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Faculty of Engineering & Information Technology  
Department of Computer Engineering

### **Graduation Project I**

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# **Disclaimer**

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# Abstract

Technology has greatly improved in human life to be an important aspect of all the small details. As a result, it interferes with the medical, educational, and other aspects of our life. It affects pet care, handling, and treatment as well. As a result, this project aims to work directly with pet owners to assist them in dealing with animals and to organize a healthy, practical daily life for them with the help of specialized veterinary doctors and pet supply shops. Therefore, this application will be a perfect mate for pet owners.

There are three types of users for the mobile application: pet owners, veterinarians, and pet supply store owners, Pet owners can utilize several features in the application to benefit their pets, including: Scheduling vaccinations for animals, connecting them with responsible vet for the pit, searching for veterinarians, shops or products that they need, showing the closest shops and vets to the user's location on a map, There are two forms, one to register the pets with the veterinarian and another to schedule an appointment with the veterinarian to make a quick medical examination in the emergency cases, make recommendations about the most popular products and offer advice about animal care. The veterinarian has a list of all the pets he is responsible for, the ability to contact the pet owners and a calendar to remind him to perform a medical examination on each pet. Finally, the owners of the shops showcase their products and connect with pet owners. In support of the project, a web page was created for the admin to accept requests from shop owners and vets to create accounts in the mobile application.

We designed the mobile app using Flutter framework with a dart language for front-end. We designed the website using OOP PHP and bootstrap for front-end. For the back-end we used mango database.

# Chapter 1

## Introduction

In the middle Ages, the Internet was the most important and significant event, changing human life in many aspects, such as communication, social life, economics, etc. These changes also affected animals and their lives. Because people are increasingly interested in animals and are eager to take care of them.

Pet ownership has become an interesting addition to families' lives. Domesticated animals are a common practice around the world, and taking good care of them is already a part of our humane culture. In our imaginations we imagine a world where human life and animal life are explored. Thus caring for pets has become a way for people to escape from the stresses of life, as people often resort to eliminate boredom and bring life back to their lives by taking care of pets and spending time with them. In the opinion of many, this solution is better than watching movies or playing on mobile devices.

Seventy percent of U.S. households, or about 90.5 million families, own a pet, according to the 2021-2022 National Pet Owners Survey conducted by the American Pet Products Association (APPA). 69.0 millions of them are dogs and 45.3 million are cats [1]. The emotional connection and relationship between pet owners and animals is enormous. Pets are often seen as members of the family. A good example of this is the new trend that has emerged in the past few years for celebrating pets' birthdays. Since pets play such an important role in an owner's life, owners want to make sure their furry friends are taken care of in their absence. No matter how much money they pay, it sometimes costs them a lot where the recent American study shows that the global pet market worth \$261 billion. It is expected that people in the United States will spend approximately \$109.6 billion on their pets in 2022. Also, there was an 18% increase in pet food sales. [2]

Today's users are more and more immersed in searching for products that benefit them, choosing what suits them, taking advantage of people's comments and opinions to choose the best and most suitable products according to characteristics, price and more. Therefore, connecting commercial sites and services, both for humans and animals, will provide a qualitative and quantitative leap in many sectors: healthcare, logistics, entertainment, etc. In fact, Eastern, Europe and Asia will become potential markets for pet services. According to Meadows and Flint, a lower birth rate and weaker bonds between family members increased the importance of pets, resulting in a similar rise in pet services. [3]

Hence our adventure when we saw the need for a world in which we respect the basic vitality of every animal. In this study, we try to help pet owners in raising their pets easily. By offering a complete app in which we bring together all pet stores and supplies, as well as vets in one place, we are creating a new way of understanding, characterizing and relating animals so that they too can live full and meaningful lives.

This project attempts to solve the problems pet owners face. Helps pet owners find the right products for their animals, with the best quality and prices from well-known and trusted stores through an intuitive and easy-to-use interface, in addition to choosing a reputable vet that suits them in terms of distance and experience, booking appointments on the day and date they want and giving consumers a clear idea of The type of services that are offered to benefit from, in addition to providing a personal page for each pet to support communication between the owners of these animals, enabling them to meet and get acquainted. Thus, we are confident that our application is valuable in our time today. Because it will affect the well-being of the animals, the people who care for them, and the planet.

This report will walk you through the project's development process. We'll start by reviewing the constraints, relevant research, and work. After that, we will explore the methodology chapter, focusing on the technologies used in the application, the application design, architecture, and implementation. Our discussion will also focus on the results we achieved and, at the end, the conclusion of the whole project and the discussion of limitations faced and how to extend our current work.

## Chapter 2

# Constraints, Standards, and Earlier course work

In the first place, we faced many constraints, but thanks to God we were able to overcome them. , first gathering data about the shop, product and vet was the main challenge, specifically if we asked about the price of their services or products, the sellers assumed we were their competitors, and installing the necessary software and teaching us to use the mongo database were all challenges we faced.

Moreover, the map is a challenge, even if it does not require any effort now, but at the beginning, it takes two weeks to overcome the limitations of the Google map and then to select the best map library to deal with it and get a marker at the needed location.

Regarding our previous project preparations, we started early on choosing the project idea since the first semester, and at the same time we studied the flutter language from YouTube to learn how to use it because flutter is a completely new language for us. For the purpose of collecting data, we visited Royal Pet Center to see what kind of data they have.

In fact, when we investigated this topic further, we found very few studies and techniques used. Our concept was to create a program that would be the first in the field of pet care and enable animal owners to care for the special needs of their animals in order to appreciate animal life. We found an application named "Feed your pet", that is similar to our project that was previously created for the care and attention of pets, but it lacks distinctive features and is not useful to the customer. From this point our concept was to create a program that would be the first in the field of pet care and help animal owners to provide for the special needs of their pets.

## Chapter 3

# Literature Review

As technology has been rapidly developing, people try to find all their needs online so that they can save time and effort, choose the best products and enjoy the best services. Pets also enjoyed this development, as owners became very interested in sharing their happy moments with their pets and selecting the best food and entertainment products for their animals.

As the total expenditures of the pet industry in the United States amounted to 103 billion dollars in 2019, APPA estimates that expenditures will reach 109.6 billion dollars in 2021. For dogs and \$201 for cats and many more services, more than 50% of pet owners are willing to pay more for eco-friendly pet care products and as a result the pet supplies market is expected to grow by \$9.2 billion during the period from 2021 to 2025 [2]. As for the emerging countries, the number of pet dogs increased by 51% to 243 million. Cat ownership jumped by 49% to 126 million [4].

Despite the increasing interest in pets and their care in Palestine and the Arab world, and the opening up of stores and clinics that have a focus primarily on providing health care for them, especially periodic vaccinations against diseases, there is still a need for more development that links them with technology, as opposed to what is happening in western countries from using modern technology and advanced technologies in the service of animals and care for animal care in an organized and easy way.

Considering this perspective, we wish to provide an application is geared towards providing an application that facilitates the life of the pet and its owner by providing the owner with a complete listing of all pet stores in his country, and reviewing their products with descriptions, prices, and the possibility of purchasing, as well as veterinarians with the ability to choose

the most suitable one and to book appointments for medical examinations, hygiene services, and more. Also, our application provides each pet owner with a profile page, which they may use to follow friends to communicate with them so they can meet, especially during animal mating seasons, in order to find the right mate for the animal, as well as displaying a photo gallery of the animal to commemorate its happy moments.

# Chapter 4

## Methodology

### 4.1 Technologies

The development of mobile applications requires numerous tools and different types of programming. In this chapter we will cover the technologies, programming languages, and tools that were used to develop our project.

#### 4.1.1 Database

In order to store and manage all data in our application, we use MongoDB as our database. This database offers a wide range of advantages that meet the needs of our application. It's an open-source document-oriented database designed to store scale volumes of data and to work with data efficiently.

We found MongoDB, a free database management system, to be the most suitable for our application. That uses NodeJs languages to provide counting, adding, grouping, and combining queries easily. This allows for fast and reliable queries. Since our data size is expected to increase as more users join, so MongoDB provides scalability and flexibility, along with its high performance and support for every application development need.

We used one of the most popular MongoDB administration tools to manage the database easily. Express platform which is a framework for building web applications on top of Node.js.

### 4.1.2 Server Side

On the server side we use NodeJs which is a mature and well-tested tool that really shines for fast build, offers performance advantages, faster development, and won't be deprecated or abandoned anytime soon.

We have found that NodeJs is the right language for MongoDB access and data programming, our data is not limited so NodeJs provides scalability that fits the micro service architecture, which is really useful for projects that will expand and grow in the future.

### 4.1.3 API

API generally stands for Application Programming Interface, which is a set of definitions and protocols for building and integrating application programs. Programs often need to send and receive data from other programs or through the operating system. Therefore, API defines how two machines talk to each other as shown in figure below. [6]

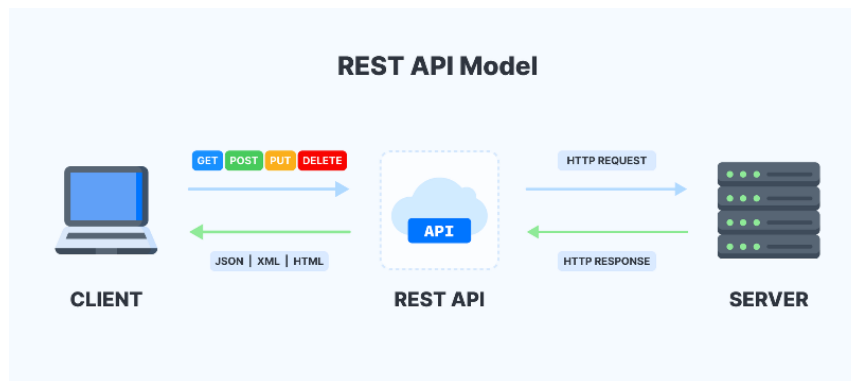


Figure 1: rest API architecture design

We have the same idea here because we use it to link between python project and the flutter project in our app. We have integrated AI feature, for recommendation system for products that are written with python code at flask program. In another word, to take advantage of recommendation system in our mobile application, we have built a RESTful flask API for communication between the mobile application and the Python project.

#### **4.1.4 UI Design**

For designing beautiful, attractive, user-friendly e-commerce user interface, we choose Flutter cross- platform mobile development tools.

Flutter is an open-source UI software development kit created by Google for building beautiful, natively compiled, it is used to develop cross platform applications for Android and IOS from a single codebase. Flutter is powered by Dart, a client-side programming language. It is easy to learn, stable, and creates high-performance applications, optimized for fast apps on any platform.

We found it easy to use since it is widely used and there are many examples of user interfaces designed and courses available on YouTube and the Internet, so we can take advantage of it.

Also, we program the front end page of admin to accept the request from vets, shops, pet owners to join our application by using html, css, and Bootstrap. Bootstrap is a potent front-end framework used to create modern and creative websites and web apps.

## **4.2 Recommendation System**

### **❖ What is a Recommendation System?**

A recommendation system is an Information filtering Systems that aims to recommend products, movies, and any item to the user based on many different factors. These systems predict the most likely product that the users are most likely to purchase and are of interest to.in simple word, it is an algorithm that suggests relevant items to users. [7]

## There's three types of recommendation system:

- 1- Collaborative Filtering.
- 2- Content-Based Filtering.
- 3- Hybrid Recommendation Systems.

### ➤ Collaborative Filtering divided into many filtering:

#### a- User-User Collaborative Filtering:

It is based on the notion of users' similarity. Where it find the neighbor who their choices are similar to your, then recommend a new item based on your neighbors' choice.

#### a- Item-Item Collaborative Filtering:

Is similar to previous one but here we concern about rating item, where the recommendation system use people's ratings of the items. To find similar items. In simple words, it is based on the notion of item similarity.

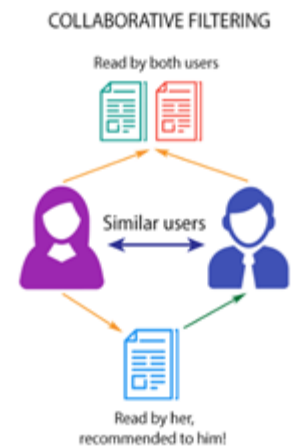


Figure 2: Collaborative filtering

### ➤ Content-based filtering:

A content-based filter simulates a user's preferences for a product feature. When it tries to guess what a user may like based on his activity such as lovely products or purchase process then recommended similar products based on the features that the user prefers.

