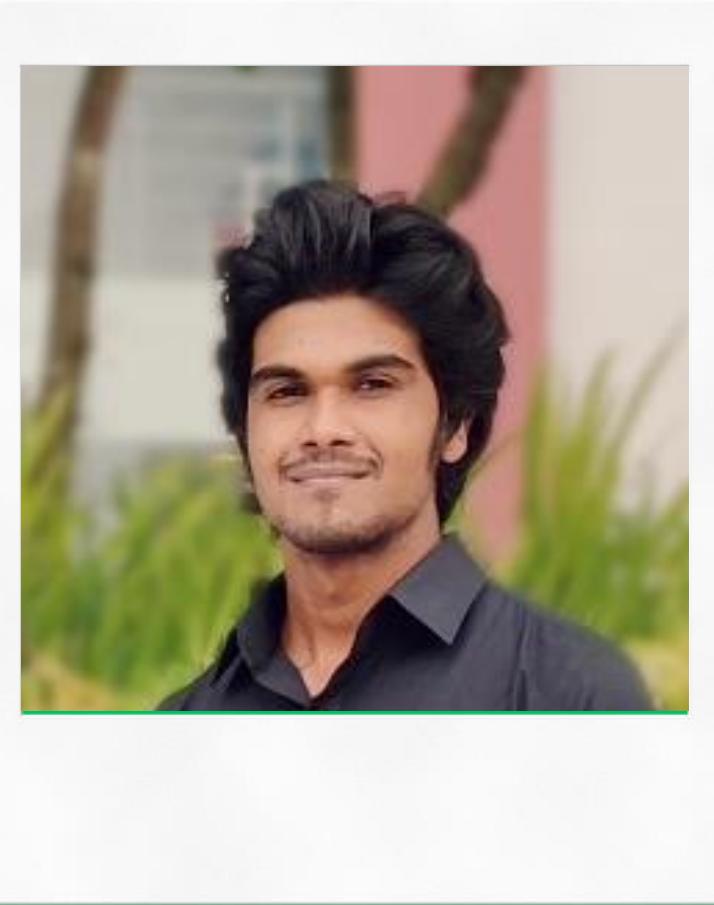


# Integrated Veterinary Application for Enhanced Cow Health Management

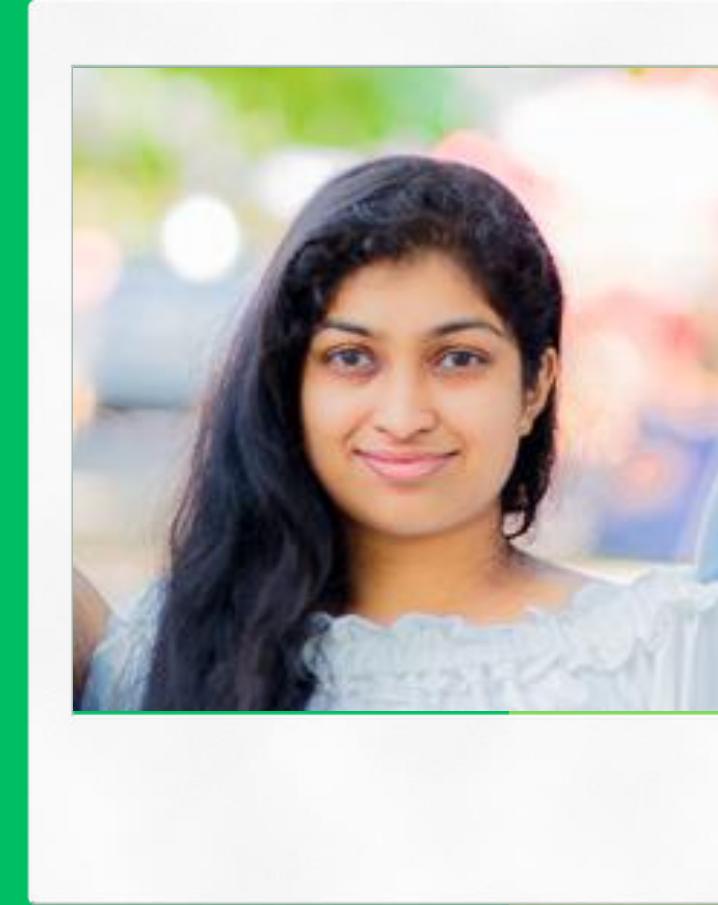
PROJECT ID: 24-25J-  
085



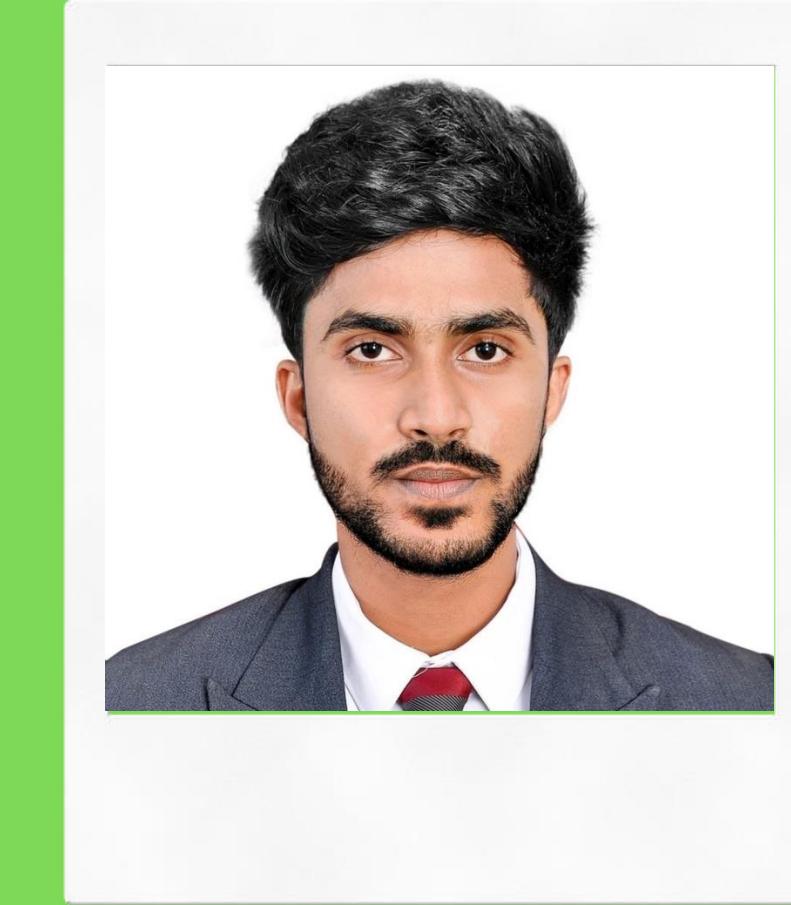
# Our Team..



