

# **Integrated Veterinary Application for Enhanced Cow Health Management**

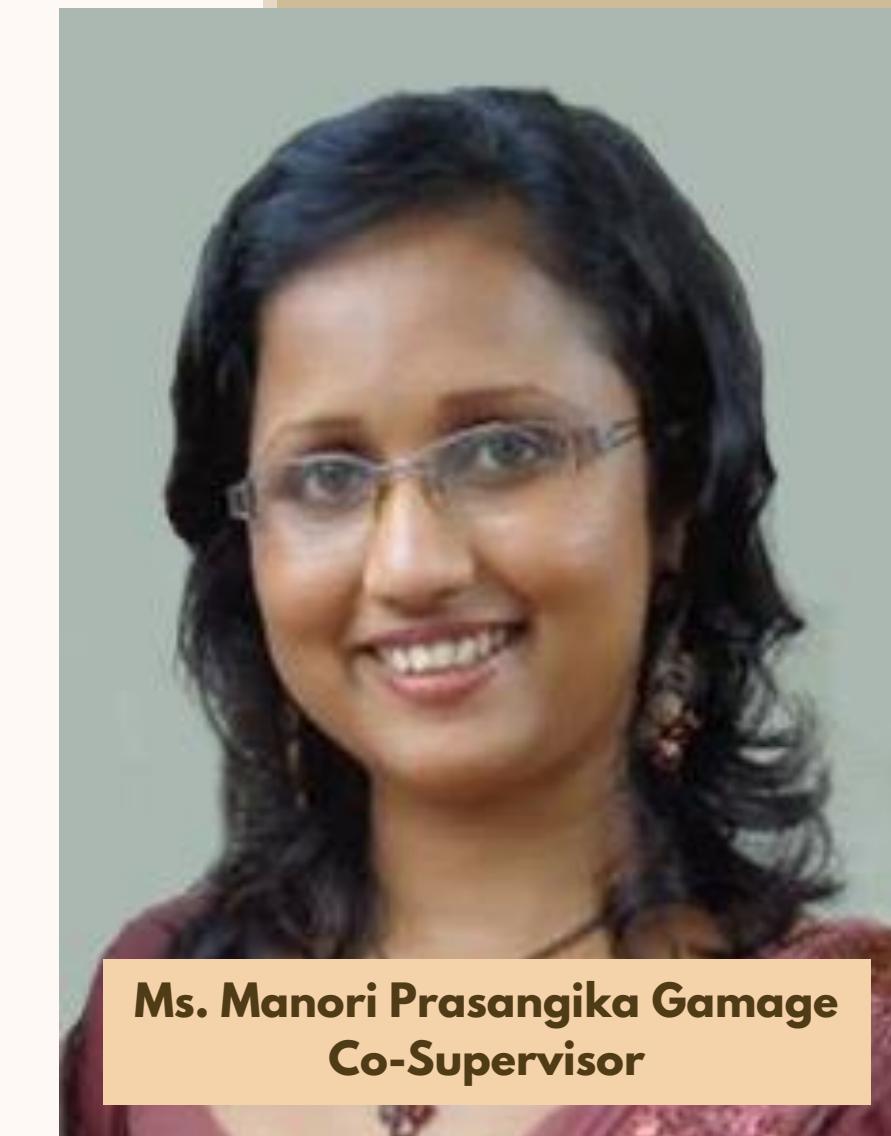
**PROJECT ID: 24-25J-085**



# Supervisors



**Mr. S M B Harshanath**  
Supervisor

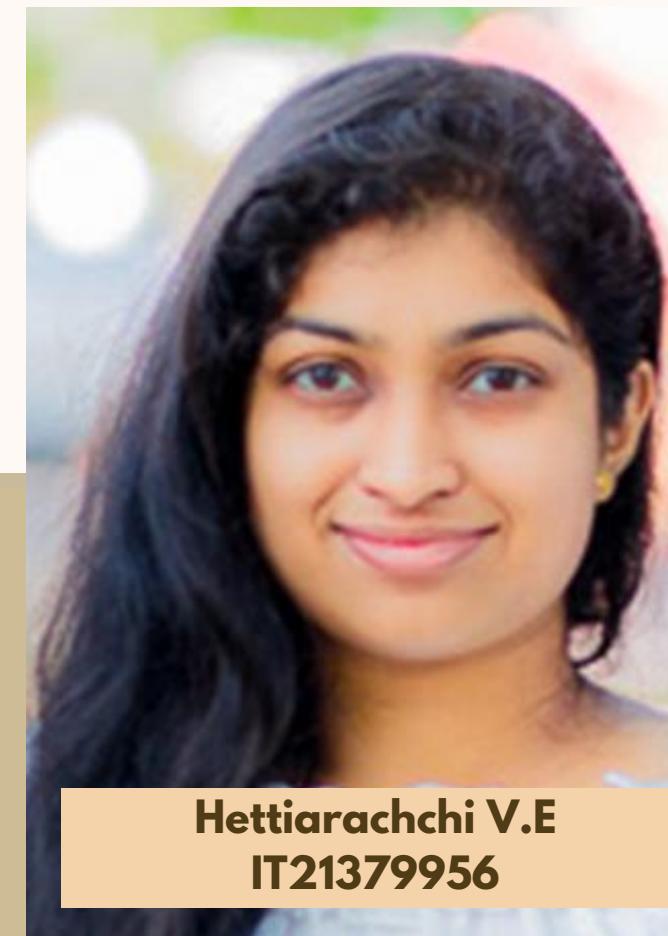


**Ms. Manori Prasangika Gamage**  
Co-Supervisor

# Our Team..



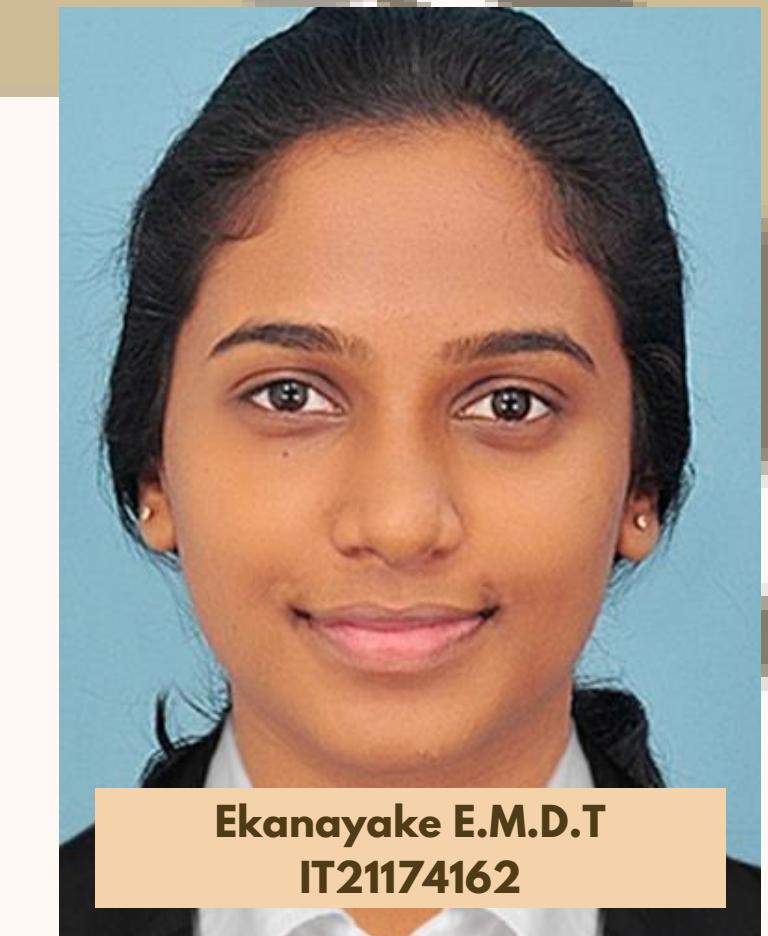
**Perera L.P.S.R**  
**IT21381218**



**Hettiarachchi V.E**  
**IT21379956**



**Dissanayake D.M.W.B.T**  
**IT21164194**



**Ekanayake E.M.D.T**  
**IT21174162**

## Brief Overview

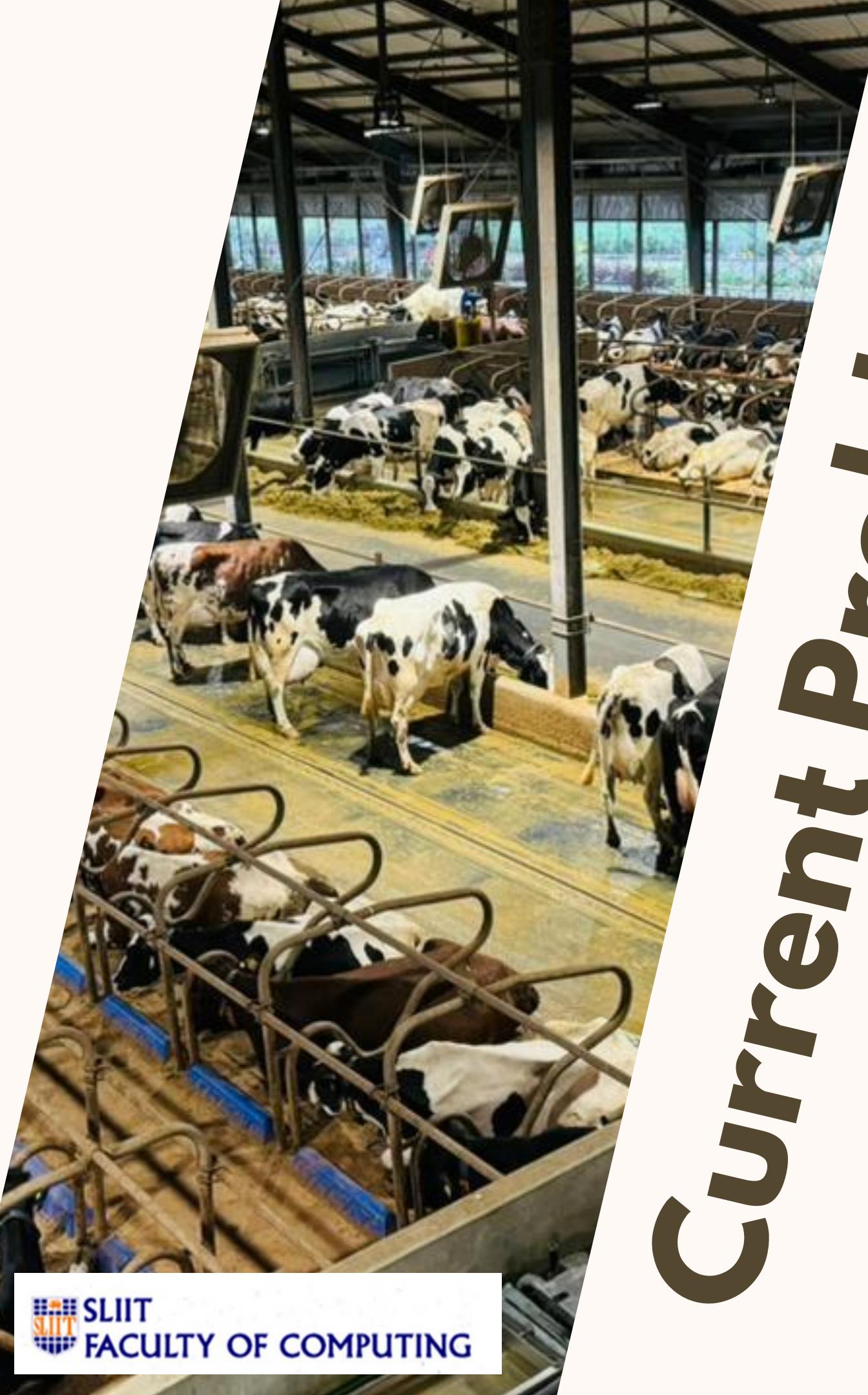
Our project focuses on developing an integrated veterinary application to enhance cow health management. It aims to improve disease detection, optimize cow care practices, predict milk production, and streamline veterinary services.

## Importance

Effective cow health management is crucial for ensuring animal welfare, enhancing productivity, and sustaining profitability in the agricultural industry.

## Goal

Our primary goals are to leverage advanced technologies for disease detection and milk production prediction, provide comprehensive tools for cow care, and facilitate efficient communication between farmers and veterinarians.



# Current Problems

**Difficulty in early disease detection**

**Inadequate tracking of health and nutritional data**

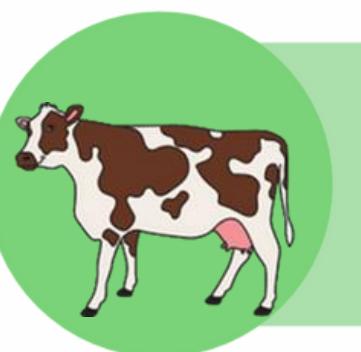
**Lack of proper method to predict the milk production**

**Lack of proper method to reach an available veterinarian in an emergency**

# Project Objectives



**Enhance disease detection and prevention**



**Improve cow care practices**



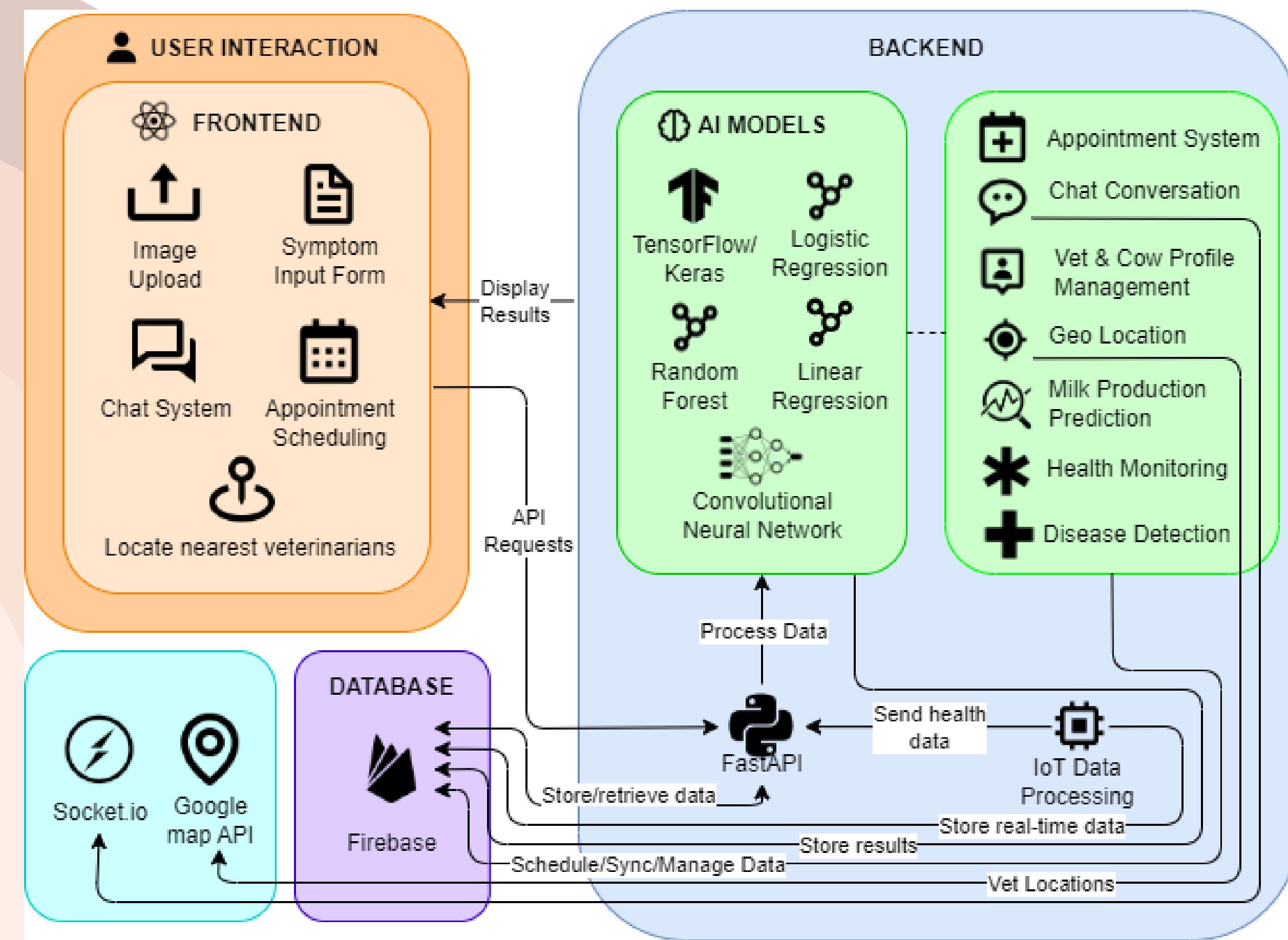
**Predict milk production**



**Streamline veterinary communication and services**



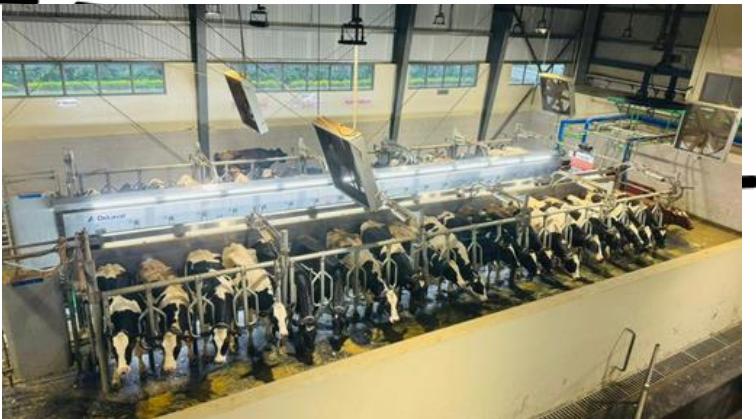
# Overall System diagram



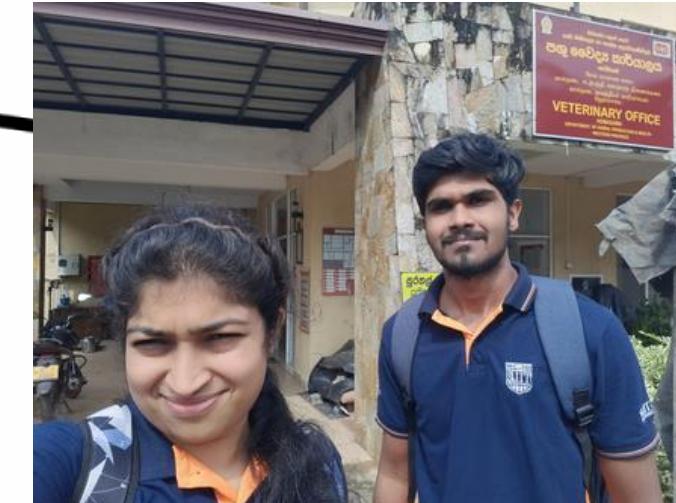


# Field Visits

**Ambewela  
Farm**



**Government  
Veterinary  
Surgeons Office  
Homagama**



**District  
Agriculture  
Training Center  
Homagama**



**IT21381218**  
**Perera L. P. S. R**

**BSc. (Hons) Degree in Information Technology**  
**Specialization in Information Technology**

**Component 1 : Disease Detection and  
Prevention**



# Research Problems

- How to identify the diseases that infected to the cattle skin?
- How to put together a database of different images depicting common cattle diseases?
- What are the preventions that can be taken until channeling a veterinarian?