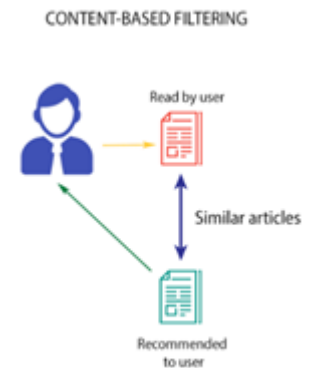


Figure 3: Content-Based filtering

### ➤ Hybrid Recommendation Systems:

It is a combination of content-based filtering and collaborative filtering.

In our app, we use a content based filtering recommendation system to recommend products to pet owners; with this feature, we do not need to do market research to know if a customer is willing to purchase from our store, since they get the maximum help in discovering the right product.

### ❖ **Content based filtering:**

Simply put, in this model, if you prefer a product like shawarma, the recommendation system will suggest pizza, not a book, or salad, which is food that is not another type of product, and fast food that is not healthy food, in general this depends on the system implementation.

Content-based filtering is more advantageous than collaborative filtering by those:

- 1- It does not require data from other users, so that the recommended product depends on the user itself and his interests, it is not affected by other users, as such, the recommended system can begin working after a few searching or purchasing process, unlike collaborative filtering, which is dependent on user activity and suffers from the cold start problem. Cold start problem combine when a new items added to the database then it didn't have any interactions on it, so it makes it difficult to get its' advantages. This is considered a major challenge in collaborative filtering.
- 2- This system is ideal for application that don't have a large numbers of users to sample. As well as shops with a lot of users, but only a few interactions. At a far level, it may be possible to convert it to collaborative filtering when the data and user numbers grow significantly. [8]
- 3- Using the system, specialized items can be recommended to a user based on their interests, also it attract the user attention to items which is something very few other users are interested in.

## ❖ Dataset

In this model we don't need a large database to examine the successful of the algorithm, this differentiate content based model from collaborative model, so we apply it at our actual data with low number of products or large and it works properly. Where building the dataset with real products was one of the challenges we faced.

We don't need to treat data before analysis because they are almost with formal language since it adds by the shops owners and have a name related to the brands.

Our database contained a real products identified by IDs with all their information such as name, type, price and others. The figure below show an example of products store at the data base:

```
▶ _id: ObjectId('62883df164a81f5b57458f65')
  shop_id: "12345123"
  product_name: "Petex Pate"
  product_type: "Canned Food"
  pet_type: "Dog"
  image: "uploads/image_picker6205670677821294072.png"
  price: 7
  quantity_available: 3000
  description: "ingredients:meat and meat by-products cereals,minerals"
  review: 0
  sale_percentage: 0
  __v: 0

_id: ObjectId('62883f5b64a81f5b57458f6c')
  shop_id: "12345123"
  product_name: "HIQ Rabbit Dices"
  product_type: "Treats & Snacks"
  pet_type: "Dog"
  image: "uploads/image_picker1266610640765367256.jpg"
  price: 20
  quantity_available: 3440
  description: "Convenient,easy-to-open package with a zipper to protect against moist..."
  review: 0
  sale_percentage: 0
  __v: 0
```

Figure 4: Example of products at database

## ❖ Building the model:

Building a product recommendation system begins with getting the appropriate data from the database, converting it to a series, which is a one-dimensional array with an access label, and then storing it as a CSV file.

The CSV file contains an overview of all products in the database, including all their features, we need to find similarity based on the type of product, the name of the product, and the pet type. We will read our CSV file into a df dataframe, which can then be accessed in the Python IDE's variable explorer.

Then, we will then implement a combined features function. This function will combine the useful features (product type, product name, and pet type) from their respective rows, and return a column with all the combined information.

The output of this function will be fed into the word vector model, either with `CountVectorizer ()` or `TF-IDF`.

We use the `CountVectorizer ()` instead of the `TF-IDF`. Because it is important not to down weight the product type, name, or pet type presence. `CountVectorizer ()` has the main advantage of picking out the relevant "words" when training the model rather than `Tf-IDF`, which doesn't do so. Even the output matrix for count vectorizer shows marginally better results than `tf-IDF`. [12]

Apply `countvectorizer` on the combined column, where `countvectorizer` is a function that transforms text into a frequency representation. That represents how many a specific word are repeated at the given dataset. For example when apply `countvectorizer` at the text bellow:

- Document 1 = 'the best data science course'
- Document 2 = 'data science is popular'

Figure 5: Input text to the `countvectorizer` function

The output is:

	the	best	data	science	course	is	popular
D1	1	1	1	1	1	0	0
D2	0	0	1	1	0	1	1

- $D1 = [1, 1, 1, 1, 1, 0, 0]$
- $D2 = [0, 0, 1, 1, 0, 1, 1]$

Figure 6: Output vector of the countvectorizer function

Therefore the output is a set of vectors, where each word is represented by a vector that indicates how many times that word is repeated within the text. In our application, we will find how many times the product I am interested in is repeated within the combined column which have all the information about all the other products.

The final processing step, we'll calculate the similarity score. The Manhattan, Euclidean, Pearson, and the cosine scores are all similarity metrics that you can use for this task. There is no right or wrong answer as to which score is the best. Each score is appropriate for different circumstances.

We used the cosine similarity to calculate a numeric quantity that appoints the similarity between two products. Due to its independence from magnitude and ease of calculation [11].

Mathematics defines it as the dot product of the vectors dividing by the magnitude of the vectors. For example, to find the similarity between two vectors X and Y which form the output vectors of countvectorizer, is calculated as:

$$\cos(\mathbf{x}, \mathbf{y}) = \frac{\mathbf{x} \cdot \mathbf{y}^T}{\|\mathbf{x}\| \cdot \|\mathbf{y}\|} = \frac{\sum_{i=1}^n \mathbf{x}_i \cdot \mathbf{y}_i^T}{\sqrt{\sum_{i=1}^n (\mathbf{x}_i)^2} \sqrt{\sum_{i=1}^n (\mathbf{y}_i)^2}}$$

Figure 7: Cosine similarity equation

In reality, Python language support a library that define function to calculate Cosine similarity (cosine\_similarity()) instead of implemented it with the equation.

The cosine similarity output range between 0 and +1.where 1 showing full similarity and 0 showing no similarity. [9][10]

For example this figure show the similarity percentage between each products and others in the database:

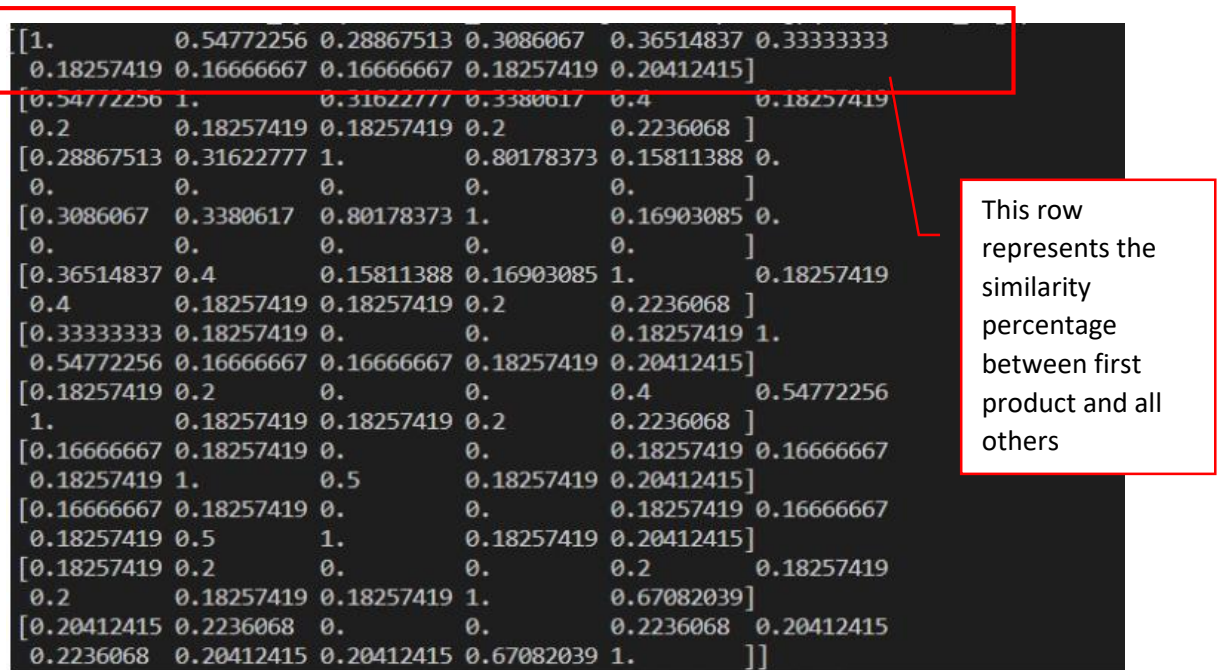


Figure 8: output of similarity percentages between all products with each others

In each row of products there is a score equal to one, and this indicates a complete similarity between the product and itself.

When a pet owner orders products, we take that as a sign of their interest in them.

Then, when passing product id through the recommendation system, we can get the most similar products with the highest score, in our code we get the take the highest five product and show them to the pet owner.

For example, if the pet owner is interested in this product and will buy it as shown in the figure below:



Figure 9: product at cart example

And this is the product information:

```
_id: ObjectId('62866fff1bd112142a1a2447')
shop_id: "12345123"
product_name: "Regal Adult"
product_type: "Dry Food"
pet_type: "Dog"
image: "uploads/image_picker7897993827497127409.jpg"
price: 40
quantity_available: 9000
description: "adult Farmhouse Recipe(chicken) complete food for adult dogs"
review: 0
sale_percentage: 0
__v: 0
```

Figure 10: Product information found in the shopping cart from the database

So when pass the product id to the recommendation system, the output of the cosine similarity is shown as this: (we remove the similarity between the product and itself)

```
[(0, 0.5477225575051662), (4, 0.39999999999999997), (3, 0.3380617018914066), (2, 0.3162277660168379), (10, 0.22360679774997896), (6, 0.19999999999999998), (9, 0.19999999999999998), (5, 0.18257418583505539), (7, 0.18257418583505539), (8, 0.18257418583505539)]
192.168.136.1 - - [21/May/2022 08:13:52] "GET /getProducts/62866fff1bd112142a1a2447 HTTP/1.1" 200 -
```

Figure 11: The similarity percentage between the product and all others

As a result, the recommended products are shown like this:

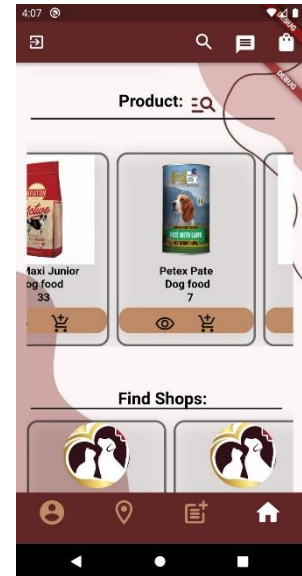


Figure 12: The recommendation system output products

Which they have the following features as shown in the database:

Product 1:

```
__id: ObjectId('62866f621bd112142a1a2444')
shop_id: "12345123"
product_name: "HIQ Maxi Junior"
product_type: "Dry Food"
pet_type: "Dog"
image: "uploads/image_picker8272892110499526763.jpg"
price: 33
quantity_available: 4000
description: "for young dogs off large breeds"
review: 0
sale_percentage: 0
__v: 0
```

Figure 13: Information about the first recommended product

Product 2:

```
__id: ObjectId('62883df164a81f5b57458f65')
shop_id: "12345123"
product_name: "Petex Pate"
product_type: "Canned Food"
pet_type: "Dog"
image: "uploads/image_picker6205670677821294072.png"
price: 7
quantity_available: 3000
description: "ingredients:meat and meat by-products cereals,minerals"
review: 0
sale_percentage: 0
__v: 0
```

Figure 14: Information about the second recommended product

We can see that the three products related to dog products, and they are from dry food category or from canned food, not a vitamin or toys or other. This proves that the system is working properly and provides the user with the right product for him.

