



PetHome

IM3180 Design and Innovation Project

(AY2023/24 Semester 1)

Project Report

Title: PetHome

Github: <https://github.com/mingzhi987/pethome>

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1. Background and Motivation

Presently, individuals interested in adopting a pet must directly contact various animal shelters individually through their respective websites via The Animal & Veterinary Service (AVS). With over 50 animal shelters in existence, this decentralised approach can be cumbersome, requiring users to invest significant amounts of time in research. Additionally, potential pet owners face challenges in visualising the size of the pets available for adoption, necessitating a physical visit to the shelter to determine whether the pet's size is suitable for their living space and potentially a wasted visit. Many irresponsible pet owners also often use the excuse of the dog outgrowing their expectation in size to abandon them. The adoption process does not end there, pets are required to be microchipped and health checked before bringing them home, and the new owners will need to find new vets.

In response to these challenges, our group created PetHome. PetHome aims to streamline the adoption process. By serving as a centralised platform, PetHome offers users a one-stop solution to browse available pets for adoption or pet-sitting, along with comprehensive information about each pet, and further, providing veterinary services with collaborating vets thus addressing the current inefficiencies in the pet adoption process.

2. Objective

The primary objective of our mobile app, PetHome, is to revolutionise the pet adoption and pet-sitting experience by addressing the current challenges faced by potential pet owners. PetHome aims to simplify and streamline the adoption process by providing an easy to use, centralised platform that offers comprehensive information about pets available for adoption or pet-sitting. By doing so, our objective is to eliminate the time-consuming and scattered nature of the current adoption process from research to health check, making it more convenient for users to find the perfect pet soulmate for their homes while enhancing their ability to visualise and understand the characteristics of each potential companion.

3. Review of Literature/Technology

3.1. Literature Review

Pet owners in Singapore have increased over the years. As of June 2023, about 34% of Singaporeans own pets (Tan, 2023). Singapore's pet dog and cat figures have grown by 3% to 114,000 and by 10% to 94,000 respectively from 2019 (Lee, 2023). However, most pet owners prefer to buy instead of adopt.

The most prevalent reason aspiring pet owners buy instead of adopt is that they want a pet right away. They want a speedy transaction and do not want to go through the arduous adoption procedure, which many people believe is too long.

Some individuals just desire newborn pets or a specific breed and believe that they can only acquire them by purchasing them. Because there are animal welfare organisations in Singapore that specialise in saving whole breeds, these breeds are frequently available. However, some will have health or behavioural concerns as a result of the environment in which they were produced and reared (Sacchi, 2023).

Unfortunately, AVS investigated up to 315 cases of pet abandonment last year, which has been on the rise over recent years (Ang & Tang, 2023). The majority of pet owners are put off by the exorbitant fees and end up leaving their animals outside SPCA or shelters as a result of circumstances changing or not having the time to properly train them.

Therefore, potential pet owners are likely to purchase pets from pet shops rather than adopt from shelters or other owners. So, we came up with the idea of an app that is able to streamline the process to make it easier and seamless to allow more users to adopt or pet-sit. Our application allows people to look for their preferred breed and age and helps adopters contact vets regarding the health concerns .

3.2. Technologies Used

The following are the technologies employed in the development of the app

- Programming Language: Java

- Development Environment: Android Studio
- Database: Firebase Firestore
- Augmented Reality: Unity with Lightship ARDK and ARCore
- Design: Figma, DrawIO, Illustrator
- Project Management: Github, Jira

3.3. System Requirements

The system requirements for running the PetHome app:

- Minimum SDK: 26
- Target SDK: 33

PetHome supports a minimum SDK version of 26 to ensure compatibility with a wide range of Android devices. The target SDK version is set to 33 to leverage the latest features and optimizations.

3.4. Architecture

Overall Architecture

The architecture of PetHome is designed to provide a cohesive and efficient user experience. It comprises various components, including the user interface, data storage, and augmented reality modules.

Database Architecture

PetHome relies on Firebase Firestore for secure and scalable data storage. The database architecture ensures efficient retrieval and storage of pet-related information.

Authentication

PetHome uses Firebase Authentication to authenticate users via email/password or via Gmail to ensure utmost security.

AR Integration

The integration of Unity with Lightship ARDK and ARCore enriches PetHome with augmented reality features, enabling users to interact with virtual elements seamlessly. Integrating the Unity library into the Android app involves incorporating the AR features seamlessly.