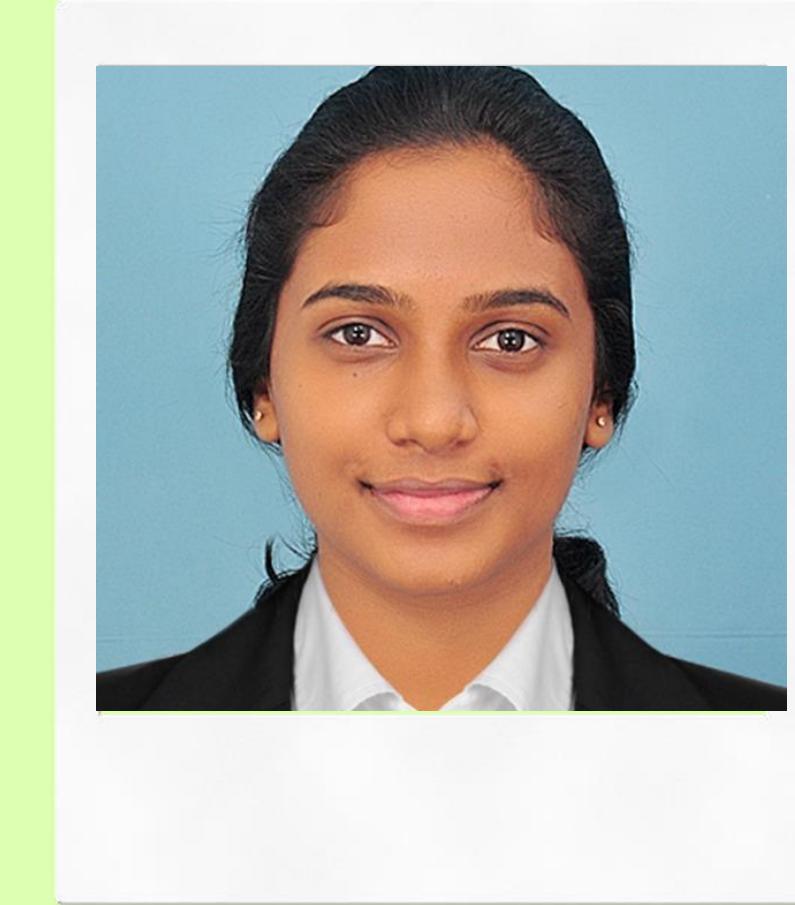
**Perera L.P.S.R**  
IT21381218



**Hettiarachchi V.E**  
IT21379956



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



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

## Brief Overview of the Project

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.

## Goals of the Project

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

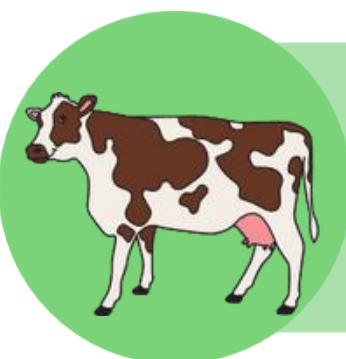
- Difficulty in early disease detection
- Limited access to reliable diagnostic tool
- Inadequate tracking of health and nutritional data
- Lack of proper method to reach an available veterinarian in an emergency