### 4.3 Application Architecture

In our application we follow Client-Server Architecture which consists of two types of components: clients and servers. A server component perpetually listens for requests from clients components. When a request is received, the server processes the request.

In principle our application combine of three types of clients: Pets owners, pet’s shops and vets. Alike, the server side is made up of two main servers each for a specific purpose, that cooperate with each other to meet the client's demands, MongoDB database to get and store data on it, Flask API for recommendation system. These two component cooperate with each other to provide the application in best way.



Figure 15: Application Architecture

### **4.3.1 Database server**

The MongoDB database server is the main server of the structure of our application, in this server all request requested, received and treated.

MongoDB stores data objects in collections and documents instead of the tables and rows used in traditional relational databases. Collections comprise sets of documents, which are equivalent to tables in a relational database. Documents consist of key-value pairs, which are the basic unit of data in MongoDB.

On another world, MongoDB uses a document storage format called BSON, which is a binary form of JSON (JavaScript Object Notation) that can accommodate more data types.

To get the data from the MongoDB database. MongoDB queries provide the simplicity in process of fetching data from the database, it's similar to SQL queries in SQL Database language.

### **4.3.2 Flutter mobile application**

The mobile application is at the heart of the application structure. In order to get and receive needed data, it requests the database. All of the requests are set up and received by the client-side. Thus, the mobile application at the client-side keeps light and fast. This is due to the absence of heavy processing.

### **4.3.3 Flask API**

Flask is a widely used micro web framework for creating APIs in Python. It is a simple yet powerful web framework which is designed to get started quick and easy, with the ability to scale up to complex applications.

It provides functionalities for managing HTTP requests and can be used to build REST APIs. We developed a REST API with Flask to provide an interface for building the AI model. And get the recommended items from them as JSON.

Using an API for this was essential to our application for many reasons. The main reason was to reduce the computation overhead on the user-side, which made the application faster and lowered its size.

## 4.4 Application Design:

### (A) Log in & Registration Pages Design



Figure 16.1: Application welcome page

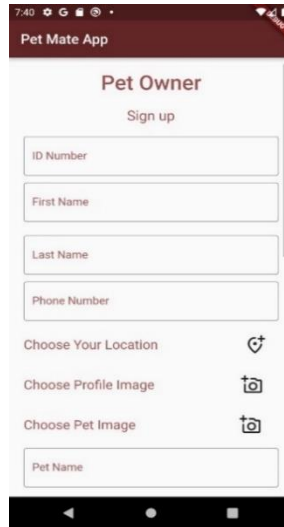


Figure 16.2: Sign up page1

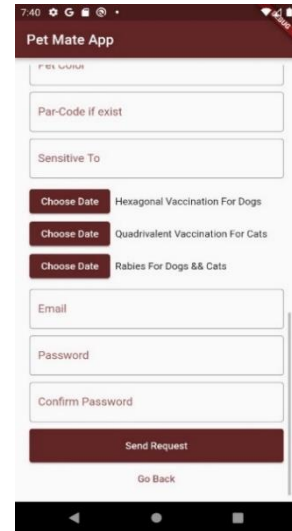


Figure 16.3: Sign up page2

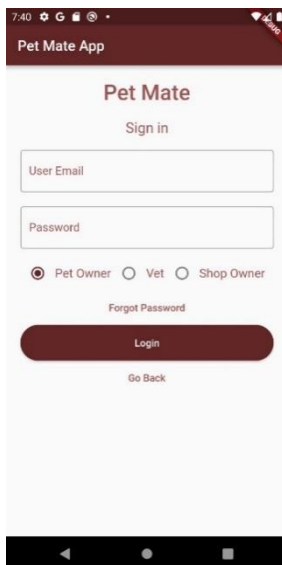


Figure 16.4: Log in page

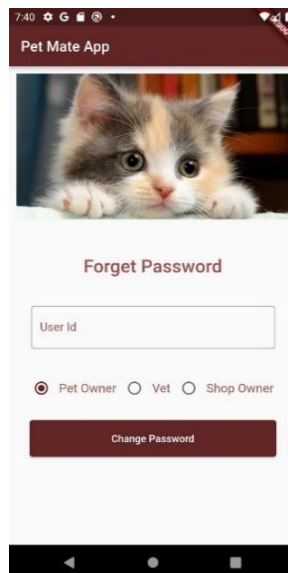


Figure 16.5: Forget password page.

## (B) Pet Owners Pages Design

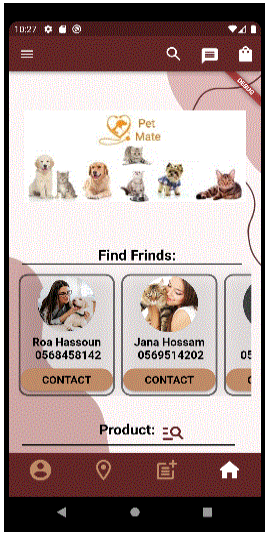


Figure 17.1: home page show friend



Figure 17.2: home page show products



Figure 17.3: Filter product tab

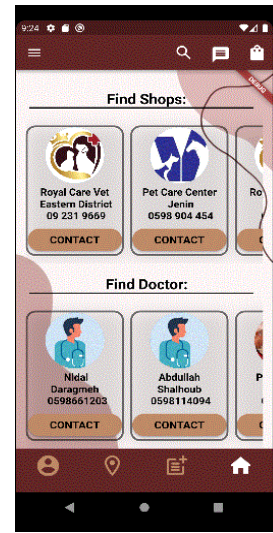


Figure 17.4: home page show shops and

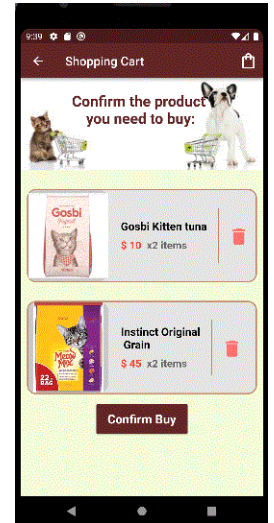


Figure 17.5: cart page

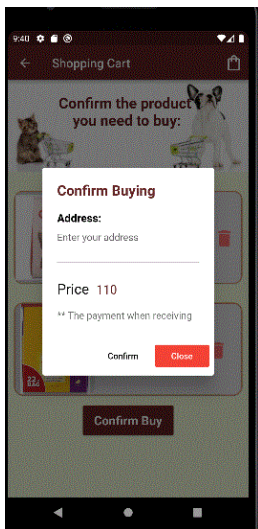


Figure 17.6: Dialog box on confirm

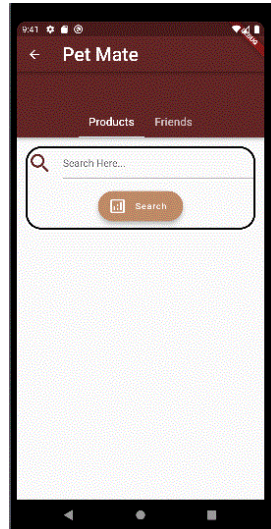


Figure 17.7: Search page

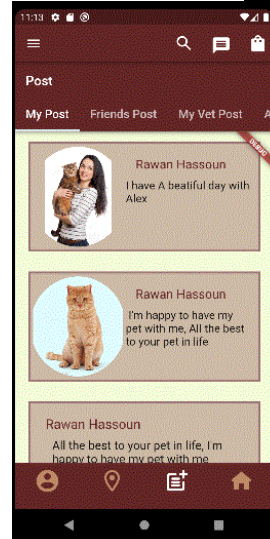


Figure 17.8: Posts page

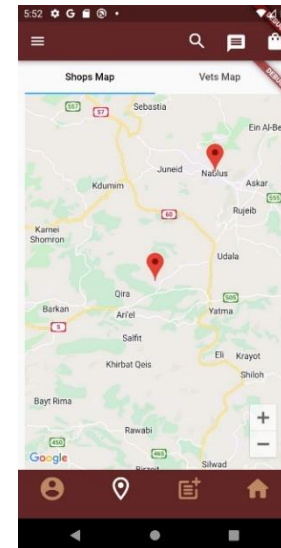


Figure 17.9: Map page display nearest shops

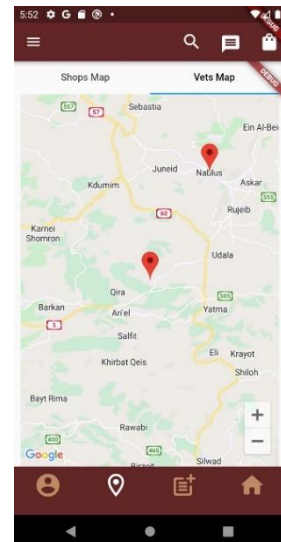


Figure 17.10: Map page display nearest vets

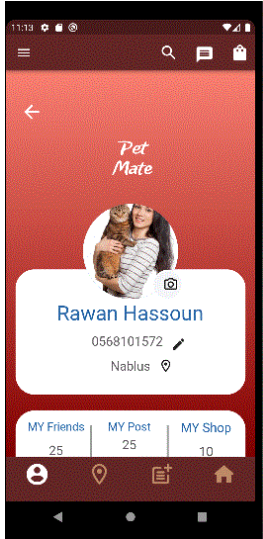


Figure 17.11: My profile (pet owner)

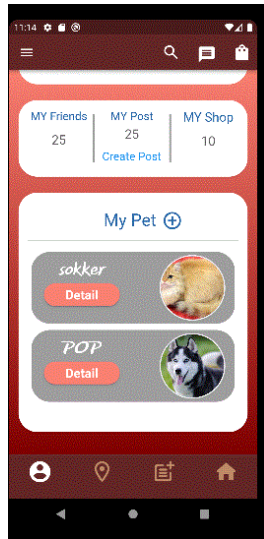


Figure 17.12: My pets

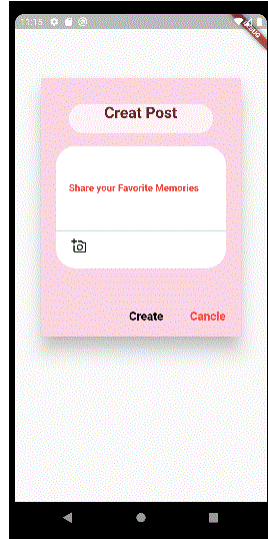


Figure 17.13: Create post box

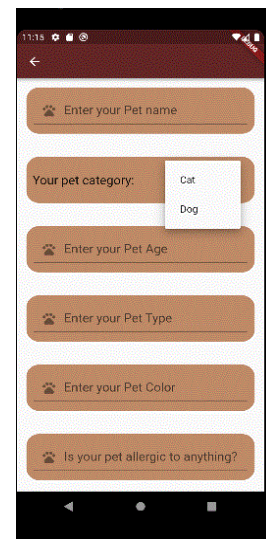


Figure 17.14: Add new pet page

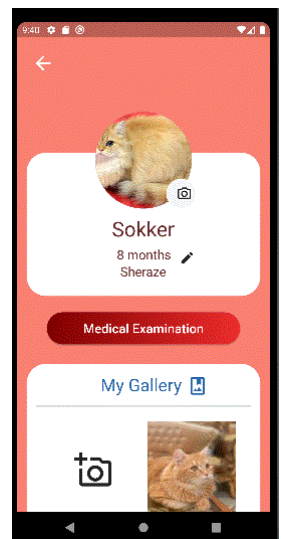


Figure 17.15: Pet profile page

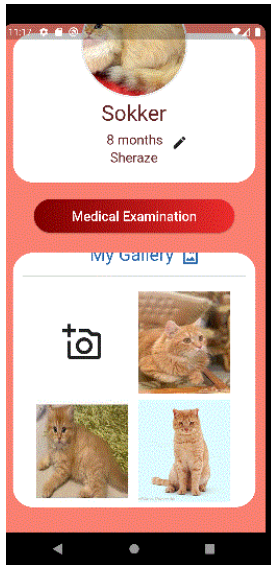


Figure 17.16: Pets' photo gallery at profile

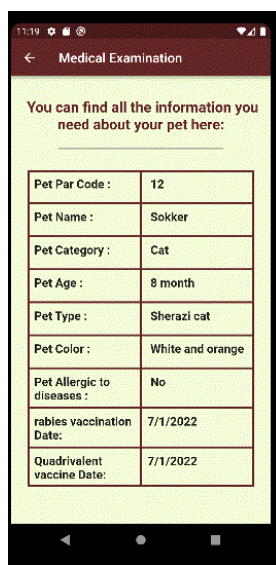


Figure 17.17: pet examination medical

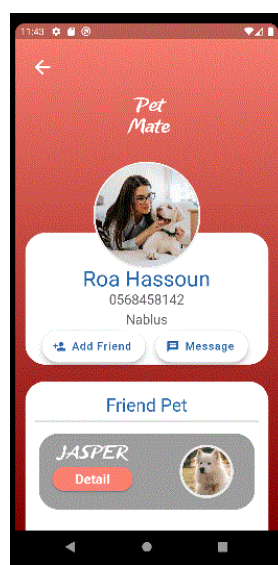


Figure 17.18: Pet owners profile before following her.



