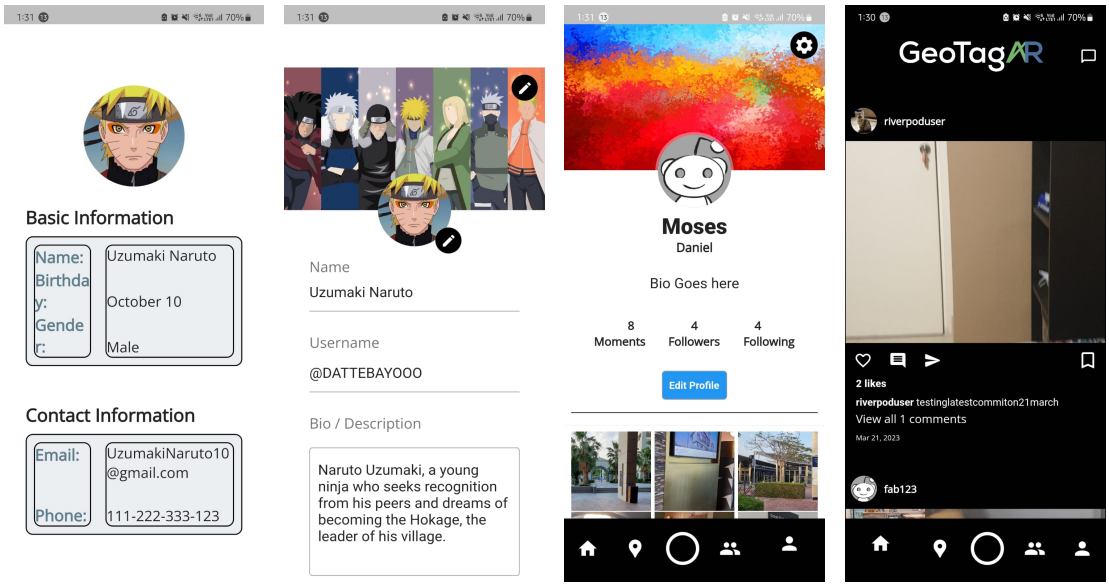
CLASS DIAGRAM

The following class diagram represents the main classes that our application consists of and the relations between them.



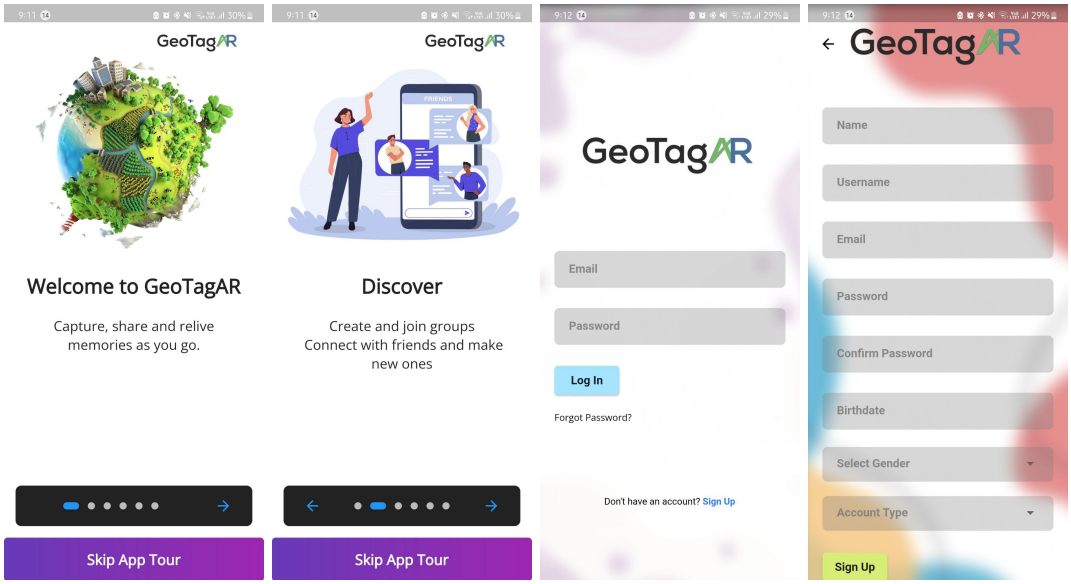
INITIAL UI DESIGN





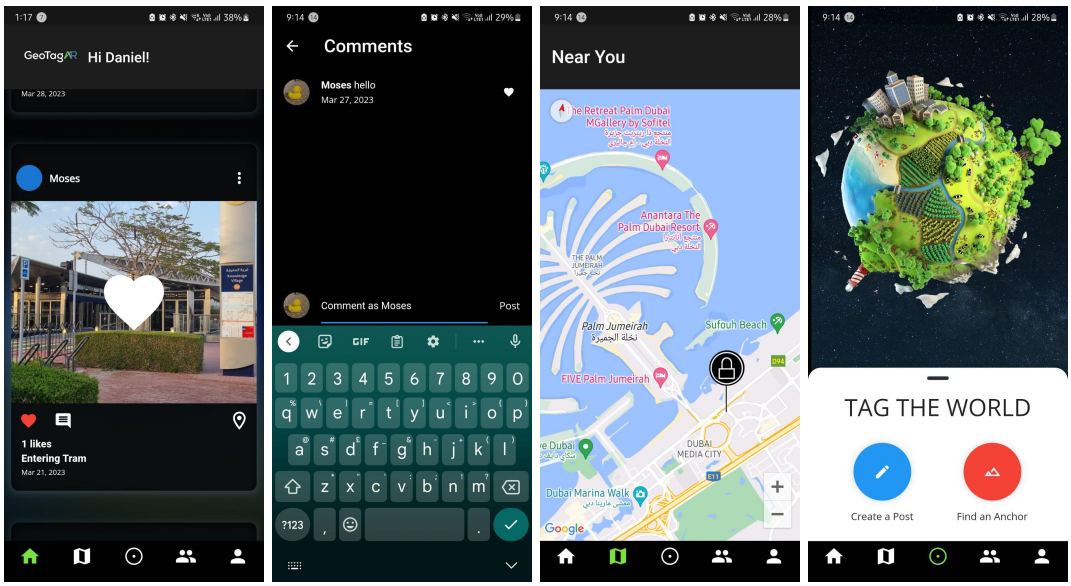
FINAL UI DESIGN

Brief features of the app displayed for a new user to understand it at a glance followed by the login page

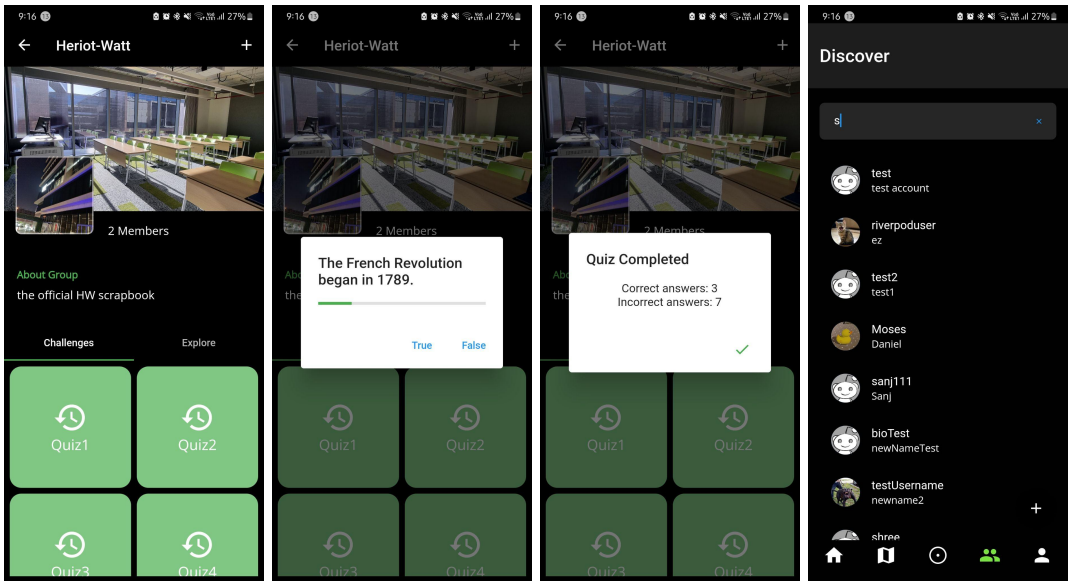


The home page contains a feed populated by posts from the users followed and public posts. It allows the user to comment on them. The icons were changed and made more rounded in the final design and the feed card was given a border. The bottom navigation bar was also updated to match the overall color scheme of the app and the icons were resized.

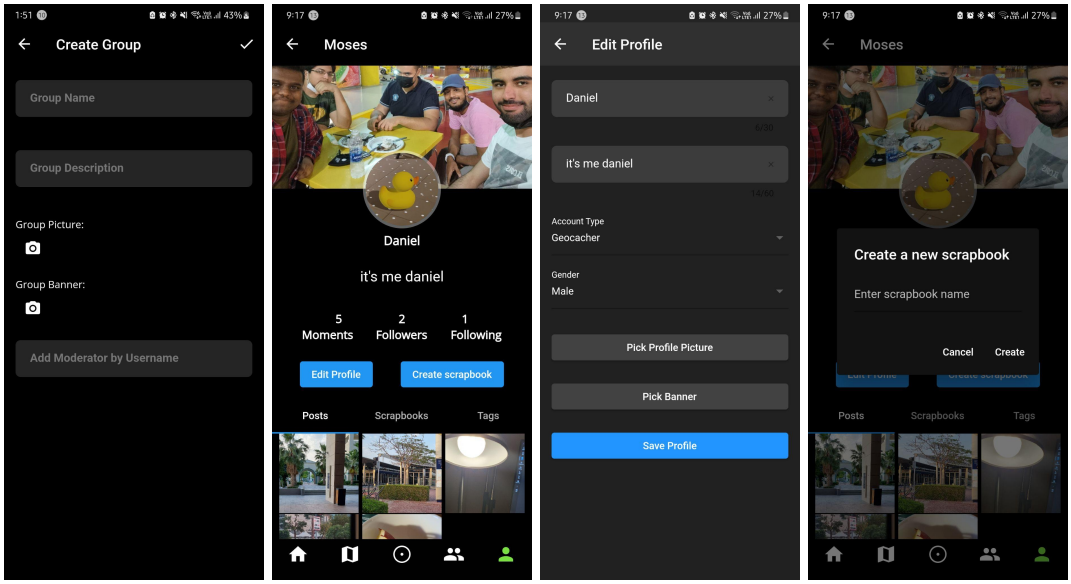
The uploading post page which also includes the AR feature was built in the final interface along with the discover page. The map page was updated to show different markers for locked and unlocked posts.



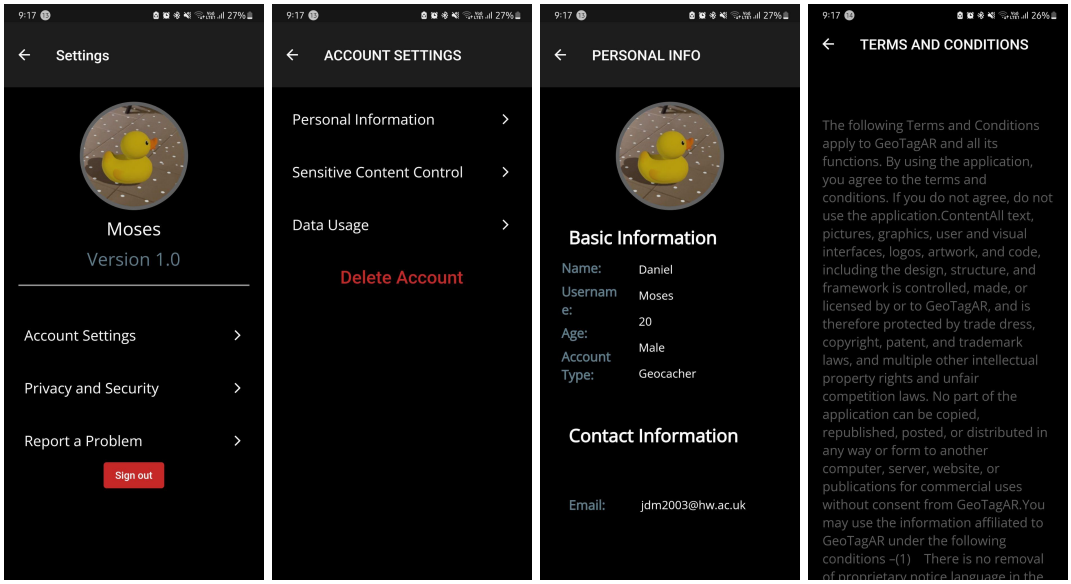
This is the group page which includes challenges in the form of quizzes. It also has a bio, picture and banner which has an interface similar to that of a user profile. The discover page allows the user to search for other users and groups. Users or group which are the most relevant appear at the top. The plus icon at the bottom right allows for creation of a new group which leads to a page where the user can create a new group by filling out the group name, bio, banner, picture etc. We also added a different page for other users' profiles viewed.



The profile tab allows the user to see their profile page, edit their information, create a new scrapbook etc. The centre tab allows the user to create a post. It crops the picture in an appropriate ratio for better view when displaying post.



The settings page has not seen many changes other than some minor visual changes and a switch to dark mode.



FINAL USABILITY EVALUATION

USABILITY TESTING PLAN

OBJECTIVE AND AIMS

The test provided will help us understand how each user from a different perspective examines the system's usability and the design aspect of the product. Participants will be tasked with observing the given final product, then answering questions related to its functioning and design. This information will help to make sure that the features and general purpose of the product are in line with client expectations. The main aims of the tests will be to ensure that the participants are able to identify the purpose of each section of the application, share suggestions about the design of the product, and evaluate its functionality as well. The AR implementations will be mainly focussed on in terms of the functionality as it is part of the foundation of the application.

After completion of the test, user feedback and common issues in the system will be noted.

PARTICIPANTS

The participants chosen must consist of potential users of the platform – such as Geocachers or Historians. However, we must include the average user – who does not conform to the above categories – as well, to observe all possible types of users. The client must also be a participant, as they must be able to check if the overall functionality of the application conforms to what they envisioned. Also, they must fall in the general group of ages 18-65 as per the usability guidelines.

TRAINING

A training procedure will be demonstrated by the respective principal investigators to showcase how the AR functionality works, this is needed to ensure the participants will have an easier time on utilising the app and it would also be time efficient for the usability testing procedure. However, No instructions will be provided on how the system will operate. This is done to allow the participants to envision the purpose of the system through their perspective. They will, however, be given a general idea of the purpose of the system. This will give them a fresh perspective, with which they can provide feedback.

PROCEDURE

Each participant will be directed towards their specific location where each team member of the group will be supervising their respective participant. All the participants will be given a consent form to fill in, which will notify them about the aims and objective of the given test, whilst also giving them the option to opt out if needed. By following the General Data Protection Regulation (GDPR), they will be informed on the collection of specific data

needed and ensure that any data provided by the user will be protected and not misused. Video and audio recording will not be used during the testing protocol in order to protect the identity of the participant.