# Project Objectives



Enhance disease detection and prevention



Improve cow care practices



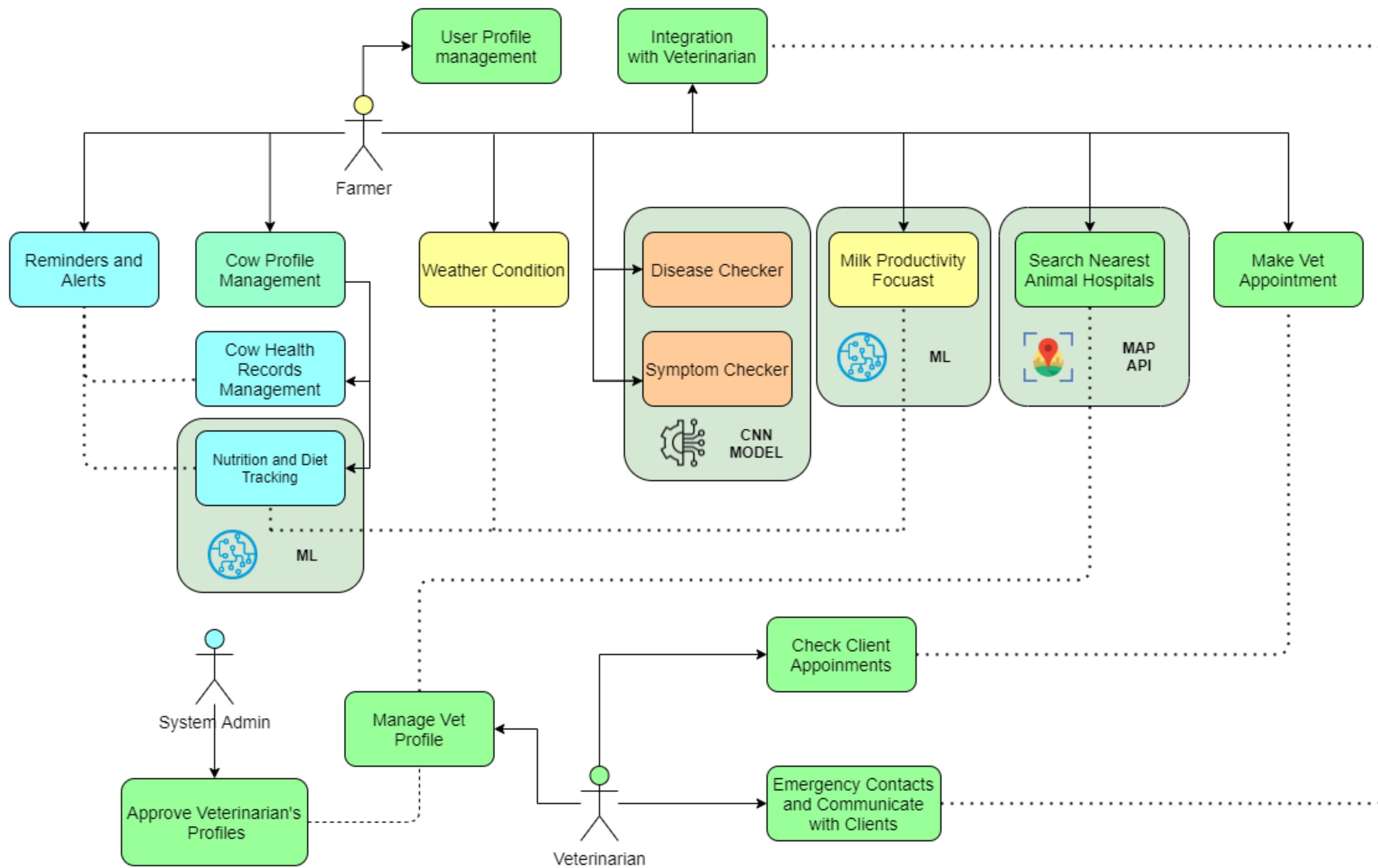
Predict milk production



Streamline veterinary communication and services



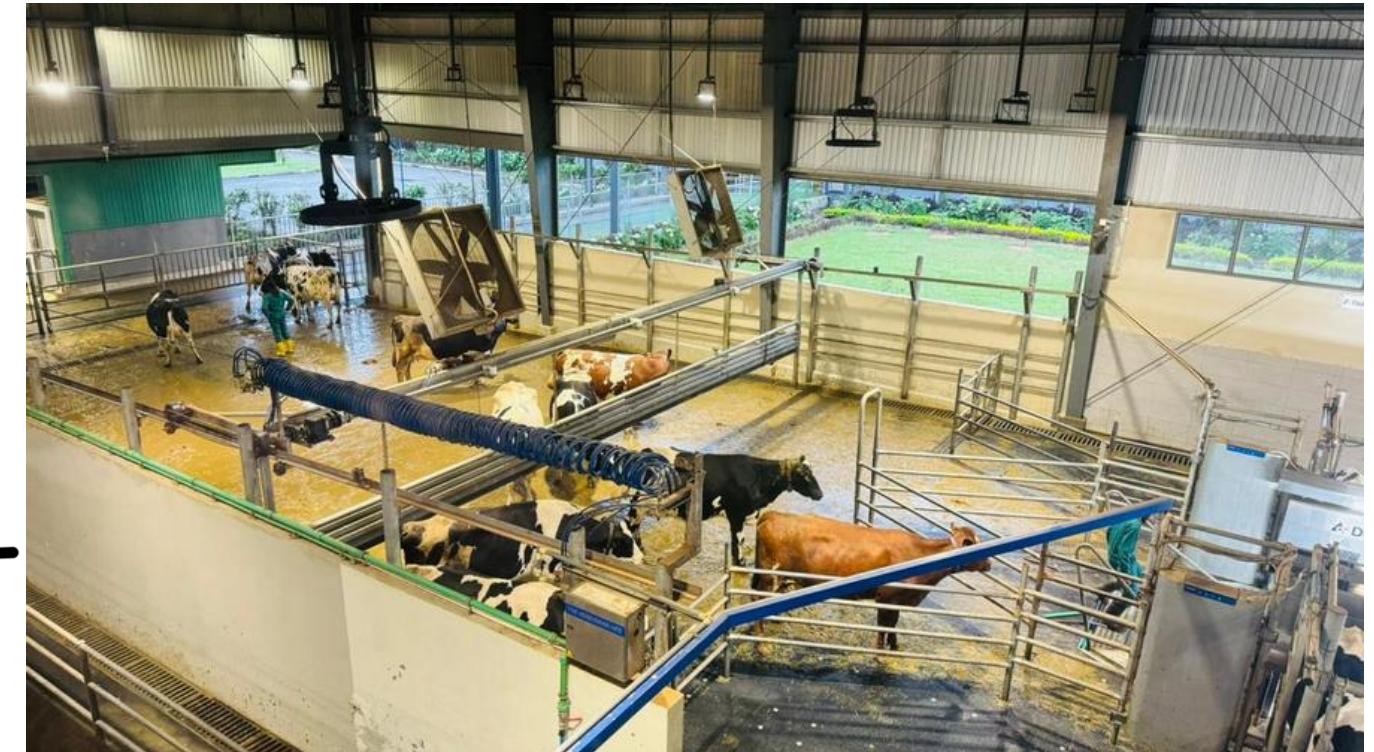
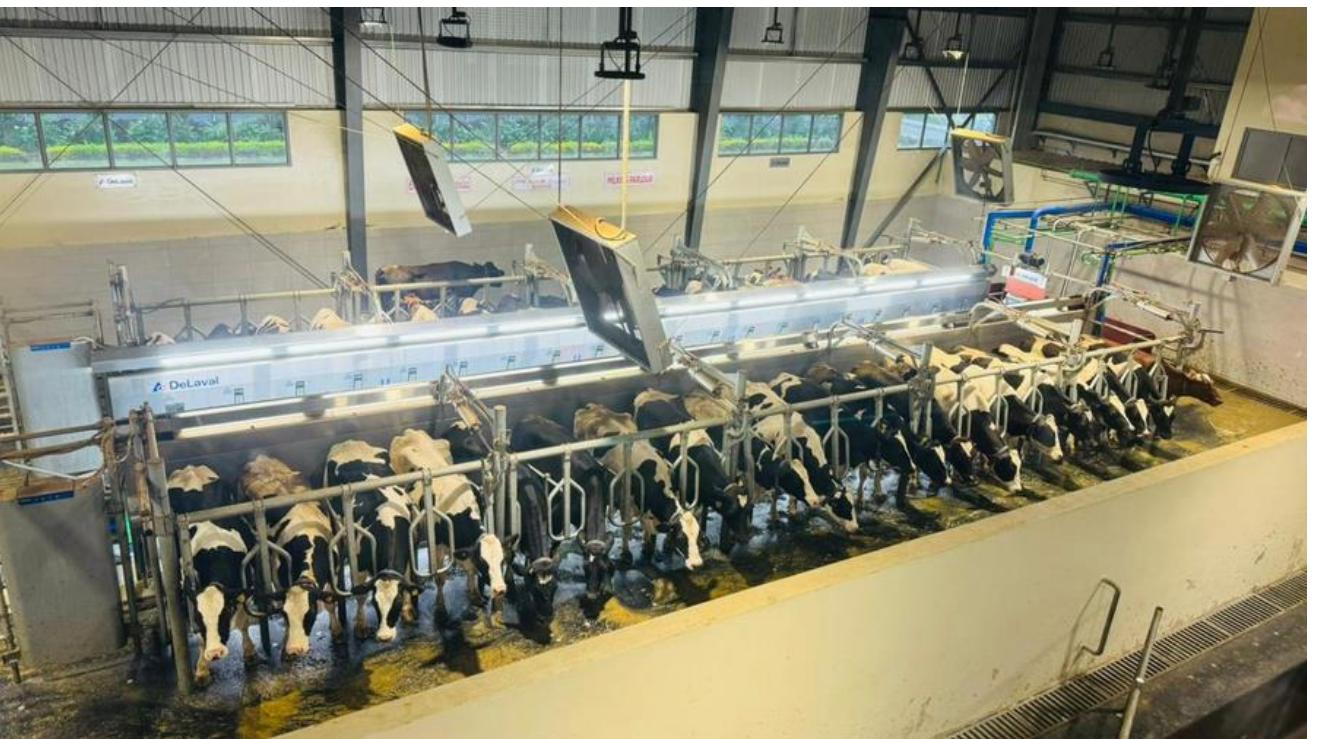
# Overall System diagram