Figure 17.19: Show product detail to purchase

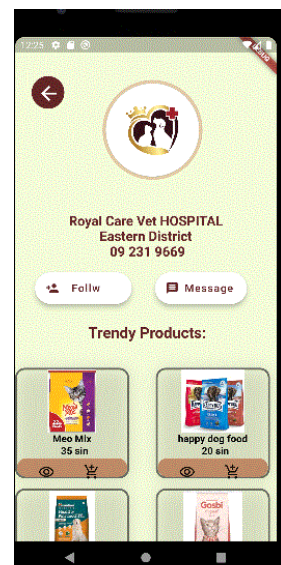


Figure 17.20: shop profile before follow

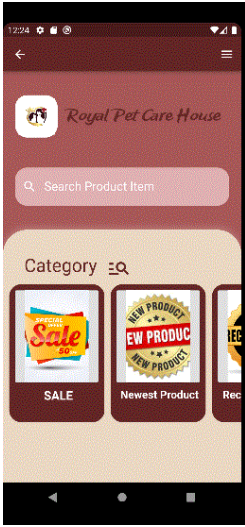


Figure 17.21

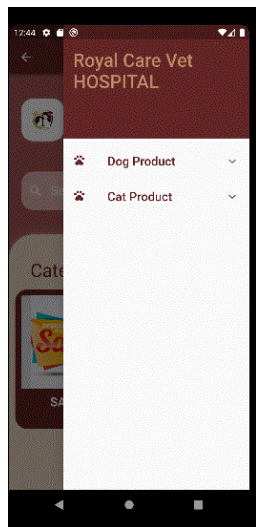


Figure 17.22

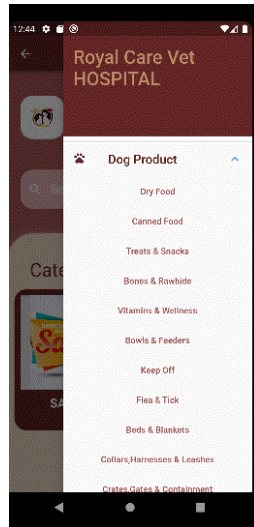


Figure 17.23

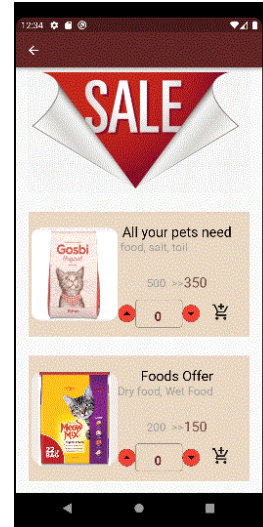


Figure 17.24

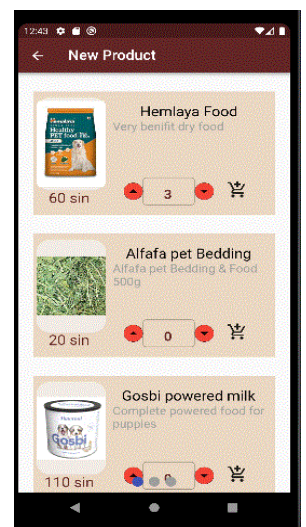


Figure 17.25

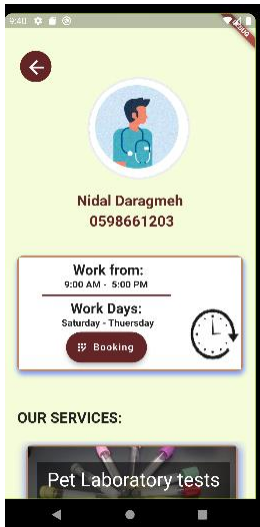


Figure 17.26

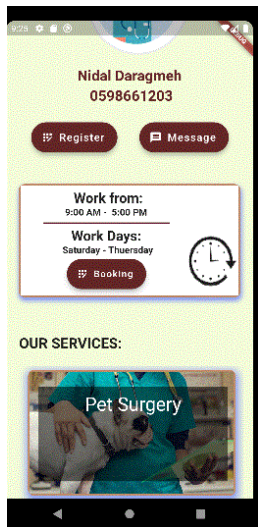


Figure 17.27

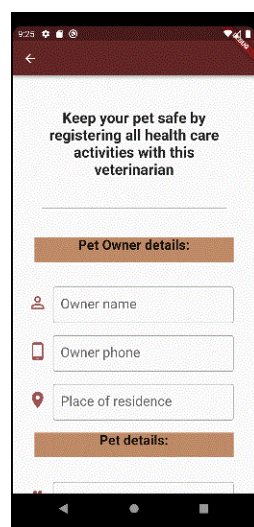


Figure 17.28

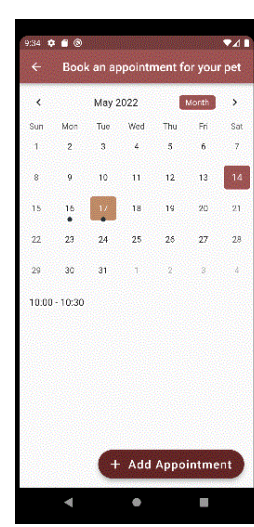


Figure 17.29

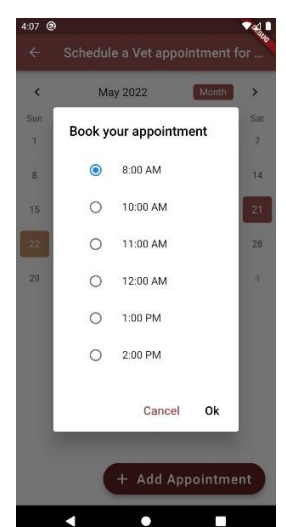


Figure 17.30

**Figure Description:**

Figure 17.21: shop after follow page

Figure 17.22: shop drawer show product category

Figure 17.23: product type base on category at drawer

Figure 17.24: Offer page

Figure 17.25: New product page

Figure 17.26: Vet profile after I (pet owner) register pet with him

Figure 17.27: Vet services.

Figure 17.28: Pet information entry page when registering with the vet

Figure 17.29: Calendar page to book an appointment with vet

Figure 17.30: Show the available times for the vet so that the pet owner can book an appointment

**(C) Shop Pages Design**



Figure 18.1: Shop Home page, show products classification.