An initial questionnaire will be given before the user gets access to the test protocol in order to collect demographic data. A series of tasks will be given for the users to fulfil, the users will be prompted to finish the given task on their own. The time completion for any given task will not be analysed to prevent the participants from rushing the process but to give them the time needed to fully view the user interface and design. The participants will still have the option to ask their respective supervisor in the case where they are unable to complete the given task. The users will also be encouraged to bring up any issues during the test which will enable us to get any subjective qualitative data on the prototype, this is where the supervisor will be given their role to take down any notes from their respective participants. This will end with the user filling in an exit questionnaire to provide the feedback with the questions provided.

(The questionnaires are found in the Appendix section of the report)

A pilot test of the prototype will be done by some of the team members before the initiation of the procedure to ensure that there are no problems within the product side and help us determine if the tasks are clear.

Task scenarios: The test scenarios provided will satisfy the functional and non-functional requirements that have been implemented.

A completion rating system will be evaluated at the end of every task scenario question, the ratings are compromised into 3 values which will be noted by the supervisor when the testing protocol takes place:

- *Completed: - The participant has completed the given task independently – i.e., without any assistance from the supervisor.*
- *Completed with Help: - The participant has completed the given task but required some assistance from the supervisor.*
- *Not Completed: - The participant is unable to complete the given task even though they were given a hint or any form of assistance.*

The supervisor will mark the scenario as “Completed” if they deem the participant to have a good understanding of the given task. The goal of the usability test for our prototype is to have all the test case scenarios completed without any required help, but, even if the task is not completed, it would help us understand the flaws in our product.

GOALS

The usability goals for each task scenario are evaluated using the Completion rate and the Error free rate, and within these rates, the critical and non-critical errors are factored. **Critical** errors are when the error is a big factor in the task that leads to the user not

completing the task given. **Non-critical** errors may pose an issue with the task but can still end up being completed in the end.

- *Completion rate: - Indicates the percentage of the participants who can complete a task with no critical errors; non-critical errors do not affect the completion rate.*
- *Error free rate: - Indicates the percentage of completed tasks with no errors at all (Critical and Non-critical errors).*
- *Problem severity: - Prioritises the changes to be made according to the severity of the problem. This severity will be measured based on 2 metrics – problem frequency and problem impact.*

Frequency classification	Low	Medium	High
% of participants encountering a problem	<=10%	11%-29%	>=30%

Impact classification	Low	Medium	High
Effect of problem	Problem is minor, and has minimal effect on task completion	Problem causes non-critical error	Problem causes critical error

TESTING PROTOCOL

(Refer to the Section 1.2, 1.3, 1.4 of the Appendix)

DATA FINDINGS

PRE-TEST QUESTIONNAIRE FINDINGS

This is the demographic data that includes the results from the pre-test questionnaire. The data from these tests are protected according to the GDPR standards, so the anonymity of the participants' data will remain hidden as they are assigned with a unique ID.

What is your age?	**Participants count**
18 - 24	17
24 - 34	0
35 - 50	0
51 -65	0

What is your gender?	Participants count
Male	11
Female	5
Other	0
Prefer not to say	1

How often do you use social media?	Daily	Weekly	Monthly	Never
Participants count	15	1	1	0

Have you heard of the term "Augmented Reality"?	Participants count
Yes	17
No	0

TESTING PROTOCOL FINDINGS

The scenarios where the participants were given a certain task to complete will be calculated based on the completion rate and the error free rate.

Login and Sign-up page

The login page was shown to not have that many features according to 11.2% of the participants stating that adding a verification feature can create a more secure environment for the application. All the participants agreed that the sign up page had all the relevant features required.

a) Are you able to **login** and proceed?

b)	Participants data
Completed	15
Completed with help	2
Not completed	0
Completion rate	100%
Error free rate	88.2%

Almost all the participants were able to login and proceed. One of the participants was having some difficulty completing the task as the user was confused if they were prompted to sign up beforehand.

d) Are you able to return to the **login** page?

d)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

All of the participants were able to return to the login page indicating no issues in the user interface and the navigation.

e) Are you able to **sign-up** and proceed?

e)	Participants data
Completed	16
Completed with help	1
Not completed	0
Completion rate	100%
Error free rate	94.1%

Only 1 participant needed assistance when signing up but the rest of the participants were able to sign up with no issues at all.

Feed Page

In terms of the user interface and interaction, all of the users enjoyed the interaction within that section the page:

a) Were you able to **locate** the feed page?

a)	Participants data
Completed	15

Most of the participants were able to

Completed with help	2	navigate to the feed page but one user had a hard time trying to find the feed page which could determine how the buttons and layout could be improved in order for users.
Not completed	0	
Completion rate	100%	
Error free rate	88.2%	

b) Are you able to **view** the posts of other users?
c) Are you able to **like** the posts of other users?
d) Are you able to **comment** on the posts of other users?

	Participants data b)	**Participants data c)**	**Participants data d)**
Completed	17	17	17
Completed with help	0	0	0
Not completed	0	0	0
Completion rate	100%	100%	100%
Error free rate	100%	100%	100%

The post page where the users are able to view, like and comment is possible for all the participants. Since no issues were found we can confirm that the post section of the application does not need any major changes.

Map Page

All users, upon navigating through the in-built Map, found it easy to navigate to the page and were able to view the posts **on the map:**

a) Were you able to **locate** the map page?

a)	**Participants data**	
Completed	17	None of the users had any difficulty in navigating to the Map Page, hence indicating no bugs/issues in navigation,
Completed with help	0	
Not completed	0	

Completion rate	100%	and a simple user interface.
Error free rate	100%	

b) Were you able to **view** the geotagged post pins of other users?

b)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

No user faced any difficulty in viewing the "**geotagged**" posts on the map - which is shown as a **pin,** hence indicating no bugs/issues in the page.

c) Were you able to **scroll** through the map page to another location?

c)	Participants data
Completed	16
Completed with help	1
Not completed	0
Completion rate	100%
Error free rate	100%

Only one user faced difficulty in scrolling across the map to another location, hence indicating no bugs/issues while navigating through the map.

AR Page

In terms of the user interface and interaction, all of the users enjoyed the interaction within that section the page:

a) Were you able to **locate** the AR page?

a)	Participants data
Completed	14
Completed with help	3
Not completed	0
Completion rate	100%

17.6% of the participants were not able to locate the AR page with ease which makes it evaluate the way we implement the navigation for the AR page.

Error free rate	82.4%

b) Were you able to **upload** an AR anchor?

b)	Participants data
Completed	15
Completed with help	2
Not completed	0
Completion rate	100%
Error free rate	88.2%

One student mentioned a guide on the app on how to use the AR anchor would be helpful as the training provided before may have been forgotten already.

c) Were you able to **download** an AR anchor?

c)	Participants data
Completed	14
Completed with help	3
Not completed	0
Completion rate	100%
Error free rate	82.4%

There are some minor issues when it comes to downloading the AR anchor as mentioned before by implementing a user guide for the AR page in general or a tutorial.

d) Were you able to **capture** a memory?

d)	Participants data
Completed	13
Completed with help	3
Not completed	1
Completion rate	94.1%
Error free rate	76.5%

No user faced any difficulty in viewing the "**geotagged**" posts on the map - which is shown as a **pin,** hence indicating no bugs/issues in the page.

e) Were you able to **edit** a memory?

e)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

No user faced any issue when editing a memory

f) Were you able to **upload** a post from your gallery?

f)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

No user faced any difficulty in uploading a post from your gallery.

Discover Page

There were mainly no issues in this page in terms of the usability or task scenarios, Some suggestions were brought up to improve the colour scheme of the page.

a) Were you able to **locate** the Discover page?
b) Were you able to **search** for a user?
c) Were you able to **search** for a group?
d) Were you able to **join** a group?
e) Were you able to **leave** a group?

	Participants data a)	Participants data b)	Participants data c)	Participants data d)	Participants data e)
Completed	17	17	17	17	17
Completed with help	0	0	0	0	0

Not completed	0	0	0	0	0
Completion rate	100%	100%	100%	100%	100%
Error free rate	100%	100%	100%	100%	100%

User Profile Page

a) Were you able to **locate** the user profile page?

a)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

No user faced any difficulty in locating the user profile page.

b) Were you able to **view** your posts?

b)	Participants data
Completed	16
Completed with help	1
Not completed	0
Completion rate	100%
Error free rate	94.1%

One user needed assistance understanding the task scenario as he/she assumed that the post was meant to be sent first.

c) Were you able to **view** your scrapbooks?

c)	Participants data
Completed	16
Completed with help	1

Not completed	0	One user needed assistance as he/she was not able to find the button to view the scrapbooks. This reflects the how the user interface should be better rendered and engaging
Completion rate	100%	
Error free rate	94.1%	

d) Were you able to **view** the number of followers and following on your profile?

d)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

All the participants were able to view the number of followers and the following in their profile

e) Were you able to **locate** the Edit Profile button?

e)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

All the participants were able to navigate and find the Edit Profile button

f) Were you able to **edit** your profile?

f)	Participants data
Completed	16
Completed with help	1
Not completed	0

All the participants were able to edit their profile except for one user as

Completion rate	100%
Error free rate	94.1%

he/she could not make changes without a hint

g) Were you able to **locate** the Settings button?

g)	Participants data
Completed	15
Completed with help	2
Not completed	0
Completion rate	100%
Error free rate	88.2%

Two users was not able to navigate the settings button, as one stated that it was too small to see and hard to find the button

User Settings Page

a) Were you able to **change** the account settings?

a)	Participants data
Completed	15
Completed with help	0
Not completed	2
Completion rate	88.2%
Error free rate	88.2%

Two users could not change their account settings

b) Were you able to **delete** your account?

b)	Participants data
Completed	12
Completed with help	0
Not completed	5
Completion rate	70.6%
Error free rate	70.6%

Five users had difficulties in deleting their account - hence indicating a flaw in the user interface;

c) Were you able to **access** Privacy and Security and make changes?

c)	Participants data
Completed	15
Completed with help	0
Not completed	2
Completion rate	88.2%
Error free rate	88.2%

Two users were not able to make changes to their privacy settings - which means they either faced problems in navigating to the **Privacy and Security** page, or faced problems in making the changes upon navigation.

d) Were you able to **Report** a problem?

d)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

All users were able to report any problems they faced, with ease.

e) Were you able to **Sign out**?

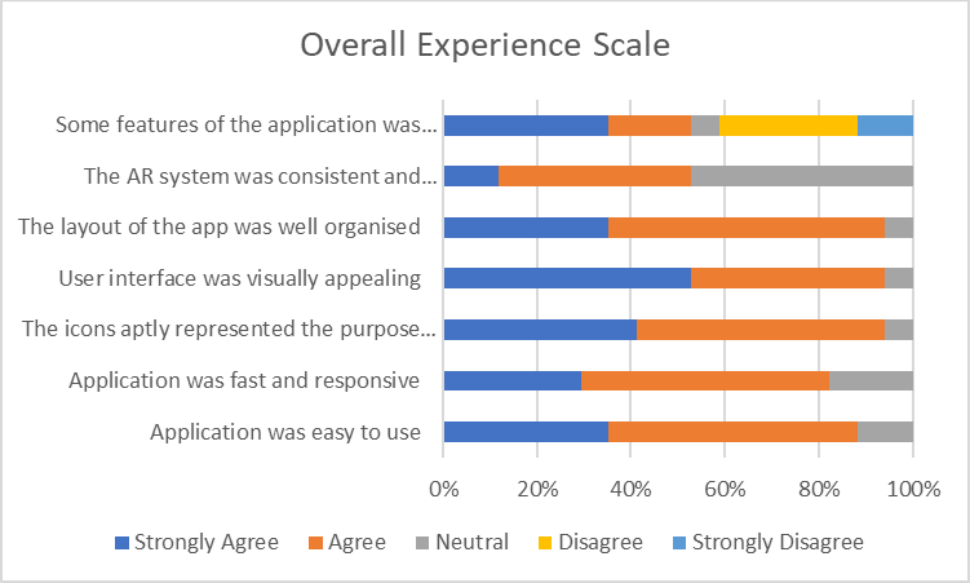
e)	Participants data
Completed	17
Completed with help	0
Not completed	0
Completion rate	100%
Error free rate	100%

All users were able to sign out of their accounts with ease.

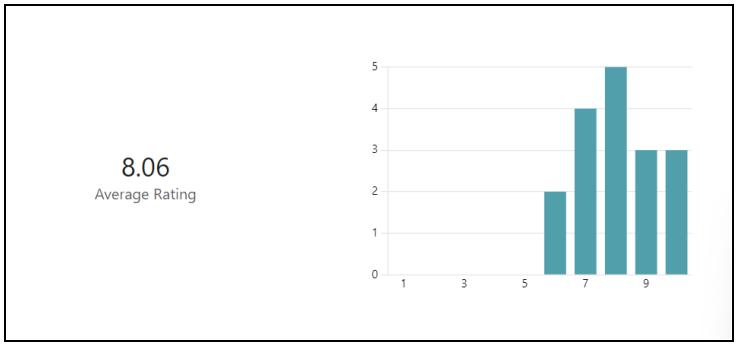
POST-TEST QUESTIONNAIRE FINDINGS

The main favourable features about the product was the Map page and the AR page, with the implementation of displaying the post from the user's perspective as the marker pops up. The AR page was mentioned a lot as users enjoyed using the AR features and found it interesting. With this feedback, it shows that we are moving in the right direction in order to develop a fully implemented application.

Many users felt that there were no flaws in the app but some users had some issues with the app in terms of usability and the functionality in the application. By using this feedback, we will continue to improve the application and try to make ends meet for all users.



The overall review of the product was a positive note as the average rating is an 8.06, this gives a promising future for the application and we will continue to work on it to implement all the functionalities needed for the app



USABILITY EVALUATION

During the earlier stages, constructive feedback was given when doing the previous usability test. The following sections that have been an issue before has been resolved

- Map page crash has been fixed
- User Interface for map page has been changed in order to make the map more engaging for the users
- Created a much better Group Page User Interface
- The design of the Feed page was remodelled for enhance in the user interactivity
- Changes were added in the Discover page for the User Interface
- With the new admin panel, it is now updated to show a reason for the flag

With these changes done beforehand, we will discuss the new feedback given by the participants based on the final usability tests and work on a change for the application..