# Field Visits

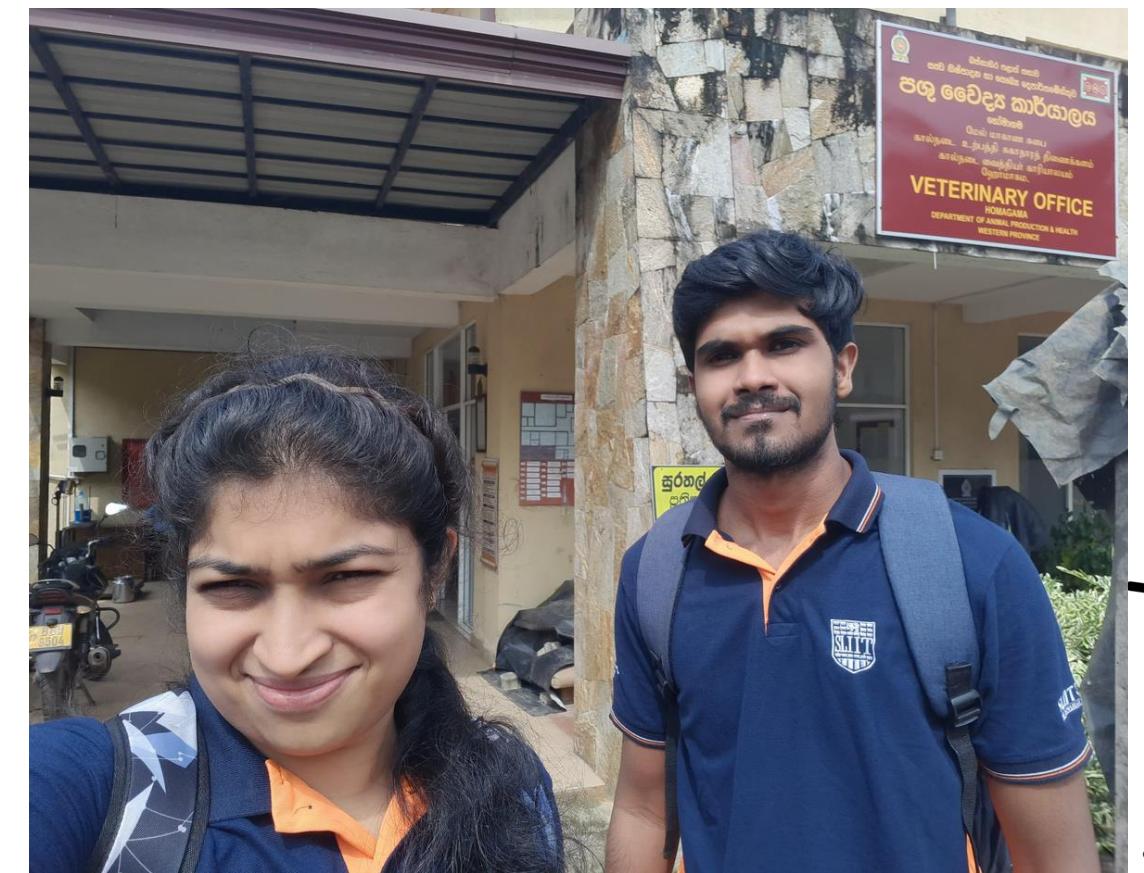


## Ambewela Farm



24-25J-085

# Government Veterinary Surgeons Office - Homagama



# District Agriculture Tranning Center Homagama



24-25J-085

# **IT21381218**

## **Perera L. P. S. R**

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

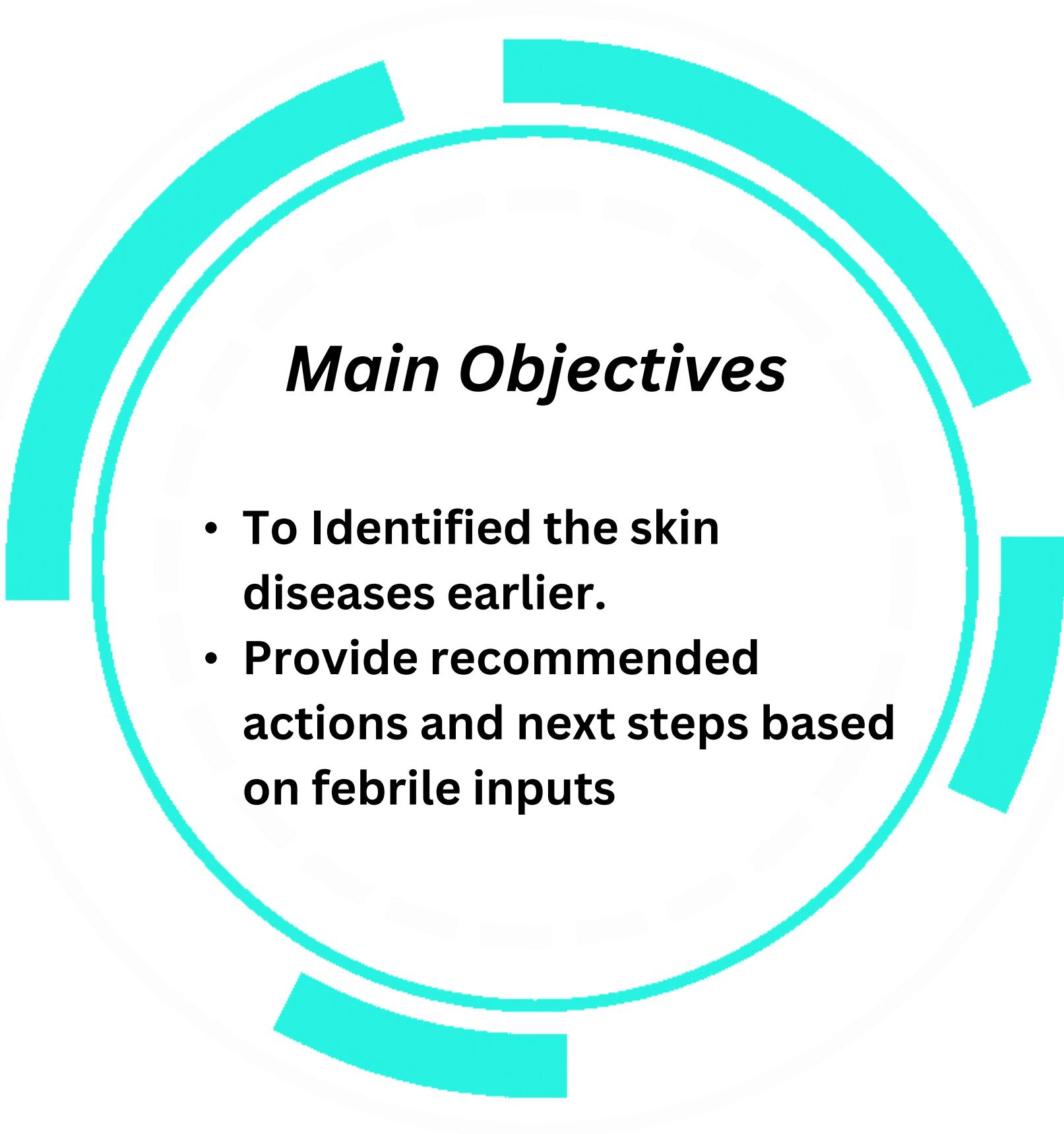
**Component 1 : Disease Detection and Prevention**



# Research Question

- 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?