4. Design and Implementation

4.1. Design Consideration / Choice of components

In the design of our application, PetHome, several key considerations have been incorporated to enhance the user experience:

Colour Scheme:

- Utilises calming pastel colours to create a visually soothing environment.
- Aims to evoke feelings of comfort and warmth for potential pet owners.

Interactive Design:

- Draws inspiration from dating apps, implementing a swiping mechanism for users to navigate through the available pets.
- Injects an element of fun into the browsing experience.
- Easy to use and instinctive flow for our users

Data-Driven Recommendations:

- Adopts a dating app-style liking and disliking system to gather user preferences.
- Enables the application to provide more accurate and personalised pet recommendations based on user interactions.

Minimalistic Interface:

- Embraces a minimalistic design philosophy to declutter the user interface.
- Allows users to focus on the main objective of selecting a pet without unnecessary distractions.

By combining these design elements, PetHome aims to create a user-friendly and enjoyable platform for all potential pet owners, streamlining the pet adoption process while ensuring a visually appealing and stress-free experience.

4.2. Final Design (with block diagram) (For software, use the proper Software Engineering Diagram, such as a Use Case Diagram / Sequence Diagram, etc.)

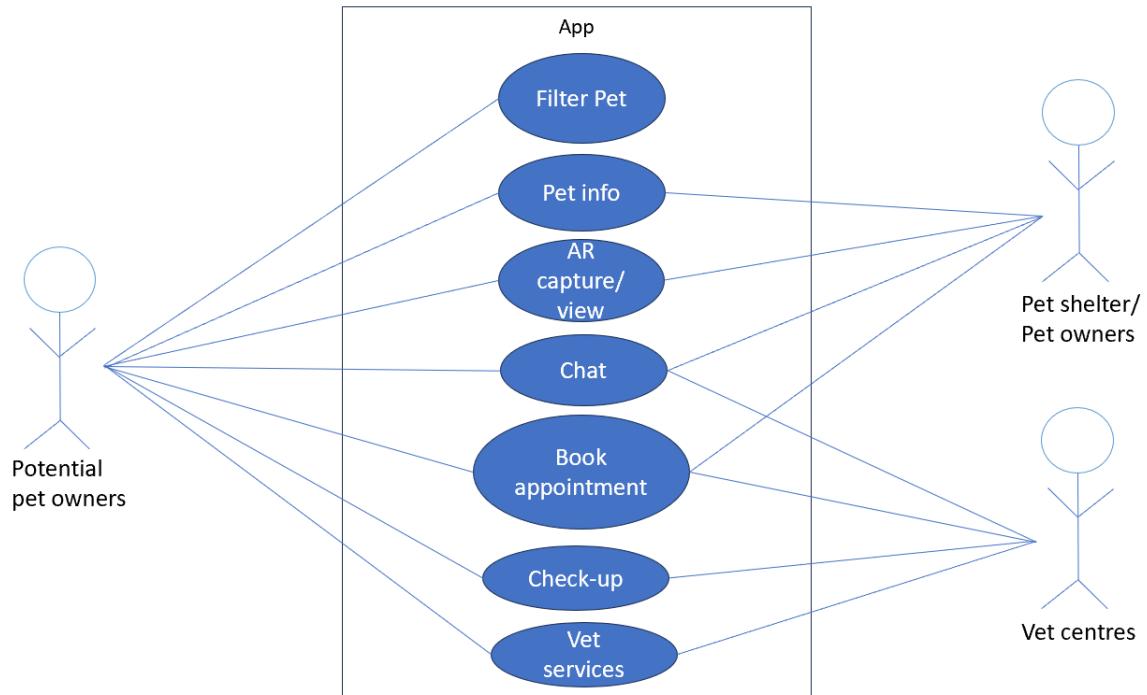


Figure 1: Use Case Diagram

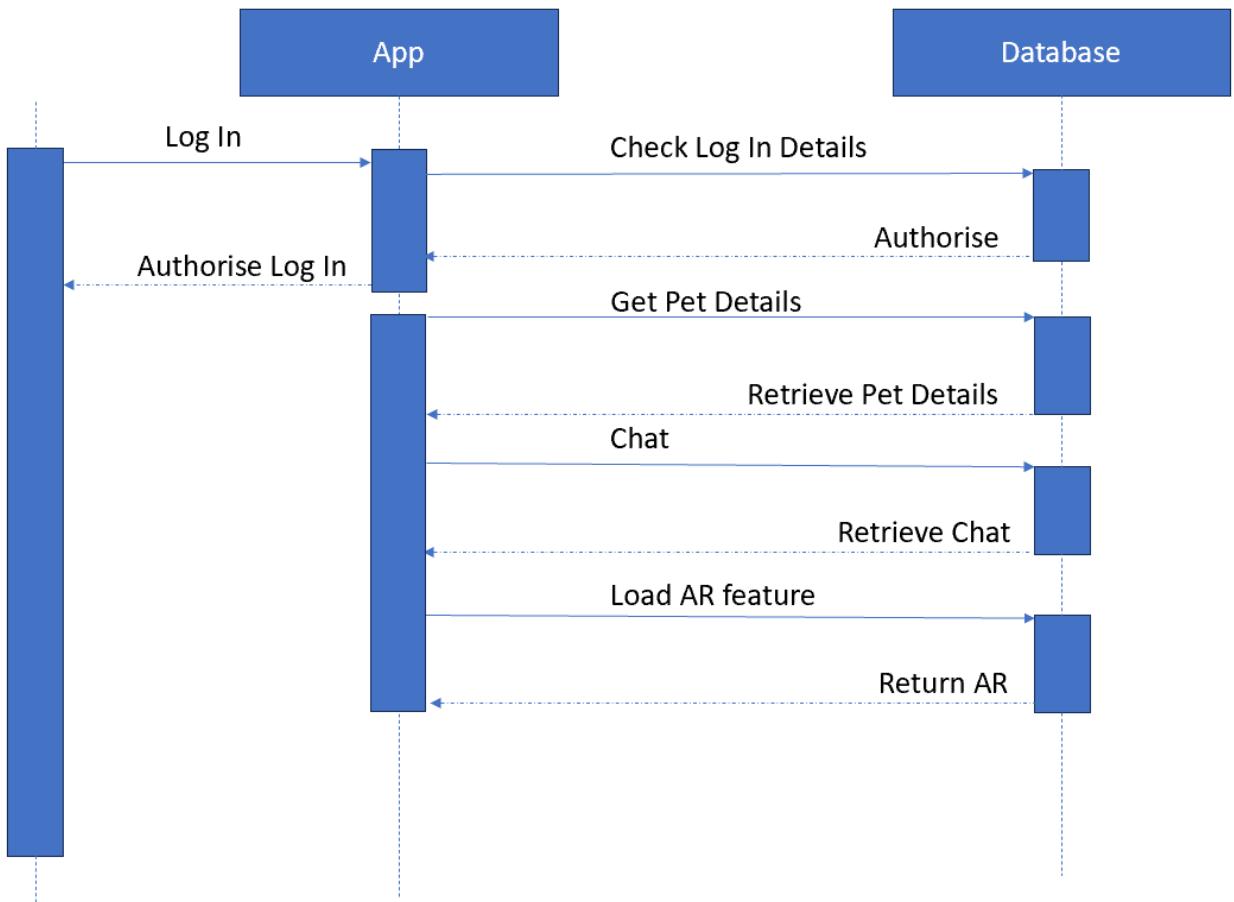


Figure 2: Sequence Diagram