PROJECT EVALUATION

ORGANIZATION

GROUP ORGANIZATION

Our team consisted of 8 members who played the following roles based on their strengths and abilities –

NAME	ROLE
Aamir Nazir	Full-Stack Developer
Gauri D Revankar	Front-End Developer, Scrum Master, Marketing Manager
Ismael Shaikh	Full-Stack Developer, Database Administrator, Reporter
Jacinth Daniel Moses	Team Leader, Full-Stack Developer, Reporter
Praveen Venkataraman	Full-Stack Developer
Rylan Chris Silveira	Web-Designer
Sanjeevani Rajpurohit	Front-End Developer, Web-Designer, Marketing Manager
Tejas Syam	Tester

- The distribution of jobs according to the roles mentioned above was very effectful and allowed us to finish our tasks on time and stay on track.
- Daniel and Gauri handled the team coordination with the latter setting the deadlines and sprints in which the work was to be done as she was the Scrum Master.
- Knowing their way around both Flutter and Firebase, Aamir, Ismael, Daniel, and Praveen carried out the role of Full-Stack Developers perfectly. The other Front-End Developers were proficient at using Flutter and developed the application UI well.
- Gauri and Sanjeevani were well acquainted with and had previous knowledge concerning Marketing Strategies and procedures.
- Being good at designing, Rylan was assigned Website creation and design with Sanjeevani contributing for providing content.

GROUP COLLABORATION

Throughout the project time period, meetings (both online and in-person) were organized at least twice a week with everyone in the group working according to their assigned roles.

- The work done and topics discussed in every meeting was logged in the Project Diary by Ismael and Daniel - the Reporters (Check the Project Diary at Section 1.7 of Appendix).
- Aamir, Ismael, and Praveen worked with Firebase for the Back-End and linked it with Flutter for the Front-End. They also worked along with Gauri and Praveen on the Front-End and design. Last but not least, fixed application bugs.
- Gauri developed the initial layout for User Pages and Settings and worked on minor overall changes in the application along with designing and handling the Gantt charts, and working on Marketing with Sanjeevani.
- Daniel implemented the ARCore using the ARCore Legacy API in Flutter with the AR plug-in. He also hosted the application for iOS and Windows using Netlify and worked with Flutter.
- Sanjeevani made a few UI changes for the app in Flutter and worked on the content for the company website with Rylan creating and designing it. She also handled the Marketing section, designed the poster, flyer, business card, merchandise, and created the social media platforms.
- Tejas did the application Testing and worked with Praveen for Usability evaluation.
- Finally, everyone worked on the report with Gauri and Sanjeevani designing the UML diagrams.

SUCCESSFULNESS OF THE ORIGINAL PLAN

We managed to implement a majority of the functional and non-functional requirements. The implemented requirements are mentioned in the requirements tables, which can be

found in the earlier sections of the report. The checked requirements are the ones that have been implemented.

There is a slight shift in the dates planned for the sprints compared to the ones originally planned. We had to reorder a few sprints and add or remove the features to be implemented under a few sprints. The sprint dates and deadlines were updated taking the courseworks, assignments and quizzes of other courses throughout the year in account. The implementation section of the report specifies the updated sprints and their deadlines.

The original Gantt Chart along with the sprints and their deadlines is attached in the Project Reports of the previous stages.

IMPLEMENTATION

IMPLEMENTATION SCHEDULE (GANTT CHART)

Below is the Gantt chart for Stage 3 -

Tasks with deadlines, durations and contributions –

Name	Start Date	End Date	Duration	Progress %	Dependency	Resources
SPRINT 1	Mar 06, 2023	Mar 27, 2023	22 days	0		Ismael
Persistent Login	Mar 06, 2023	Mar 07, 2023	2 days	0		Ismael
User search	Mar 15, 2023	Mar 16, 2023	2 days	0		Ismael
Edit Profile	Mar 20, 2023	Mar 20, 2023	1 day	0		Ismael
Quizzes in Groups	Mar 21, 2023	Mar 22, 2023	2 days	0		Ismael
Displaying geotagged memories on Map	Mar 21, 2023	Mar 22, 2023	2 days	0		Ismael
Testing and Documentation	Mar 27, 2023	Mar 27, 2023	1 day	0		Gauri,Sanjeevani,Tejas

Name	Start Date	End Date	Duration	Progress %	Dependency	Resources
SPRINT 2	Mar 15, 2023	Mar 20, 2023	6 days	0		
Creating a group	Mar 15, 2023	Mar 16, 2023	2 days	0		Ismael
Joining and Leaving a group	Mar 18, 2023	Mar 19, 2023	2 days	0		Ismael
Testing and Documentation	Mar 19, 2023	Mar 20, 2023	2 days	0		Gauri,Sanjeevani,Tejas
SPRINT 3	Mar 15, 2023	Mar 23, 2023	9 days	0		
Website Making	Mar 15, 2023	Mar 21, 2023	7 days	0		Rylan
Testing and Documentation	Mar 23, 2023	Mar 23, 2023	1 day	0		Gauri,Sanjeevani,Tejas

Name	Start Date	End Date	Duration	Progress %	Dependency	Resources
SPRINT 4	Mar 15, 2023	Mar 24, 2023	10 days	0		
Geotagging a memory	Mar 15, 2023	Mar 18, 2023	4 days	0		Aamir,Praveen
GPS Waypoint (routing user to Google Maps)	Mar 19, 2023	Mar 22, 2023	4 days	0		Ismael
Testing and Documentation	Mar 23, 2023	Mar 24, 2023	2 days	0		Gauri,Sanjeevani,Tejas
SPRINT 5	Mar 19, 2023	Mar 23, 2023	5 days	0		
Editing a memory	Mar 19, 2023	Mar 21, 2023	3 days	0		Praveen
Creating a scrapbook	Mar 21, 2023	Mar 21, 2023	1 day	0		Ismael
Adding a memory to scrapbook	Mar 21, 2023	Mar 21, 2023	1 day	0		Ismael
Testing and Documentation	Mar 23, 2023	Mar 23, 2023	1 day	0		Gauri,Sanjeevani,Tejas

Name	Start Date	End Date	Duration	Progress %	Dependency	Resources
SPRINT 6	Mar 21, 2023	Mar 23, 2023	3 days	0		
Report posts	Mar 21, 2023	Mar 21, 2023	1 day	0		Ismael
Admin panel	Mar 22, 2023	Mar 22, 2023	1 day	0		Ismael
Show flagged posts and remove/reinstate posts	Mar 22, 2023	Mar 22, 2023	1 day	0		Ismael
Testing and Documentation	Mar 22, 2023	Mar 23, 2023	2 days	0		Gauri,Sanjeevani,Tejas
SPRINT 7	Mar 21, 2023	Mar 24, 2023	4 days	0		
Testing Final Application	Mar 21, 2023	Mar 22, 2023	2 days	0		Tejas,Ismael,Aamir,Daniel…
Testing Final Website	Mar 21, 2023	Mar 22, 2023	2 days	0		Gauri,Sanjeevani,Rylan
EXPO	Mar 22, 2023	Mar 22, 2023	1 day	0		
Documentation	Mar 23, 2023	Mar 24, 2023	2 days	0		Gauri,Sanjeevani

SPRINT 8	Mar 25, 2023	Mar 30, 2023	6 days	0		Aamir,Daniel,Gauri,Ismae…
Final finished documentation	Mar 25, 2023	Mar 29, 2023	5 days	0		
Project Review	Mar 29, 2023	Mar 30, 2023	2 days	0		
Submission of stage 3 document	Mar 30, 2023	Mar 30, 2023	1 day	0		

SOFTWARE PROCESS

We are following an **Iterative Incremental Development Process** for our project. Iterative development and Incremental development are some of the popular approaches of the Phase Development Process, which aims to reduce the cycle time.
In this type of Software Process, the requirements are broken down by functionality into subsystems, called increments (each increment delivering each functionality of the system). Each increment is developed in one iteration and at the end of each iteration, it is tested and integrated into the system.
We adopted an **Agile Scrum Methodology** for the project. Such a methodology values individuals and interactions over processes and tools. Late changes are responded to quickly without excessive rework. We didn't have a clear idea of the requirements of the system when we first started with the project and added new requirements to the list as we progressed. The clients are an integral part of the development process and closely work with the developing team. We frequently contacted our line manager to evaluate our increments and to ensure whether we understood the requirements of the client correctly. Such a methodology is preferred for a small team with co-located members. We conducted face-to-face meetings (daily standup meetings) for five to ten minutes every day to update each other with the individual's progress and the difficulties they faced. Our team leader was designated the role of the scrum master who communicated with our line manager to remove the roadblocks whenever the team faced any.
The roles have been assigned as follows:
Scrum Master - **Gauri R.**
Scrum Team - Other 7 members
Product Owner – **Abbasi, Ubaid (Proxy customer)**

VERSION CONTROL

We have made use of **GitHub** to collaborate on the coding section of the project. GitHub is an Internet hosting service for software development and version control using Git. It is a code hosting platform that allows multiple users to work together on projects from anywhere around the world.

Below is the link of our GitHub repository which contains all the project files needed to build the application and their version histories. While working on the project individually, we pushed our draft codes to separate branches so that it wouldn't affect the main code in the master branch.

GitHub allows us to pull the changes made to the project by other users and merge them with our own changes. This way it allows multiple users to view, discuss and review the changes made to the project files. GitHub also provides the "Issues" feature which allows users to create and assign new tasks to those working on the project, report content fixes and allows one to track progress of the project on the project board.

We also used **GitHub Desktop**, an application that enables one to interact with GitHub using GUI instead of command line or through a web browser.

https://github.com/JacDM/GeoTagAR

TOOLS

The end user will be able to access the mobile application on devices such as mobile, tablet and laptop. The application will also be responsive across the following web browsers:

1. Google Chrome
2. Mozilla Firefox
3. Apple Safari
4. Microsoft Edge

The minimum requirements and dependencies necessary to successfully run and deploy the application are as follows:

1. For the AR component of the application - ARCore
2. Firebase
3. HTML 5
4. Flutter (3.3.10)
5. Android toolchain - develop for Android devices (Android SDK version 33.0.1)
6. VS Code (version 1.74.3)
7. JAVA 1.8
8. Java 11.14

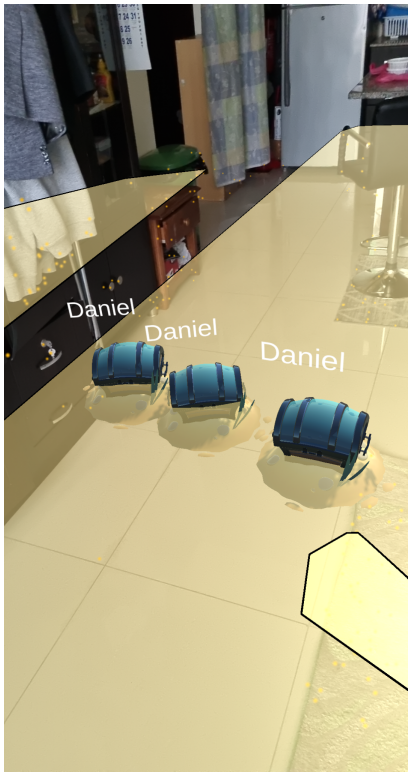
PROBLEMS

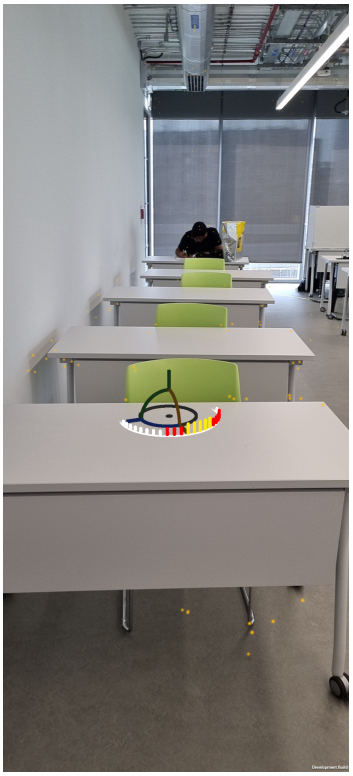
Our initial plan was to incorporate Unity into the project as it allows native builds with full AR capability with one 'Code Base'. Until two weeks before the expo, we incrementally progressed as seen in the pictures below. A file called 'android.support.v4.aar' was unable to build with flutter as it was an older library and incompatible with Jetifier. When Jetifier would rebuild, it would fail.

Moreover, switching from ARcore Microsoft spatial anchors for Unity yielded no better result as it used Azure Cozmos databases to store the anchors and could not be deployed since the service was currently not available.

Hence, we had to remove Unity from our project, scrape native IOS builds (in favor of a web wrapper in the case of IOS), and lose all the work done in Unity, such as text being able to be displayed on anchors and more.

This resulted in AR only being available for Android using the legacy deprecating ARCore API resulting in incredibly long waiting time for uploading and downloading anchors.





PRODUCT

FEATURES IMPLEMENTED

Dynamic User Profiles

This component of the application displays user details like the profile picture, number of followers, number of people they follow, and a grid displaying the memories and scrapbooks shared (as “posts”).

User Settings

This component allows users to view and update their account settings. It also contains tabs to report a problem, set account visibility, reset account password, view, and modify user profile and personal information etc.

AR Camera

This is one of the main features of the application. Users can use the AR Camera to view AR objects in real time and leave objects at a particular location.

Map Page

This page allows users to view the posts in the user's current and neighbouring regions.

Capturing a Memory

Users can capture memories using their device camera. The front-view and rear-view cameras have been implemented to capture a memory.

Posting a Memory

This component allows users to post the captured memory which will be stored in Firebase once the user clicks on the Post button.

User Feed Page

This page allows users to view “posts” from other users and interact with them by using the “Like” and “Commenting” features.

Loading photos from phone gallery

This feature gives users the ability to upload their own existing pictures from their local device, which may be an ios, android, windows, or mac device, as a post in the application in addition to being able to take a picture through the app.

Likes and comments

This allows our users to interact with other users’ posts in 2 ways - first, by liking the post to acknowledge the post, and second, by commenting on the post, to engage with the post further by sharing their opinions about it.

User Registration and Login

If a user is new to the application, they must create a new account to register themselves and use the various features the app has to offer. Registered users can log in to the application using their email and password. In case they forget their password, they can reset their password by requesting – on which, an email is sent to their registered email IDs with a link to reset their password.

Discover Page (Join and Unjoin Groups)

Users have the ability to join new groups created by other users or leave an existing group they are already a part of.

Geotagging a Memory

Users who upload posts can share their location by allowing gps to be accessed by the app. This enables an anchor to be placed on the map where the photo is uploaded. The anchor is displayed on the map, visible via an object in the AR camera which when clicked on, opens a new page showing the user a post.

Admin panel

Granting privileges enables access to the app's admin panel. On the web version, the feed will be replaced with reported or flagged posts, whereas on mobile, posts will be displayed normally. Users with admin privileges can delete reported posts or mark them as safe.

User search

This component allows users to use the provided search bar in the app to search up other users in order to view their profile, follow or unfollow them.

Creating quizzes feature for the historians and geocachers user category

This allows Historians to make and post quizzes about a historical site or landmark, and geocachers can get a geocaching experience by opening locked posts geotagged on the map and earning badges that mark their achievements.