# Research Objectives

## *Main Objectives*

- To Identified the skin diseases earlier.
- Provide recommended actions and next steps based on febrile inputs

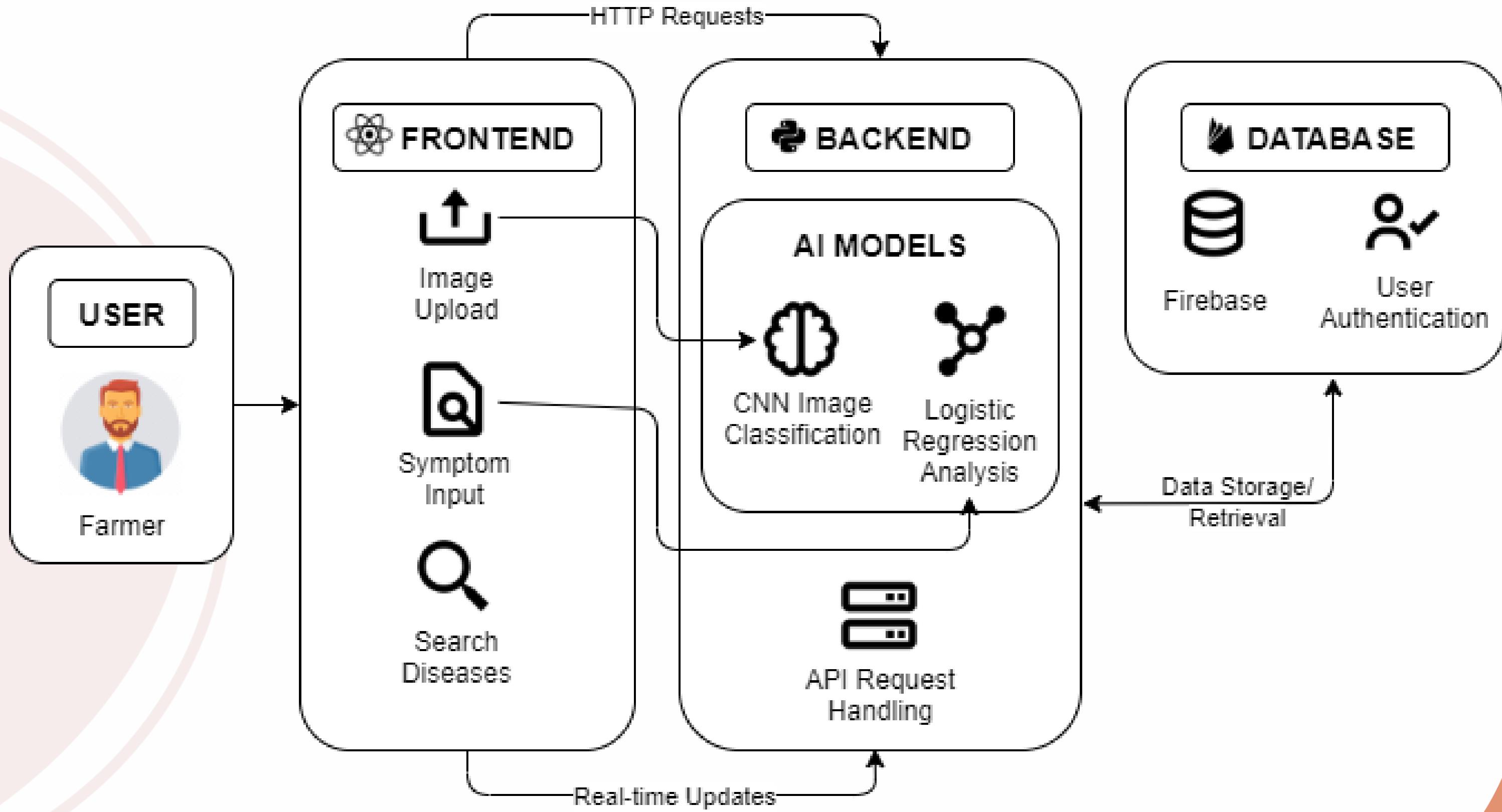
## *Sub Objectives*

- ❖ Use of CNN for image classification to detect diseases.
- ❖ Develop a tool for farmers to input observed symptoms and receive effectiveness disease diagnoses.
- ❖ Compile and maintain a detailed list of common cattle diseases, including symptoms and recommended treatments

# Research Gap

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	Our Research
Machine Learning	✓	✓	✓	✗	✓	✗	✓	✓	✗	✓
Image-Based Detection	✓	✓	✓	✗	✗	✗	✗	✗	✗	✓
Symptom-Based Diagnosis	✗	✗	✗	✓	✓	✓	✗	✗	✗	✓
Recommendation System	✗	✗	✗	✓	✗	✗	✓	✓	✓	✓
Comprehensive Database	✗	✗	✗	✗	✗	✓	✗	✓	✗	✓
Real-Time Integration	✗	✗	✗	✗	✗	✗	✓	✓	✗	✓
User-Friendly Platform	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓

# Function diagram



# Technologies and Techniques

## Technologies

-  Python
-  React
-  TensorFlow
-  Keras
-  Firebase
-  VS code
-  GitHub
-  FastAPI



## Techniques

-  Data preprocessing
-  Data Visualization
-  Data Augmentation
-  Convolutional Neural Network

# Requirements

## Functional Requirements

- Provide image-based disease classification.
- Enable users to input observed symptoms and receive disease diagnoses.
- Provide recommended actions and next steps based on input symptoms.

## System Requirements

- High-resolution image capturing and processing capabilities.
- Efficient backend for CNN model integration.
- Secure data handling and transmission protocols.

## Non-Functional Requirements

- Ensure system reliability and accessibility 24/7.
- Ensure quick response time for disease detection (within seconds).
- Achieve high accuracy (90%+) in disease classification.

## Personal Requirements

- Expertise in machine learning and image processing.
- Familiarity with veterinary diseases and treatments.
- Proficiency in backend development and database management.

## Visualizing Training and Validation Performance

```

epochs = range(1, 41) # Adjust to match the number of epochs

# Plot training & validation accuracy values
plt.figure(figsize=(12, 5))

plt.subplot(1, 2, 1)
plt.plot(epochs, history.history['accuracy'], label='Training Accuracy')
plt.plot(epochs, history.history['val_accuracy'], label='Validation Accuracy')
plt.title('Training and Validation Accuracy')
plt.xlabel('Epochs')
plt.ylabel('Accuracy')
plt.legend()

# Plot training & validation loss values
plt.subplot(1, 2, 2)
plt.plot(epochs, history.history['loss'], label='Training Loss')
plt.plot(epochs, history.history['val_loss'], label='Validation Loss')
plt.title('Training and Validation Loss')
plt.xlabel('Epochs')
plt.ylabel('Loss')
plt.legend()

# Display the plots
plt.tight_layout()
plt.show()

```

## Approach 01 - Custom CNN

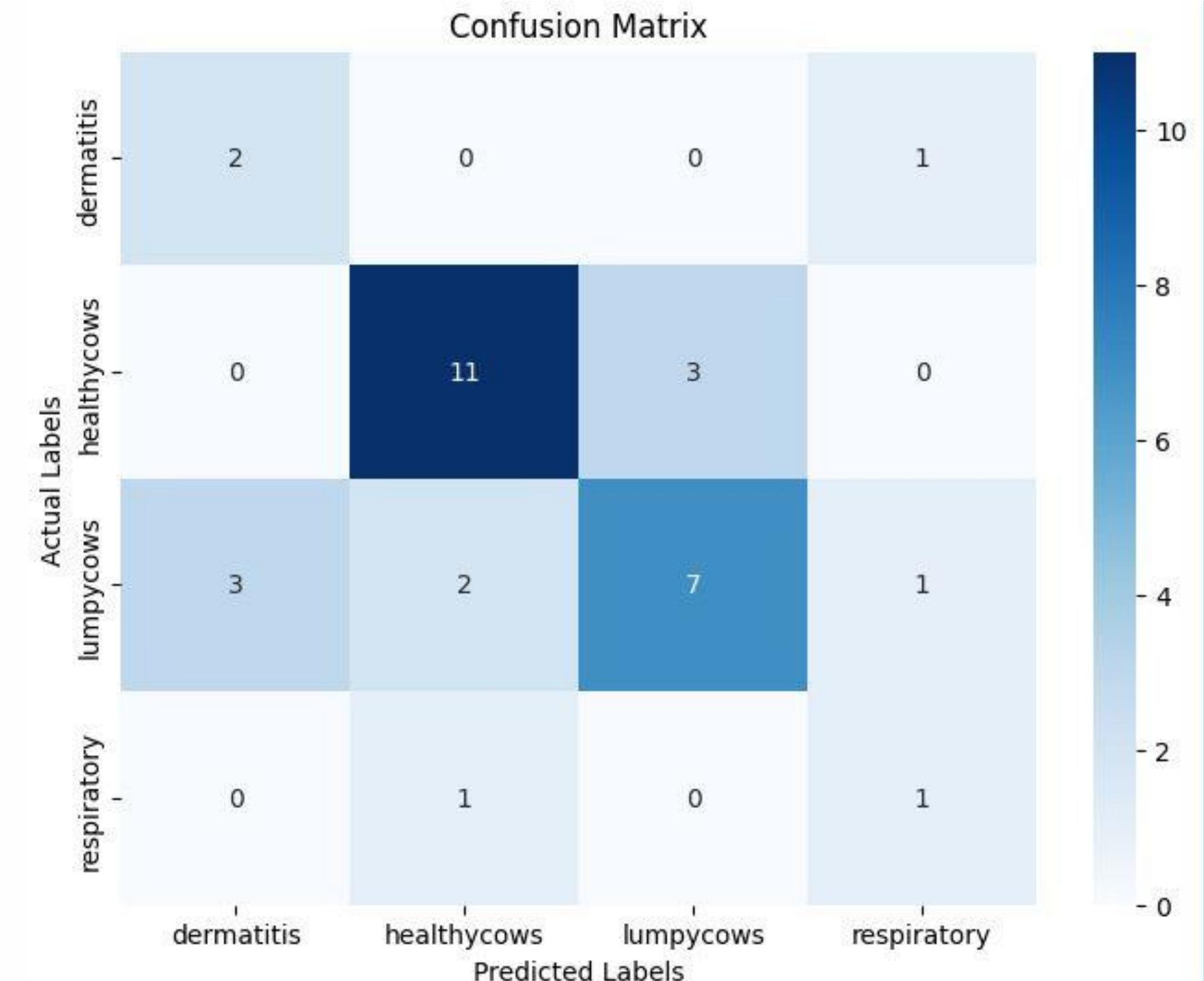
```

from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense

model = Sequential([
    Conv2D(32, (3,3), activation='relu', input_shape=(128, 128, 3)),
    MaxPooling2D(pool_size=(2, 2)),
    Conv2D(64, (3, 3), activation='relu'),
    MaxPooling2D(pool_size=(2, 2)),
    Flatten(),
    Dense(128, activation='relu'),
    Dense(4, activation='softmax') # Updated for 4 classes
])

```

## Confusion Matrix: Identifies specific classes that are often misclassified



## Data Preprocessing with ImageDataGenerator

# Evidence of completion

## Accuracy

Epoch 40/40

27/27 ————— 41s 1s/step - accuracy: 0.7874 - loss: 0.4447 - val\_accuracy: 0.7594 - val\_loss: 0.5948

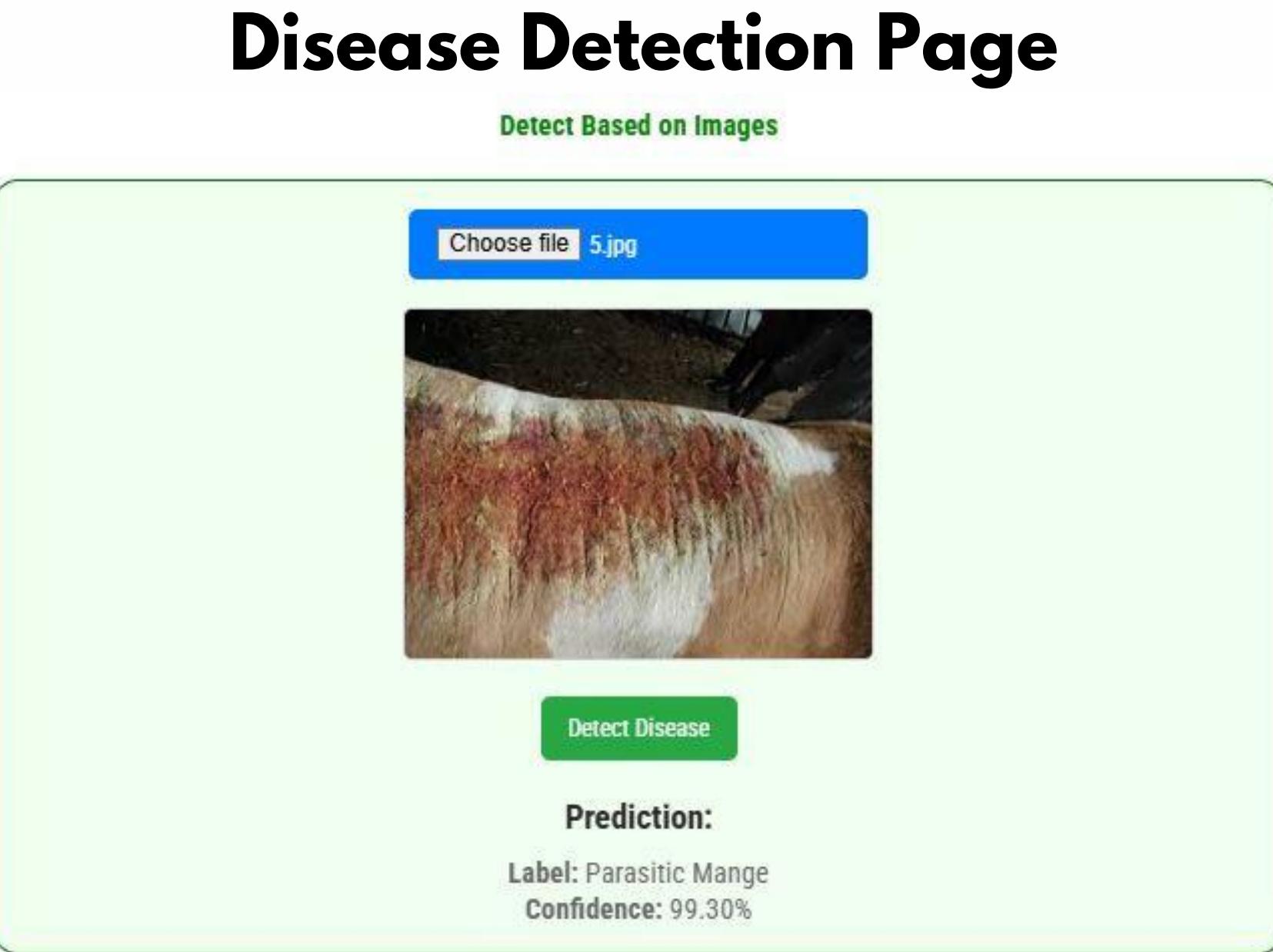
```
// Handle file selection
const handleFileChange = (event) => {
  const file = event.target.files[0];
  if (file) {
    setUploadedImage(file);
    setPreviewUrl(URL.createObjectURL(file)); // Create a preview URL for the image
  }
};

// Handle disease detection
const handleDetectDisease = async () => {
  if (!uploadedImage) {
    alert('Please upload an image first.');
    return;
  }

  const formData = new FormData();
  formData.append('file', uploadedImage);

  setLoading(true);
  setPrediction(null);

  try {
    const response = await axios.post('http://localhost:8000/predict-pest', formData, {
      headers: { 'Content-Type': 'multipart/form-data' },
    });
    setPrediction(response.data);
  } catch (error) {
    console.error('Error detecting disease:', error);
    alert('Failed to detect disease.');
  } finally {
    setLoading(false);
  }
};
```



# Evidence of completion

# Recommendations for disease

## Disease Detection

## Search Diseases

b

### Condition: Black Quarter (BQ)

Black Quarter (BQ), also known as Blackleg, is a severe bacterial disease affecting cattle and other ruminants. It is caused by *Clostridium chauvoei*, a spore-forming bacterium. The disease is highly fatal and primarily affects young cattle (6 months to 2 years old), though older animals can also be susceptible.