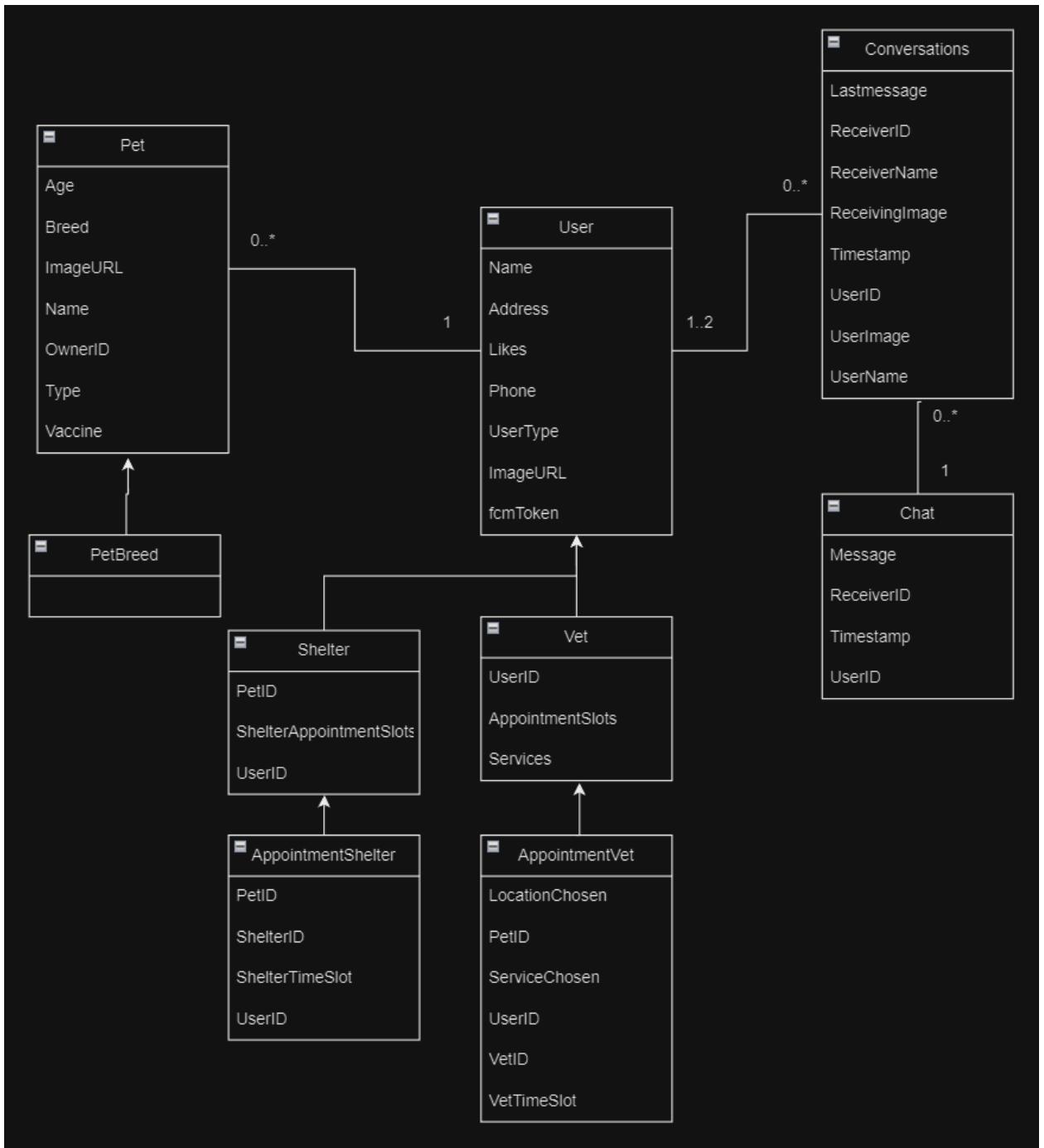


Figure 3: Database Schema

4.3. Implementations (with photos)

Firstly, we drafted our app prototype using Figma. We brainstormed on the pages that we needed to build in order to provide a smooth and pleasant experience for the users.

Then, we used Android Studio for the development of our app. Besides, we also incorporated Blender and Unity for our main AR feature by creating 3rd-dimensional (3D) models which will be superimposed in a given environment. For our data, we used Firebase to store both users' and pets' data in the server database.

1) Log-in / Register page

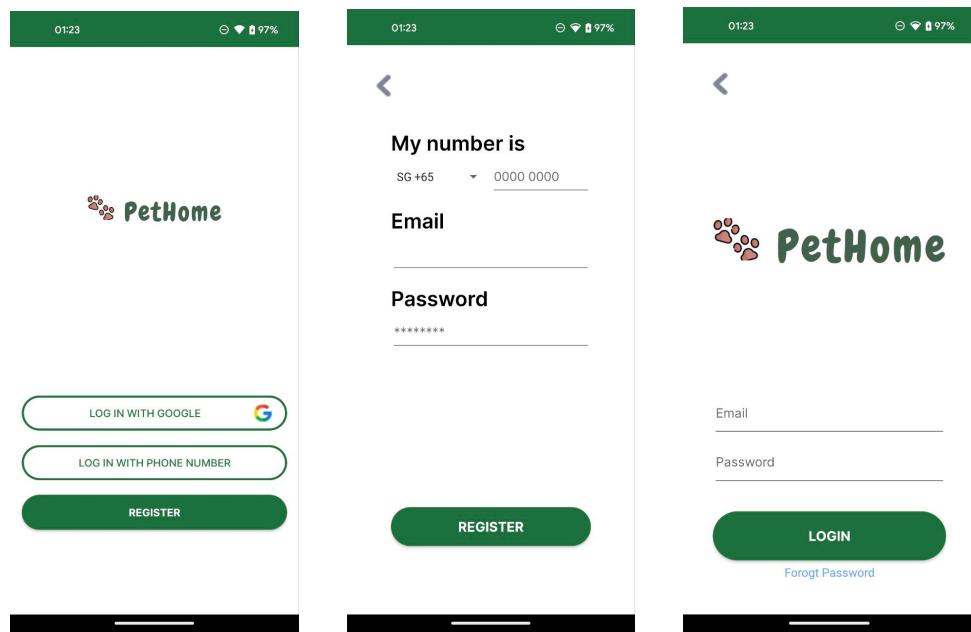


Figure 4 (left to right): App Page, Register Page, Log in Page

Users will start by signing up for an account, either by email or Google account.