## ***Main Objectives***

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

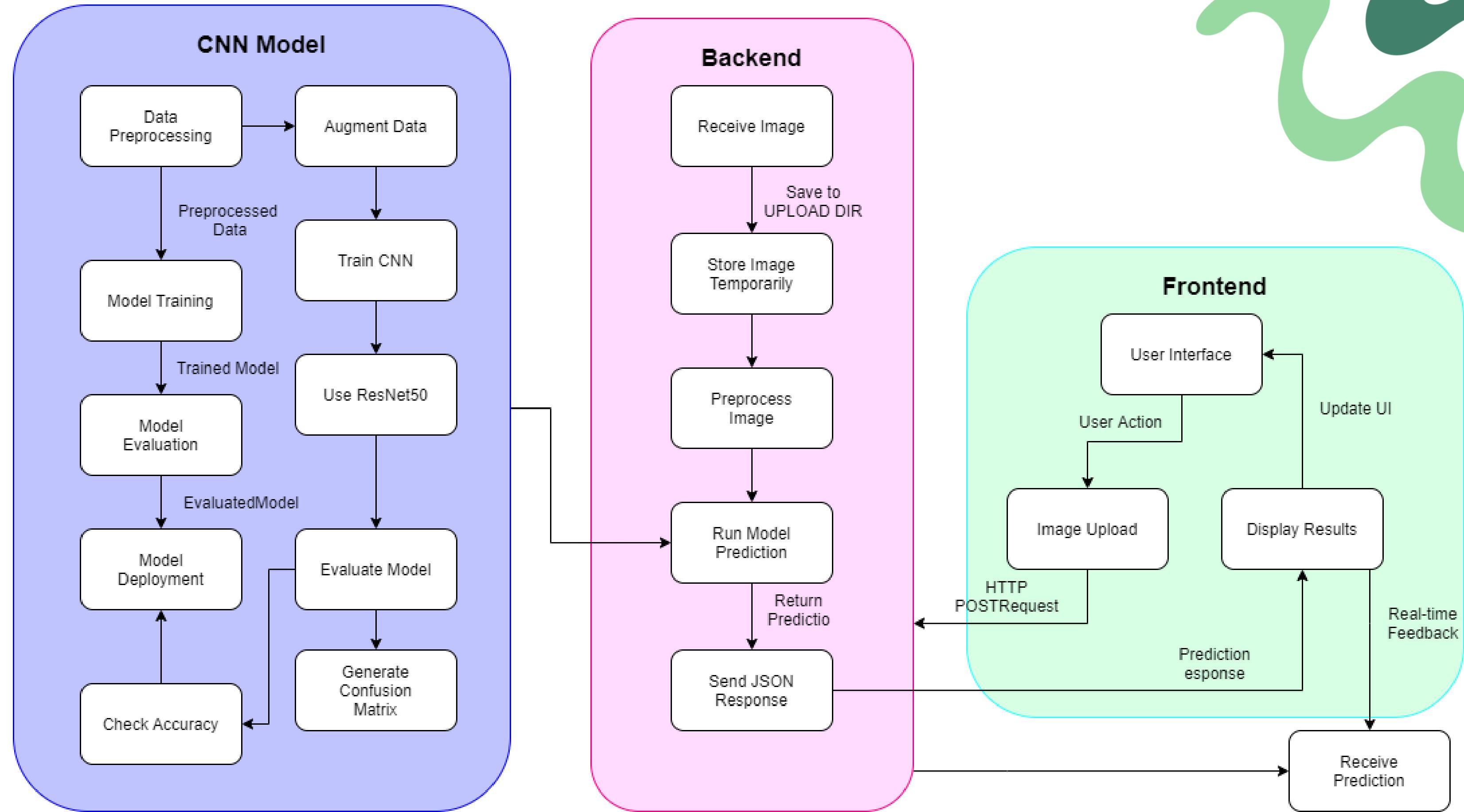
## ***Sub Objectives***

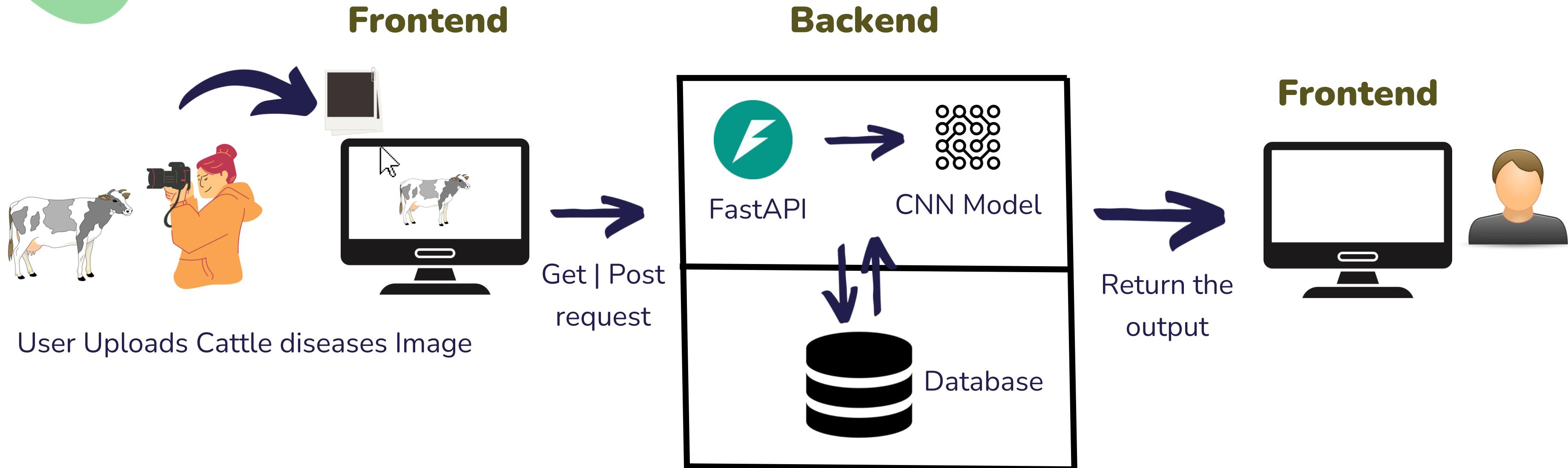
- Use of CNN for image classification to detect diseases.
- Develop a tool for farmers to input observed symptoms and receive effectiveness disease diagnoses.
- Compile and maintain a detailed list of common cattle diseases, including symptoms and recommended treatments