### Remedies:

- Immediate veterinary intervention is critical.
  - Antibiotics such as penicillin or tetracycline may be effective in early stages.
  - Supportive care, including anti-inflammatory drugs and wound management, may be necessary.
  - Treatment is often ineffective in advanced cases, so prevention is the key strategy

# Behavioural Disease Detection Page

## Health Condition Checklist

nervous system disorders  
blister-like lesions on the skin  
respiratory distress  
scabby lesions on the lips and muzzle  
foul breath  
painful mouth  
decreased performance  
colic  
blood in urine  
lethargy  
dark urine  
loss of appetite  
oral ulcers  
immunosuppression  
nervousness  
rough hair coat  
pale mucous membranes  
bone abnormalities

Search Possible Diseases

### Possible Diseases:

- blackleg

# Evidence of completion

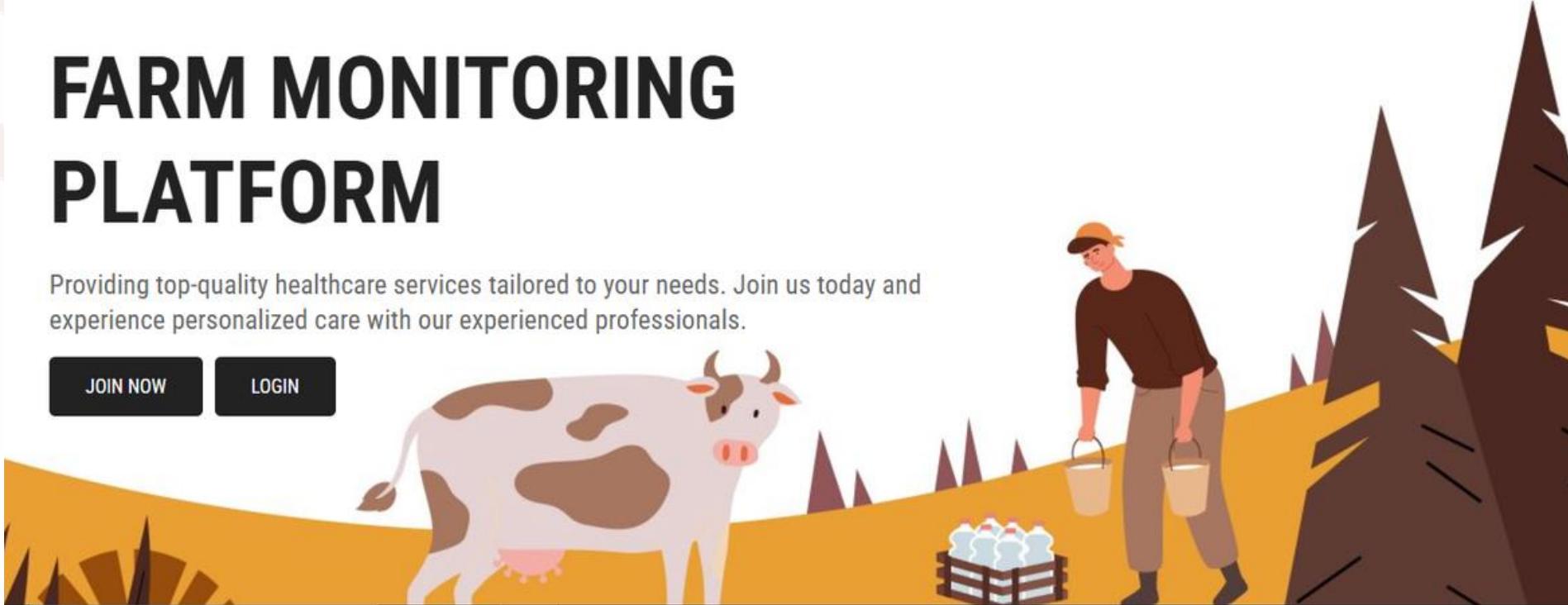
Cattle Site

Services About Us Contact

## FARM MONITORING PLATFORM

Providing top-quality healthcare services tailored to your needs. Join us today and experience personalized care with our experienced professionals.

JOIN NOW LOGIN



A stylized illustration of a cow standing on a grassy hill. A farmer wearing a cap and a brown shirt is carrying two buckets. Next to him is a wooden crate filled with white milk cartons. The background features dark brown pine trees and a yellow field.

**Home Page**

Cattle Site

Contact Us

Name

Contact Number  Email

Title

Message

**Submit**

**Contact Us Page**

# Challenges and deviations

- **Data Collection Difficulties.**

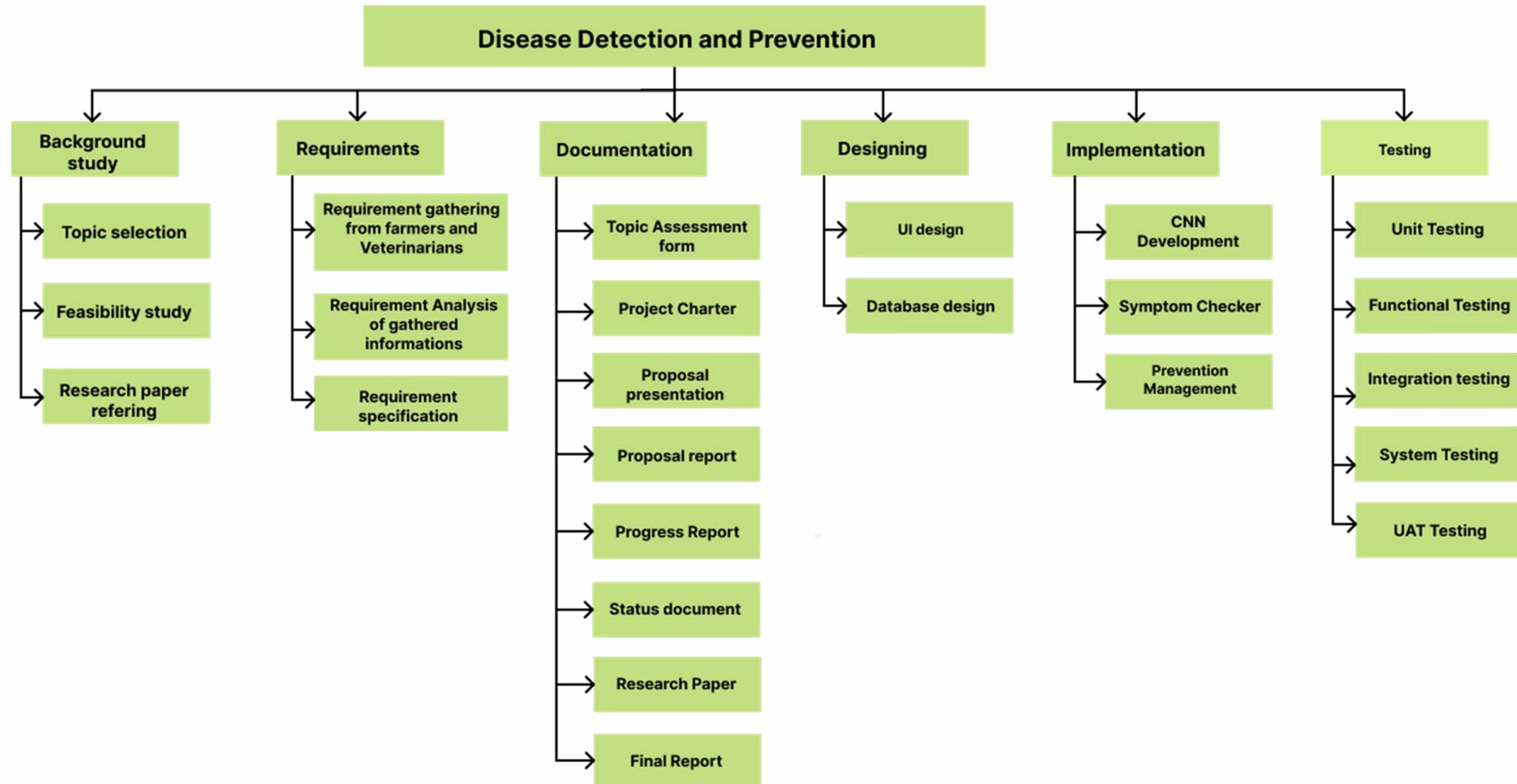
**Names of diseases detected by the component:**

CNN model:- Tick Infestation, Black Quarter (BQ), Dermatophytosis (RINGWORM), Fly Strike (MYIASIS), Foot and Mouth disease, Lumpy Skin, Mastitis and Parasitic Mange

Recommendations and prevention tips:- Tick Infestation, Black Quarter (BQ), Dermatophytosis (RINGWORM), Fly Strike (MYIASIS), Foot and Mouth disease, Lumpy Skin, Mastitis and Parasitic Mange

- **Some farmers may lack technical knowledge to effectively use the application.**

# Work breakdown structure

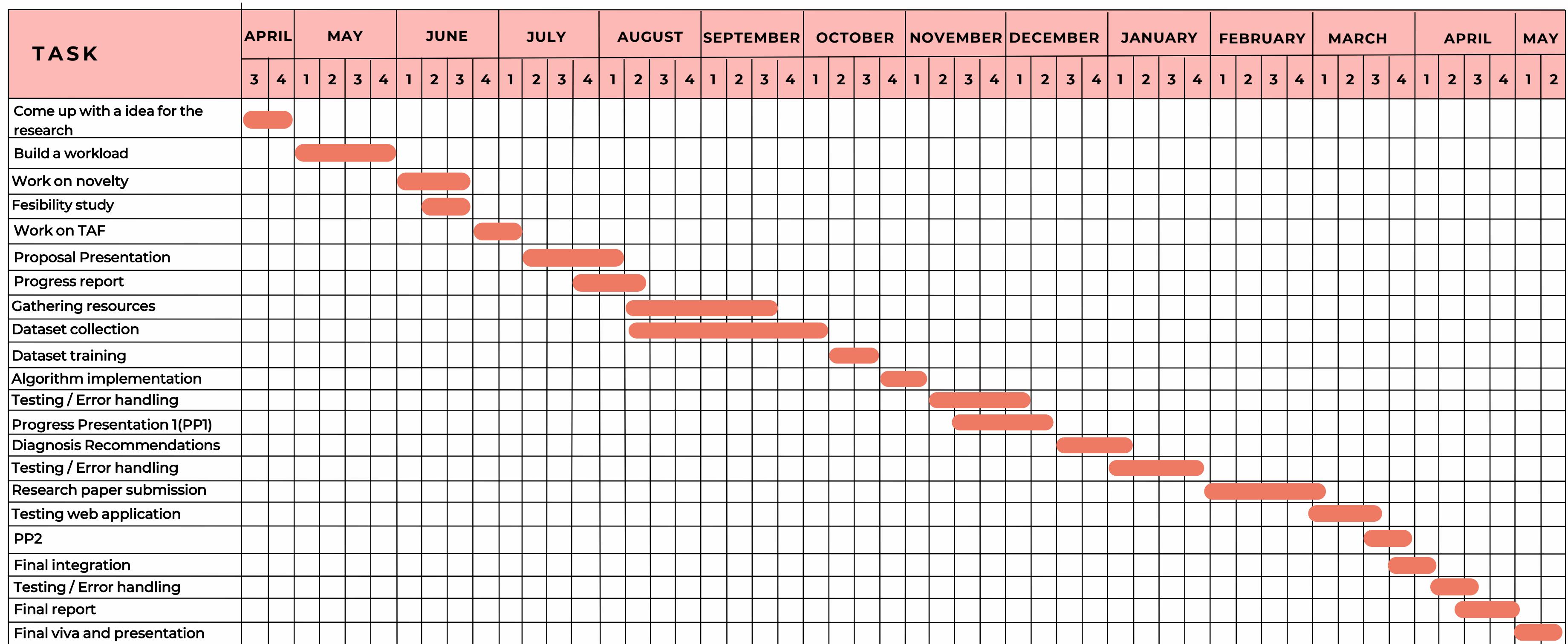


# Estimated Budget per month

	Amount (LKR)
Travel fees for data collection(Government Veterinary Surgeons Office - Homagama, District Agriculture Tranning Center Homagama)	2000.00
Internet charges (the development and technical information learning)	2500.00
Electricity	3000.00
Documentation and Printing Cost	500.00
<b>Total</b>	<b>8000.00</b>



# Gantt Chart



# References

- [1] A. A. AlZubi1, "Arcc Journals," 2024. [Online]. Available: <https://arccjournals.com/journal/indian-journal-of-animal-research/BF-1793>.
- [2] A. M. D. F. C. G. M. H. Ghaffari, "journalofdairyscience," 2022. [Online]. Available: [https://www.journalofdairyscience.org/article/S0022-0302\(22\)00609-9/fulltext#:~:text=A%20deep%20convolutional%20neural%20network,3%20d%20of%20life%20on..](https://www.journalofdairyscience.org/article/S0022-0302(22)00609-9/fulltext#:~:text=A%20deep%20convolutional%20neural%20network,3%20d%20of%20life%20on..)
- [3] M. S. R. M. J. H. F. A. A. K. B. T. D. Ali Rohan, "sciencedirect," 2024. [Online]. Available: [https://www.sciencedirect.com/science/article/pii/S0168169924005064#:~:text=In%20precision%20livestock%20farming%2C%20a,monitoring%20\(Atkinson%20et%20al.%2C](https://www.sciencedirect.com/science/article/pii/S0168169924005064#:~:text=In%20precision%20livestock%20farming%2C%20a,monitoring%20(Atkinson%20et%20al.%2C).
- [4] A. G. Derara Shanka, "researchgate," Mobile Application Based Expert System for Cattle Disease Diagnosis and Treatment in Afan Oromo Language, October 2022. [Online]. Available: [https://www.researchgate.net/publication/366751997\\_Mobile\\_Application\\_Based\\_Expert\\_System\\_for\\_Cattle\\_Disease\\_Diagnosis\\_and\\_Treatment\\_in\\_Afan\\_Oromo\\_Language](https://www.researchgate.net/publication/366751997_Mobile_Application_Based_Expert_System_for_Cattle_Disease_Diagnosis_and_Treatment_in_Afan_Oromo_Language).
- [5] K. H. A. R. H. D. S. O. Evta Indra, "Application of C4.5 Algorithm for Cattle Disease," 2019. [Online]. Available: <https://iopscience.iop.org/article/10.1088/1742-6596/1230/1/012070/pdf>.
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- [7] H. O. A. A. O. A. O. M. A. A. B. S. A. A. K. O. O. E. K. Segun Adebayo b, "sciencedirect," Enhancing poultry health management through machine learning-based analysis of vocalization signals dataset, 2023. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S2352340923006285>.
- [8] C. C. A. K. Naftali Slob, "researchgate," Application of Machine Learning to Improve Dairy Farm Management: A Systematic Literature Review, 2020. [Online]. Available: [https://www.researchgate.net/publication/347729135\\_Application\\_of\\_Machine\\_Learning\\_to\\_Improve\\_Dairy\\_Farm\\_Management\\_A\\_Systematic\\_Literature\\_Review](https://www.researchgate.net/publication/347729135_Application_of_Machine_Learning_to_Improve_Dairy_Farm_Management_A_Systematic_Literature_Review).
- [9] K. S. K. S. A. R. Sakshi Shinde, "researchgate," 2023. [Online]. Available: [https://www.researchgate.net/publication/369417859\\_Survey\\_on\\_Crop\\_Recommendation\\_System](https://www.researchgate.net/publication/369417859_Survey_on_Crop_Recommendation_System).

**IT2116419**

**Dissanayake D.M.W.B.T**

**BSc. (Hons) Degree in Information Technology  
Specialization in Information Technology**

**Component 2 : Enhancing Cow Care Practices**



# Research Problems

- Real-time health monitoring and management.
- Lack of personalized nutrition plans.
- Manual tracking of vaccinations and vet check-ups.



# Research Objectives

## *Main Objectives*

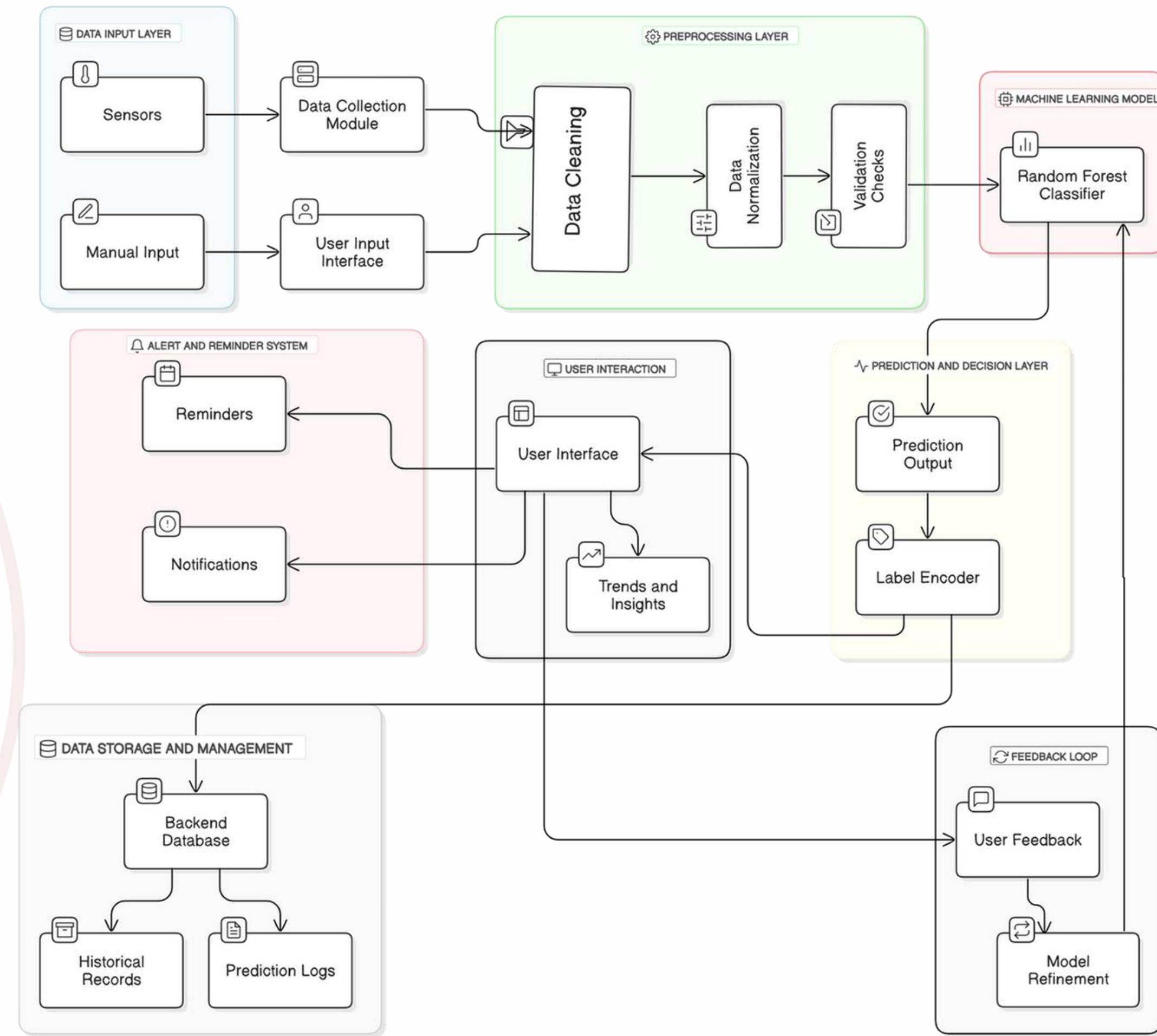
To present a holistic approach to cow care by integrating the management of cow profiles, nutrition tracking, and automated reminders using Machine Learning, focusing primarily on enhancing cow productivity.