2) Home page

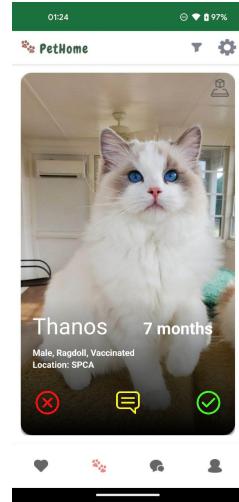


Figure 5: Home Page

Users will be able to swipe left or click the red cross to dislike, swipe right or click the green tick to like. The chat button will redirect to chat with the shelter/owner.

3) AR feature

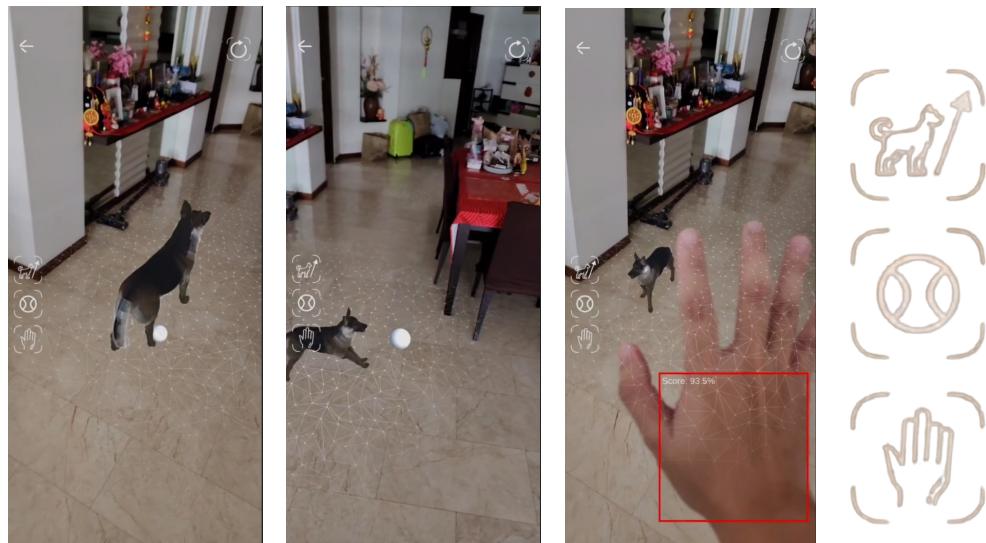


Figure 6 (left to right): AR feature (Pet Grow, Ball Throw, Hand Out), Icons

It will first scan the environment and the pet will be placed automatically. Users will then be able to click the buttons on the left panels to trigger actions. The first icon will be to increase the size of the pet (to simulate the growth), the ball icon

will be to throw a ball to the pet, and the hand icon will stop the pet, stretching out a hand works as well.

4) Like page

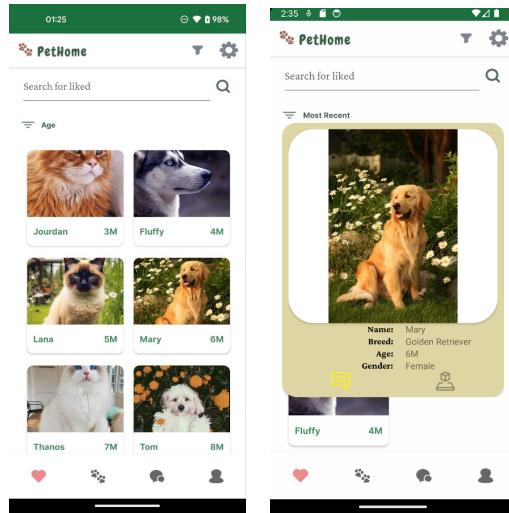


Figure 7 (left to right): Like page, Info card

All likes from home page will appear here to look back at all the liked pets. When clicked, info cards will pop up. In the info card, some information such as Name and Breed of the pet, they will also be able to superimpose with the AR feature and contact the shelter of your favourite pet.