# 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.

# Evidence of completion

## 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()

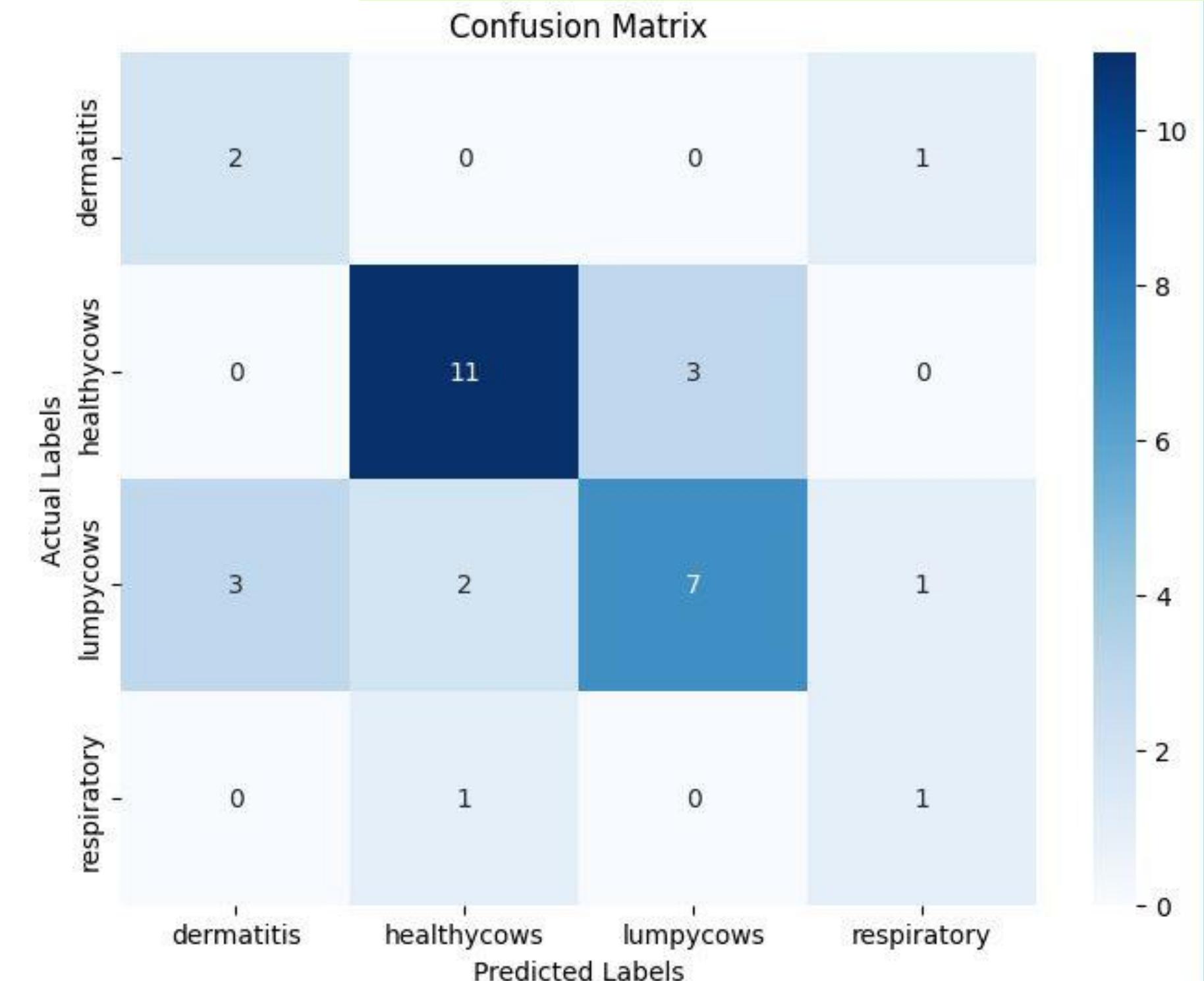
# Display the plots
plt.tight_layout()
plt.show()
```

## 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);
  }
};
```

## Disease Detection Page



The Disease Detection Page is a web application interface. It features a sidebar on the left with a green header 'CattleFarm' and a profile icon of a cow. The sidebar contains links: 'Summary' (with a house icon), 'My Profile' (with a hat icon), 'Locate Veterinarian' (with a speech bubble icon), 'Milk Production Details' (with a bar chart icon), 'Disease Detection' (with a gear icon), 'Health Checkup' (with a gear icon), and 'Sign Out' (with a right arrow icon). The main content area has a header 'Disease Detection Page' with a blue 'Choose File' button and a preview image of a cow's skin with a skin lesion. Below the image is a 'Detect Disease' button. The prediction results are displayed as 'Prediction: Label: Lumpy Skin Confidence: 100.00%'. To the right of the main content, there is a sidebar titled 'Cattle Management and Care Instructions' with a list of 14 items.

### Cattle Management and Care Instructions

- Ensure your cattle have access to clean and fresh water at all times.
- Provide a balanced diet that meets the nutritional needs of the cattle.
- Schedule regular veterinary check-ups to monitor and maintain health.
- Keep the living area clean and dry to prevent infections and diseases.
- Vaccinate cattle as per the recommended schedule to avoid diseases.
- Isolate sick animals immediately to prevent the spread of infections.
- Provide shade and proper ventilation to protect cattle from heat stress.
- Train handlers and workers on safe and humane cattle management practices.
- Monitor cattle behavior daily to detect any signs of illness or discomfort.
- Regularly deworm cattle to prevent parasitic infestations.