## *Sub Objectives*

- Develop Comprehensive Cow Profiles for individual cattle Management
- Implement a health monitoring function using machine learning and IoT devices
- Implement Personalized Nutrition and Diet Tracking using machine learning
- Create Automated Reminder Systems
- Improve Overall Cow Welfare and Management Efficiency

Research Gap	Vet2Pet	Vetter Software	PetDesk	Our Research
Application type	mobile	web	mobile	web
Comprehensive Cow Profile Management	✗	✗	✗	✓
Integrated Health Records and Nutrition	✗	✗	✗	✓
Personalized Nutrition and Diet Tracking	✗	✗	✗	✓
Machine Learning Predictive Analytics	✗	✗	✗	✓
Automated Reminders for Medical Situations	✗	✗	✗	✓

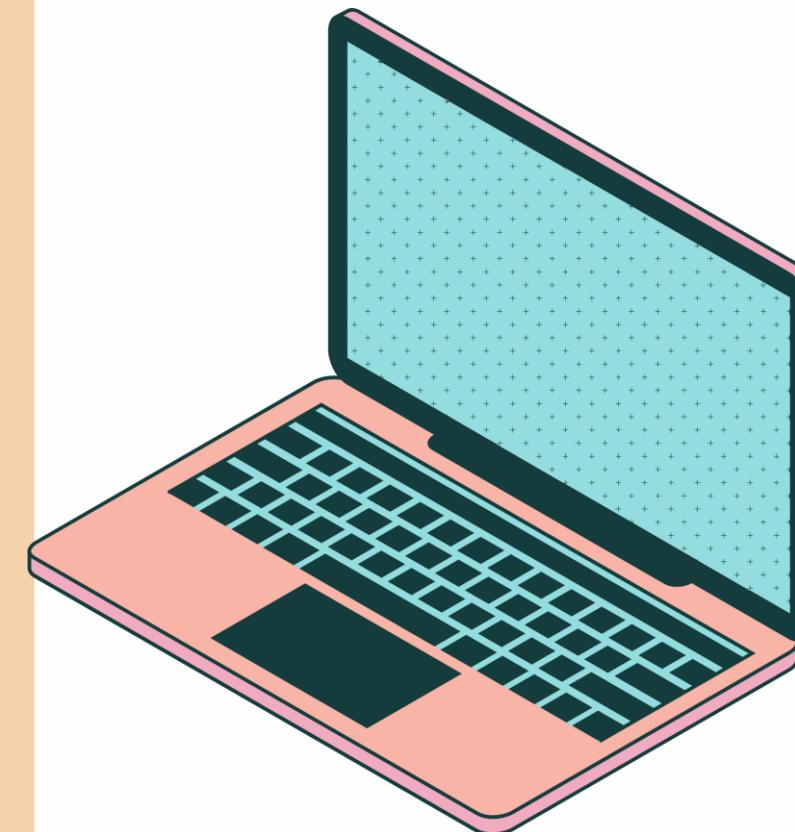
# Function diagram



# Technologies and Techniques

## Technologies

-  Python
-  React
-  TensorFlow
-  Firebase
-  VS code
-  GitHub



## Techniques

-  ML Techniques
-  Data Preprocessing
-  Deployment Strategies
-  Automated Alerts
-  Real-Time Data Integration

# Requirements

## Functional Requirements

- Provide interfaces to create and manage comprehensive cow profile.
- Allow modifications to cow profiles.
- Enable tracking of individual cow's feeding regimens and health records.
- Create systems for setting alerts and reminders for critical tasks.

## System Requirements

- User-friendly interfaces for data input and management.
- Notification system for reminders and alerts.
- Communication option for emergency assistance.
- Appointment scheduling system.

## Non-Functional Requirements

- Ensure system reliability and accessibility 24/7.
- Maintain high system availability and minimal system downtime.
- Provide latency-free communication channels for real-time interaction

## Personal Requirements

- Skills in API integration and data security.
- Familiarity with veterinary practices and services.
- Proficiency in backend development and database management.

# Evidence of completion

## Add cattle

### User Summary

Full Name: mala gamage  
Username: mala  
Email: rajmalperera@gmail.com  
NIC: 2777465278  
Contact: 0714777848



### Cattle Summary

cow1

(Bgqu5VMvgIDJLNnBnCFi)



Breed: Sahiwal

Birth: 2022-01-07

Health: Healthy

Status: Active

Owner: mala

Age: 3 years, 2 months

Update

Remove

### Add New Cattle

Name:

Breed:

Birth Date:

Health:

Status:

Image:

# Evidence of completion

## Health status



cow1

Bgqu5VMvgIJJLLnBnCFi

3 years, 2 months

Sahiwal

Measures	Normal Range	Your Cow Level
Body Temperature	38.5 - 39.5°C	63.48633°C
Heart Rate (Pulse Rate)	48 - 84 bpm	98 bpm
Oxygen Saturation	95 - 100%	82%

Health parameters are within the normal range.

[Get Treatments](#)

### Reminder and Alert Set

Vet Checkup [Set](#)

Vaccination [Set](#)

Medical Treatment [Set](#)

### Action and Recommendation

Health Status: Healthy

Status: Active

Owner: mala

Nutrition and Food: Provide a balanced diet rich in minerals and vitamins.

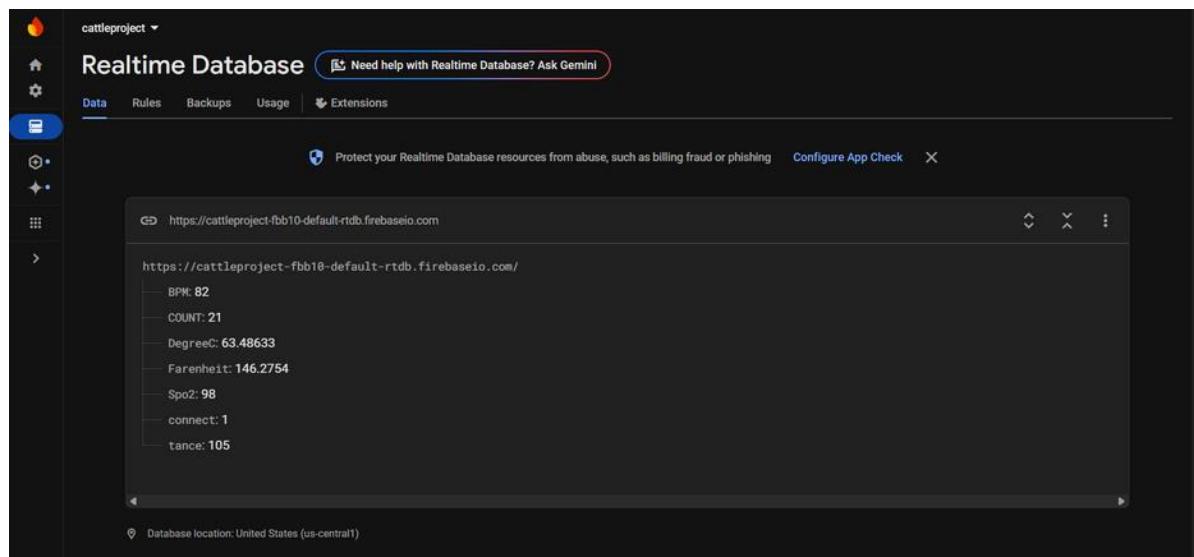
[Contact Vet](#)

# Evidence of completion

*Demonstration IoT devices for capturing cattle health parameters.*

- Temperature
- Heart Rate
- SpO<sub>2</sub>

**Firebase Realtime Database**

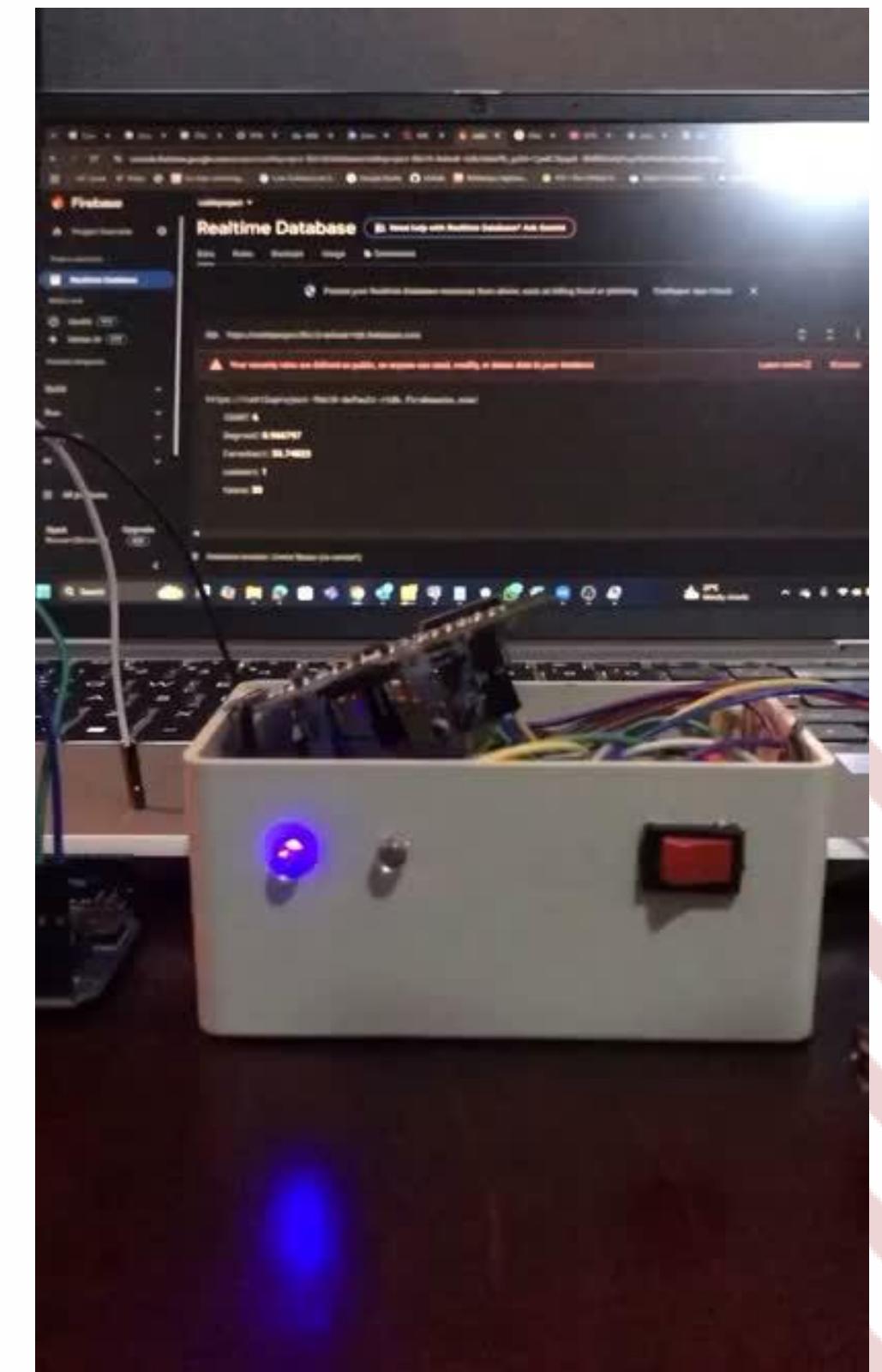
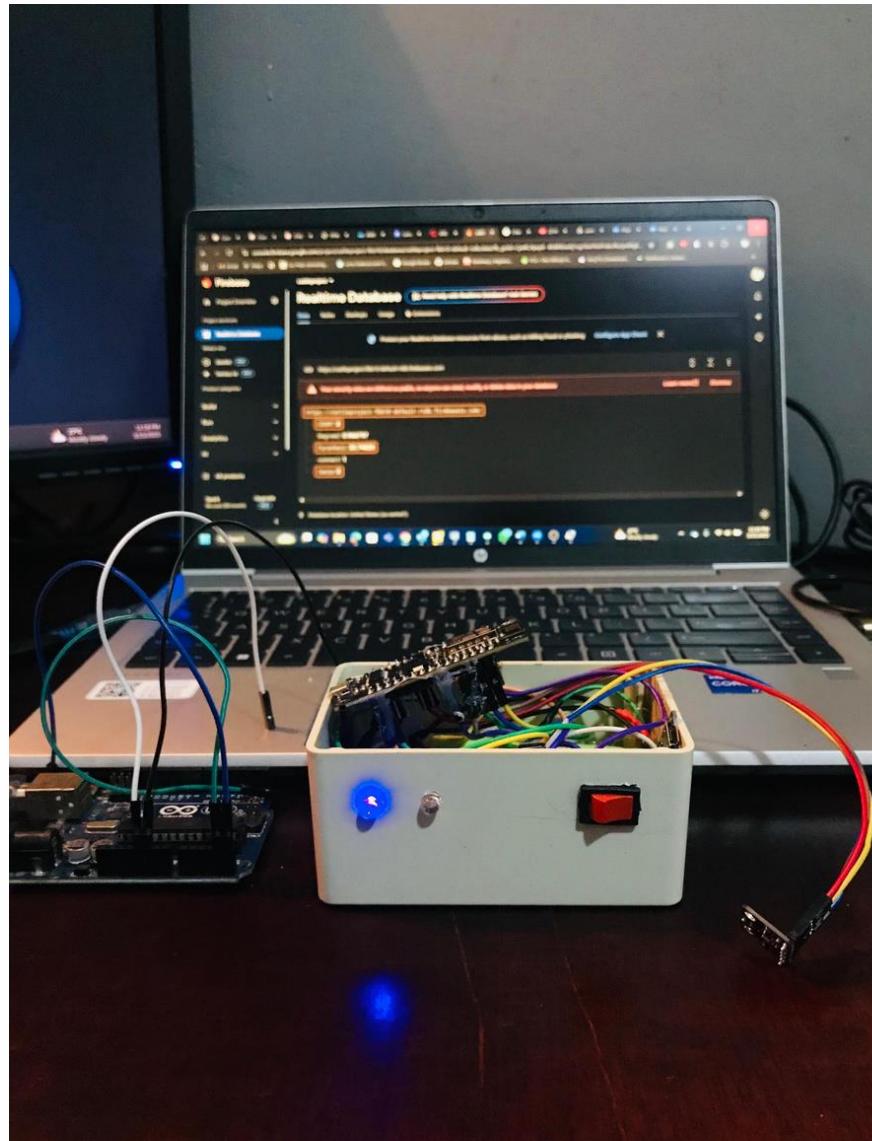


The screenshot shows the Firebase Realtime Database console with a single data entry under the path `https://cattleproject-fbb10-default-rtdb.firebaseio.com/`. The data is as follows:

```
BPM: 82
COUNT: 21
DegreeC: 63.48633
Fahrenheit: 146.2754
SpO2: 98
connect: 1
tance: 105
```

Database location: United States (us-central1)

**IoT device capturing data**



# Challenges and deviations

- **Data Collection Difficulties.**

## Limited Availability of Cattle Health Data:

Many farms lack historical health records, making ML training challenging.

## Sensor Accuracy Issues:

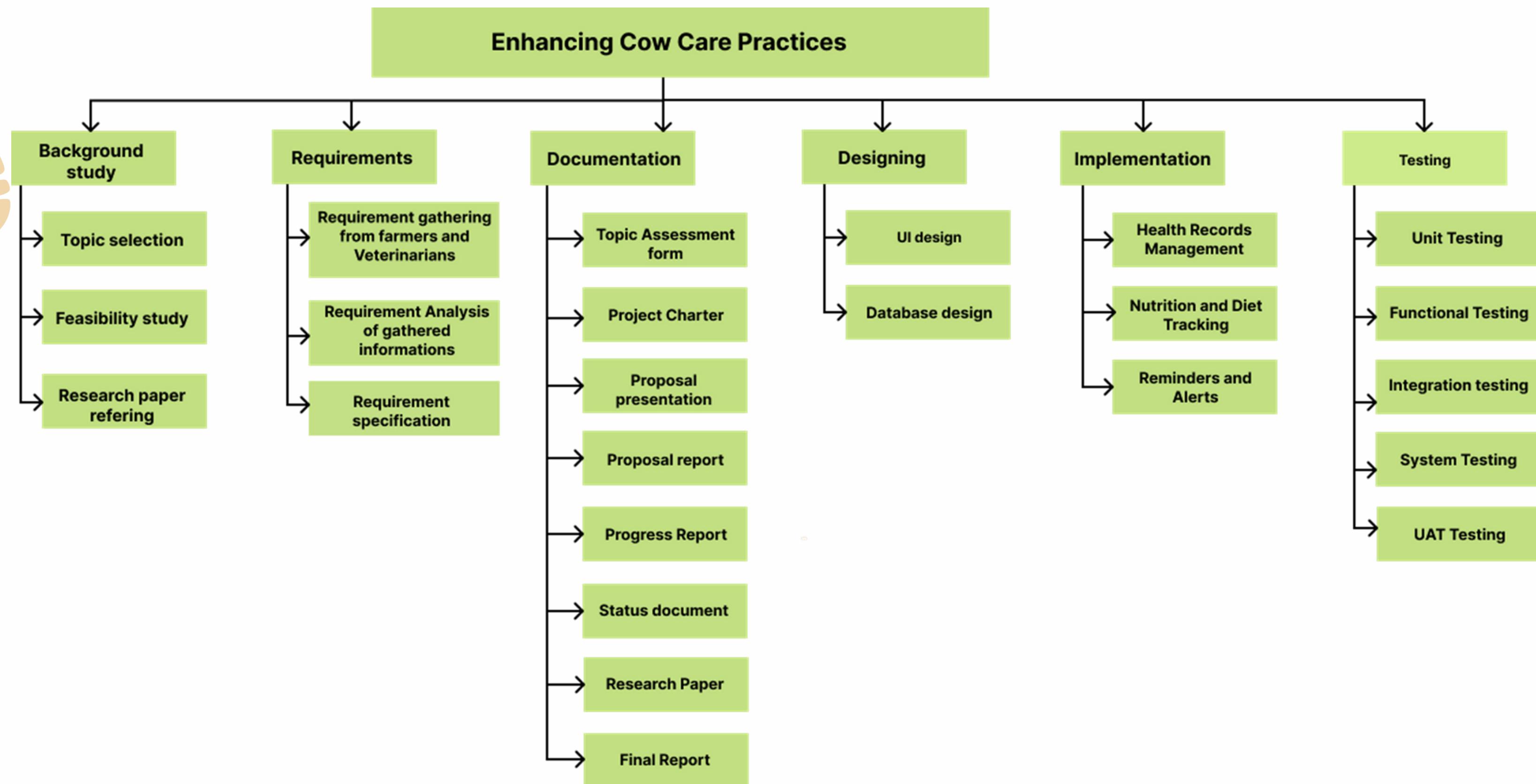
IoT sensors may provide inconsistent or noisy data because these devices are not industrial-grade equipment; I used for demonstration purposes.