Cropping a captured memory

Pictures once captured through the application can then be cropped or resized before posting it as a memory, allowing users to remove parts of the picture which they don't want to be shown to others.

Persistent Login

This feature keeps logged in users logged in even after shutting down/locking their device,

giving them the ability to dive right back into the application without the hassle of logging in everytime they want to use the app.

Edit Profile

Every user edit their profile to change their bio, name, birthday, gender, email and phone number. This gives users the ability to keep their account without losing all their data if for example, their email or phone number needs to be changed or was inputted incorrectly in the first place. The profile picture can also be added, changed or removed as per the user's wishes.

Geotagged memories on the map

This component allows users all over the world to view pins on the map displaying all geotagged memories at different locations across the world.

Quizzes in groups

Groups can create quizzes/challenges for users to participate in.

OUTSTANDING BUGS AND ROBUSTNESS

Overall, our application does not contain any bugs that cause it to crash. Hence, it's safe to say that our application is robust.
However, there are some problems that don't have any effect on the functionality of the app but persist briefly.

- Firstly, during the first run of the app, the camera will display a "LateInitializationError" briefly. This issue resolves itself in a few seconds, and the camera loads after some time.
- Posts which the user has marked as "Locked" from being viewed, are still visible on the map.
- Multiple taps on the initial AR page result in multiple ducks/anchors spawning, even though only ONE duck is permitted to be placed at a time.
- While the uploading or downloading of the previously placed AR anchors, a long time could be taken to complete and carry out the process from the database and in rare cases it might not be completed at all. A video of the AR anchors successfully being deployed and fetched on another device, is given below:
  Link for placement and downloading of the AR anchor

TESTING

The testing process was implemented in a SCRUM format after each sprint was completed. Unit and Widget tests were used to input automated testing for the application to prevent

any bugs and issues from being introduced when the user starts using the app. The main objective was to verify the functional and non-functional aspects of the application to work as intended and to meet the requirements that have been listed. The testing done was the widget testing, this was prioritised as the graphical user interface was the concern when developing the app. It was also to ensure that the components for each section were working correctly and are responsive to the user input.

The figure below shows an example test case which tests the behaviour of a switch widget. The main context of this switch is to provide users the control of being able to view or not see any sensitive content.

```
Run | Debug
22  testWidgets('switches modes when tapped', (WidgetTester tester) async {
23    await tester.pumpWidget(
24      MaterialApp(
25        home: const SCC(),
26      ), // MaterialApp
27    );
28
29    final switchWidget = tester.widget<GestureDetector>(
30      find.byType(GestureDetector),
31    );
32
33    // Initially, the switch is off
34    expect(switchSCCModeFlag, SCCSwitchMode.off);
35    expect(find.byIcon(Icons.toggle_off_outlined), findsOneWidget);
36
37    // Tap the switch
38    await tester.tap(find.byType(GestureDetector));
39    await tester.pumpAndSettle();
40
41    // The switch should now be on
42    expect(switchSCCModeFlag, SCCSwitchMode.on);
43    expect(find.byIcon(Icons.toggle_on), findsOneWidget);
44
45    // Tap the switch again
46    await tester.tap(find.byType(GestureDetector));
47    await tester.pumpAndSettle();
```

Figure. Shows the input test code for the sensitive content section of the application

The test would find and tap the widget that is bound to the switch, the expected outcome from that interaction would switch the mode ‘On’ and it would be verified to the tester if the switch mode is on and vice-versa.

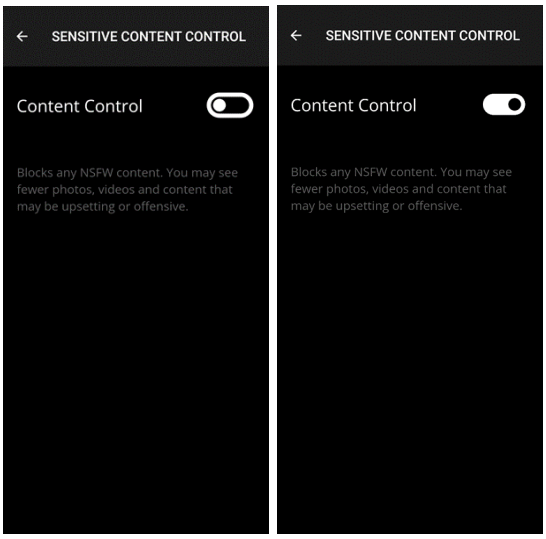


Figure. Shows the expected Output from the test case for the sensitive content section of the application.

Similarly these test cases were implemented to different directories of the application. A minor issue which was found was with the Camera dependencies allocation, Sometimes the widget is unable to properly navigate the camera making it difficult to implement a functional test.

The final testing of the product was done manually, this was to ensure there were no issues when tested with a physical device. Different models and operating system versions of devices were used to test the efficiency of the app.

Test Environment

At this final stage of the project, Both Android and IOS devices were used and tested in order to check the usability and was another method to navigate any bugs. The main tests were done by utilising the functional requirements. The main feature was the AR page to ensure the change from unity is still functional in the app.

In these cases, android devices was used to test the AR features of the application

Device Model	OS Version	Resolution
Samsung S10e	Android 12	1080 x 2280
Samsung A73 5G	Android 12	1080 x 2400

Samsung S21	Android 13	1080 x 2400
Sony Xperia XA1 Plus	Android 8.0	1080 x 1920
Samsung S9+	Android 10	1440 x 2960

The resolution within the devices is different depending on the model and its latest features present. When testing on all the devices, there was an issue with the older models of the devices, the amount of time it had taken to find the required space to input the object using AR. It was also less engaging when utilising the AR function with the older models and the lower pixel density can cause blurring. Higher pixel density can create more realistic images and videos for the human eye. However this cannot be fixed as it ends up being an issue from the user's hardware. Screenshots of the AR implementations are explained in the user guide.

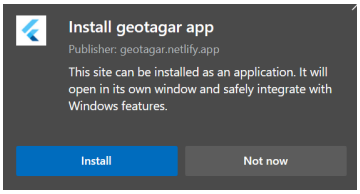
USER GUIDE

INSTALLATION GUIDE

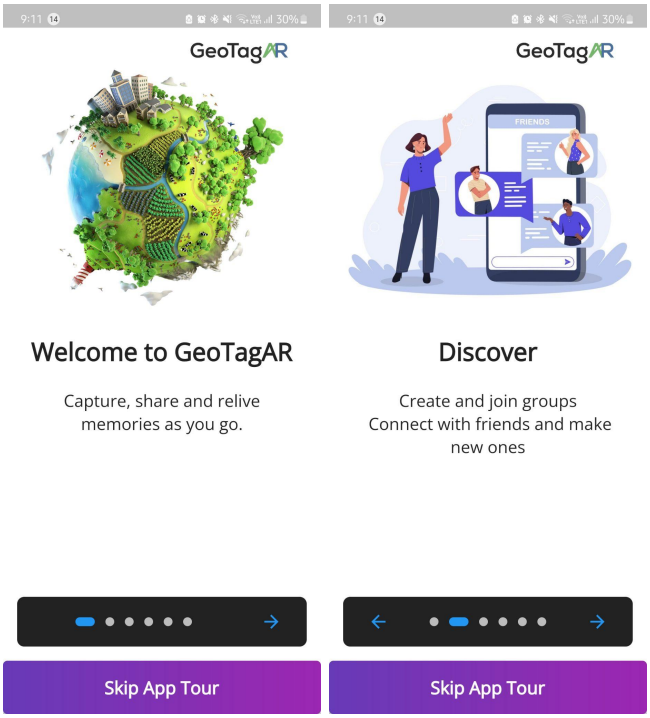
Steps to install the app on android:

- Go to the github repo and get the latest release in in the releases section : [JacDM/GeoTagAR: Educational Experience Project done by Group 11 Heriot-Watt Dubai Students 2022-2023 (github.com)]
- Download the apk you your phone and run it.

Steps to install on IOS, Windows and other platforms that support web apps

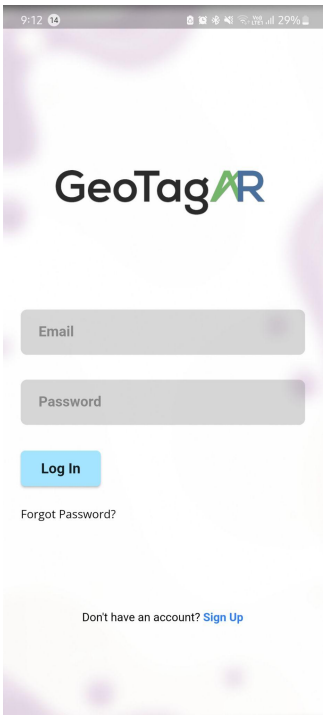


- Go to the webpage https://geotagar.netlify.app/
- Click on a prompt to install the app on your platform ->
- For IOS use the guide [How to Install Web Apps on iPhone or iPad: 6 Steps (with Pictures) (wikihow.com)]



ONBOARDING PAGE

This page shows the first time users of the app what they can expect the app to do.

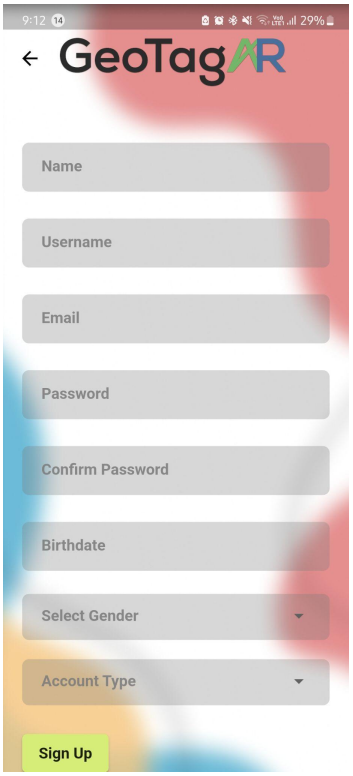


LOG-IN PAGE

From here a user can login to an already existing account, for e.g.

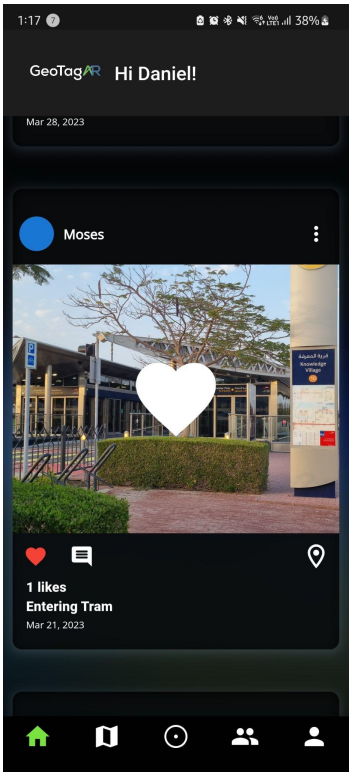
- Email: riverpod2@mail.com
- Password: qwerty

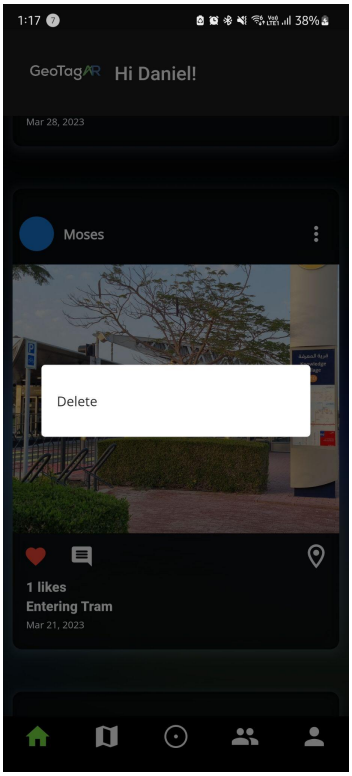
Or sign up for a new account.



SIGN-UP PAGE

When creating a new account a user will be prompted with the following fields with the mail field only accepting emails of the format: something@something.something
And accepting passwords of any type with a length of 6 or greater.





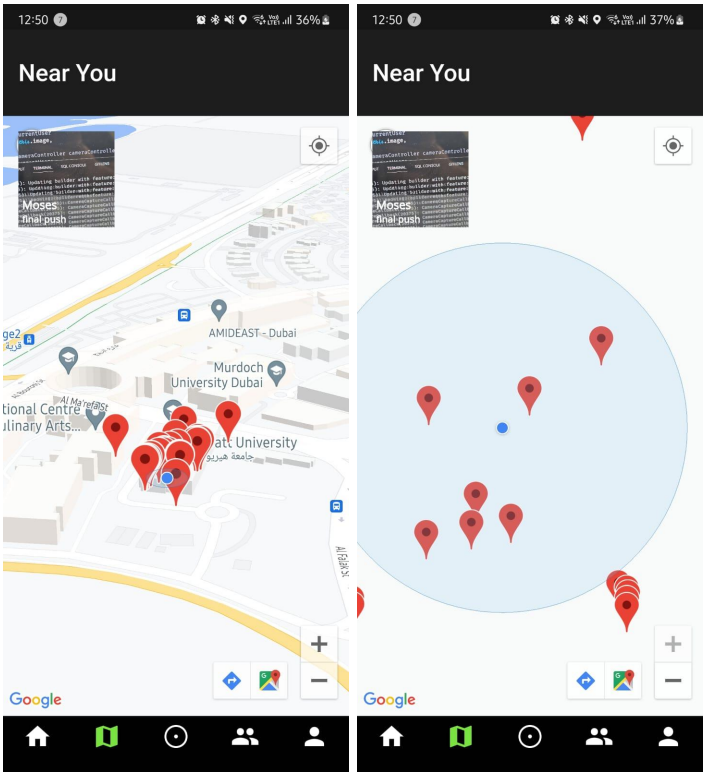
FEED PAGE

Initially there will not be any posts on your feed as you need to follow accounts to see their posts, for e.g.

- moses

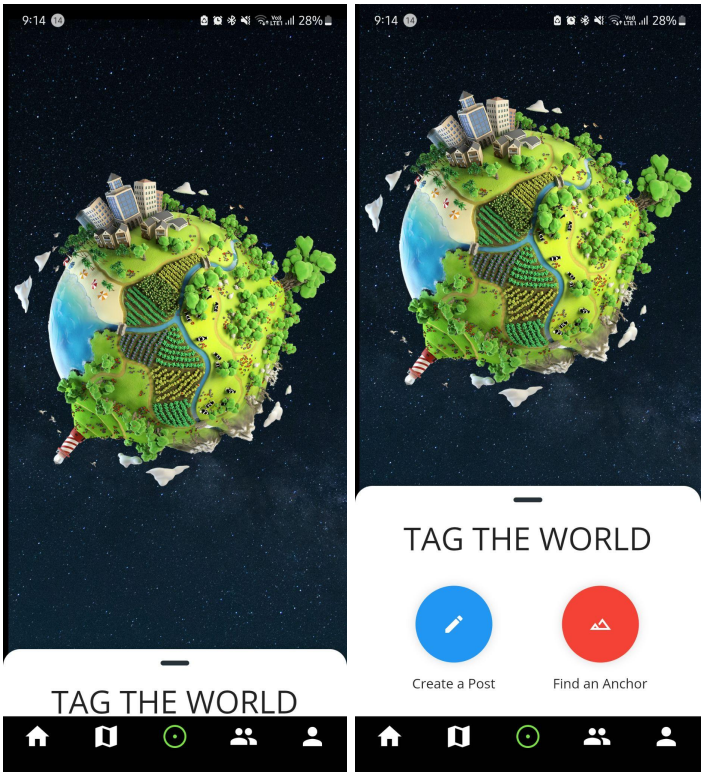
Users can be found in the search bar in the discover tab located on the 4th icon in the navbar.