# Evidence of completion

Cattle Site

Services About Us Contact

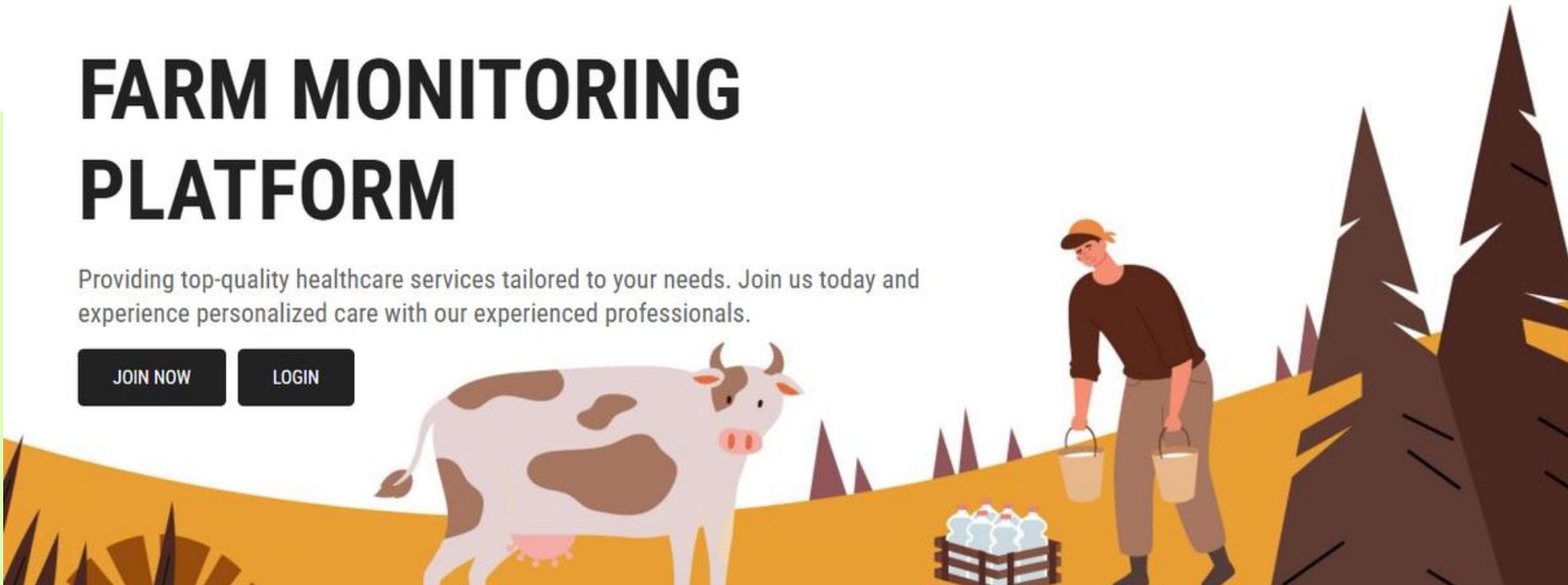
Contact Us

## 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



Home Page

Cattle Site

Name

Contact Number

Email

Title

Message

Submit

Contact Us Page

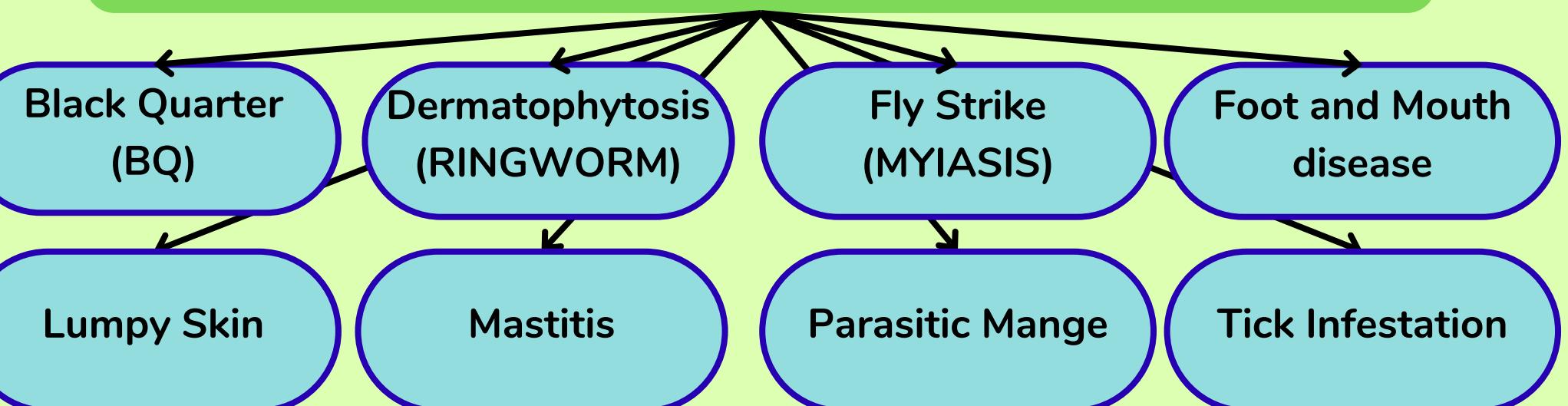
# Completion and Future works

## Completion of the components

Collect cattle diseases data sets

Identification of best architecture for transfer learning

Identification cattle diseases based on CNN model by uploading a picture

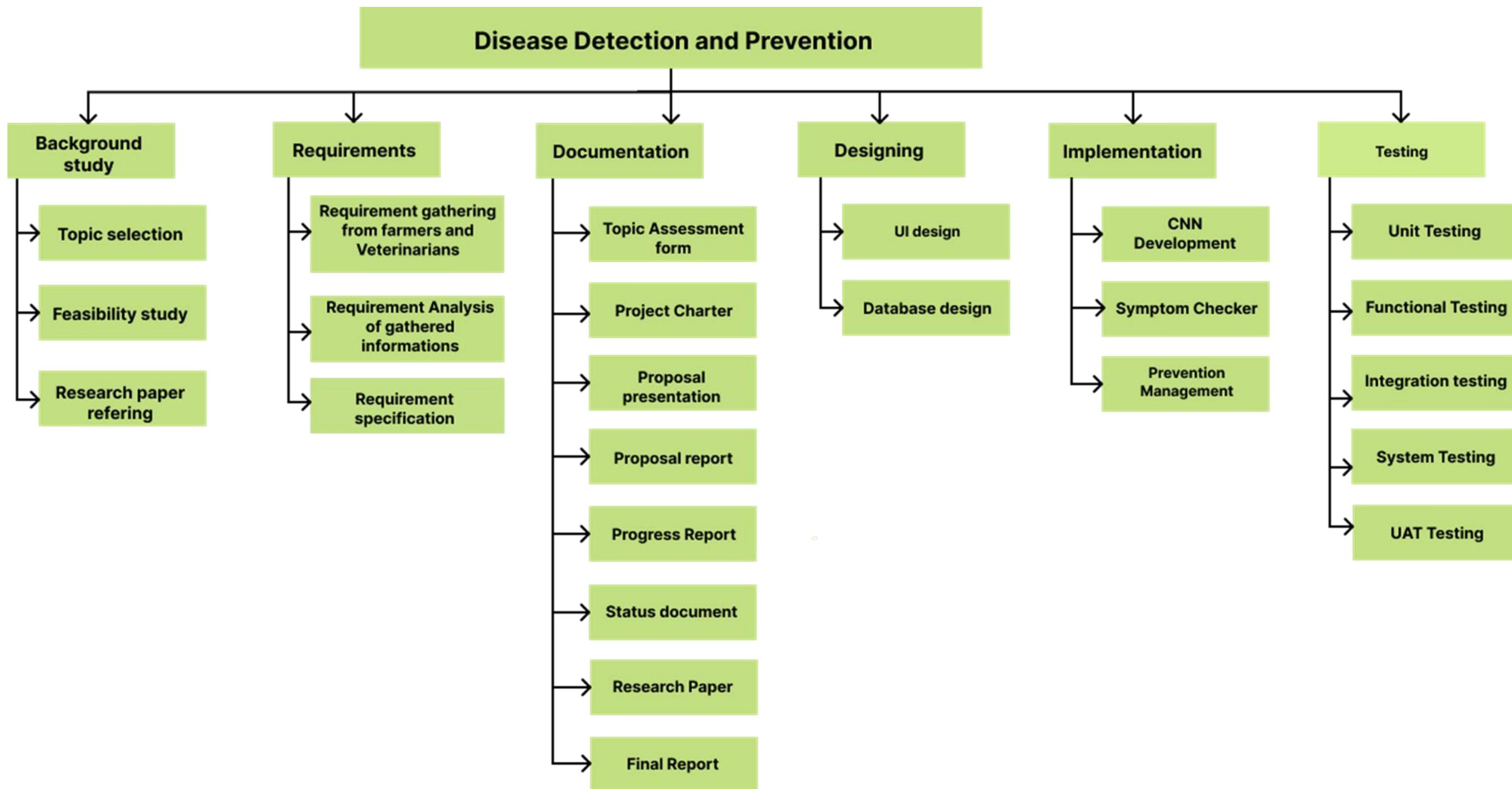


## Future Implementations

Maintain a detailed list of common cattle diseases, including symptoms and recommended treatments