- **Difficulty in Finding Suitable Sensors.**

Most sensors do not function properly, and finding reliable ones can be challenging. In Sri Lanka, the MAX30102 sensor, which is used for measuring  $\text{SpO}_2$  and heart rate, is not readily available.

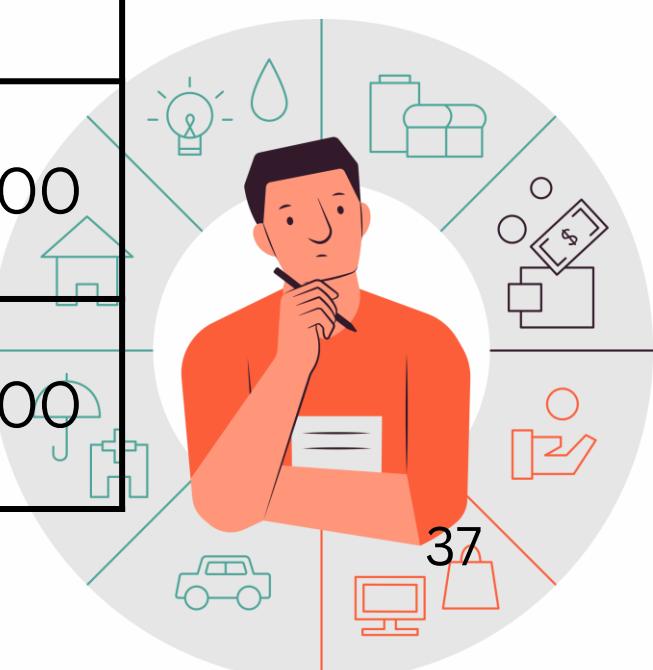


# Work breakdown structure

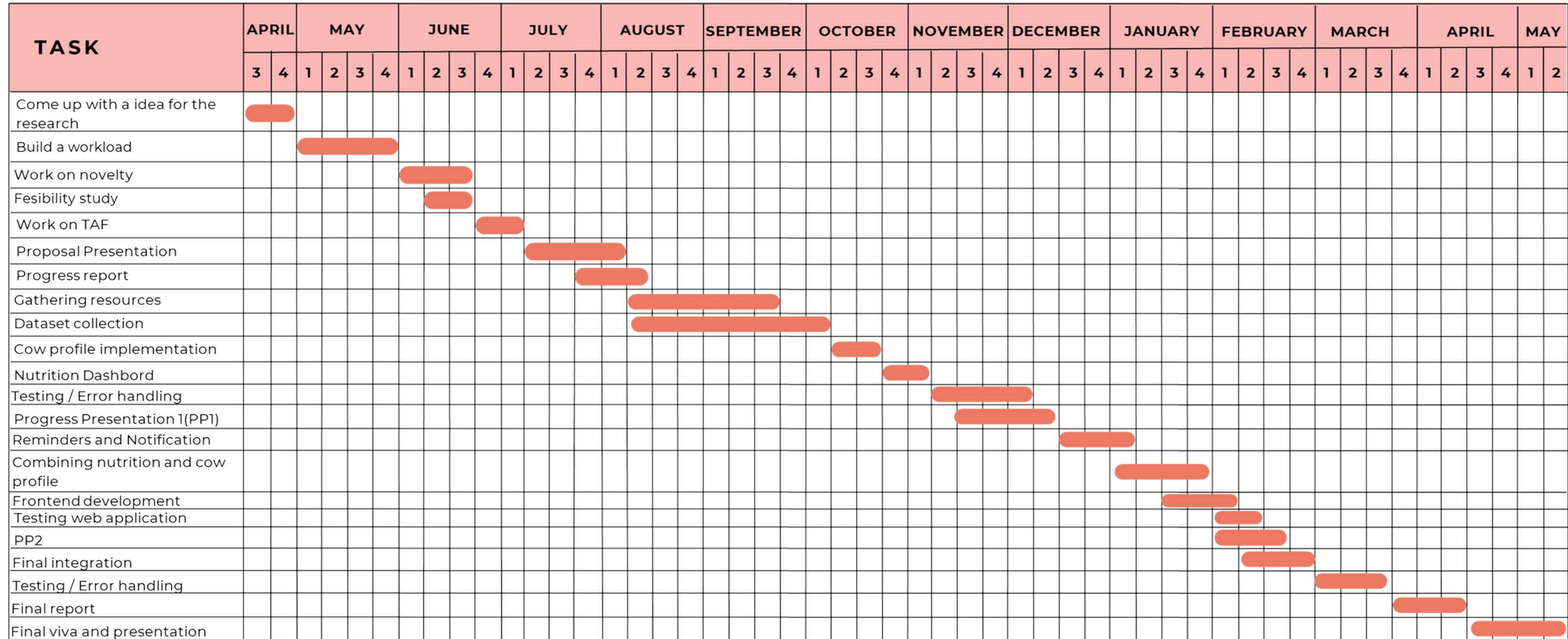


# Estimated Budget per month

	Amount (LKR)
Travel fees for data collection(Government Veterinary Surgeons Office - Homagama, District Agriculture Tranning Center Homagama)	4000.00
Internet charges (the development and technical information learning)	2500.00
Electricity	3000.00
Documentation and Printing Cost	500.00
IOT Devices	7000.00
Total	8000.00



# Gantt Chart



# References

- [1 ] Y. Altshuler, T. C. Chebach, and S. Cohen, “From microbes to methane: AI-based predictive modeling of feed additive efficacy in dairy cows,” arXiv preprint arXiv:2311.12901, Nov. 2023.
- [2 ] J. Linstädt, C. Thöne-Reineke, and R. Merle, “Animal-based welfare indicators for dairy cows and their validity and practicality: A systematic review of the existing literature,” Frontiers in Veterinary Science, vol. 10, Jul. 2024.
- [3 ] P. Monteiro, et al., “An artificial intelligence approach of feature engineering and ensemble methods depicts the rumen microbiome contribution to feed efficiency in dairy cows,” Animal Microbiome, vol. 6, no. 5, 2024.
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**IT21174162**  
**Ekanayake E.M.D.T**

**BSc. (Hons) Degree in Information Technology**  
**Specialization in Information Technology**

**Component 3 : Enhancing Dairy Farm Efficiency  
through Milk Production Prediction**



# Research Problems

- How do seasonal changes affect milk production?
- How to use past performance data to forecast future production?
- What are the economic implications of milk production predictions?



# Research Objectives

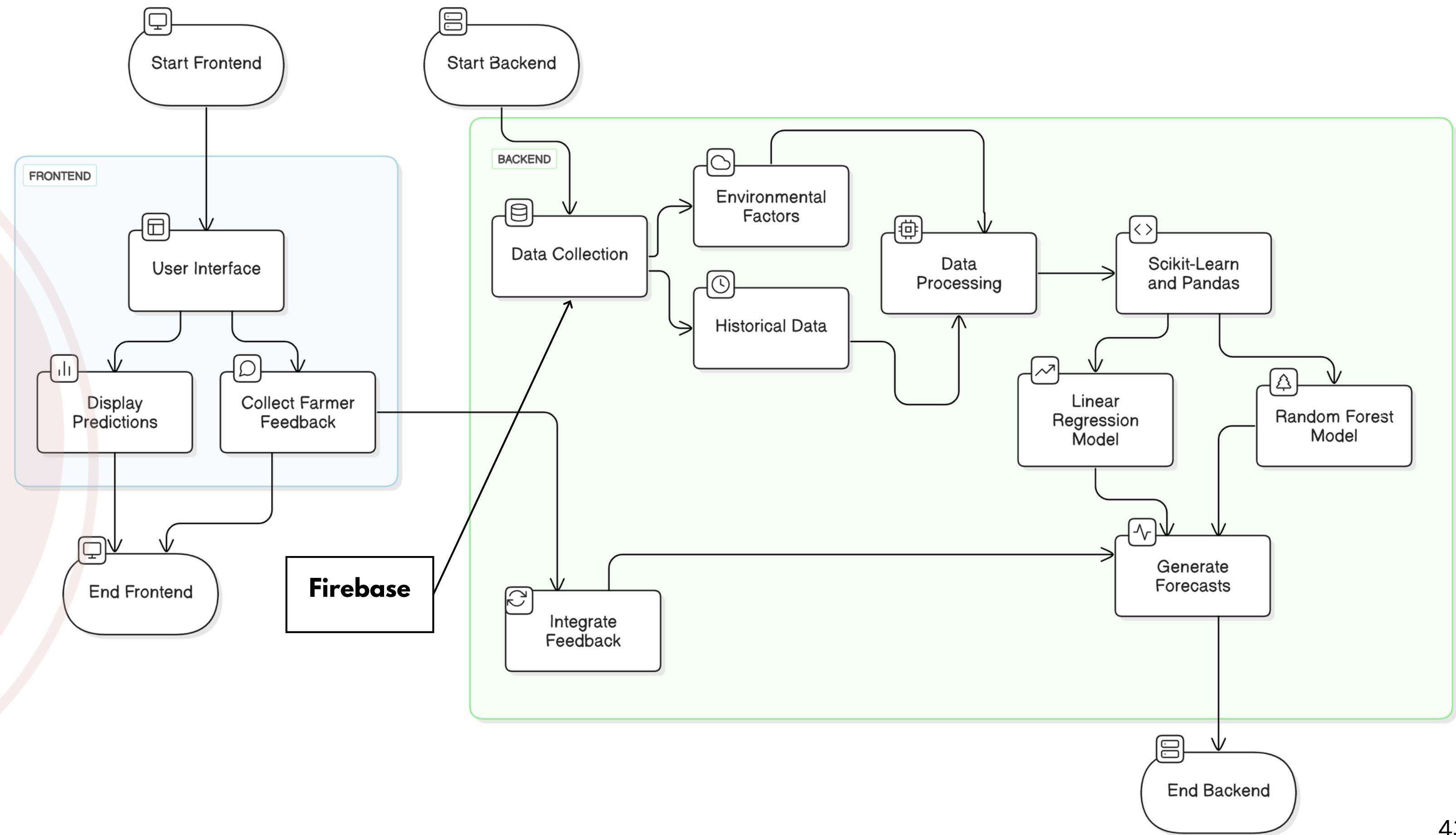
## Main Objectives

- Gather historical and real-time data on environmental factors and milk production.
- Choose suitable machine learning models and train them.
- Develop an application or dashboard that integrates the predictive model for real-time predictions.

## Sub Objectives

- ▼ Select factors like temperature, humidity, and rainfall.
- ▼ Gather historical and real-time data from weather stations, IoT devices, and farm systems.
- ▼ Train models with historical data and optimize parameters.
- ▼ Create a user-friendly dashboard that integrates the predictive model.

# Function diagram



# Research Gap

	1	2	3	4	5	6	7	8	Our Research
Data Prediction	✓	✓	✓	✓	✓	✓	✗	✗	✓
Machine Learning	✓	✓	✓	✓	✗	✗	✗	✗	✓
Weather Parameters	✗	✗	✗	✗	✗	✓	✗	✗	✓
Health Management	✗	✗	✗	✗	✓	✗	✓	✓	✓
Lactation Modeling	✓	✓	✓	✓	✗	✗	✗	✓	✓
Robotic modeling	✗	✗	✗	✓	✗	✗	✗	✗	✓
Genetic Data	✗	✓	✓	✗	✗	✗	✗	✗	✗
Data Accuracy	✓	✓	✓	✓	✓	✓	✗	✗	✓
Individualized Nutrition Plans	✓	✗	✗	✗	✗	✗	✓	✓	✓
Historical Milk Production Data	✓	✓	✓	✓	✓	✓	✗	✗	✓

# Technologies and Techniques

## Technologies

-  Python
-  React
-  TensorFlow
-  Firebase
-  VS code
-  GitHub



## Techniques

- Data Collection
- Data Cleaning
- Integrating Domain Knowledge
- Decision Trees
- Random Forests
- ARIMA (AutoRegressive Integrated Moving Average)
- Long Short-Term Memory Networks (LSTM)

# Requirements

## Functional Requirements

- Milk production prediction
- Data collection
- UI & API Integration
- Model Training
- Reporting & Analysis
- User Authentication & Authorization

## Non-Functional Requirements

- Performance
- Scalability
- Security
- Usability
- Reliability

## System Requirements

- User-friendly interfaces for data input and management.
- Notification system for reminders and alerts.
- Communication option for emergency assistance.
- Appointment scheduling system.

## Personal Requirements

- Skills in API integration and data security.
- Familiarity with veterinary practices and services.
- Proficiency in backend development and database management.

# Evidence of completion

## Data collection on Milk yeild

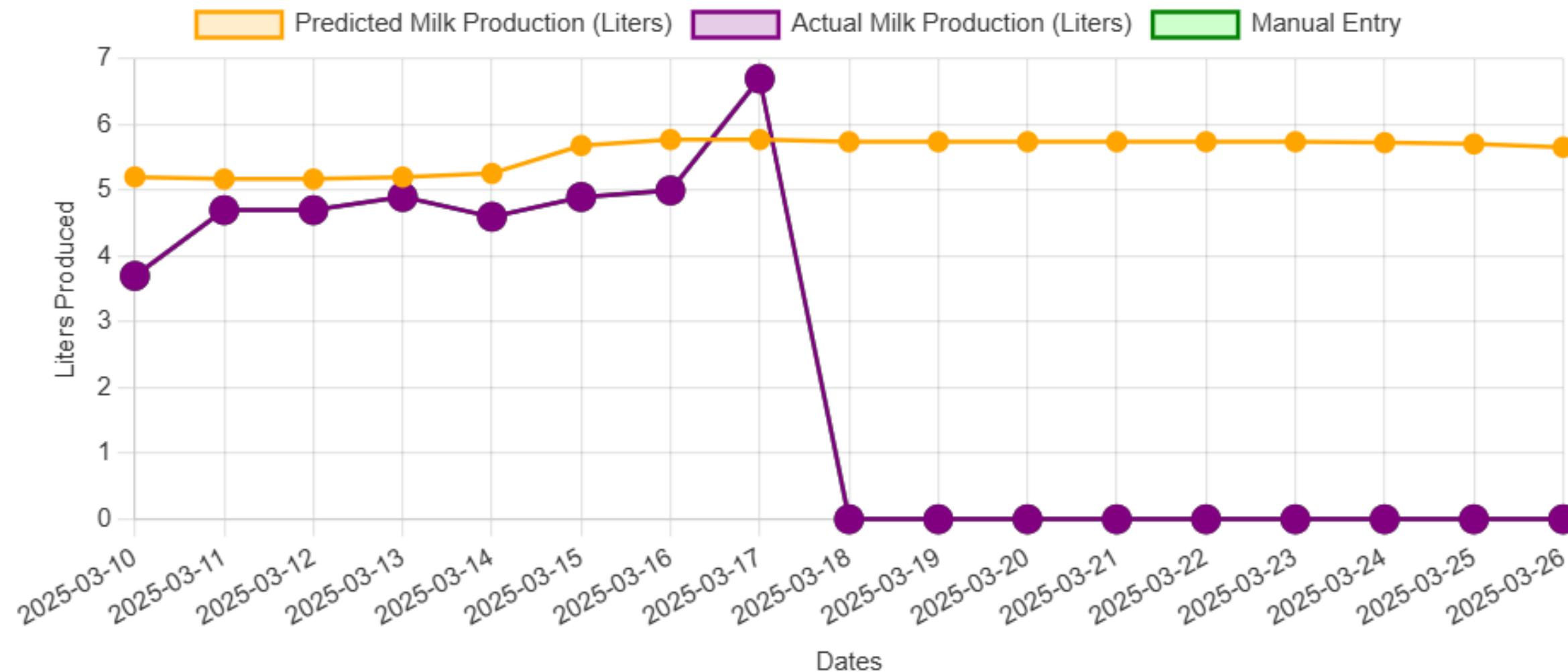
Sl No	Date	Receipt No	Quantity	FAT	SNF	Rate	Total
01/22	06/22	038912	102	102	15.3	2.8	111.84
01/23	06/23	038930	102	102	15.3	2.7	111.31
01/24	06/24	038946	102	102	16.5	2.7	117.55
01/25	06/25	038963	102	102	16.1	2.7	116.47
01/26	06/26	038982	102	102	5.3	2.6	13.78
01/27	06/27	038999	102	102	14.0	2.8	111.20
01/28	06/28	133016	102	102	15.3	2.8	111.52
01/29	06/29	133044	102	102	15.3	2.8	111.52
01/30	06/30	133052	102	102	7.3	2.8	20.44

Sl No	Days	Quantity	FAT	SNF	Rate	Total	Days	Quantity	FAT	SNF	Rate	Total
230	24/06/01	1.8				1.8	1.8					1.8
02	2.6					2.6	2.6					2.6
03	6.4					6.4	6.4					6.4
04	6.0					6.0	6.0					6.0
05	5.8					5.8	5.8					5.8
06	9.6					9.6	9.6					9.6
07	-					-	-					-
08	6.3					6.3	6.3					6.3
09	8.6					8.6	8.6					8.6
10	4.6					4.6	4.6					4.6
11	7.5					7.5	7.5					7.5
12	3.8					3.8	3.8					3.8
13	5.0					5.0	5.0					5.0
14	-					-	-					-
15	7.6					7.6	7.6					7.6
16	6.5					6.5	6.5					6.5
17	-					-	-					-
18	9.1					9.1	9.1					9.1
19	6.3					6.3	6.3					6.3
20	9.6					9.6	9.6					9.6
21	8.3					8.3	8.3					8.3
22	8.2					8.2	8.2					8.2
23	8.7					8.7	8.7					8.7
24	6.3					6.3	6.3					6.3
25	8.7					8.7	8.7					8.7
26	-					-	-					-
27	12.0					12.0	12.0					12.0
28	9.9					9.9	9.9					9.9
29	-					-	-					-
30	8.5					8.5	8.5					8.5
31	5.7					5.7	5.7					5.7

# Evidence of completion

## Milk Production Trend

### Milk Production Prediction for the Next 10 Days



## Milk Records

Feedback

03/17/2025



2.5

Add

Update

# Challenges and deviations

## DATA QUALITY & AVAILABILITY

- LIMITED HISTORICAL DATA (ONLY 5 COWS) MAY NOT GENERALIZE WELL TO LARGER HERDS.
- MISSING OR INCONSISTENT RECORDS IN TEMPERATURE, HUMIDITY, RAINFALL, OR MILK YIELD.