5) Filter page

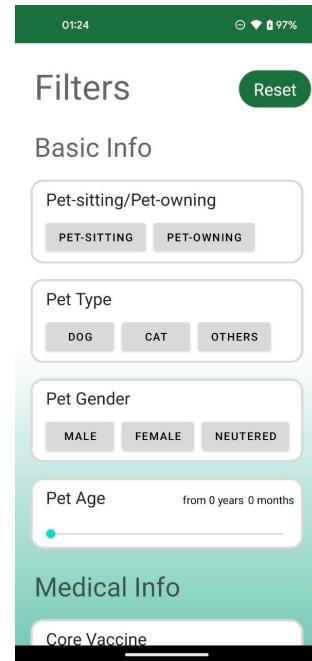


Figure 8: Filter Page

To filter what kind of pets users want to look for as well as the medical information of the pets.

6) Chat page

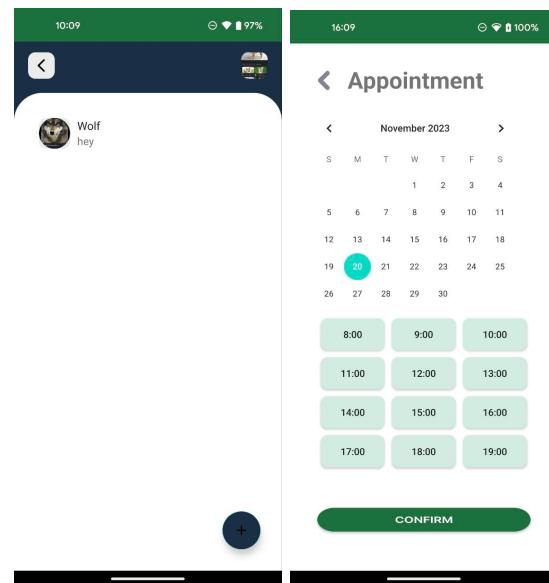


Figure 9: Chat Page, Appointment Page

Used to communicate with or book appointments with pet shelters/ owners or vets.

7) Profile page

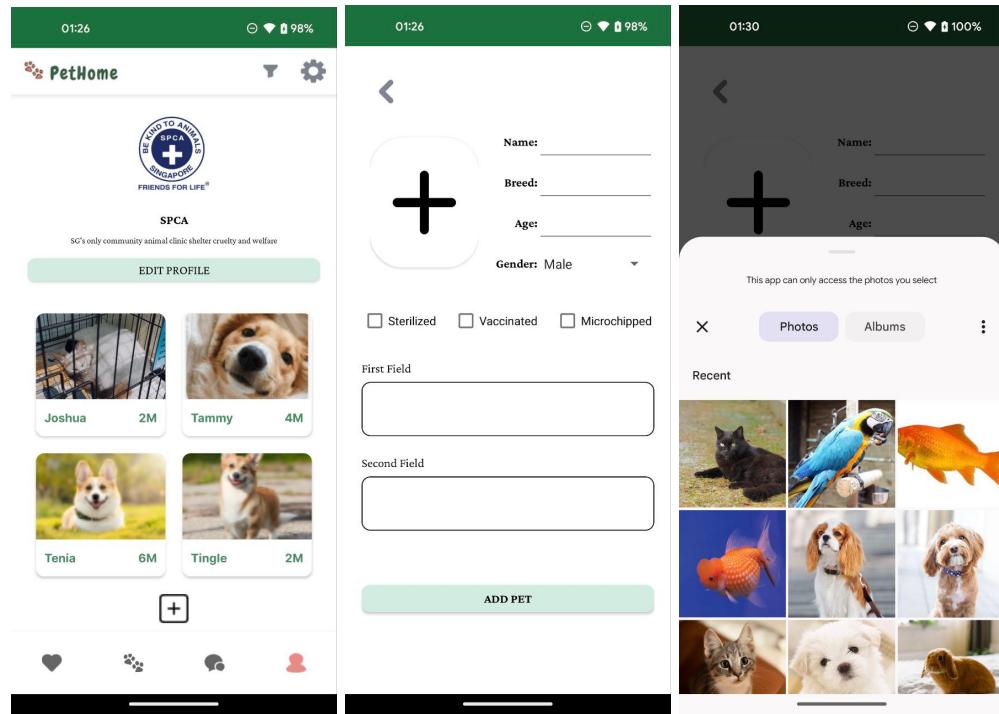


Figure 10: Profile Page, Add Pet Page, Gallery Upload

Users can use this page to edit profile or add pets that are available to be adopted by potential pet owners.