You can click the 3 dots to report a post or delete a post you made.



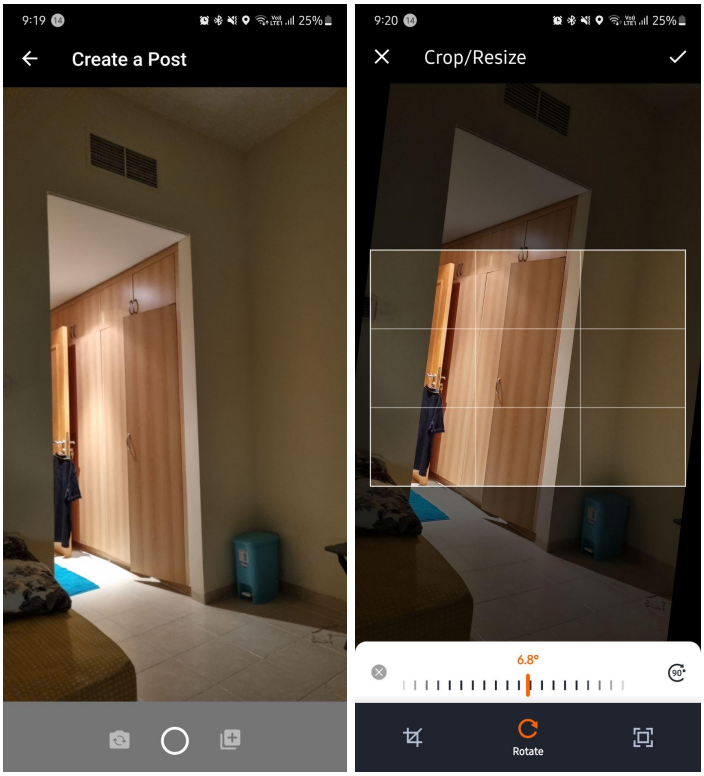
MAP PAGE

Here users can find pins of posts and their locations you can tap to view the posts if they aren't locked
Tapping a post and returning to the previous screen will yield a button you can press to open google maps to go to the approximate location of the post.



CAMERA/AR PAGE

In this page you can do 2 things either create a post which takes you to the camera page or you can find an anchor which is placed by another user, approximate locations of the post can be seen represented by the map pins.

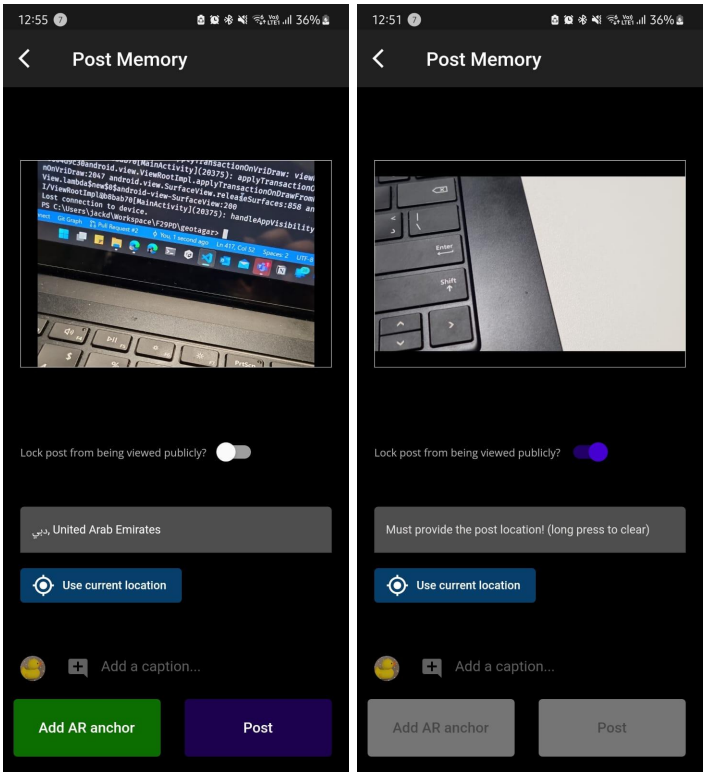


CAMERA

When creating a post first you must capture an image or select an image from the gallery by clicking the 3rb icon on the grey bar, you can also take a selfie by switching the camera.

After selecting an image you will be taken to a crop and resize page where you can zoom, rotate and crop.

After editing the picture you will be taken to the post page



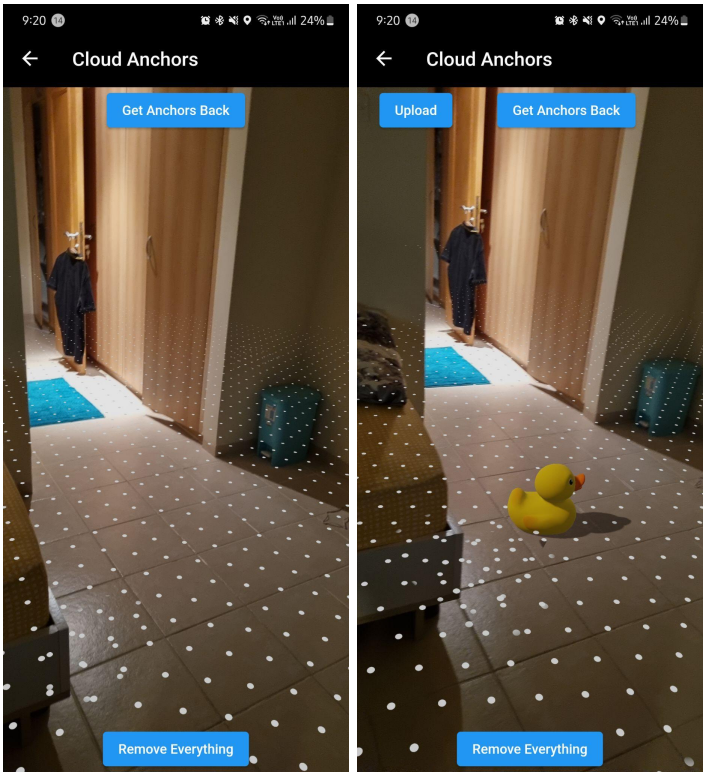
POST MEMORY PAGE

In this page you will not be allowed to proceed before assigning your current location as this will help update the map pins.

You can also add a caption to the post.

Furthermore you have 2 options

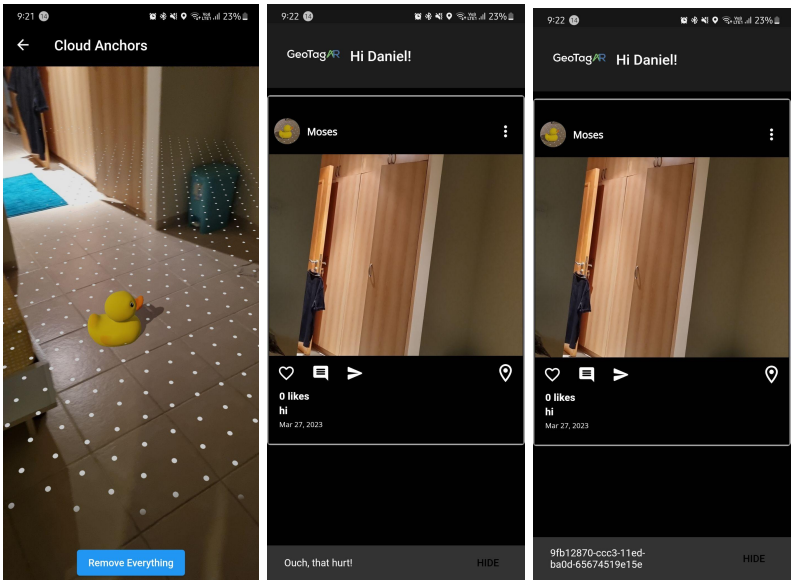
- Do a normal post
- Add an AR Anchor



CREATE AR OBJECT

If you decide to add an AR Object you will be prompted to move your phone around until ARCore produces dots signifying plane detection

After which you can tap ONCE to place a duck in a detected plane after which you can upload the anchor, This process varies and can take anywhere from 2 seconds to 5 minutes if not longer, unfortunately we had to use the deprecated ARCore API as the new one did not work well with flutter.

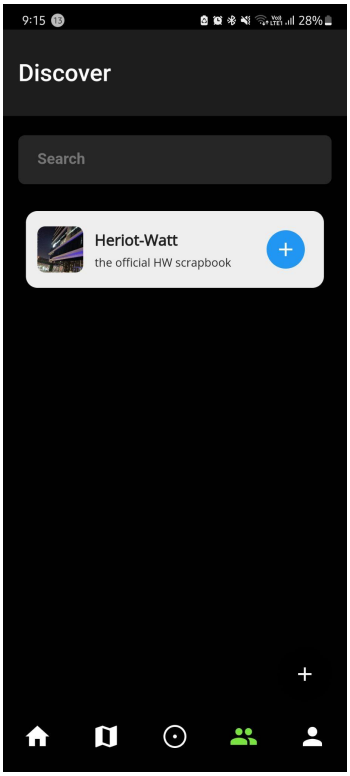


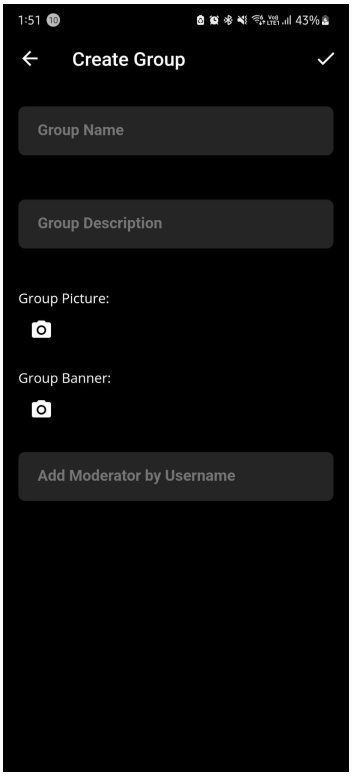
FIND ANCHORS PAGE

Once you have placed an anchor or have gone to a location that holds an anchor click the download anchors button and it will download all nearby anchors, when done downloading tap the duck to be taken to another page linking to the post.

However this also sometimes does not work as mentioned above

- See video below to see a demo of how it is supposed to work.



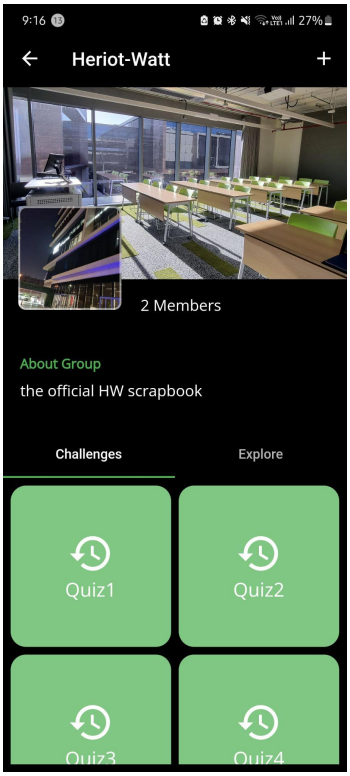


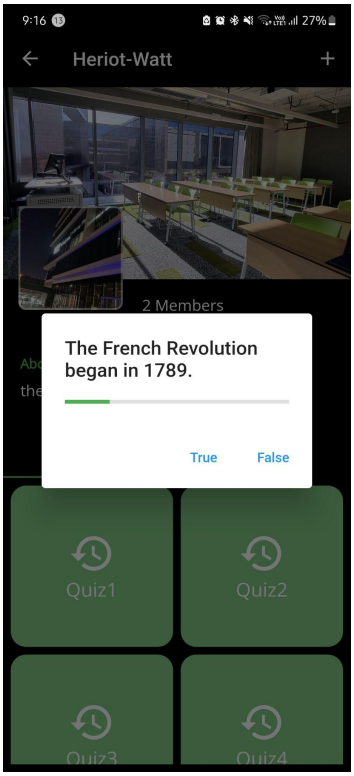
DISCOVER PAGE

In this page you can explore different groups and join them, clicking on them results in going to the group page as seen below.

The search bar is used to loop up different users, try “moses”

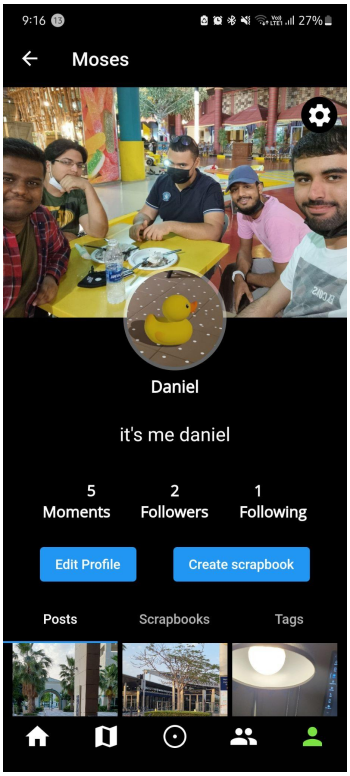
CREATE GROUP PAGE

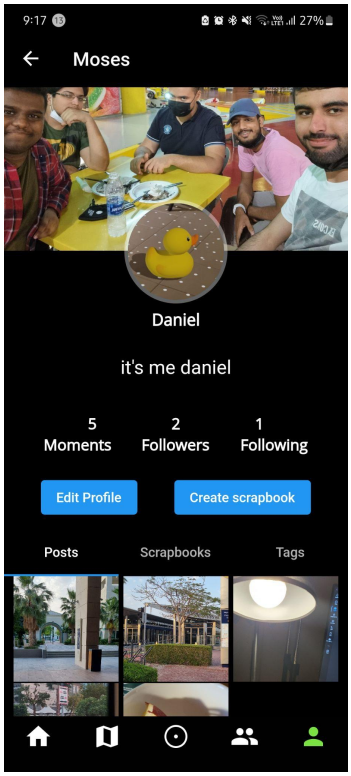




GROUP PAGE

When a group is selected this page is brought up and you can do 4 quizzes which is a demo of a historian group, in the explore tab you can view the posts added to the group.