Figure 18.2: Products types of specific product category



Figure 18.3: Add new product page

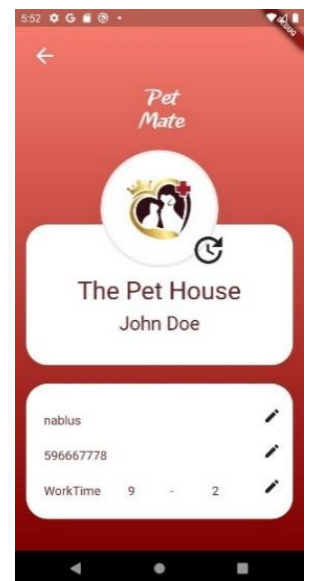


Figure 18.4: Shop profile page

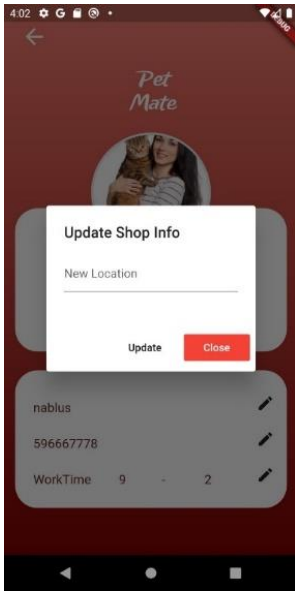


Figure 18.5: update shop location box dialog

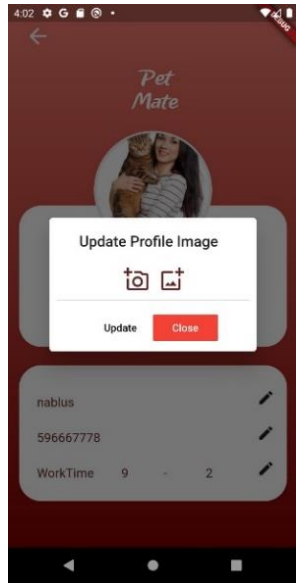


Figure 18.6: update shop profile picture



Figure 18.7: Create new offer page



Figure 18.8: Choose products to create an offer

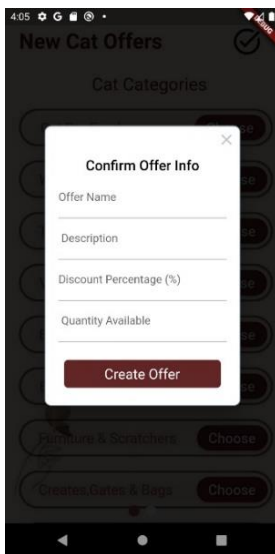


Figure 18.9: Confirm information about the offer to be created

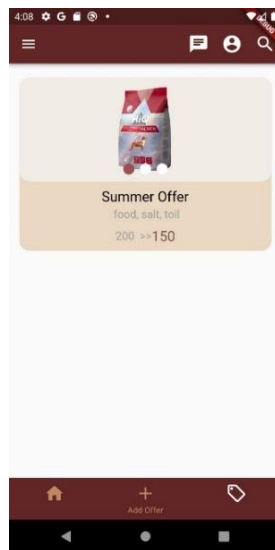


Figure 18.10: Show offers page

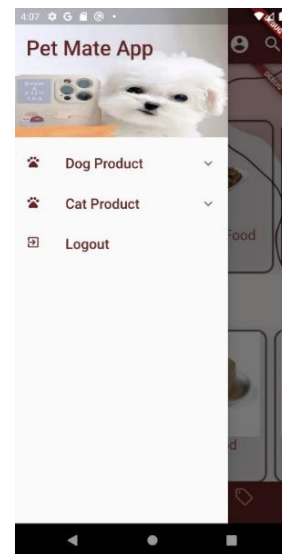


Figure 18.11: Shop page drawer

## (D) Vet Pages Design

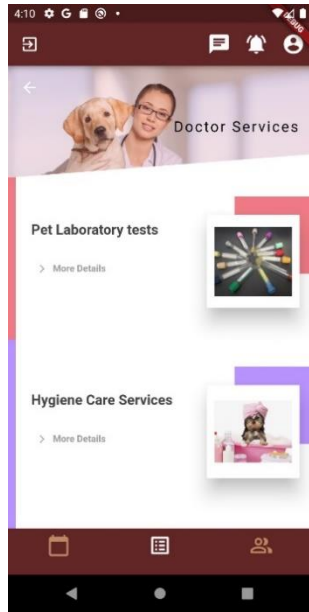


Figure 19.1: Vet home page, show vet services

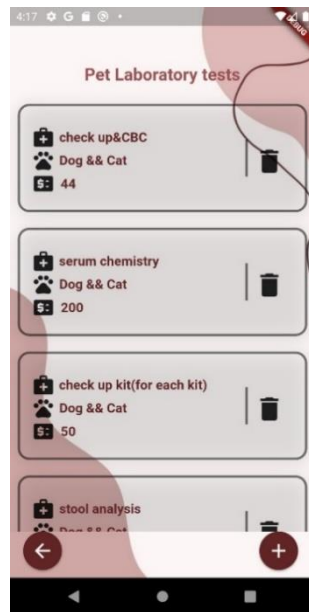


Figure 19.2: All subservices page from a pet laboratory tests service

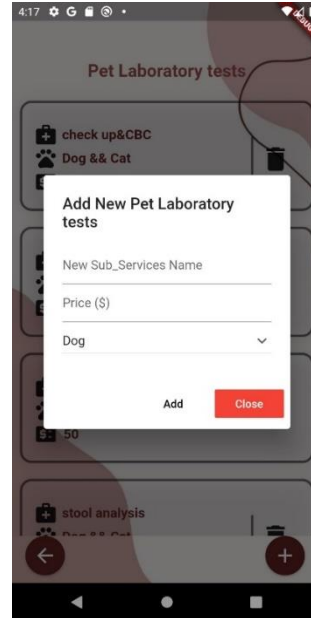


Figure 19.3: Add new subservice

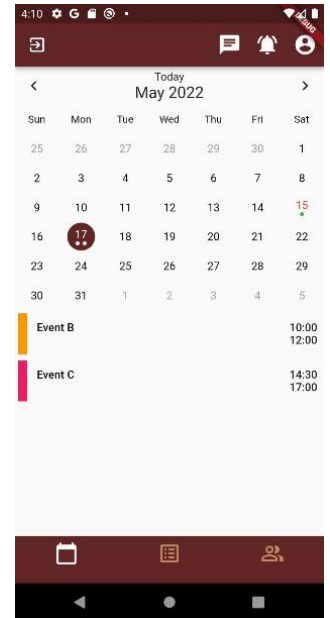


Figure 19.4: Calendar show the vet appointments every day

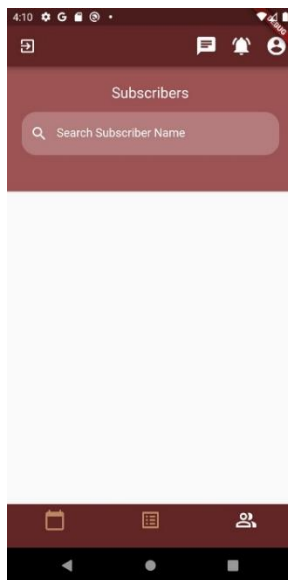


Figure 19.5: Page show all pet owners who register with vet

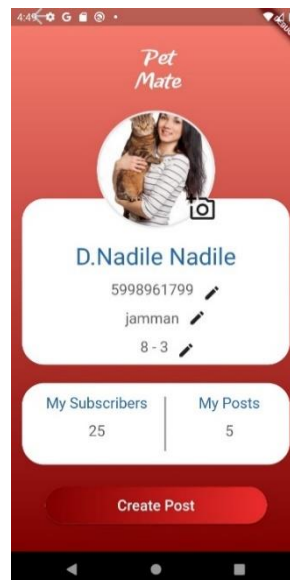


Figure 19.6: Vet profile page

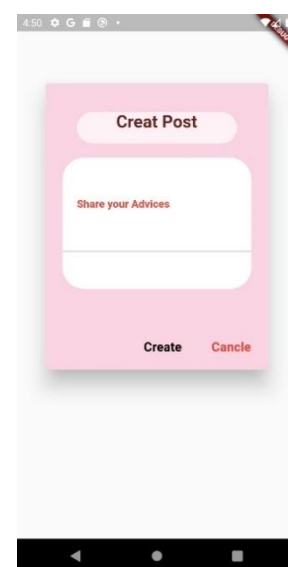


Figure 19.7: Create post box dialog

We used a color scheme of Russet, Beige, pink, and Light brown colors to create a contrast in the application design.

We use Russet color to highlight the important elements like nav bar, buttons, the important pages titles and others. At same time we made sure to make the application background colors light and fill huge spaces elegantly so we use Beige color or others, so that it is easy to deal with and can be seen clearly as usual in global applications.

We put a border for each element and make it user friendly and easy to understand by all clients whatever their knowledge background. Also, we are interested in using icons and explanation images to help users.

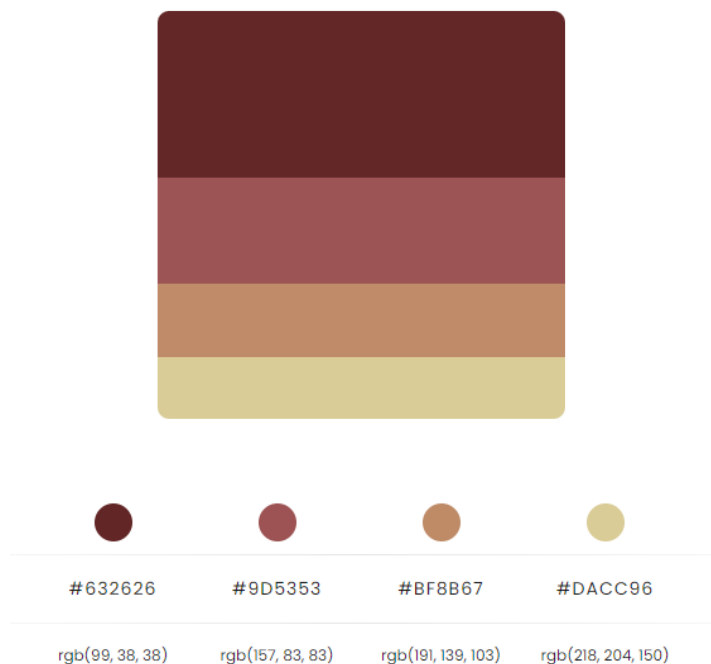


Figure 20: Color Scheme

We offer a bottom bar at the user interface side which enable them to go home page where ever they in the application regularly, and other main feature such as search and profile, are always within reach of the user's eye.

## 4.5 Application Implementation

In this section, we will go deeply in the application implementation and explain all the features and methods used. Show each page at the application and its functionality whatever its clients type, either pets owners, shops, or vets. Then we will tackle each of the user interfaces separately.

### 4.5.1 Log in & Verification

#### 1- Welcome page:

This is the welcome page of our application, you can choose to login if you've already created an account before, or choose to sign up if you're a new user, then we welcome you in.

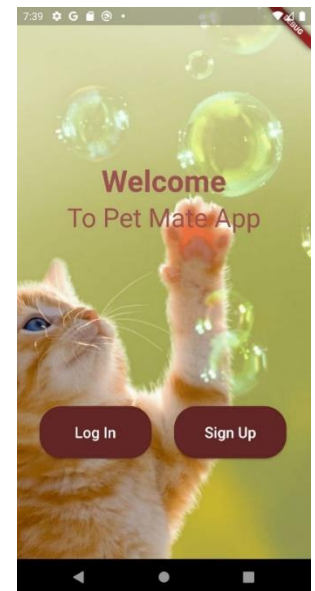


Figure 16.1: Application welcome page

#### 2- Sign up page:

Surely, you are a new user of the application, so use this page to sign up and enter your and yours' pet information to start your trip at the app.

To choose the location address we put a map that enable the user to allocate his location accurately.

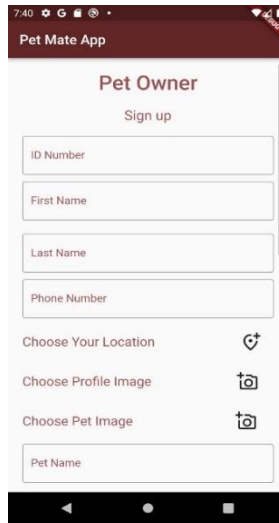


Figure 16.2: Sign up page1

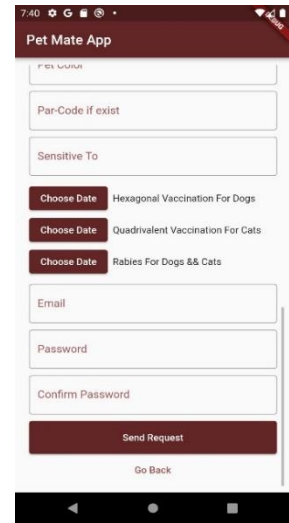


Figure 16: Sign up page2

### 3- Log in and forget password page:

if the user already signed up with the app, then he\ she can login using the email and password, if the user forget the password, he can change it regarding to his id at the application, where this id is given to him at the application, and it's a unique id that mustn't share with others.

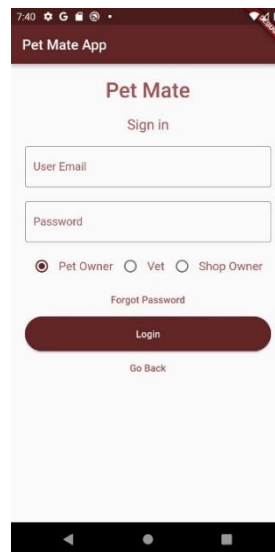


Figure 16.4: Log in page

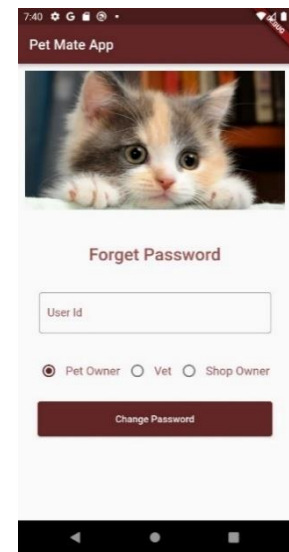


Figure 16.5: Forget password page.

## 4.5.2 Pets Owners Side

In this section we will show all the pages from pet owner side

### 1- Home page:

As soon as the client joins the application as a pet owner, the home page appears as below, with a slide show of many pictures at the top, then showing friends, vets, shops, and products available in the data base.

In general, the home page has a nav bar at the top that shows the shopping cart, search, messages, and drawer. The bottom of the page allows us to scroll between the home page, posts, locations, and profiles.

It offers an easy and friendly interface to the user with an attractive appearance, enabling them to move smoothly between pages.

When you scroll down the page the available products, shops, vets appear. At product section the owner can select the product type he/she interested in.

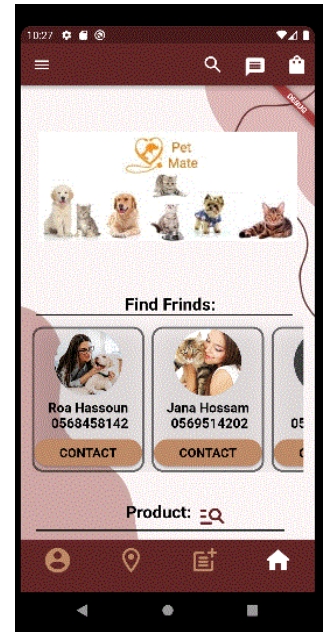


Figure 17.1: home page show friend

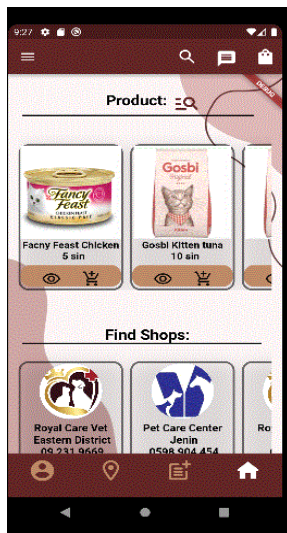


Figure 17.2: home page show products



Figure 17.3: Filter product tab

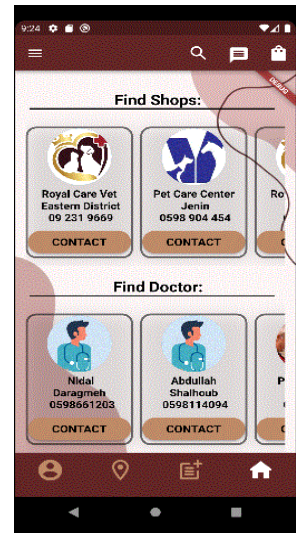


Figure 17.4: home page show shops and vets

## 2- Shopping cart page:

The shopping page cart show all the product that the pet owner choose it to purchase, with the availability to delete the unwanted selected products. Then confirm the purchase process by entering the pet owner details of address and final price.