## ENVIRONMENTAL VARIABILITY

- SUDDEN CLIMATE SHIFTS (DROUGHTS, EXTREME HEAT, UNEXPECTED RAINFALL) MAY NOT ALIGN WITH PAST TRENDS.

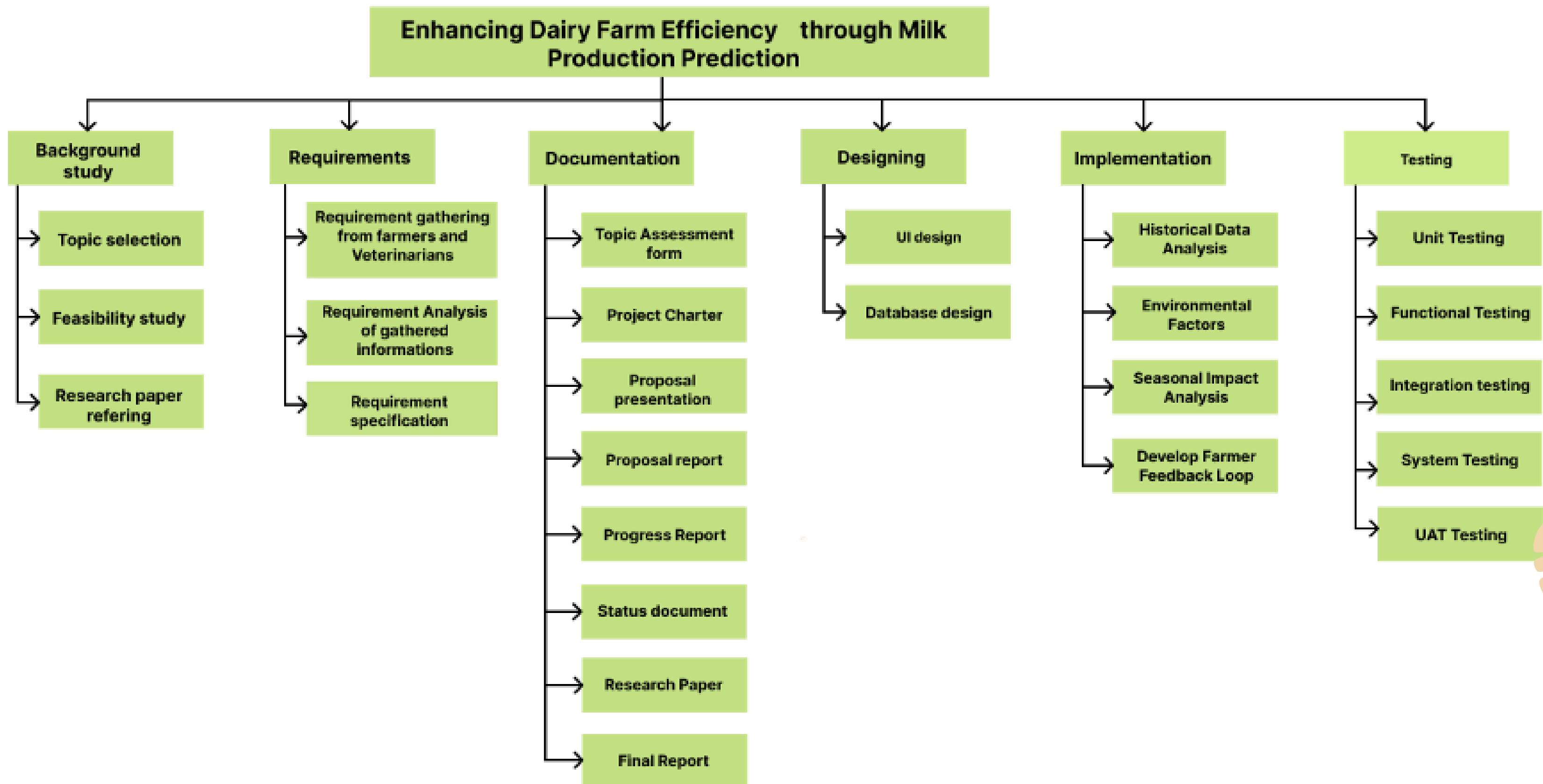
## UNEXPECTED INFLUENCES ON PRODUCTION –

- FARM MANAGEMENT CHANGES (FEEDING, MILKING SCHEDULES) MAY NOT BE REFLECTED.

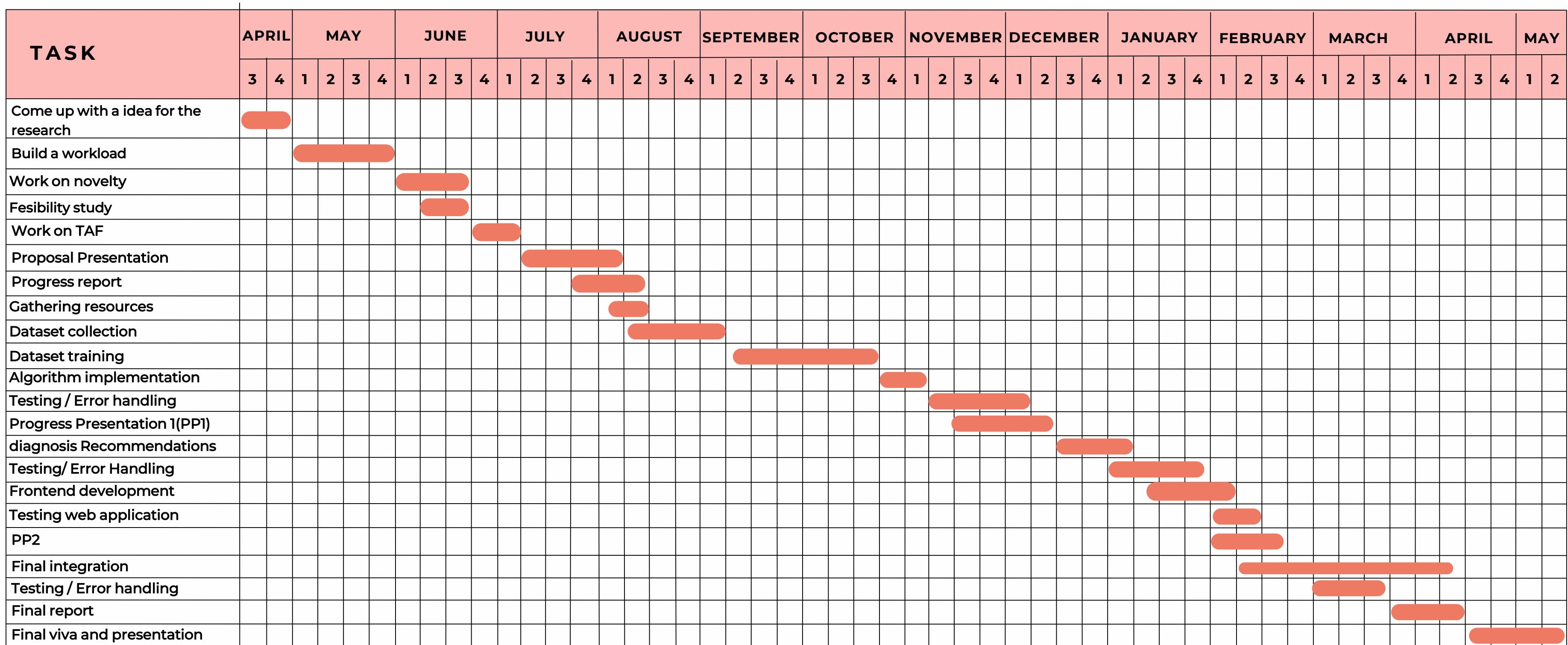
## SCALING ISSUES FOR LARGER HERDS –

- SMALL DATASET MAY NOT GENERALIZE WELL FOR LARGE-SCALE FARMS.

# Work breakdown structure



# Gantt Chart



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**IT21379956**

**Hettiarachchi V. E.**

**BSc. (Hons) Degree in Information Technology  
Specialization in Information Technology**

**Component 4 : Streamline veterinary  
communication and services**



# Research Problems

- How to find nearest available veterinarian center?
- How to find a qualitied veterinarian with good animal care service?
- What are the possible ways to schedule an appointment with the veterinarian?
- What are the better ways to communicate with a veterinarian that will be available immediately?



# Research Objectives

## *Main Objectives*

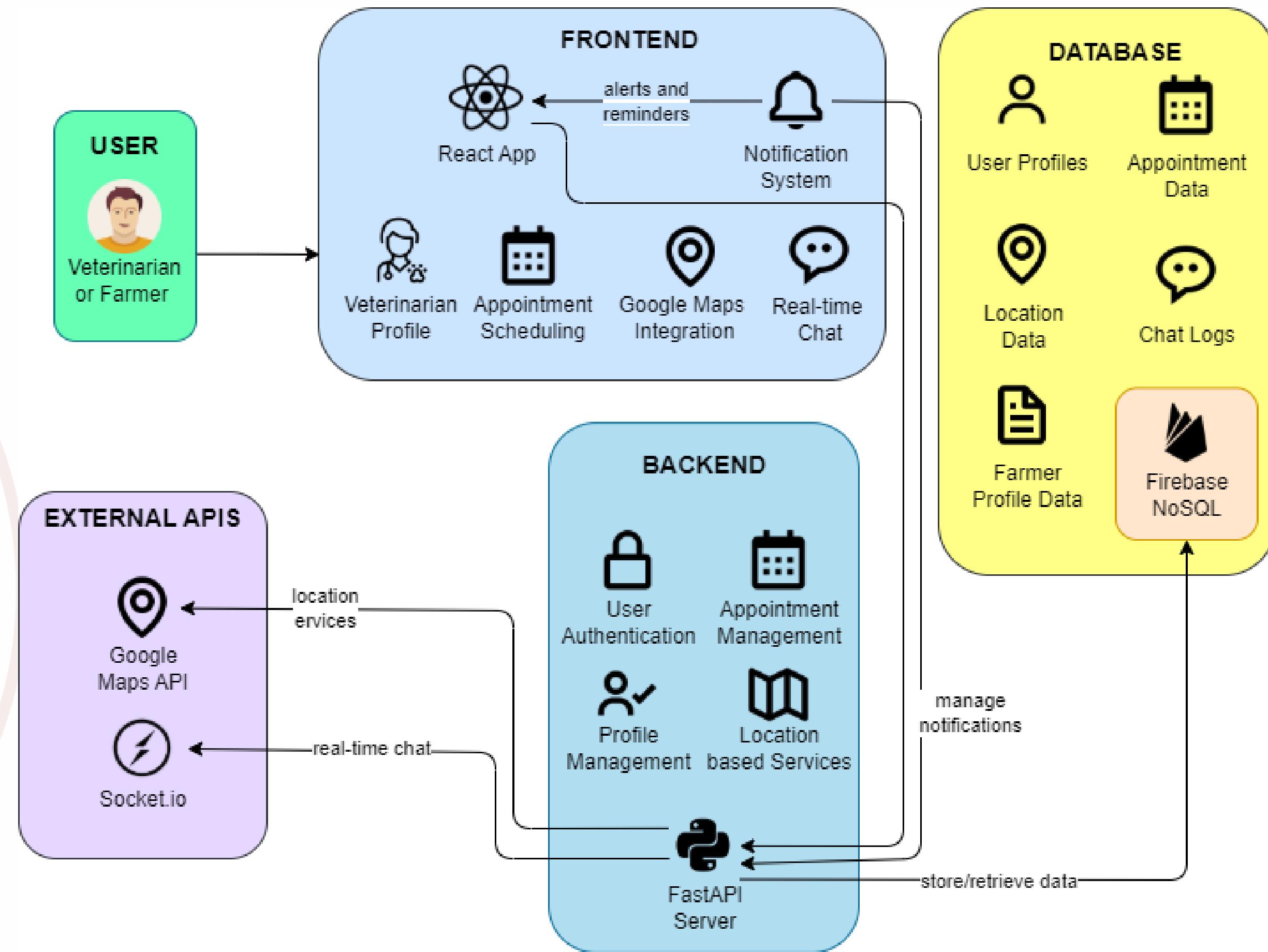
Creating an application which facilitate the ability to identify nearest available veterinarians in an emergencies and provide the support to communicate easily.

## *Sub Objectives*

- ▼ Integration of an API to locate the nearest animal hospitals.
- ▼ Communication tools for consultations and emergency support.
- ▼ Provide alerts about appointment scheduled.
- ▼ Scheduling and managing veterinary appointments.
- ▼ Veterinarian Profile Management.

Research Gap	Detect nearest location	Appointment scheduling	Chat with veterinarians	Alerts	Veterinary Profile Management
Petvet	✗	✓	✗	✗	✗
Vet2Pet	✗	✓	✓	✓	✗
DaySmart vet	✗	✓	✗	✗	✗
PetDesk	✗	✓	✓	✓	✗
Vetstoria	✗	✓	✗	✓	✗
afimilk	✗	✗	✗	✗	✗
ezyVet	✗	✗	✓	✓	✗
CowManager	✗	✗	✗	✓	✗
Our Research	✓	✓	✓	✓	✓

# Function diagram



# Technologies and Techniques

## Technologies

-  Python
-  React
-  Firebase
-  Google map
-  API
-  Postman
-  VS code
-  GitHub



## Techniques

-  User Authentication
-  Geolocation Service
-  Map customization
-  Asynchronous Data Fetching
-  Form validation
-  Notification System

# Requirements

## Functional Requirements

- Veterinary appointment scheduling option.
- Enable emergency assistance.
- Integrate API to locate nearest veterinary clinic.
- Offer real time information.
- Ensure secure transmission and data protection.

## System Requirements

- API for locating veterinarians.
- Veterinary profile management.
- Communication option for emergency assistance.
- Appointment scheduling system.

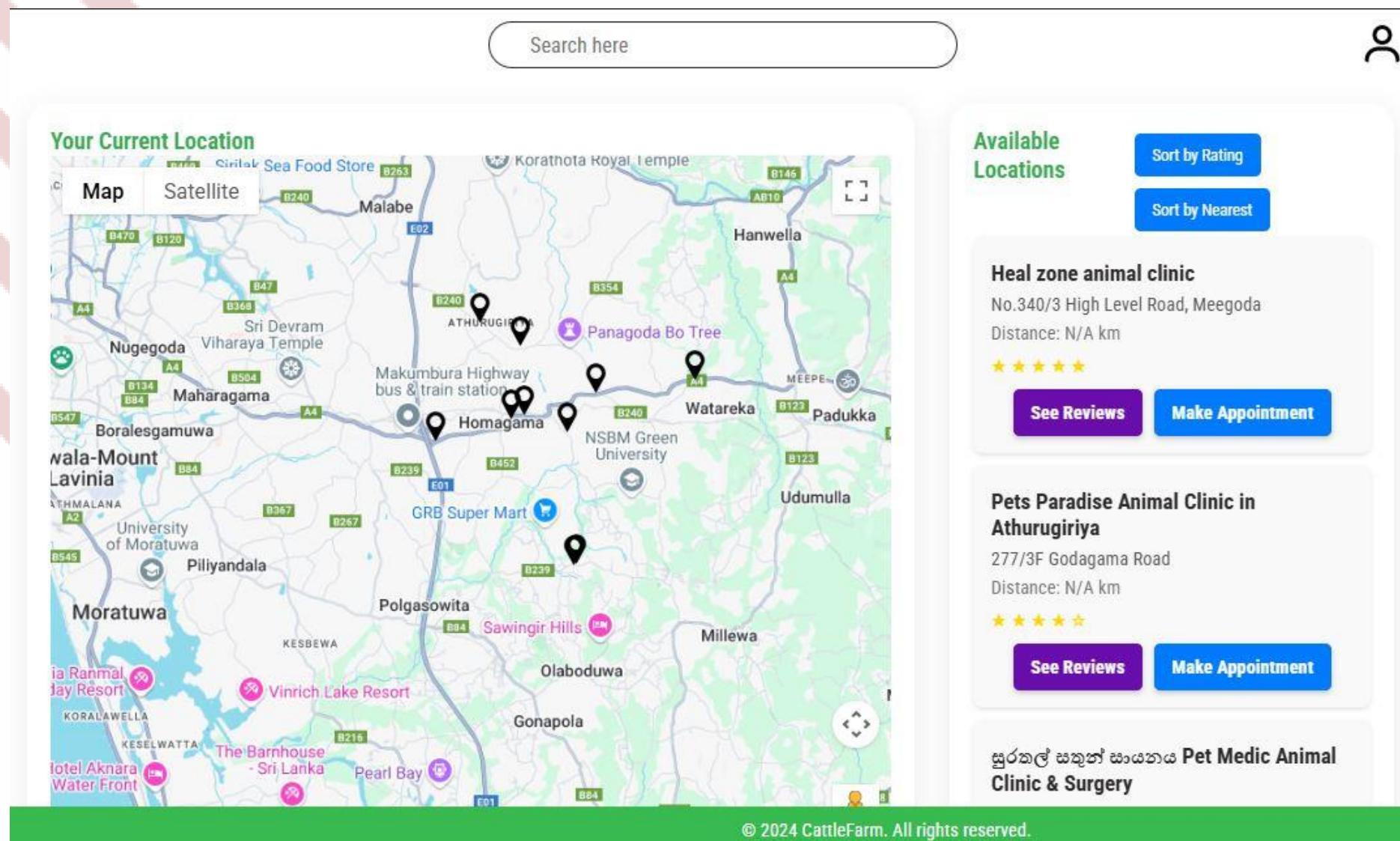
## Non-Functional Requirements

- Ensure system reliability and accessibility 24/7.
- Maintain high system availability and minimal system downtime.
- Provide latency-free communication channels for real-time interaction

## Personal Requirements

- Skills in API integration and data security.
- Familiarity with veterinary practices and services.
- Proficiency in backend development and database management.