4.4. Project Management

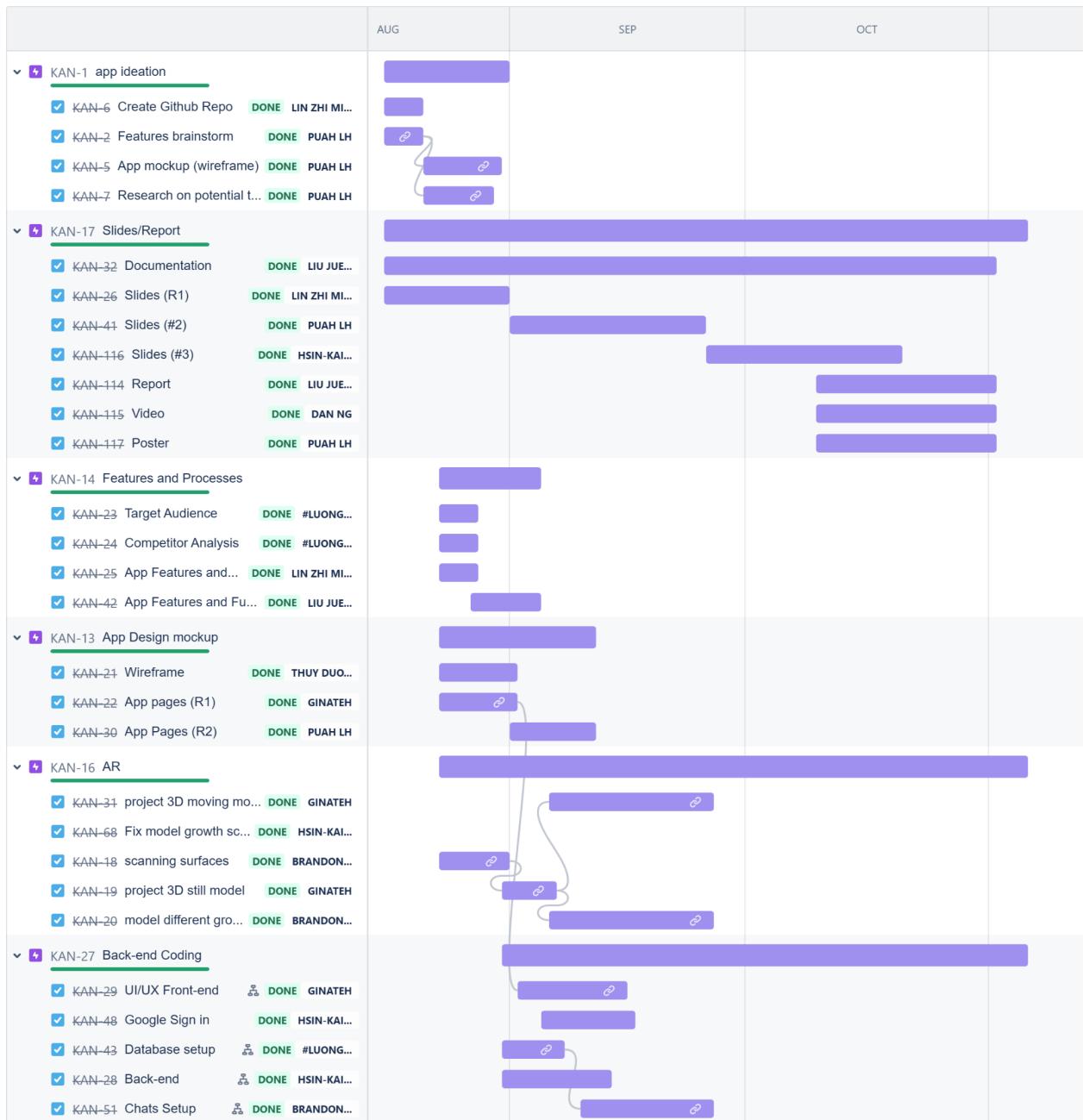


Figure 11: Timeline of our project management

Our project's main features were done before the first app mockup presentation, and refinements to the features were arranged in the schedule leading up to the final presentation.

We started by brainstorming on features and creating an app mockup within the first week before splitting up into groups to work on the features that we were assigned.

After that, we had weekly meetings on Wednesday with our supervisor as well as our own private meeting on Saturday mornings so that we could set smaller deadlines and keep everyone up to date with what should be done from one meeting to the next.

4.5. Discussion

Challenges Faced

The development of the project presented several challenges, with notable pain points emerging in the implementation of the chat and AR features.

Addressing the chat functionality required numerous iterations of database schema adjustments, coupled with extensive exploration of Firestore API documentation to facilitate the seamless exchange of chat messages.

When implementing the chat function, it will require real-time data exchange between users. However, due to budget constraints, we are unable to consider the chat function to be of a larger scale.