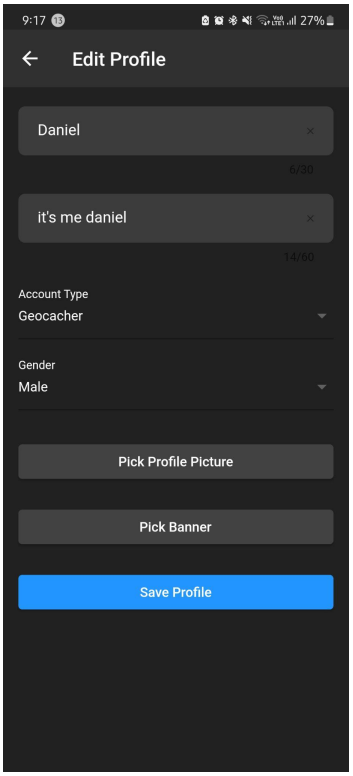


PROFILE PAGE

The profile page is where you can:-

- see all your posts
- Edit your profile
- Create a scrapbook
- See the number of followers
- Number of posts
- Number of followers
- Number of people you follow

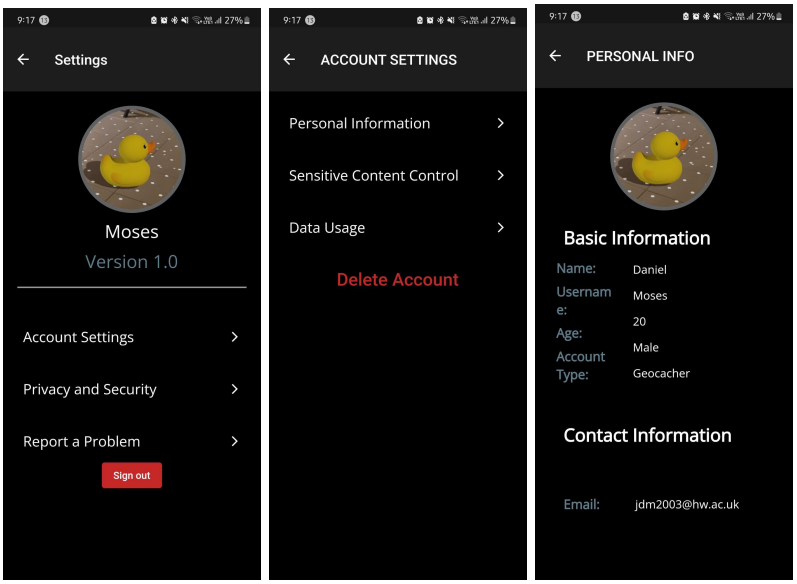
You can also see your created scrapbooks and can add posts by hard pressing them and adding them to the scrapbook.



EDIT PROFILE PAGE

In this page you can edit your:-

- Name
- Bio
- Account type
- Gender
- Profile Picture
- Banner picture



SETTINGS PAGE

In this page you can view your account details
Adjust settings like
- content control
- Data usage
- Bug reports

And you can read the T&C and privacy policy.

FUTURE WORK AND CONCLUSION

FUTURE WORK

As is the case for every project with a deadline, we have features which we were not able to implement due to limited time and resources.
For our future work, we have planned the following -

- Implementation of ARkit
- Switching to Riverpod 2 as our state management
- Future expansion of the content moderation team
- Ability of General users to create and share quizzes
- Improving the quality of the features and services we provide to our users
- Implement an Integration test to test the whole application when complete
- Finally, all the functional and non-functional requirements we couldn't meet

CONCLUSION

Our team worked together and developed a completely functional application which met most of the major functional requirements we decided in the initial stage of this project. The application deployed - GeoTagAR, was supposed to be a scrapbooking platform using

Augmented Reality allowing users to share and organize their memories while offering possibilities for exploration and education, and we were able to achieve this.
Therefore, we provided a secure and unique alternative to the metaverse which builds a feeling of community and connection among our users and are optimistic that GeoTagAR will be useful for everyone who wishes to explore and share their experiences with the world.

APPENDIX

1. 1. Abbreviations

Acronym	*Description*
FR	Functional Requirement
NFR	Non-Functional Requirement
F - UR	Functional - User Requirement
NF - UR	Non-Functional - User Requirement
F - SR	Functional - System Requirement
NF - SR	Non-Functional - System Requirement
App	Application

1.2. Consent Form

Heriot-Watt University

Consent to Act as a Subject in The GeoTagAR Usability Study

Principal Investigators:

AAMIR NAZIR

GAURI D REVANKAR

ISMAEL SHAIKH

JACINTH DANIEL MOSES

PRAVEEN VENKATARAMAN

TEJAS SYAM

SANJEEVANI RAJPUROHIT

RYLAN CHRIS SILVEIRA

Description: The purpose of this study is to evaluate the product usability in the hands of the target demographic which has no connection to product development. There are minimal risks for you as a user if you decide to participate in this study. All personal information provided by you will be kept confidential in a secure filing cabinet or password-protected computer directories.

Your participation or willingness to no longer participate at any given time will not affect your performance in your registered courses (if you are a student) or your relationship with the university in any way. You are free to decline participation in this study.

Voluntary consent: I certify that I have read the preceding and that I understand its contents. Any questions I have pertaining to the research have been and will be answered by the team. My signature below means that I have freely agreed to participate in this study, and that I agree to the publication of the results for scientific purposes and to the distribution of the recordings and transcripts of the sessions for research purposes so long as my identity is not revealed

_____	_____	_____
Date	Subject Signature	Inv. Initials

Investigator's certification: I certify that I have explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature.

_____	_____
Date	Investigator Signature

1.3 Pre-Test Questionnaire

1. Enter your unique ID *

2. What is your age? *
   - 18 - 24
   - 25 - 34
   - 35 - 50
   - 51 - 65

3. What is your gender? *
   - Male
   - Female

- Other
- Prefer not to say

4. How often do you use social media? *
    - Daily
    - Weekly
    - Monthly
    - Never

5. Have you heard of the term “Augmented reality”? *
    - Yes
    - No

1.4. Testing Protocol

Aim
The purpose of the application is to act as a social medium, wherein users can share pictures in the form of a “scrapbook” to show the activities they engage in. Therefore, this test aims to assess how the participants interact with a prototype of the application, and checks whether the general purpose of the application is satisfied to some degree.

Introduction
You will be given a mockup of the system and will be tasked with navigating and using it. Based on these, we will ask certain questions to assess whether you are able to describe the features on the screen. You can use the icons on the page to give yourself an idea.
Using your description of the features, you will be asked to describe how you would perform some tasks and use the features. Your responses to the questions and the actions you take will be monitored – but will not be linked to you. There are no right/wrong answers to this – you can also provide suggestions on certain features that you deem irrelevant/inappropriate to the context. To avoid unwanted influence with the test, the supervisor will provide hints only when asked.
Although your test responses will be linked to the system – it will not be affiliated with the university by any means. If, at any given time, you wish to stop the test, please make the test supervisor aware.

After finishing the test, you will be asked to complete a short (anonymous) questionnaire to collect some feedback about your experience with the mockups.

Enter your unique ID*

_____

Test Supervisor*

_____

Date*

_____

1.5. Testing Protocol(Questionnaire)

1. Login and Sign-up page

a) Do you think the **login** page has all the features required? *
- Yes, all the appropriate features are present
- Most of the necessary features are present
- No, some features are absent
- Most of the necessary features are absent

b) Are you able to **login** and proceed? *
- Yes
- Yes, but with some difficulty
- No

c) Do you think the **sign-up** page has all the features required? *
- Yes, all the appropriate features are present
- Most of the necessary features are present
- No, some features are absent
- Most of the necessary features are absent

d) Are you able to return to the **login** page? *
- Yes
- Yes, but with some difficulty

- No

e) Are you able to **sign-up** and proceed? *
- Yes
- Yes, but with some difficulty
- No

2. Feed Page

a) Were you able to locate the **feed** page? *
- Yes
- Yes, but with some difficulty
- No

b) Are you able to **view** posts of other users? *
- Yes
- No

c) Are you able to **like** the posts of other users? *
- Yes
- No

d) Are you able to **comment** on the posts of other users? *
- Yes
- No

3. Map Page

a) Were you able to **locate** the map page? *
- Yes
- Yes, but with some difficulty
- No

b) Were you able to **view** the geotagged post pins of other users? *
- Yes

- No

c) Were you able to **scroll** through the map page to another location? *
- Yes
- Yes, but with some difficulty
- No

4. AR Page

a) Were you able to **locate** the AR page? *
- Yes
- Yes, but with some difficulty
- No

b) Were you able to **upload** an AR Anchor? *
- Yes
- No

c) Were you able to **download** an AR Anchor? *
- Yes
- No

d) Were you able to **capture** a memory? *
- Yes
- Yes, but with some difficulty
- No

e) Were you able to **edit** a memory? *
- Yes
- No

f) Were you able to **upload** a post from your gallery? *
- Yes
- No

5. Discover Page

a) Were you able to **locate** the Discover page? *
- Yes
- Yes, but with some difficulty
- No

b) Were you able to **search** for a user? *
- Yes
- No

c) Were you able to **search** for a group? *
- Yes
- No

d) Were you able to **join** a group? *
- Yes
- No

e) Were you able to **leave** a group? *
- Yes
- No

6. User Profile page

a) Were you able to **locate** the user profile page? *
- Yes
- Yes, but with some difficulty
- No

b) Were you able to **view** your posts? *
- Yes
- No

c) Were you able to **view** your scrapbook? *
- Yes
- No

d) Were you able to **view** the number of followers and following on your profile? *
- Yes
- No

e) Were you able to **locate** the Edit profile button? *
- Yes
- No

f) Were you able to **edit** your profile? *
- Yes
- Yes, but with some difficulty
- No

g) Were you able to **locate** the Settings button? *
- Yes
- Yes, but with some difficulty
- No

7. User Settings page

a) Were you able to **change** the account settings? *
- Yes
- No

b) Were you able to **delete** your account? *
- Yes
- No

c) Were you able to **access** Privacy and Security and make changes? *

- Yes
- No

d) Were you able to **Report** a problem? *
- Yes
- No

e) Were you able to **sign out**? *
- Yes
- No

1.6. Post-Test Questionnaire

1. Enter your unique ID *

2. What feature did you like **most** about the product? *

3. What feature did you like **least** about the product? *

4. Rate your overall experience with the product: *

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Application was easy to use					
Application was fast and responsive					

The icons aptly represented the purpose of the features					
User interface was visually appealing					
The layout of the app was well organised					
The AR system was consistent and predictable with it's operation					
Some features of the application was unclear					

5. How would you rate your overall experience with the product? *

← Very Poor Excellent →

0	1	2	3	4	5	6	7	8	9	10

6. If you had the opportunity to add changes in application, what would it be? *

7. Would you be willing to take part in a usability test in the future? *
   - Yes

- No
- Not decided

1.7. Project Dairy

Meeting - 1

Date /Time	30/09/22, 14:00 hrs. – 16:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Project & Team Introduction	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Syam, Tejas			

Key points discussed:

- Introductions and familiarization among team members.
- Review of Group Project Guide and Group Project Specification documents.
- Creation of a draft document for Stage 1.
- Exploration of applications adhering to stated specifications.
- Discovery of mixed-reality applications combining physical and AR objects (e.g., QR code-based AR object placement).
- Establishment of a checklist to track important items.

Member responsibilities:

Daniel: Liaison

Ismael: Reporter

Rylan, Tejas, Gauri, Aamir, Praveen, Sanjeevani: Brainstorm viable and feasible application ideas.

Meeting - 2

Date /Time	03/10/22, 10:00 hrs. – 12:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Application Concept Development	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Syam, Tejas			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

- Initiating documentation for Stage 1.
- Working on Requirements Specification, including project introduction, requirements, and UML diagrams.
- Drafting temporary purpose, aim, and scope (subject to modifications).
- Discussing application working: QR codes or physical objects as AR placeholders; Pokemon Go and Snapchat Map functionalities.
- Praveen emphasized Snapchat's Map functionality.The team agreed with it.

Member responsibilities:

Daniel: Liaison, brainstorm application ideas, note down the purpose and requirements development.

Ismael: Develop minutes of meetings, note down the aim and scope, brainstorm application ideas and develop requirements.

Rylan, Tejas, Gauri, Aamir, Praveen, Sanjeevani: Brainstorm viable application ideas, note down the objectives of the project and requirements development.

Meeting - 3

Date /Time	06/10/22, 15:30 hrs. – 17:00 hrs.	Venue	In-Person Meeting at University
Subject	Application Functionality & Documentation	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Syam, Tejas			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

- Reviewing previous meeting's content and application functionality.
- Adding functional and non-functional user and system requirements to the document.
- Reworking the aim, purpose, and scope of the project.

Member responsibilities:

Daniel: Liaison, brainstorm application ideas and requirements development.

Ismael: Develop minutes of meetings, rework the aim, purpose and scope, brainstorm application ideas and develop requirements.

Rylan, Tejas, Gauri, Aamir, Praveen, Sanjeevani: Brainstorm viable application ideas, note down the objectives of the project and requirements development.

Meeting - 4

Date /Time	07/10/22, 14:30 hrs. – 15:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Application Working & Requirements Reconsideration	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Syam, Tejas			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

- Discussed the working of the application, including feasibility of physical AR placeholders and client clarification.
- Prof. Abrar and Prof. Ubaid approved Unity for application development (based on a doubt previously raised by Daniel on the usage of Unity).
- Reconsidering and rewriting requirements; discussing reaction and messaging aspects.
- Established a fixed schedule for meetings.

Member responsibilities:

Daniel: Liaison, brainstorm application ideas and requirements development.

Ismael: Develop minutes of meetings, rework the aim, purpose and scope, brainstorm application ideas and develop requirements.

Rylan, Tejas, Gauri, Aamir, Praveen, Sanjeevani: Brainstorm viable application ideas, note down the objectives of the project and requirements development.

Meeting - 5

Date /Time	10/10/22, 10:00 hrs. – 14:00 hrs.	Venue	In-Person Meeting at University
Subject	Drop-in Session and Project Documentation Revision	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

- Combined drop-in session with Prof. Abbasi Ubaid regarding project doubts and showcasing previous projects as examples.

- Prof. Abbasi Ubaid stated the following;

o No specific way for an application to work and emphasized on team creativity and vision for application functionality.

- Reworked the aim, purpose, scope, and requirements of the project.

Member responsibilities:

Daniel: Liaison, brainstorm application ideas and requirements development.

Ismael: Develop minutes of meetings, rework the aim, purpose and scope, brainstorm application ideas and develop requirements.

Rylan, Tejas, Gauri, Aamir, Praveen, Sanjeevani: Brainstorm viable application ideas, note down the objectives of the project and requirements development.