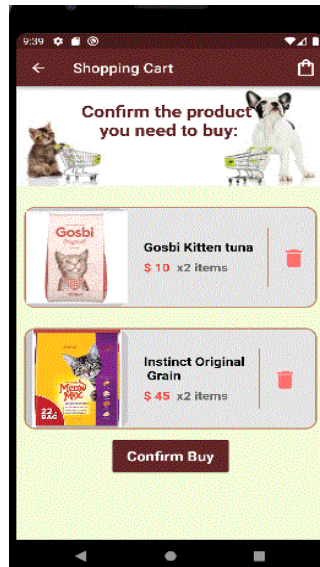


Figure 17.5: Shopping cart page

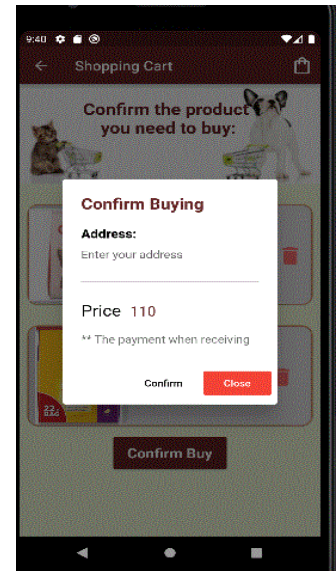


Figure 17.6: Dialog box on confirm purchase

## 3- Search page:

This page enable the pet owner to search for products he\she interested in, and find friends that he\she is looking for. The selection done by what he\she choose from the tabs.

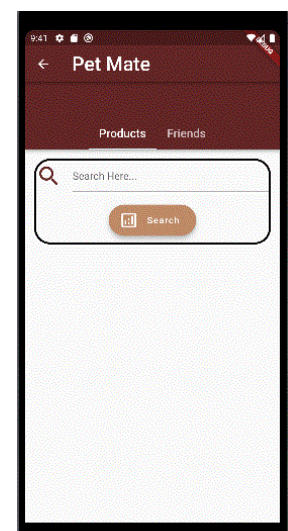


Figure 17.7: Search page

#### 4- Post page:

In this page we show all posts. The posts come from vets, friends that I follow them, and my post which I created at my profile page, this post are dynamic data established by different people at any time they wanted.

The post may contain a picture or not, but it's always consist of text. The vets post a set of tips, instructions and directions for a better life for your pet, the owner of the animal shares with his friends the special moments and activities he does with his pet, and he can also share the types of products he has tried and benefited from in order to encourage his friends to try them.

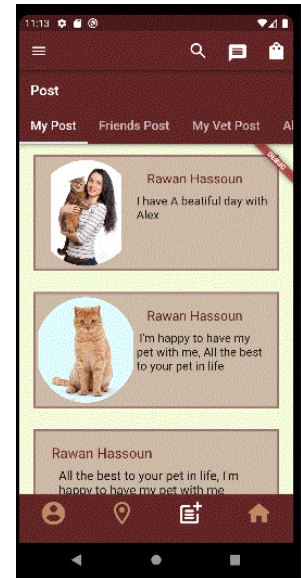


Figure 17.8: Posts page

#### 5- Map page:

The map page was a challenge and a hindrance for us at first, but after constant research we were able to continue using Google Maps.

The page has two tabs one for the shops and the other shows the vets who are near the pet owner,

The red marker identifies the location of the pet owner, and you get the location coordinates from the sign up page, because the user enters his location and then we save the longitude and latitude of the user for later use in this map.

Also, when you click on the vet marker or the shop marker, a dialog box will open containing the main information about that site.

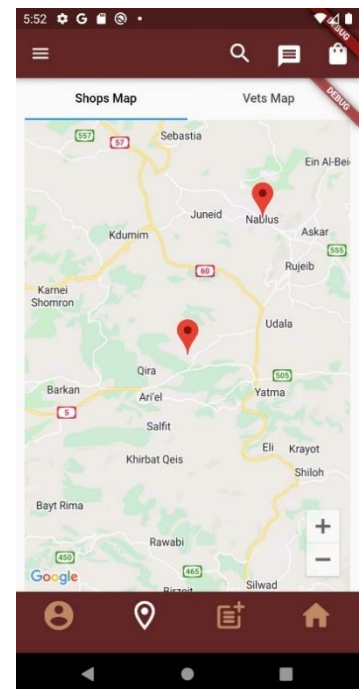


Figure 17.9: Map page display nearest shops

## 6- Profile page:

Like the rest of the usual applications such as Facebook and others, this is one of the most important pages that users are interested in activating, so it was important to us to appear in the most effective and attractive manner.

It consists of three main sections, the header section allows you to attach a picture of yourself, the owner, with your pet if you wish, as well as some personal information that your friends can use to communicate with you to meet and get acquainted with you to make new friends, such as your phone number. Also, Information about your location where most people prefer to communicate with people close to them to save time and effort, with the ability to modify this information and the changes are stored in the database.

The second part represents the number of followers from friends and shops that the pet owner interested in, in addition to the number of publications post related to the pet owner and providing a button to create a new post.

Last but not least, a part of the pets that a person raises and takes care of, here we show all the pets owned by one person, so that each pet has a profile which contains its information, as a result the relationship is one to many, because it is inappropriate to have multiple profiles for one person who owns more than one pet.

This part displays a photo of the animal and its name. If the owner wants to see more information about one of his animals, he can do so through the details button.

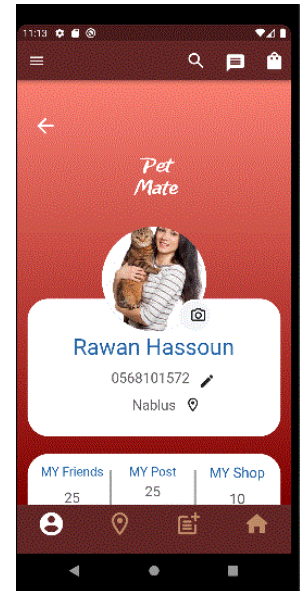


Figure 17.11: My profile (pet owner)

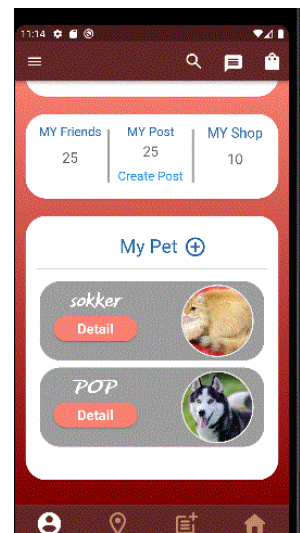


Figure 17.12: My pets

## 7- Create Post page:

Upon clicking on the Create Post button, it appears dialog box. The user can write the text of the post and attach a picture if he wishes to do so, and once the post is created, it will appear on the publications page as described previously.

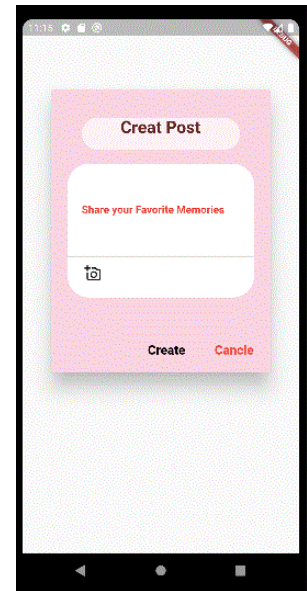


Figure 17.13: Create post box dialog

## 8- Add new pet:

Finally, if pet owners want to register a new pet in the profile, they can do so using the plus icon button that pops up a dialog box to register the required information about the pet, then the pet will be attached to the app to take advantage of its features.

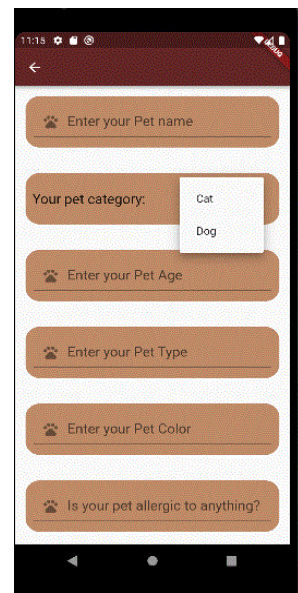


Figure 17.14: Add new pet page

## 9- Pet profile page:

In this page you can see the profile of the pet you choose, firstly, display its picture, age and type. With the availability of modify them. Then a button to see the medical examination and all pet medical information. After that, display a gallery for the pet picture.

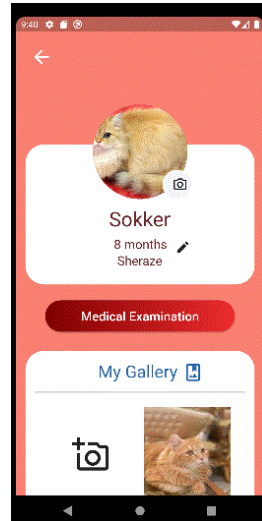


Figure 17.15: Pet profile page

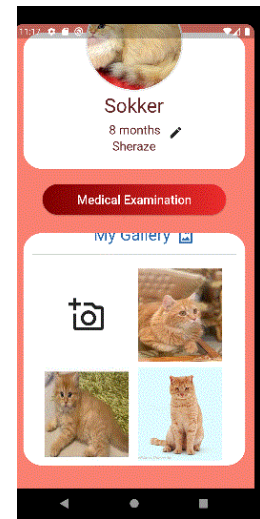


Figure 17.16: Pets' photo gallery at profile

## 10- Medical Examination page:

When click on Medical Examination button this page appear to display all the information about the pet. It contain pet name, par code, type, category, age, color, information about the pet health such as allergic to disease and vaccination according to pet category.

It is worth mentioning that the medical information is updated regularly by the responsible doctor.

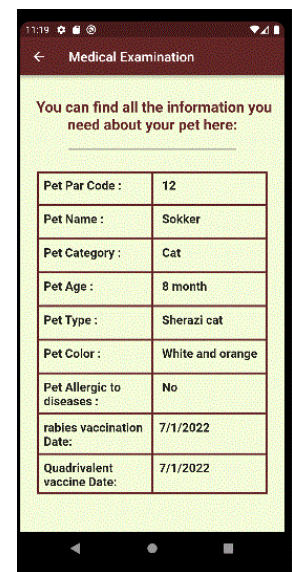


Figure 17.17: pet examination medical

## 11-Friend profile page:

This is the profile page of the friend, we built it as the owner pattern where the user can see the profile picture, phone number, and location of this person. You can either chat this person by message button or add him to your friends list then you can share posts, chat, and communicate easily. And show all the pets that owned by this person.

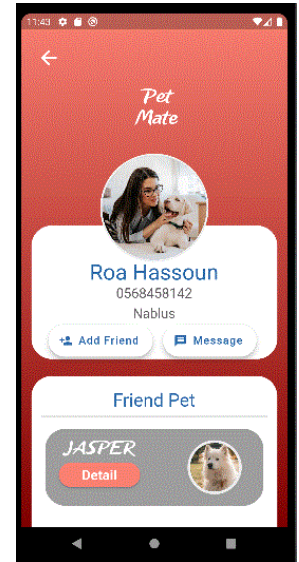


Figure 17.18: Pet owners profile before

## 12- Product details page:

This page open once click at eye icon of the product from the products section in the home page. In this page show the product image, name, description and price of the product also the user can determine the number of elements he want to purchase from this type, just a hint, the user can determine up to 10 element not more. Then you can add the product to the shopping cart.



Figure 17.19: Show product detail to purchase

### 13- Shop page:

This page can be in two forms, once before the person follows this shop and once after they follow.

Before following, the user can see the traditional information of each store such as its image, phone number, location address and also the most famous products and merchandise only, so to enable users to see all the products of the store, they must follow them, in order to attract him to follow the pages of the stores.