The AR feature posed a distinct challenge, as existing resources for mobile AR were scarce and often deprecated, hindering integration with our intended functionalities. Our team explored four different AR modules, including Google Sceneform (native Android), ARFoundations (Unity), Echo3D (Unity), and Manomotion (Unity), before ultimately selecting Lightship ARDK (Unity).

Unity's Lightship ARDK allows for depth and meshing on any device and at a greater distance where a Light Detection and Ranging (LIDAR) sensor is not present. It also allows for dynamic navigation and a visual positioning system where pets will be able to move around the scene in real-world locations with precise accuracy while maintaining a smaller runtime size.

Integrating Unity as a library into our native Android application proved to be a complex task, exacerbated by a lack of online instructions or documentation. As a result, our team took the initiative to create our documentation (referenced below), which will be made

available online soon, detailing the process of integrating Unity-as-a-library into a native Android application.

Group Cohesion

We are mostly able to reach all our targets by our set deadlines. However, some of the more complex features required more time than expected. Nonetheless, we were able to split the work and work parallel with each other, which allowed us to make it to the deadline set. Our group is also very helpful and kind to hear everyone's opinions and problems. We were able to communicate effectively and complete the project successfully.

5. Conclusion & Recommendation

5.1. Conclusion

Our application serves as an all-encompassing platform for individuals to explore pets available for adoption and pet-sitting. Within this process, users can conveniently filter pets based on their breeds and characteristics, expressing their preferences by liking or disliking each pet. A standout feature of our app is the integration of augmented reality (AR), allowing users to visualise the potential size of the pet as it grows, aiding in determining how well the pet may fit into their living space. The distinctive user interface employs a seamless swiping gesture - swipe right to express interest and left to indicate disinterest, providing an intuitive way to discover a compatible pet companion. In summary, the development of a pet adoption app presents a unique opportunity to positively impact the lives of both animals in need and individuals seeking companionship. Through user-friendly design elements like the swiping gesture, comprehensive pet profiles, and advanced search options, our app aims to bridge the gap between adopters and rescue organisations. Ultimately, a thoughtfully crafted pet adoption app has the potential not only to connect pets with loving homes but also to promote a culture of responsible pet ownership and advocacy for animal welfare.

5.2. Recommendation for future works

Embarking on the creation of a mobile app for pet adoption is a commendable and significant initiative. To ensure the success of our app, we are contemplating the integration of the following features and strategies.

First and foremost, contemplate incorporating a capture model function that allows users to perform a 3D scan of the pet while creating a listing. However, it's important to note that currently, the inclusion of this feature in an Android application is not feasible due to limitations in mobile phone capabilities. Specifically, most phones lack an inbuilt lidar sensor, preventing accurate sizing in the captured model. This consideration is vital for users to be aware that the current technology constraints may affect the precision of the sizing information within the 3D model.

Secondly, we aim to cultivate a more user-friendly interface by incorporating a clean, intuitive design that facilitates easy navigation for users of all ages. Simultaneously, we plan to streamline the registration process to enhance user accessibility.

Thirdly, the inclusion of more comprehensive pet profiles is pivotal. This involves providing detailed information about each pet, encompassing aspects such as age, breed, size, and behaviour. Additionally, enriching these profiles with high-quality images and videos will effectively showcase each pet's unique personality.

As a fourth recommendation, social media integration will allow users to share pet profiles across platforms, amplifying adoption visibility. We will also incorporate more social login options for user convenience. Implementing push notifications will keep users informed about new arrivals, events, or changes in adoption status. Leveraging geolocation services, the app will display pets available for adoption in the user's vicinity, providing maps and directions to adoption centres.

Finally, establishing a community within the app will enable users to share their adoption stories and experiences, fostering a sense of connection. Users can leave reviews and ratings for both pets and adoption centres, contributing to a supportive environment. Educational resources, including articles, videos, or links related to pet care, training, and health, will also be provided. A dedicated FAQ section will address common questions about the adoption process. Finally, a feedback system will be implemented to gather user opinions, ensuring continuous improvement of the app.

6. References

Unity-As-A-Library Documentation (Self-Made) -

<https://outstanding-cylinder-b7a.notion.site/Unity-as-a-Library-ec75fb00ecd645f38f0bd1b3312a343d?pvs=4>

Firebase Documentation - <https://firebase.google.com/docs>

ARCore Documentation - <https://developers.google.com/ar>

LightShip ARDK Documentation - <https://lightship.dev/docs/archive/ardk/>

Database Schema -

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