Meeting - 6

Date /Time	14/10/22, 10:00 hrs. – 12:00 hrs. and 14:00 hrs. – 16:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Project Documentation – Two Teams Approach	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Syam, Tejas			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

- Meeting divided into two timeslots:

1. 10:00 hrs. – 12:00 hrs.: Team 1 (Daniel, Gauri, Praveen, Tejas) thoroughly analyzed requirements from specification document, obtaining crucial functional and non-functional requirements.

2. 14:00 hrs. – 16:00 hrs.: Team 2 (Sanjeevani, Rylan, Ismael) expanded on the requirements obtained by Team 1, with task allocation and project diary work.

Member responsibilities:

Daniel: Liaison and requirements development.

Ismael: Develop minutes of meetings and develop requirements.

Rylan, Tejas, Gauri, Aamir, Praveen, Sanjeevani: Develop requirements.

Meeting - 7

Date /Time	17/10/22, 12:00 hrs. – 14:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Refining Project Scope & Objectives	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Syam, Tejas			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			
Nazir, Aamir			

Details of points discussed:

- Modifications to project requirements, objectives, scope, and assumptions.
- Implementation of an acronyms and abbreviations table.
- Finalization of aim and purpose; reworking of objectives and scope.

Member responsibilities:

Daniel: Liaison, reworking the project outline and developing requirements.

Ismael: Develop minutes of meetings, finalize the aim, purpose, scope and develop requirements.

Rylan, Tejas, Gauri, Aamir, Praveen, Sanjeevani: Rework the project outline and requirements development.

Meeting - 8

Date /Time	18/10/22, 09:00 hrs. – 11:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	UML Diagrams & Risk Analysis	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Syam, Tejas			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

- Draft for Use Case diagram created along with discussions based on clarifications on scrapbook functionality.
- Tejas started work on Risk Analysis in accordance with the risk analysis example documents provided by Year 3 course coordinator Dr. Ubaid Abbasi. He was later joined by Ismael.
- Belbin test conducted for team role assignments.

Member responsibilities:

Daniel: Liaison, developing requirements and UML diagrams.

Rylan, Gauri, and Sanjeevani: Develop requirements and UML diagrams.

Ismael: Develop minutes, work on risk management, and develop requirements.

Tejas, Praveen: Implementation of risk management portion of the project

Aamir: Provide team with Belbin test and implement risk management portion of project.

Meeting - 9

Date /Time	19/10/22, 11:00 hrs. – 14:00 hrs.	Venue	In-Person Meeting at University
Subject	Application Feasibility & UML Diagrams	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Syam, Tejas			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			
Nazir, Aamir			

Key points discussed:

- Enhancement of use case diagram by Sanjeevani, Gauri, Praveen, Daniel, and Rylan. They were later joined by Aamir.
- Work on risk management portion of the document by Tejas. He was later joined by Ismael.
- Discussion on practicality and feasibility of application vision.

Member responsibilities:

Daniel: Liaison, brainstorm viable application ideas, developing requirements and UML diagrams.

Rylan, Gauri, and Sanjeevani: Brainstorm viable application ideas, develop requirements and UML diagrams.

Ismael: Develop minutes, brainstorm viable application ideas, and work on risk management.

Aamir, Praveen: Brainstorm viable application ideas, implement risk management portion of the project.

Tejas: Brainstorm viable application ideas and implement the risk management portion of the project.

Meeting - 10

Date /Time	20/10/22, 16:00 hrs. – 17:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Budgeting & Technology Selection	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			
Nazir, Aamir			

Key points discussed:

The meeting consisted of discussions on which software/hardware to be used, similar applications, platforms, discovering new methods of development, use case, risk management and budgeting.

- Progress on use case diagram by Gauri, Sanjeevani, Praveen, Rylan, and Daniel. Following this, they progressed towards textual descriptions.

- Progress on Risk Management portion by Tejas, along with the addition of some definitions by Ismael.

- Budget requirements discussion based on Year 3 Class Rep Ms. Nura's announcement (decision put on hold).
- Technology selection for application development and AR development compatibility.

Meeting - 11

Date /Time	21/10/22, 14:00 hrs. – 16:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Risk Management & UML Diagrams	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			
Nazir, Aamir			
Syam, Tejas			

Key points discussed:

- Progress made on UML diagrams and Risk Management portions of the document.
- Sanjeevani, Gauri, Daniel, and Rylan worked on UML diagrams.
- Praveen, Aamir, Ismael, and Tejas worked on Risk Management
- Focus shifted from use case diagrams to textual use cases.
- Developed strategies for risks in the Risk Planning portion of the document.

Meeting - 12

Date /Time	24/10/22, 09:00 hrs. – 10:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Risk Analysis & Textual Use Cases	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Venkataraman, Praveen			

Key points discussed:

- Progress made on textual use cases and risk analysis.
- Sanjeevani and Daniel worked on textual use cases.
- Tejas and Rylan worked on risk analysis.
- Tejas developed a risk analysis matrix for categorizing risk priority.
- Other team members worked independently on their allotted portions.

Meeting - 13

Date /Time	02/11/22, 11:00 hrs. – 12:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application & University
Subject	Risk Management Completion & Document Enhancement	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			
Nazir, Aamir			

Key points discussed:

- Hybrid meeting (University and Teams) to enhance and develop the document, with greater emphasis on completion of risk management.
- Gauri, Sanjeevani, Rylan, and Daniel worked on textual use cases.
- Sanjeevani modified the use case diagram based on group discussion.
- Ismael, Praveen, and Aamir worked on risk management.
- Ismael completed the risk planning portion, enhanced by Aamir and Praveen

Meeting - 14

Date /Time	04/11/22, 13:00 hrs. – 13:40 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Meeting with Line Manager	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Mihailescu, Radu-Casian			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Venkataraman, Praveen			
Revankar, Gauri D			
Syam, Tejas			

Key points discussed:

- Addressed doubts and questions with line manager, Prof. Radu-Casian Mihailescu.
- Discussed implementation platforms, user types, and general dos and don'ts.

Questions (from the team) and answers (from prof. Radu) were as follows;

Q. Should the app be implemented natively for mobile, or for every platform including browser?

A. Groups in the past have mostly focused on one platform, with the website usually being a promotional website.

Q. How will the user types work?

A. To think about the problem and come up with special features for different types of users. Also, do not assume and check with the course coordinator/client for a clear perspective.

- Prof. Radu emphasized the importance of Gantt chart for task/sprint deadlines and contribution.

Meeting - 15

Date /Time	07/11/22, 10:00 hrs. – 11:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Risk Analysis & Requirements Rework	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			
Nazir, Aamir			

Key points discussed:

- Reworked some requirements to better fit the application needs.
- Added extra features for enhanced user experience, while ensuring low load on the team.
- Aamir, Ismael & Praveen completed the risk analysis table, with enhancements by Tejas.
- Modified product scope due to reworked requirements.
- Firebase was chosen as the database.

Member responsibilities:

Aamir, Ismael & Praveen: Completion of risk analysis table.

Tejas: Enhance risk analysis portion of document.

Meeting - 16

Date /Time	08/11/22, 18:00 hrs. – 19:45 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Risk Management & Use Case Development	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Shaikh, Ismael			
Revankar, Gauri D			
Syam, Tejas			

Key points discussed:

The meeting consisted of further development in risk management and UML diagrams.

- Enhancement of textual use cases by Gauri, Daniel, Sanjeevani & Rylan.
- Sanjeevani, Daniel & Gauri developed Sequence diagrams.
- Rylan reworked some requirements.
- Daniel implemented traceability matrixes for use case and requirements.
- Skimmed through Google's ARCore documentation for AR aspect of development.
- Ismael and Tejas completed the risk monitoring portion of the document.

Member responsibilities:

Daniel, Sanjeevani, Gauri: Enhancing textual use cases.

Rylan: Reworking requirements

Tejas, Ismael: Completing risk monitoring portion.

Meeting - 17

Date /Time	09/11/22, 10:00 hrs. – 12:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Task Allocation & UML Diagrams	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Shaikh, Ismael			
Revankar, Gauri D			
Syam, Tejas			
Nazir, Aamir			
Praveen ,Venkataraman			

Key points discussed:

The meeting consisted of further development in risk management, UML diagrams and work allocation.

- Allocated work to each member.
- Further development of Sequence diagrams by Gauri and Sanjeevani.
- Gauri and Ismael worked on project planning.
- Praveen and Ismael finalised the Risk Management portion of the document.
- Ismael developed the Project Diary further.
- Rylan reworked some requirements.
- Daniel started work on project costing. Aamir started prototyping and brainstorming for feasible prototypes.

Member responsibilities:

Gauri, Sanjeevani: Developing Sequence diagrams.

Gauri, Ismael: Project planning

Ismael, Praveen: Finalizing risk management.

Ismael: Project Diary.

Rylan: Reworking requirements

Daniel: Project costing

Aamir: Brainstorming prototypes

Tejas: Risk Analysis portion of document.

Meeting - 18

Date /Time	14/11/22, 11:00 hrs. – 12:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Textual Use Cases & Documentation	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Venkataraman, Praveen			
Nazir, Aamir			

Key points discussed:

The meeting consisted of general discussions on textual use cases and general conversation.

- Progress of textual use cases.
- Ongoing coursework discussions.
- Sanjeevani collaborated on textual use cases.

Meeting - 19

Date /Time	15/11/22, 16:00 hrs. – 16:30 hrs.	Venue	In-Person Meeting at University
Subject	Prototyping & Usability Development	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Shaikh, Ismael			
Nazir, Aamir			

Key points discussed:

The meeting was short and concise, and dealt with the usability portion of the document.

- Primary focus on usability portion of the document.
- Brainstorming on prototyping ideas.
- Color palette selection for user engagement.
- Draft user interface creation in Microsoft Paint. This was further enhanced by being later implemented in Adobe Photoshop.
- Concluded with ideas for logo and app icon.

Meeting - 20

Date /Time	16/11/22, 10:00 hrs. – 12:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Group Project Documentation & Prototyping	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Revankar, Gauri D			
Nazir, Aamir			

Praveen, Venkataraman

Key points discussed:

The meeting was comprised of prototyping and further development of the UML diagrams.

- Sanjeevani, Rylan, and Gauri further enhanced the textual use cases.
- Aamir and Daniel individually initiated prototype research using Figma.
- UI development for home page and two other screens by Aamir and Ismael.

Meeting - 21

Date /Time	17/11/22, 09:00 hrs. – 11:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Group Project Documentation	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Revankar, Gauri D			
Shaikh, Ismael			
Nazir, Aamir			
Praveen, Venkataraman			
Syam, Tejas			

Key points discussed:

The meeting primarily consisted of completion of the document.

- Reworked document to adhere to 50-page limit.
- Vague team roles established.
- Finalization of UML diagrams by Sanjeevani. Further enhancement of Gantt charts by Gauri and Division of tasks among team members

Meeting - 22

Date /Time	18/11/22, 14:00 hrs. – 24:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Group Project Documentation & Prototyping	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Revankar, Gauri D			
Shaikh, Ismael			
Nazir, Aamir			
Praveen, Venkataraman			

Key points discussed:

The meeting consisted of completion of project costing, subsections of project planning, reworking the requirements and prototyping.

- Daniel finalized project costing (pending Gantt Chart completion).
- Ismael completed software and expected team roles/contribution in project planning.
- Gauri implemented Gantt Chart with input from Ismael and Aamir
- Rylan and Sanjeevani worked on prototype and reworked requirements with Ismael's assistance.
- Praveen focused on questionnaires, while Tejas improved the usability section of the document.

Meeting - 23

Date /Time	19/11/22, 16:15 hrs. – 16:45 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Prototype Development	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Shaikh, Ismael			
Nazir, Aamir			
Silveira, Rylan C			

Key points discussed:

The meeting was short and concise, and consisted of working on the prototype of GeoTagAR (product name).

- Aamir, Ismael, and Rylan worked on creating new screens for the prototype.
- Aamir began working on the top-down/subsystem diagram for the application.
- Ismael reworked the *software to be used* section of the document.

Meeting - 24

Date /Time	21/11/22, 15:45 hrs. – 16:15 hrs. & 17:00 – 18:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Reworking Requirements & Prototyping Details	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Shaikh, Ismael			
Nazir, Aamir			
Silveira, Rylan C			
Rajpurohit, Sanjeevani			

Key points discussed:

The meeting consisted of two meetings with concise and focused discussions.

- 15:45 hrs. meeting: Ismael, Sanjeevani, and Rylan discussed reworking requirements and details about prototype screens.

- 17:00 hrs. meeting: Ismael and Aamir reworked and enhanced prototype screens created by Rylan and Sanjeevani

- Concise, focused discussions in both meetings

Meeting - 25

Date /Time	22/11/22, 14:00 hrs. – 16:00 hrs.	Venue	In-Person Meeting at University
Subject	Group Project Documentation Revision	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

The meeting comprised of reworking the requirements, textual use cases, UML diagrams, traceability matrix and questionnaires.

- Sanjeevani and Gauri primarily focused on revising requirements, textual use cases, and correcting errors in UML diagrams.

- Daniel adjusted the document layout to adhere to the 50-page limit, added declaration of authorship forms, and incorporated the company/app logo created by Ismael.

Meeting - 26

Date /Time	22/11/22, 13:00 hrs. – 19:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Prototype Revision & Usability Testing Preparation	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Shaikh, Ismael			
Nazir, Aamir			
Venkataraman, Praveen			

Key points discussed:

The meeting was comprised of reworking the prototypes and usability portion of the document.

- Aamir and Ismael revised prototypes based on Stage 1 requirements.
  - o Draft versions created in Microsoft Paint.
  - o Final versions developed in Figma.
- Praveen joined to develop questionnaires.
  - o Utilized Microsoft Forms.
  - o Based on flows created from prototypes.

Meeting - 27

Date /Time	23/11/22, 11:00 hrs. – 15:00 hrs.	Venue	In-Person Meeting at University.
Subject	Documentation Update & Prototype Enhancement	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Shaikh, Ismael			
Nazir, Aamir			
Revankar, Gauri D			

Moses, Daniel
Silveira, Rylan C
Rajpurohit, Sanjeevani

Key points discussed:

The meeting's primary goal was to further complete the document and implement a flow between the prototype screens.

- Aamir, Ismael, and Rylan modified reworked requirements.
  - Further aligned with Stage 1 document
- Aamir implemented prototype connections and transitions.
  - Used for implementing flows.
- Daniel and Gauri updated requirements.
  - Incorporated input from Ismael
- Sanjeevani finalized traceability matrix and use cases.

Meeting - 28

Date /Time	19/12/22, 11:00 hrs. – 12:37 hrs.	Venue	Virtual Meeting through Microsoft Teams Application & University
Subject	Project Transition to Flutter	Prepared by	Jacinth Daniel Moses & Mohammed Ismael Abidali Shaikh
Team members / Participants			
Shaikh, Ismael			
Nazir, Aamir			
Revankar, Gauri D			
Moses, Daniel			
Silveira, Rylan C			

Rajpurohit, Sanjeevani
Venkataraman, Praveen

Key points discussed:

The meeting comprised of switching the framework of the application from react native to flutter & discussing future progress.