After following the shop page, the amazing store page appears, in which the name and image of the store appears, of course, and then a text box to search, and then the products were divided into categories, including offers, new products, recommended products, or all products in the horizontal scroll.

At the top of the page there drawer when you open it displays the products divided by the type of pet whether it is a dog or a cat, and then each pet has its own products distributed based on the criteria of the products type such as dry, wet food, toys, vitamins and many other types of pet products.

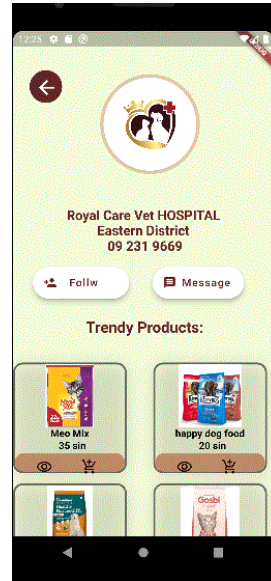


Figure 17.20: shop profile before follow

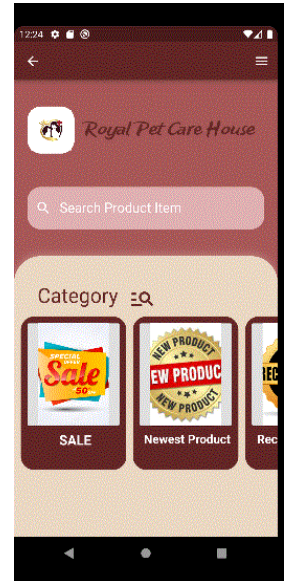


Figure 17.21: shop after follow page

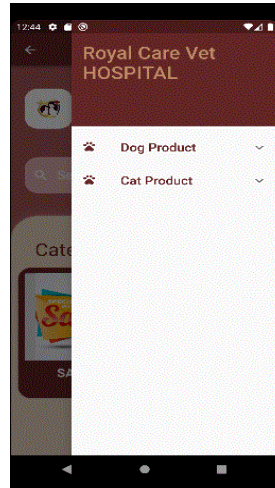


Figure 17.22: shop drawer show product

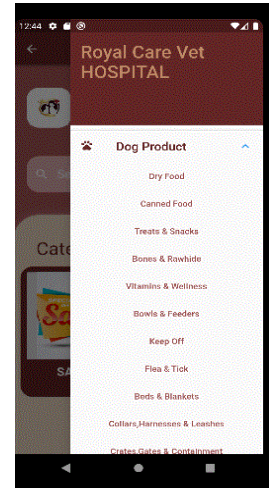


Figure 17.23: product type base on category at

#### 14- Sale page:

When click on sale product category from shop page, the product on sale shown with the discount and all its information.

The sale contain of set of products, you can see the component of the sale by passing the slide show at left to see the product picture and the product description are available, with the price before and after discount. So you can order.

The page is composed of many pages points with indicator, you can pass horizontally to see other ones, each page containing five sales

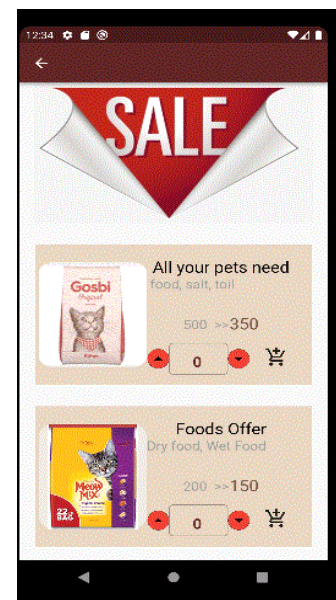


Figure 17.24: Offer page

### 15- New product page:

As a product sale page, but now the new products recently added by the store are displayed. It should be noted that the rest of the categories adopt the same design on different functionality. Once we show recommended products, or new products or all products.

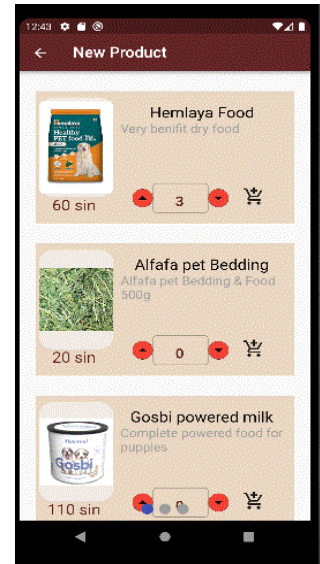


Figure 17.25: New product page

### 16- Vet page:

This is a page for the vet contain his information, name, phone number and picture if needed, then the user can register his\her pet with this vet only, so the pet are register with one and only one vet or you can chat him.

Then display an advertisement show the work days and the time where the vet will be available.

So if this is your pets' vet you can book an appointment for any service you want at the available time by clicking at Booking button.

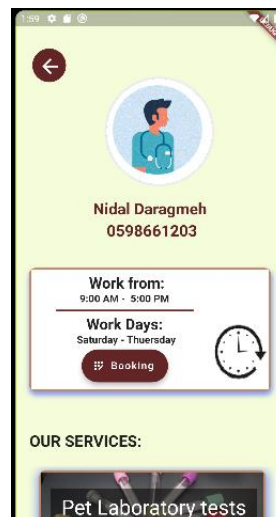


Figure 17.26: Vet profile after I (pet owner) register pet

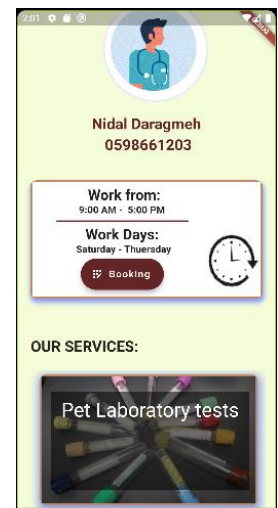


Figure 17.27: Vet services.

At the end there's a slide show all the services that this vet offer at his center. Then pet owner can see all subservices that fall under the service category when click on the service picture.

At button register, the pet owner is responsible to enter his\ her information and the pet information for the first time then the vet will follow the pets' health. So, this page is about all the information of pet owner and pet.

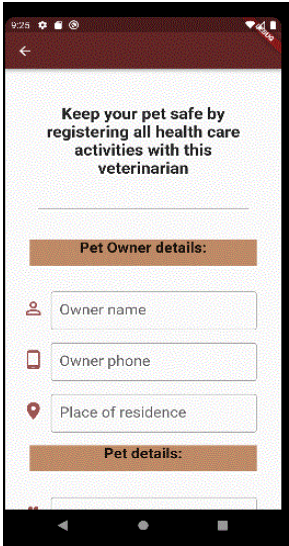


Figure 17.28: Pet information entry page when registering with

At Booking button, a calendar page will be opened that enable the user to choose the day he\ she wants to book, after choose the day, a dialog box will pop up to show all available times for the vet so that the pet owner can book an appointment



Figure 17.29: Calendar page to book an appointment with vet

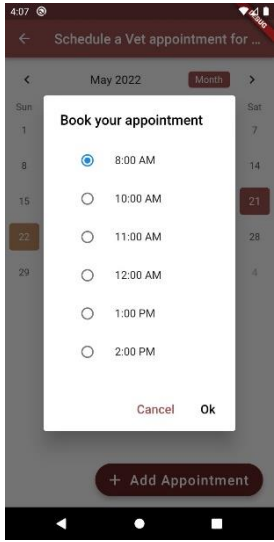


Figure 17.30: Show the available times for the vet so that the pet owner can book an appointment

In the slideshow below you can see the main services this veterinarian offers, and each image contains a group of related services.

Choosing the service type you want will let you see the details of all the services, then you can choose the one you want to book. As an example, blood and urine tests are part of the pet laboratory test category.



Figure 17.31: subservices page from a specific service category.

### 4.5.3 Shop Side

#### 1- Home page:

This page show the home page of shop page, is divided into two parts, one specialized for cat and other for dog. Every part contain many category arranged in a horizontal slide show. When click on the category picture or name a new window of all related products will open.

The page contain a nav par of profile and search icon. Also, a bottom bar of three pages, we will explain each page separately.



Figure 18.1: Shop Home page, show products

## 2- Food category page (example: Dry Food page):

This page is made up of several pages, just scroll to the right to see the components of the other pages, and each page contains five products.

Each product field contains information about the product, its name and photo, to go deeper into the product information use the update information button and the shop owner can delete any product by the delete product button at any time.

At the bottom there are two icons: a plus icon to add a new product based on the product category, and go back icon.

This page is repeated for each product category.



Figure 18.2: Products types of specific product category

## 3- Shop profile page:

Show the profile page of the shop contain its picture, shop name, the shops' owner name, with the availability to change the page. At same time display the location address of the shop and the shops' owner can modify it in case he change his location or open a new department. Also phone number and the work time of the starting time to the end time.

When you click the pen icon, a dialog alert will appear to enter the new value of the phone number, location or any other adjustable information, and the update page image will also support two ways to modify the image, either take a picture from the camera or upload a picture from the phone gallery.

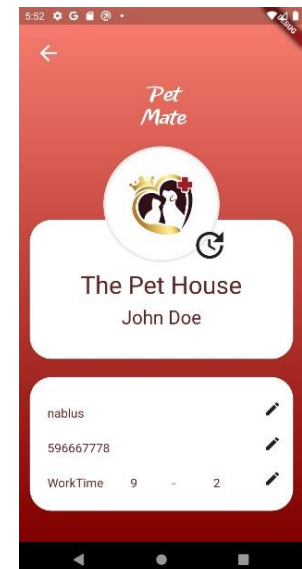


Figure 18.4: Shop profile page

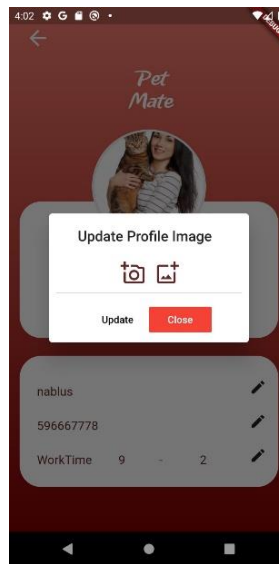


Figure 18.5: update shop location box dialog

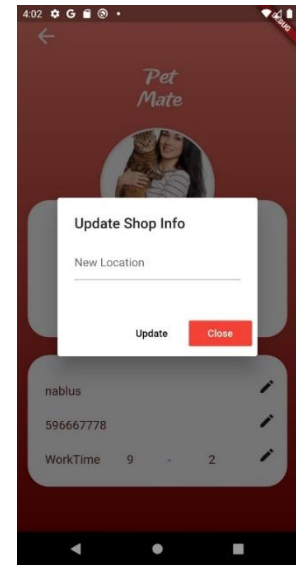


Figure 18.6: update shop profile picture

#### 4- Add new product regarding to its category:

In this part we will explain the page of adding a new product, as shown in the figure, the shop owner enters the product information such as: its picture, product name, price, etc., and saves the information.

Look at the page title here which is dry food, which is the category for the food, but if you choose another category like wet food, the new food will be added to the given category.

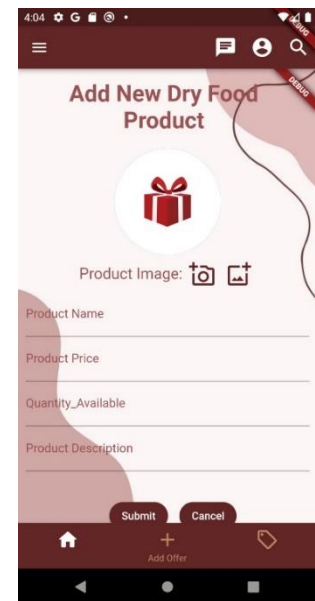


Figure 18.3: Add new product page

## 5- Offer page:

If you click on the bottom navigation bar in the center of the plus icon, the Add New offer page will open. This page enables the store owner to add a new cat or dog offer separately, the first page to display the cat and the other to the dog which is identified by the circle indicator at the bottom.