# Evidence of completion



Search here

Your Current Location

Map Satellite

Available Locations

Sort by Rating

Sort by Nearest

Heal zone animal clinic  
No.340/3 High Level Road, Meegoda  
Distance: N/A km  
★★★★★  
See Reviews Make Appointment

Pets Paradise Animal Clinic in Athurugiriya  
277/3F Godagama Road  
Distance: N/A km  
★★★★★  
See Reviews Make Appointment

සුරතල් සංුන් සායනය Pet Medic Animal Clinic & Surgery

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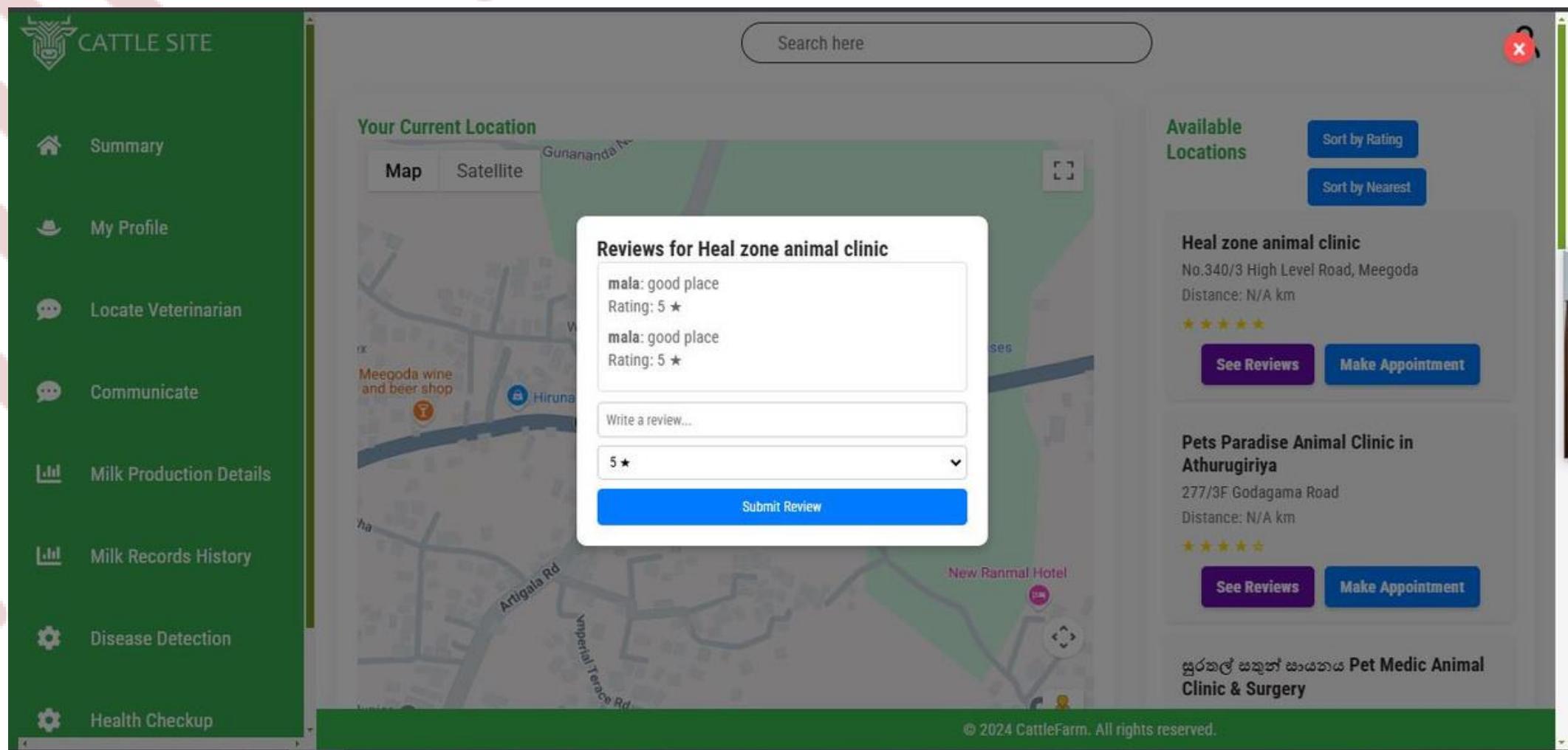
```
# Google Maps Configs
GOOGLE_API_KEY = 'AIzaSyDAsJYZSQ92_NQAz9kiSpW1XpyuCxRl_uI'
GOOGLE_PLACES_URL = "https://maps.googleapis.com/maps/api/place/nearbysearch/json"
GOOGLE_DETAILS_URL = "https://maps.googleapis.com/maps/api/place/details/json"
```

Locate veterinarians with their reviews

```
def get_nearby_locations(latitude: float, longitude: float, radius: int = 5000):
    location = f"{latitude},{longitude}"
    params = {
        "location": location,
        "radius": radius,
        "type": "veterinary_care",
        "key": GOOGLE_API_KEY
    }
    response = requests.get(GOOGLE_PLACES_URL, params=params)

    if response.status_code == 200:
        data = response.json()
        locations = []
```

# Evidence of completion



```
class Review(BaseModel):
    author_name: str
    rating: int
    text: str
    location_name: str
    polarity: Optional[float] = None

outlets_db = {}
outlet_ref = db.collection("outlets")

def analyze_sentiment(text: str) -> float:
    """Calculate polarity score using TextBlob"""
    return TextBlob(text).sentiment.polarity if text else 0.0

@app.post("/submit_review")
async def submit_review(review: Review):
    try:
        # Calculate polarity score
        review.polarity = analyze_sentiment(review.text)

        # Save review to Firestore
        review_data = review.dict()
        db.collection("reviews").add(review_data)

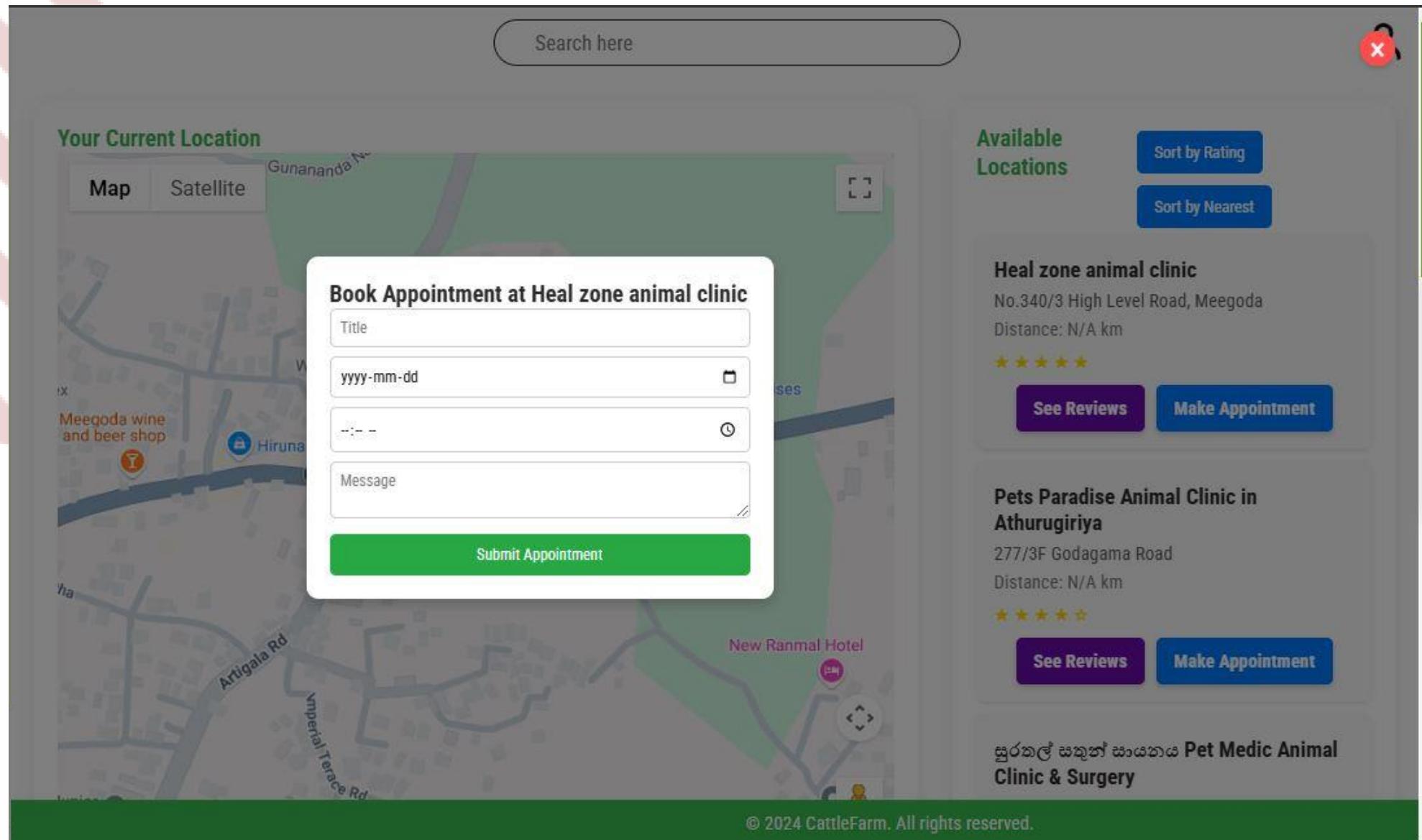
        return {"message": "Review submitted successfully"}
    except Exception as e:
        raise HTTPException(status_code=500, detail=str(e))

class PlaceDetails(BaseModel):
    name: str
```

```
>
  <button
    onClick={(e) => {
      e.stopPropagation();
      setSelectedLocation(location);
      setShowReviewsPopup(true);
    }}
    style={{
      backgroundColor: "#6a0dad", // Purple
      color: "#fff",
      border: "1px solid #6a0dad",
      padding: "10px 20px",
      borderRadius: "5px",
      cursor: "pointer",
      text-decoration: "none",
      width: "100px",
      margin: "10px auto",
    }}
  > View Details </button>
```

Reviewing the veterinarians' service

# Evidence of completion



## Appointment scheduling

```
# Appointment
class Appointment(BaseModel):
    title: str
    date: str # Stored in "YYYY-MM-DD" format
    time: str # Stored as a string, e.g., "14:30"
    message: str | None = None
    username: str # Dummy user field
    accepted: bool = False # Default value

# Function to sort by latest date
def sort_appointments_by_date(appointments):
    return sorted(appointments, key=lambda x: x["date"], reverse=True)

# ✅ Endpoint to Create an Appointment
@app.post("/appointments")
async def create_appointment(appointment: Appointment):
    try:
        appointment_data = appointment.dict()
        doc_ref = db.collection("appointments").document()
        doc_ref.set(appointment_data)

        return {"message": "Appointment created successfully", "appointment_id": doc_ref.id}
    except Exception as e:
        error_trace = traceback.format_exc()
        print(f"Error: {e}\nTraceback:\n{error_trace}")
        raise HTTPException(status_code=500, detail="Internal server error")

# ✅ Endpoint to Get All Appointments (Sorted by Date)
@app.get("/appointments", response_model=List[Appointment])
async def get_all_appointments():
    try:
        appointments_ref = db.collection("appointments").stream()
```

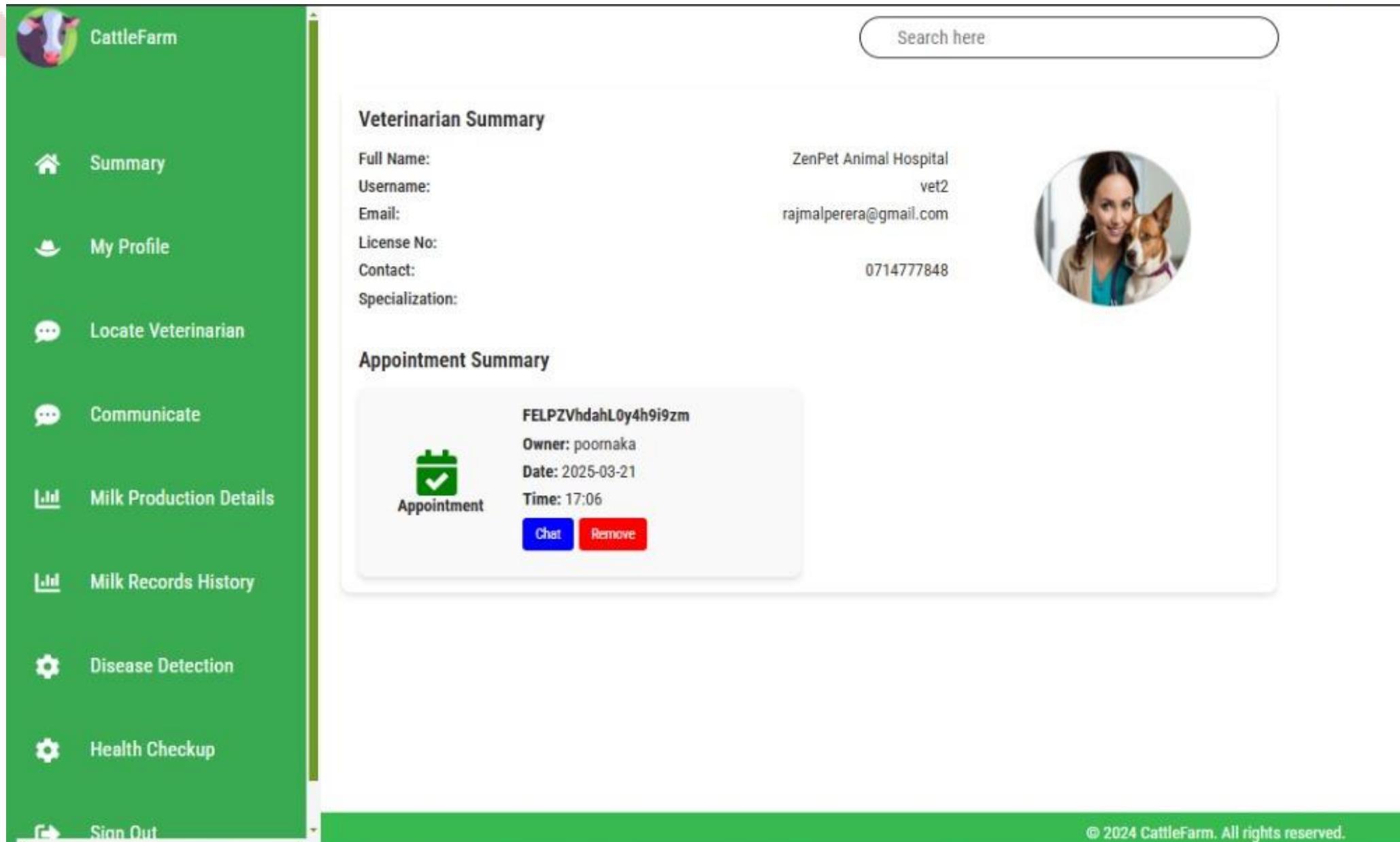
# Evidence of completion



**Emergency consultation  
by communication**

```
5  # Setup Redis for storing chat messages
6  redis_client = redis.Redis(host="localhost", port=6379, db=0, decode_responses=True)
7
8  # Function to save messages in Redis
9  def save_message(room, message):
10     chat_key = f"chat:{room}"
11     redis_client.rpush(chat_key, json.dumps(message))
12
13  # Function to retrieve chat history from Redis
14  def get_chat_history(room):
15     chat_key = f"chat:{room}"
16     return [json.loads(msg) for msg in redis_client.lrange(chat_key, 0, -1)]
17
18  # Function to initialize the chat system with FastAPI app
19  def init_chat(app):
20     socket_manager = SocketManager(app=app, cors_allowed_origins="*")
21
22     @socket_manager.on("connect")
23     async def connect(sid, environ):
24         print(f"Client {sid} connected")
25
26     @socket_manager.on("join_room")
27     async def join_room(sid, data):
28         room = data["room"]
29         chat_history = get_chat_history(room)
30         await socket_manager.emit("chat_history", chat_history, room=sid)
31
32     @socket_manager.on("send_message")
33     async def send_message(sid, data):
34         room = data["room"]
35         message = {"user": data["user"], "message": data["message"]}
36         save_message(room, message)
```

# Evidence of completion



The screenshot shows the CattleFarm Veterinary Profile Management interface. The left sidebar is green and contains the following menu items:

- Summary
- My Profile
- Locate Veterinarian
- Communicate
- Milk Production Details
- Milk Records History
- Disease Detection
- Health Checkup
- Sign Out

The main content area has a white background. At the top right is a search bar with the placeholder "Search here". Below it is a "Veterinarian Summary" section with the following details:

Full Name:	ZenPet Animal Hospital
Username:	vet2
Email:	rajmalperera@gmail.com
License No:	
Contact:	0714777848
Specialization:	

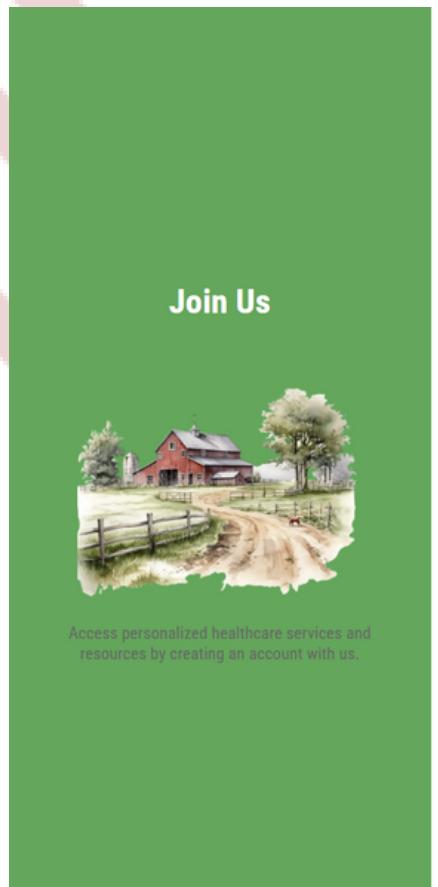
Next to the details is a circular profile picture of a woman holding a dog. Below this is an "Appointment Summary" section for an appointment with the ID FELPZVhdahL0y4h9i9zm:

 Appointment	FELPZVhdahL0y4h9i9zm
Owner:	poornaka
Date:	2025-03-21
Time:	17:06

At the bottom of the main content area is a green footer bar with the text "© 2024 CattleFarm. All rights reserved."