- Setup a GitHub Repository to host the application development.
- Decision made to switch from React Native to Flutter
- Distribution of work discussed.
- Establishing project milestones and deadlines
- Reviewing and assigning additional resources for learning Flutter.

Meeting - 29

Date /Time	26/12/22, 11:00 hrs. – 11:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application & University
Subject	Progress Check 1	Prepared by	Jacinth Daniel Moses & Mohammed Ismael Abidali Shaikh
Team members / Participants			
Shaikh, Ismael			
Nazir, Aamir			
Revankar, Gauri D			
Moses, Daniel			

Key points discussed:

The meeting was primarily held as a progress check.

- Showcase of work done so far, mainly login page done by Ismael
- Distribution of work discussed.

- Addressing challenges faced (or to be faced) during development.
- Established communication channels (Jira & GitHub) for sharing progress and resolving issues.

Meeting - 30

Date /Time	2/1/23, 11:00 hrs. – 11:40 hrs.	Venue	Virtual Meeting through Microsoft Teams Application & University
Subject	Progress Check 2	Prepared by	Jacinth Daniel Moses & Mohammed Ismael Abidali Shaikh
Team members / Participants			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Revankar, Gauri D			
Moses, Daniel			

Key points discussed:

Meeting to check the progress of the ongoing project.

- Individual progress check based on allocated tasks.
- Further distribution of work discussed.
- Discussed additional learning resources for Flutter.
- Shared best practices for Flutter development.
- Establishing a code review process along with multiple GitHub Branches.

Meeting - 31

Date /Time	5/1/23, 11:00 hrs. – 11:55 hrs.	Venue	Virtual Meeting through Microsoft Teams Application & University
Subject	Progress Check 3	Prepared by	Jacinth Daniel Moses & Mohammed Ismael Abidali Shaikh
Team members / Participants			
Revankar, Gauri D			
Moses, Daniel			

Key points discussed:

Short meeting to check progress and allocation of future tasks.

- Further distribution of work discussed.
- Daniel fixed issues with the GitHub Repository and Android Build process.
- Discussion of potential risks and mitigation strategies.

Meeting - 34

Date /Time	12/1/23, 11:00 hrs. – 11:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application & University
Subject	Progress Check 4	Prepared by	Jacinth Daniel Moses & Mohammed Ismael Abidali Shaikh
Team members / Participants			
Revankar, Gauri D			
Moses, Daniel			

Key points discussed:

Short meeting to check progress of project.

- Showcase of completed tasks.

- Distribution of work discussed.
- Reviewing project timeline and adjusted individual task deadlines.
- Identified areas for improvement and potential roadblocks, and ways to mitigate the mentioned.

Meeting - 33

Date /Time	13/1/23, 11:00 hrs. – 11:39 hrs.	Venue	Virtual Meeting through Microsoft Teams Application & University
Subject	Overall Project Progress Review	Prepared by	Jacinth Daniel Moses & Mohammed Ismael Abidali Shaikh
Team members / Participants			
Revankar, Gauri D			
Moses, Daniel			
Shaikh, Ismael			
Nazir, Aamir			

Key points discussed:

Short meeting to check the overall progress of allocated tasks.

- Showcase of work done so far by each team member.
- Reevaluation and distribution of tasks among the team members.
- Identification of potential challenges and solutions.
- Setting deadlines for the completion of tasks.

Meeting - 34

Date /Time	17/01/23, 20:30 hrs. – 21:20 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Application Development Updates	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Nazir, Aamir			
Shaikh, Ismael			
Venkataraman, Praveen			

Key points discussed:

The meeting primarily consisted of:

- Praveen's progress on creating the media gallery page.
- Daniel's progress on Unity for the AR portion of the application.
- Ismael drafted an email to the line manager addressing:

o Clarification on developing the application for both iOS and Android platforms.

o Confirmation on requirements for the February 2nd deadline (Firebase data vs. prototype with dummy data)

o Daniel sent the e-mail to the line manager.

- Brief discussion on project timeline and task allocation.

Meeting - 35

Date /Time	18/01/23, 15:00 hrs. – 15:15 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Catch-Up & Task Updates	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Venkataraman, Praveen			

Key points discussed:

The meeting primarily consisted of individual review and catching up on allocated tasks.

- Review of completed tasks and pending work.
- Update on Praveen's work on the create and post memory pages.
- Discussion on potential obstacles and solutions
- Setting priorities for the upcoming week

Meeting - 36

Date /Time	27/01/23, 11:00 hrs. – 13:15 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Comprehensive Project Review	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			

Syam, Tejas
Venkataraman, Praveen
Revankar, Gauri D

Key points discussed:

The meeting involved a comprehensive overview of the project progress. It consisted of:

- Comprehensive review of the project's progress
- Analysis of individual contributions and task completion.
- Identification of potential risks such as ongoing coursework's/assignments.
- Discussion on application testing.
- Agreement on final tasks and responsibilities leading up to the deadline.

Meeting - 37

Date /Time	28/01/23, 11:15 hrs. – 12:15 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Project Development Updates	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Nazir, Aamir			
Shaikh, Ismael			
Revankar, Gauri D			

Key points discussed:

The meeting was comprised of current project development updates.

- Gauri shifted Stage 2 document to Google Docs due to issues on Microsoft Teams.
- Ismael and Daniel resolved the Unity bug in the app development process.

o Daniel provided a Unity Library file, which included an older version, thus enabling successful building of the application.

- Team discussed potential improvements for app functionality.

Meeting - 38

Date /Time	29/01/23, 14:00 hrs. – 15:45 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Task Updates & Clarifications	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

Short meeting to catch up on tasks.

- Team members caught up on each other's tasks and addressed doubts.
- Ismael clarified issues regarding user feed appearance.

Member Responsibilities:

Ismael, Daniel, Aamir, and Praveen: Application development.

Sanjeevani and Rylan: Design and development of the website.

Gauri: Development of the report.

Tejas: Test case development.

Meeting - 39

Date /Time	01/02/23, 15:00 hrs. – 17:20 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Group Project Documentation	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Syam, Tejas			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

The meeting consisted of the team members finalizing the report:

- The team finalized the report and prepared for the upcoming demo on 2nd Feb'23 with Line Manager Prof. Radu.

- Accordingly, multiple bugs were fixed, and extra features such as user search were implemented.

Member Responsibilities:

Ismael, Daniel, Praveen, and Aamir: Completion of half the required app functionality, and further development after the demo.

Rylan and Sanjeevani: Completion of website and report.

Gauri: Completion of the report.

Tejas: Conclusion of unit tests.

Meeting - 40

Date /Time	10/03/23, 14:00 hrs. – 14:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Project Progress Review	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Syam, Tejas			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

The meeting comprised of:

- Presentation of current project status:
  - Work completed by each team member.
  - Milestones achieved.
  - Challenges faced and solutions implemented.
- Discussion on work distribution:
  - Reevaluation of assigned tasks.
  - Identification of areas requiring additional support or resources
  - Adjustment of individual deadlines if necessary
- Introduction of new points:

o Review of project timeline and potential risks i.e., assignments.

o Plans for upcoming progress meetings and checkpoints.

- Importance of regular check-ins and status updates in order to keep the flow of work going.

- Utilization of project management tools and resources such as Jira.

Member Responsibilities:

Ismael, Daniel, Praveen, and Aamir: Completion of the other half of the required app functionality, and further development after the EXPO demo.

Rylan and Sanjeevani: Completion of website and promotional material.

Gauri: Completion of the report and slight UI changes.

Tejas: Conclusion of unit tests.

Meeting - 41

Date /Time	12/03/23, 14:00 hrs. – 14:45 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Stage 3 Report & Task Assignment	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Revankar, Gauri D			

Key points discussed:

Short meeting consisting of:

- Discussed Stage 3 report and assigned tasks for projected application features.

- Sanjeevani initiated work on social media promotion for the app.

- Rylan, with assistance from Sanjeevani, began work on the website.
- Gauri contributed to the app creation and focused on the report.
- Daniel worked on the AR portion of the app in Unity.

Meeting - 42

Date /Time	15/03/23, 20:15 hrs. – 21:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Application Object Flow & Structure	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Nazir, Aamir			
Shaikh, Ismael			

Key points discussed:

Short meeting regarding:

- Discussed application object flow and access to specific features such as geotagging a memory and scrapbook creation.
- Aamir presented the structure of attributes in Firebase and the relationship between posts and scrapbooks.

o Ismael and Daniel agreed with Aamir's proposal.

Meeting - 43

Date /Time	15/03/23, 10:15 hrs. – 10:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Application Feature Implementation	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Shaikh, Ismael			

Key points discussed:

A short 15-minute meeting comprising:

- Wrapped up existing app features and discussed new feature implementation.
- Ismael suggested ways to implement features more easily.

Meeting - 44

Date /Time	17/03/23, 21:15 hrs. – 21:45 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Company Website & Promotion	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Rajpurohit, Sanjeevani			

Key points discussed:

The meeting consisted of:

- Rylan and Sanjeevani discussed and developed further on crucial elements of the company website.
- Sanjeevani worked on promotional materials, including Instagram pages, business cards, and posters.

Meeting – 45

Date /Time	20/03/23, 19:15 hrs. – 22:15 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Group Project Development & Bug Fixes	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Moses, Daniel			
Shaikh, Ismael			
Nazir, Aamir			
Venkataraman, Praveen			

Key points discussed:

- Praveen outlined issues in create memory and add memory pages:
  - Identified the error causing bugs.
  - Discussed possible solutions.
- Ismael addressed the bugs and removed the provider package:
  - Resolved null check errors.
  - Ensured consistency of Firebase calls throughout application.
  - Removed error-causing values present in Firebase Firestore.
- Daniel introduced an introductory page and AR implementation:
  - Explored alternatives to Unity.
  - Utilized Flutter-based ARCore plugin.
- Aamir focused on the map portion of the application:
  - Discussed integration with other features such as posts, scrapbooks, and users.
  - Addressed questions by Ismael and Daniel on the map implementation.
- Team worked on finalizing documentation and application features:
  - Reviewed progress and outstanding tasks.
  - Established short timeline for completion of pending features.
  - Finalized the bulk of the application.

Meeting - 46

Date /Time	27/03/23, 13:10 hrs. – 14:00 hrs.	Venue	Hybrid Meeting through Microsoft Teams Application and University
Subject	Allocation of Tasks	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Syam, Tejas			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

The meeting was comprised of:

- Allocating sections of the report to team members, thus ensuring a balanced distribution of work.
- Assigned tasks should be completed before the follow-up meeting scheduled on 30th Mar'23.

Member Responsibilities:

1. Aamir:

- Fix Application Bugs.
- Final Application Design and Implementation

o Database Design

o Initial UI Design

- o Final UI Design

2. Ismael:

- Finalize Project Diary.
- Fix Application Bugs
- Final Application Design and Implementation
- o Front-End Application Development
- o Assist in Database Design
- o Initial UI Design
- o Final UI Design

3. Rylan:

- Fix any issues (if any) with the Website.
- Assist in Features Implemented
- Future Work and Conclusion

4. Sanjeevani:

- Marketing Analysis & Strategy
- o Marketing Analysis
- o Unique Selling Point (USP)
- Final Usability Evaluation
- o Questionnaires
- Project Evaluation
- Promotional Material.

5. Gauri:

- Marketing Analysis & Strategy
- o Marketing Goals
- o Marketing Mix

- Final Application Design and Implementation
  - Design Methodology
  - Assist in Features Implemented
  - SCRUM (Gantt Chart)
- Final Usability Evaluation
  - Questionnaires
- Project Evaluation

6. Tejas:

- Testing
  - Finalize Application Testing
  - Conclude test results in document.
- Final Usability Evaluation

7. Daniel:

- Fix Application Bugs
- Oversee project development.
- Final Application Design and Implementation
  - Initial UI Design
  - Final UI Design
- User Guide

8. Praveen:

- Fix Application Bugs
- Final Application Design and Implementation
- Final Usability Evaluation
- Future Work and Conclusion

Meeting – 47

Date /Time	27/03/23, 19:30 hrs. – 20:30 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Questionnaire Development	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Revankar, Gauri D			
Rajpurohit, Sanjeevani			

Key points discussed:

The meeting was comprised of Gauri & Sanjeevani developing the following:

- Creation of consent forms.
- Development of questionnaires.
  - o Pre-questionnaire
  - o Post-questionnaire
  - o Testing-questionnaire
- Accordingly, on completion of questionnaires, results were obtained from volunteers through Microsoft Forms.

Meeting – 48

Date /Time	29/03/23, 12:30 hrs. – 14:00 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Stage 3 Report Development	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			

Revankar, Gauri D
Rajpurohit, Sanjeevani
Moses, Daniel

Key points discussed:

The meeting was primarily for:

- Further development and enhancement of the Stage 3 Document.
- Tackle roadblocks and inconsistencies within the report and product.
- Complete the final application design and implementation section of the document.
- Re-allocate time from low priority tasks to high priority tasks.

Meeting – 49

Date /Time	29/03/23, 14:45 hrs. – 15:50 hrs.	Venue	Virtual Meeting through Microsoft Teams Application
Subject	Database Structure Diagram	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Nazir, Aamir			
Shaikh, Ismael			
Silveira, Rylan C			

Key points discussed:

The meeting consisted of:

- Representing the Firebase database structure in UML form.
  - Aamir created the UML diagram and completed most of the attributes and collections.
  - Ismael assisted Aamir with the completion of the diagram.
- Rylan obtained clarity on the following features through Ismael:
  - Admin Panel.

- Live Map with posts as anchors.
- User feed.

Meeting - 50

Date /Time	30/03/23, 07:45 hrs. – 13:30 hrs.	Venue	Hybrid Meeting through Microsoft Teams Application and University
Subject	Finalization of Stage 3 Document	Prepared by	Mohammed Ismael Abidali Shaikh
Team members / Participants			
Silveira, Rylan C			
Moses, Daniel			
Rajpurohit, Sanjeevani			
Nazir, Aamir			
Shaikh, Ismael			
Syam, Tejas			
Venkataraman, Praveen			
Revankar, Gauri D			

Key points discussed:

The meeting was comprised of:

- Aamir and Ismael discussed the pending tasks.
- Aamir completed the initial and final UI portions of the document.
- Ismael worked on and completed the front-end development section of the document.
- Ismael enhanced Aamir's earlier implementation and added geotagged posts on the map.
- Daniel followed up on the Usability Evaluation questionnaires and highlighted application bugs to Ismael.
- Ismael fixed application bugs.
- Gauri and Sanjeevani worked on finalizing the document.
- Rylan worked on features implemented and conclusion sections of the document.
- Daniel worked on finalizing the report as well as identifying bugs.
- Tejas and Praveen worked on Testing and Final Usability Evaluation.
- Praveen resolved bugs regarding the camera related portion of the application.