You can configure an offer from any product categories you like, for this, select the product category you are interested in (in this example we choose dry food), then choose the specific product you are looking for through the checkbox, you can go back and select another product from other categories.

When you have finished selecting the products, you can confirm the offer from the correct icon at the top of the add offer page.

When you click the correct icon, you can enter the offer data, the offer name, description, discount percentage and quantity available for offer. After that the offer will be created successfully.



Figure 18.7: Create new offer page

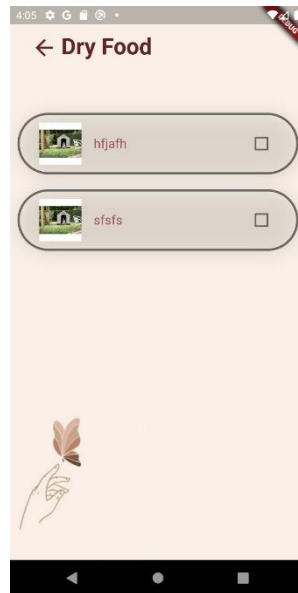


Figure 18.8: Choose products to create an

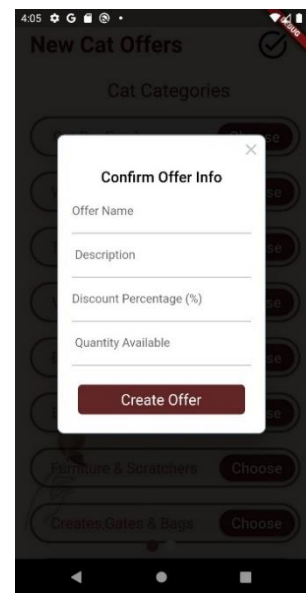


Figure 18.9: Confirm information about the offer to be created

## 6- Show offers page:

On this page, the store owner can see all the offers that he created with their data, the image is a slide, so that you can scroll through to see all the images of the products that make up the offer, and then show the name and description of the offer, with the price before and after.

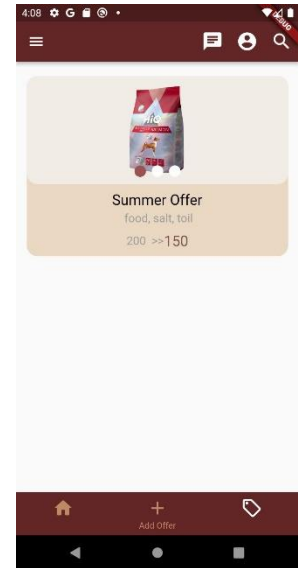


Figure 18.10: Show offers page

## 7- Drawer:

At the top left of the home page, there is a drawer icon that opens the drawer bar that divides products based on the type of pet (cat or dog), then display the product categories as they were displayed before in the home page body.

It also has a logout button as usual.

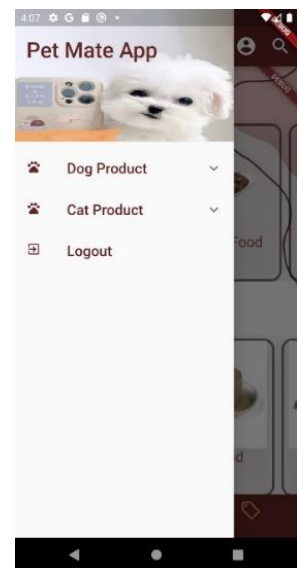


Figure 18.11: Shop page drawer

## 4.5.4 Vet Side:

### 1- Service page:

This page shows the types of services provided by the veterinarian, and it is specific, as it is divided into pet Surgical operations, laboratory tests, hygiene services, x-rays, endoscopic examinations, every service field contains a lot of services types, to see them just make a fast click at more details.

This page looks with amazing, attractive and easy interface to attract the vet.

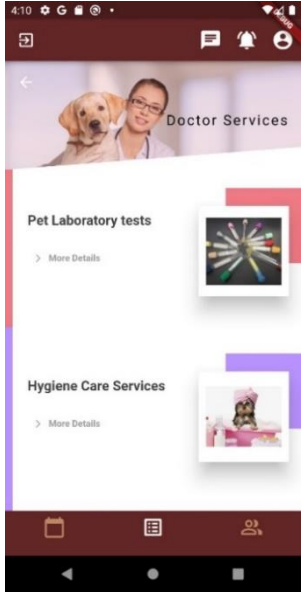


Figure 19.1: Vet home page, show vet services

Each service type contains a list of services that the vet can modify or remove. In addition to viewing service data.

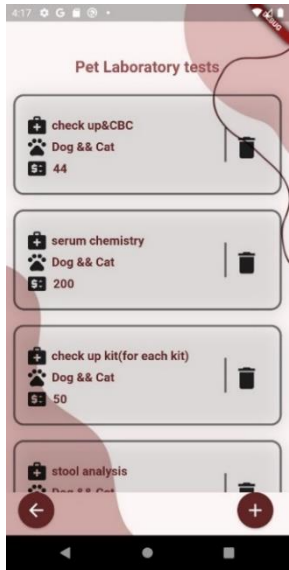


Figure 19.2: All subservices page from a pet laboratory tests

Add a new service from the add icon at the bottom, by filling the service information and then it will be added successfully

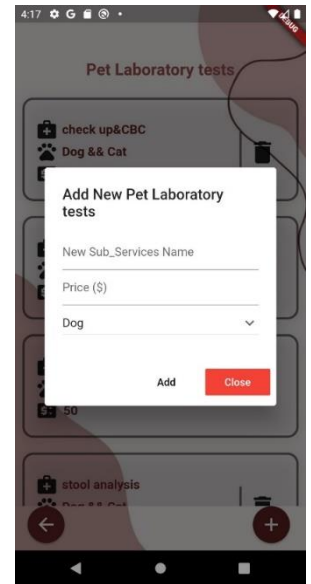


Figure 19.3: Add new subservice

## 2- Calendar page:

Move at the bottom navigation to see the calendar, this is the main feature for the vet which offer a calendar of booking appointments of the pet owners, where the pet owner book an appointment at certain day and hour then this appointment will appear at the that day.

This system will arrange the dates and avoid scheduling conflicts between the customers.

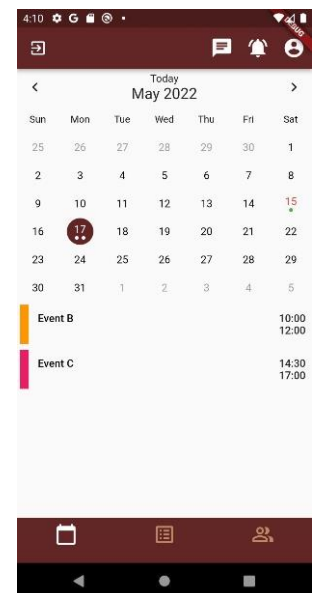


Figure 19.4: Calendar show the vet appointments every day

### 3- subscribers page

At right bottom navigation icon, the page of all the pet owners who subscribe with the vet show. It come to show the pet owners information.

Ps: at the figure there's no person register with this vet so it's empty.

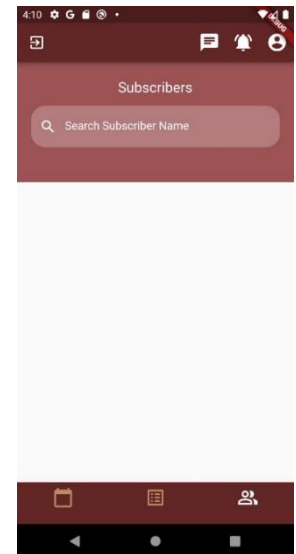


Figure 19.5: Page show all the pet owners who register with the vet

### 4- profile page:

The veterinarian's personal page displays the image of the center or the veterinarian in addition to the traditional information with the ability to modify it as in all profile pages, and display the number of people who have register with this veterinarian in addition to the number of previously published publications

Finally, there is a button that enables the vet to enter a post that is shown to pet owners.

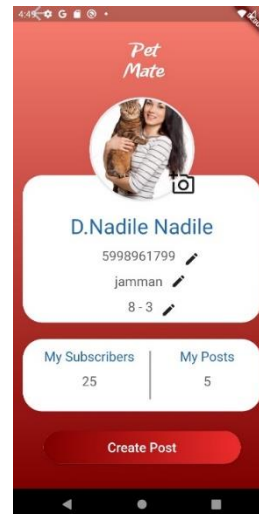


Figure 19.6: Vet profile page

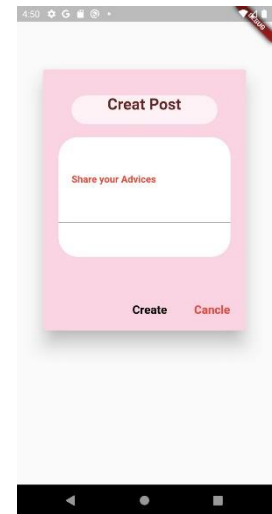


Figure 19.7: Create post box dialog

## 4.6 Software Engineering Principles [5]

By applying these software engineering principles, you will do your app tasks in the right way and achieve your engineering goals in the shortest amount of time. Almost certainly, your app will run as smoothly and efficiently as you intended.

### **1-Dry (Don't repeat yourself):**

We are interested in simplify the code as long as possible, so we try to reduce the repetition at the code by use function and call it at need, also we use a repetition flutter widgets instead of repeat the component more than once. At some point we use array technique to reduce replication by call the value from the array.

### **2- YAGNI (You Aren't Gonna Need It)**

First, we implement only the essential features and then expand them as necessary. Furthermore, we avoid code complexity, especially that which arises from adding features that might be necessary in the future.

### **3- BDUF (Big Design Upfront)**

We design the front end design first, then we attend to implement there functionality, that enable us to explore all the needed features first, then add another if necessary or apply any implementation modification at the beginning which is more easy at beginning app life cycle.

### **4- Information Expert**

The server-side was the only one responsible for accessing the database, sending, and receiving data to and from the client. The "GoogleMap" is the only one that has access to the locating functionalities.

## Chapter 5

# Results and Discussion

I give thanks to God for enabling us to prepare an integrated application that serves pets and greatly aids in overcoming the problems faced by pet owners and connecting them to everything they need in the market or veterinarians and friends who own pets so they can communicate and meet.

This project is crucial, especially during the mating seasons for pets, such as February and others, when it is difficult for humans to control their pet's desire to mate, so the animal begins to perform strange movements and behaviors that may sometimes be harmful. Due to this, we provide easy communication with friends and choose the right person for you based on the type of animal, the distance between the two of you, and other factors.

By setting up a pre-booking system with the vet, we were able to enable pet owners to schedule a vet appointment that matches the availability of vet appointments at a time that is convenient for them.

Furthermore, the recommendation system suggests to the user specific products that may be of interest to him based on previous purchases, thereby saving time in searching for the right products for the customer and attracting his interest in a new product that can help him take care of his pet.

During the course of our work, we experienced some challenges, specifically when dealing with different library versions of maps, calendars, and other resources.

Additionally, the timeline for this project was limited, in the future we may try more approaches of recommendation systems or add features such as rating the products and analyzing the output data. We might also send notifications to inform the user when there is a new product or sales.

## Chapter 6

# Conclusions and Future Work

In summary, we've successfully developed a fully functional cross-platform mobile application which we believe will change how people care for pets, by providing one platform for pet owners, veterinarians, and pet stores.

Each customer has an account with a recommendation system for pet owners, which depends on the purchase process. In addition, it has a user-friendly complete system where customers can see all product details and order. Customers can easily search, view, and order their favorite products.

For the recommendation system, we can make it based on reviews sentiment, rating, and shopping history. Likewise, we could use a larger dataset from real customers in order to make the predictions more accurate and authentic. Since we were limited by the size of the data, we could test some more advanced models that require huge datasets.

Addition of features, such as support for different online payment methods, will improve the pet care experience on the mobile application.

In the future, we will seek to activate this program and to put it into action so that we can see the results of our efforts in real life

Finally, we can only say, thank God for the completion, and we hope this work will gain your admiration and good feedback. In this semester, we have worked very hard to meet your expectations, and to make our families and our doctor, Dr. Emad, proud of at this moment. We would also like to thank everyone who helped and participated us in this work.

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