## Veterinary Profile Management

# Evidence of completion



Join Us

Access personalized healthcare services and resources by creating an account with us.

**Create an Account**

Username: Ehaneevet

Full Name: Ehanee Hettiarachchi

Address: Mattegoda

NIC: 99527273V

Role: **Veterinarian**

Farmer

Veterinarian

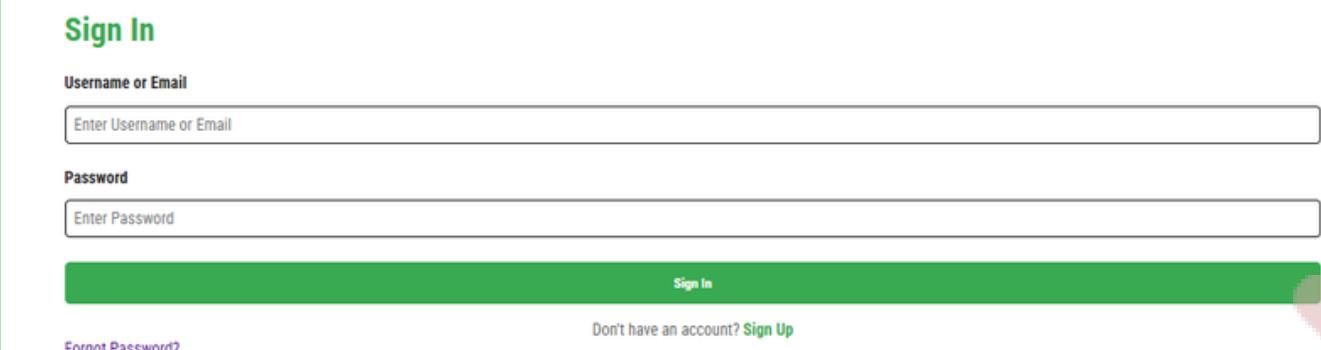
Agricultural Consultant

Supplier

Password:  Confirm Password:

I agree to the Terms & Conditions

**Sign Up**



**Sign In**

Username or Email:  Enter Username or Email

Password:  Enter Password

**Sign In**

Forgot Password?

Don't have an account? [Sign Up](#)

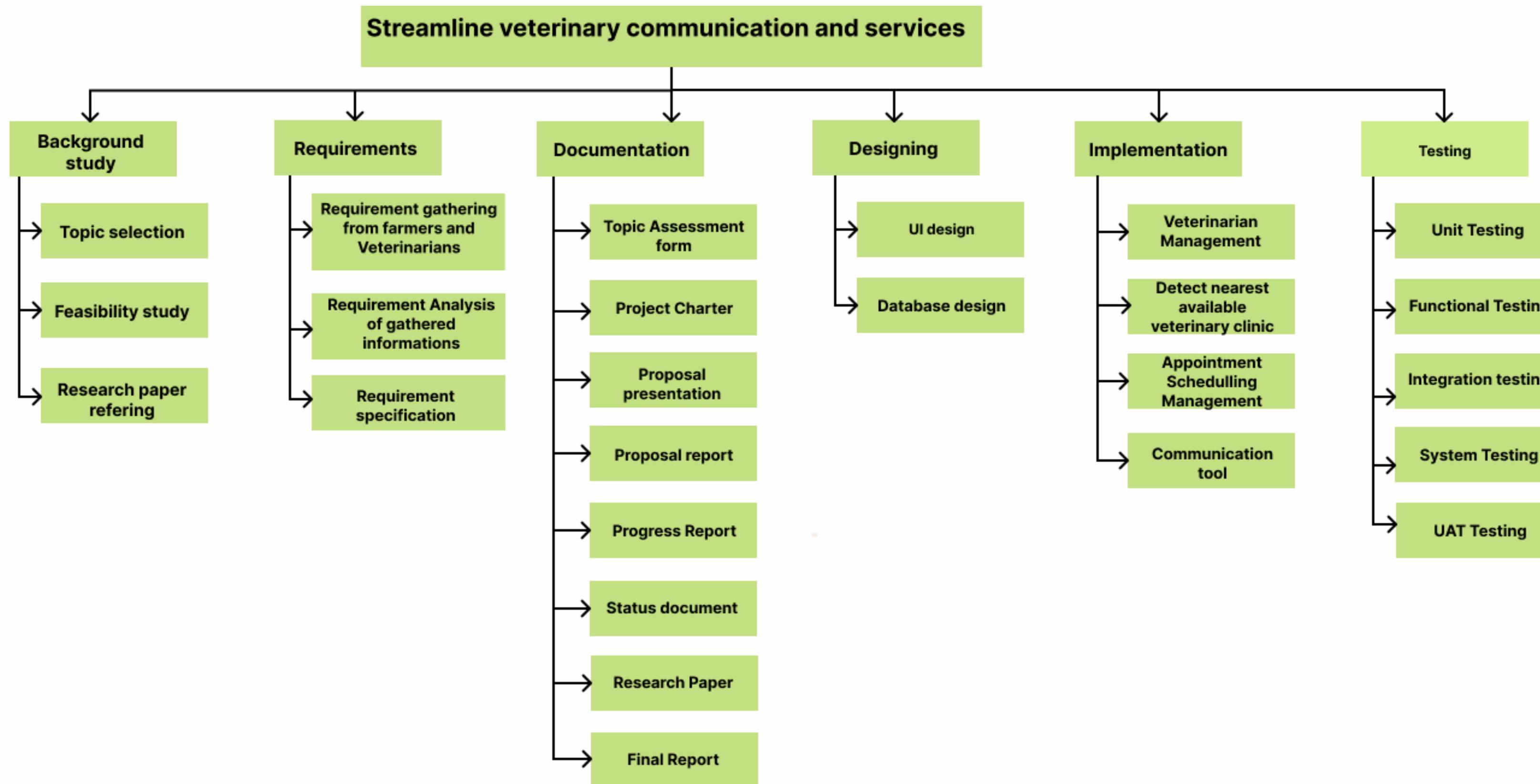
**Sign Up (Join now)**

**Sign in (Login)**

# Challenges and deviations

- Getting reviews from the google using Business API
- Difficulty in analyzing reviews which are in languages other-than English.
- Difficulty in accessing real details of available veterinary clinics.

# Work breakdown structure

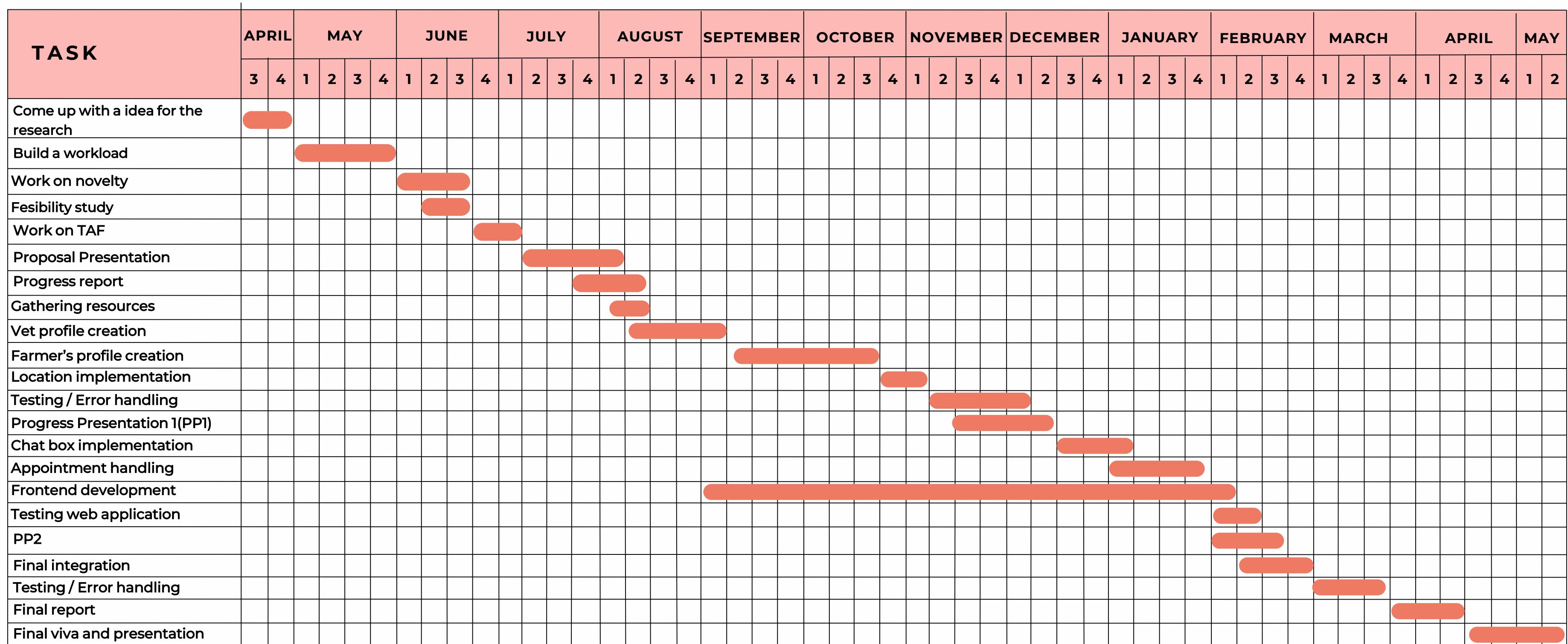


# Estimated Budget per month

	Amount (LKR)
Travel fees for data collection(Government Veterinary Surgeons Office - Homagama, District Agriculture Tranning Center Homagama)	2500.00
Internet charges (the development and technical information learning)	3000.00
Electricity	4000.00
Documentation and Printing Cost	500.00
Total	10000.00



# Gantt Chart



# References

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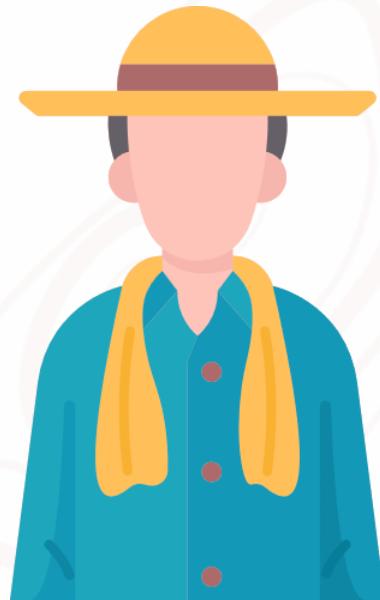
# Market Need

- The agricultural industry, particularly dairy farming, is constantly seeking ways to improve productivity, animal welfare, and operational efficiency.
- Current challenges such as delayed disease detection, inefficient cow care practices, and lack of predictive tools for milk production create a substantial demand for advanced technological solutions.
- Our application meets these needs by providing a comprehensive and user-friendly platform that integrates multiple functionalities.



# Target Market

## Dairy Farmers



Primary users who will benefit from improved disease detection, personalized cow care, and accurate milk production predictions.

## Agricultural Enterprises

Companies involved in livestock management and dairy production, looking to optimize their operations and improve productivity

## Veterinarians

Professionals who require efficient tools for managing appointments, accessing health records, and providing timely advice and support.



## Animal Health Organizations



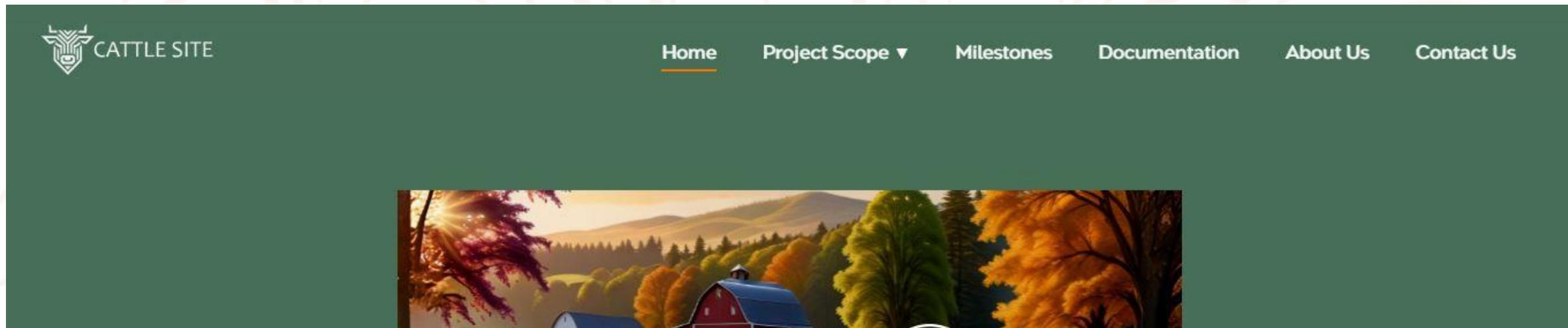
Institutions focused on animal welfare and health, seeking advanced tools to monitor and improve livestock health.

# Commercialization

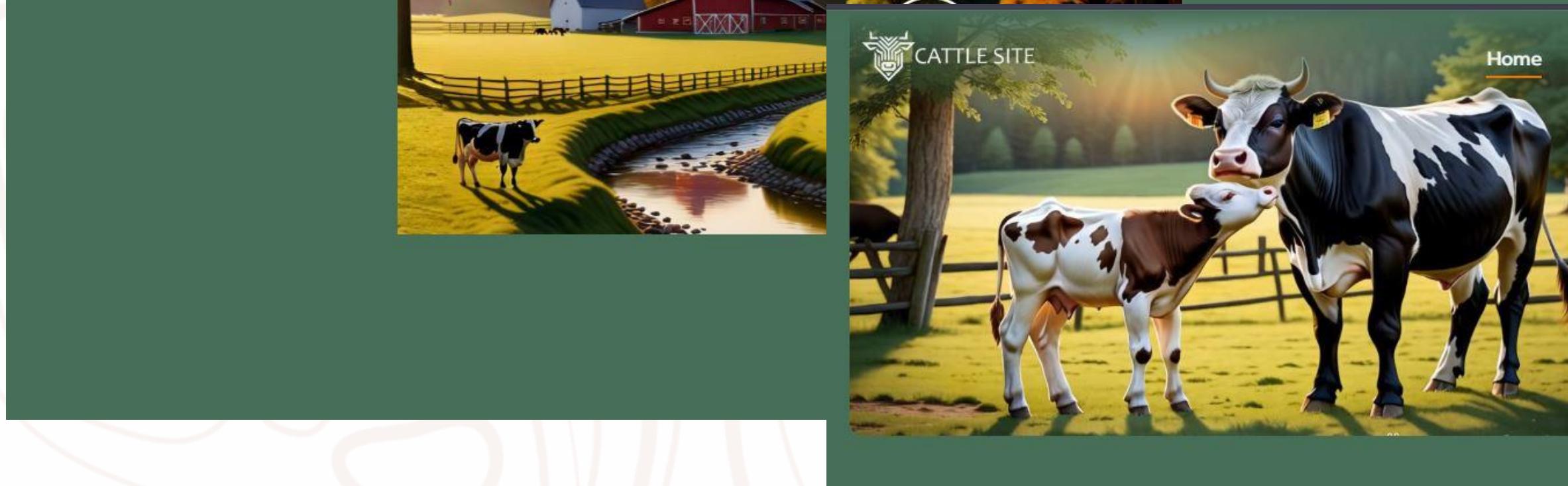
- Online Platform: Primary distribution through a dedicated website
- Initial Launch: Focus on regions with high dairy farming activity
- Subscription-Based: Offer monthly and annual subscription plans for farmers and veterinarians. (LKR 200.00 for month)
- Digital Marketing: Utilize social media and email campaigns to reach target audiences.

# Future Work

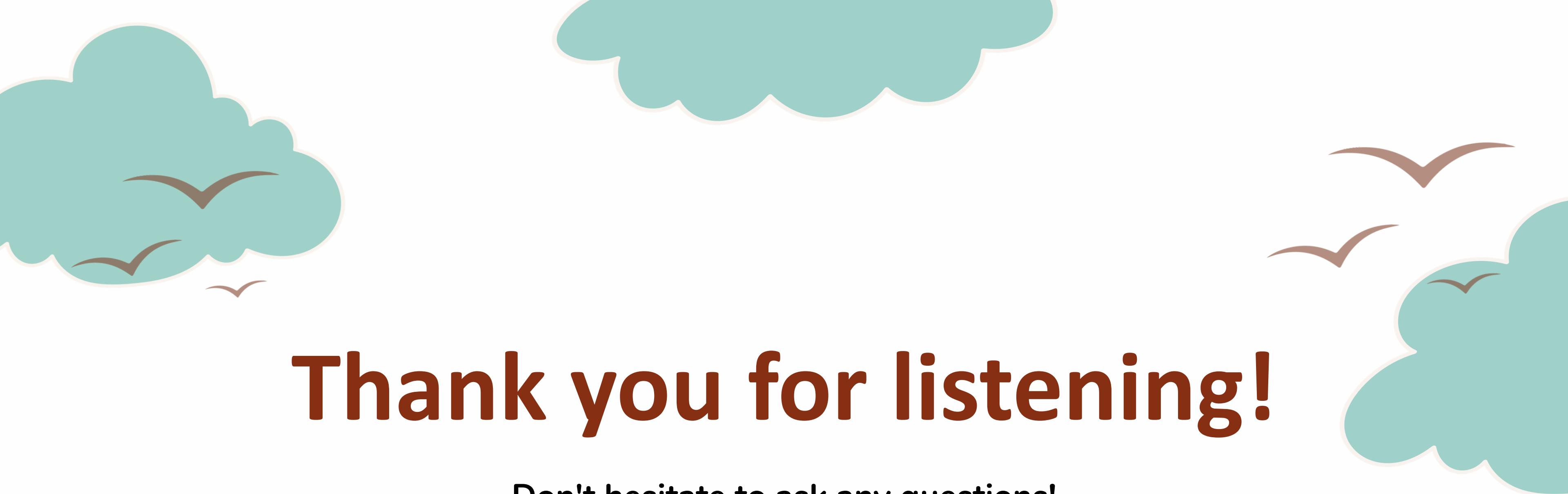
Commercialization of the application



<https://cattle-site.vercel.app/>



Cattle Statistics in Sri Lanka



# Thank you for listening!

Don't hesitate to ask any questions!