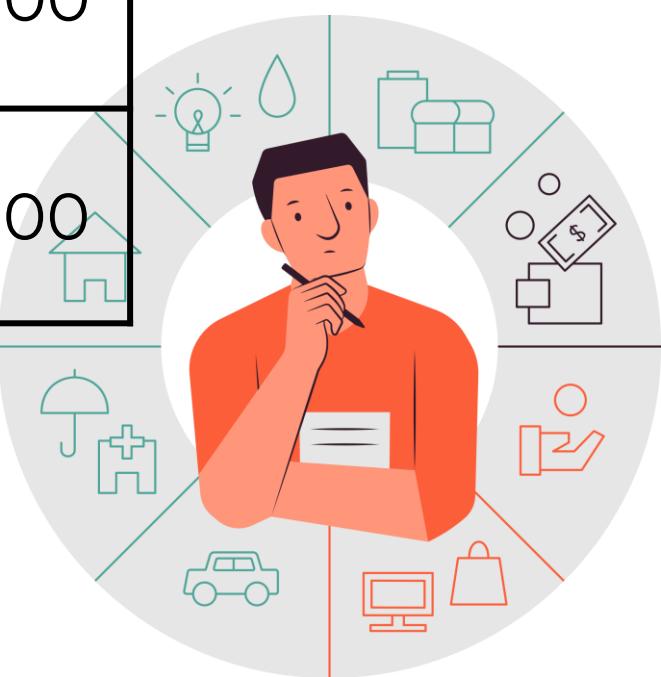
Input observed symptoms and receive effectiveness disease diagnoses.

# Work Breakdown Structure

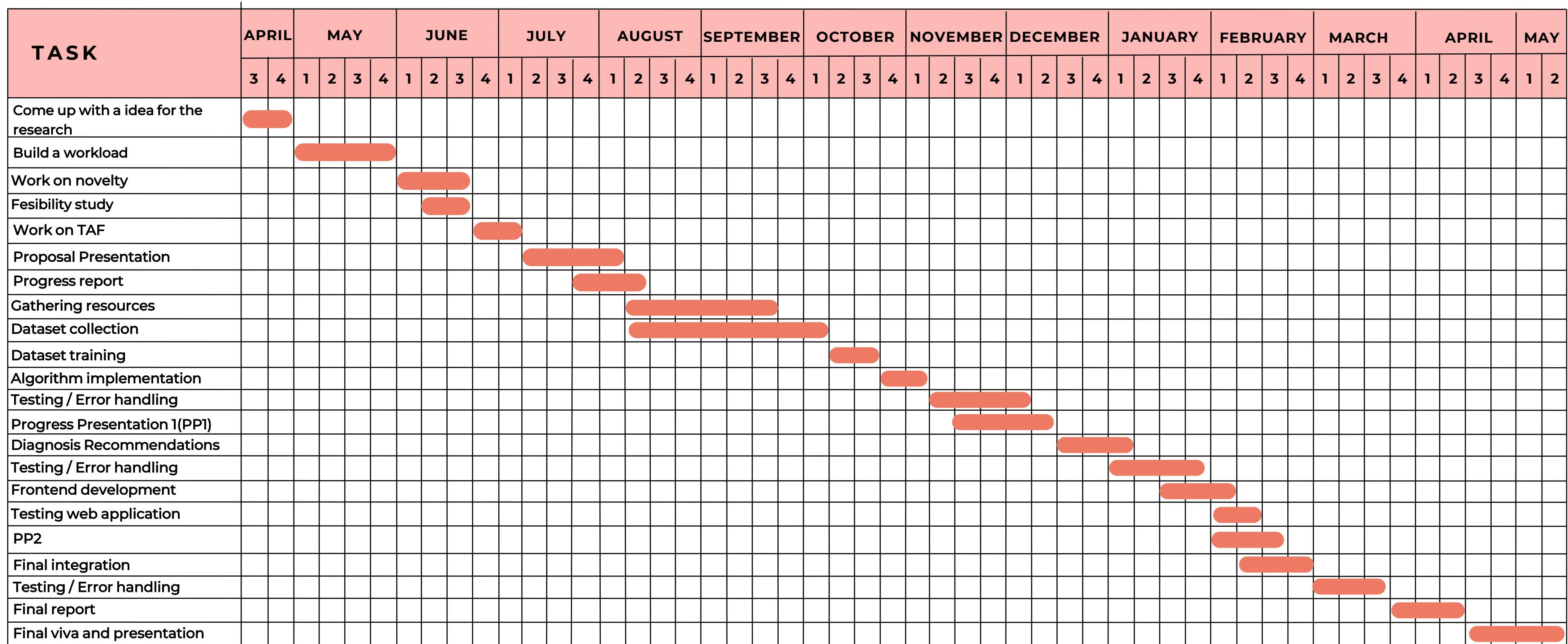


# Estimated Budget per month

	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
Total	8000.00



# Gantt Chart



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- [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..)
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- [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 Question

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



## ***Main Objectives***

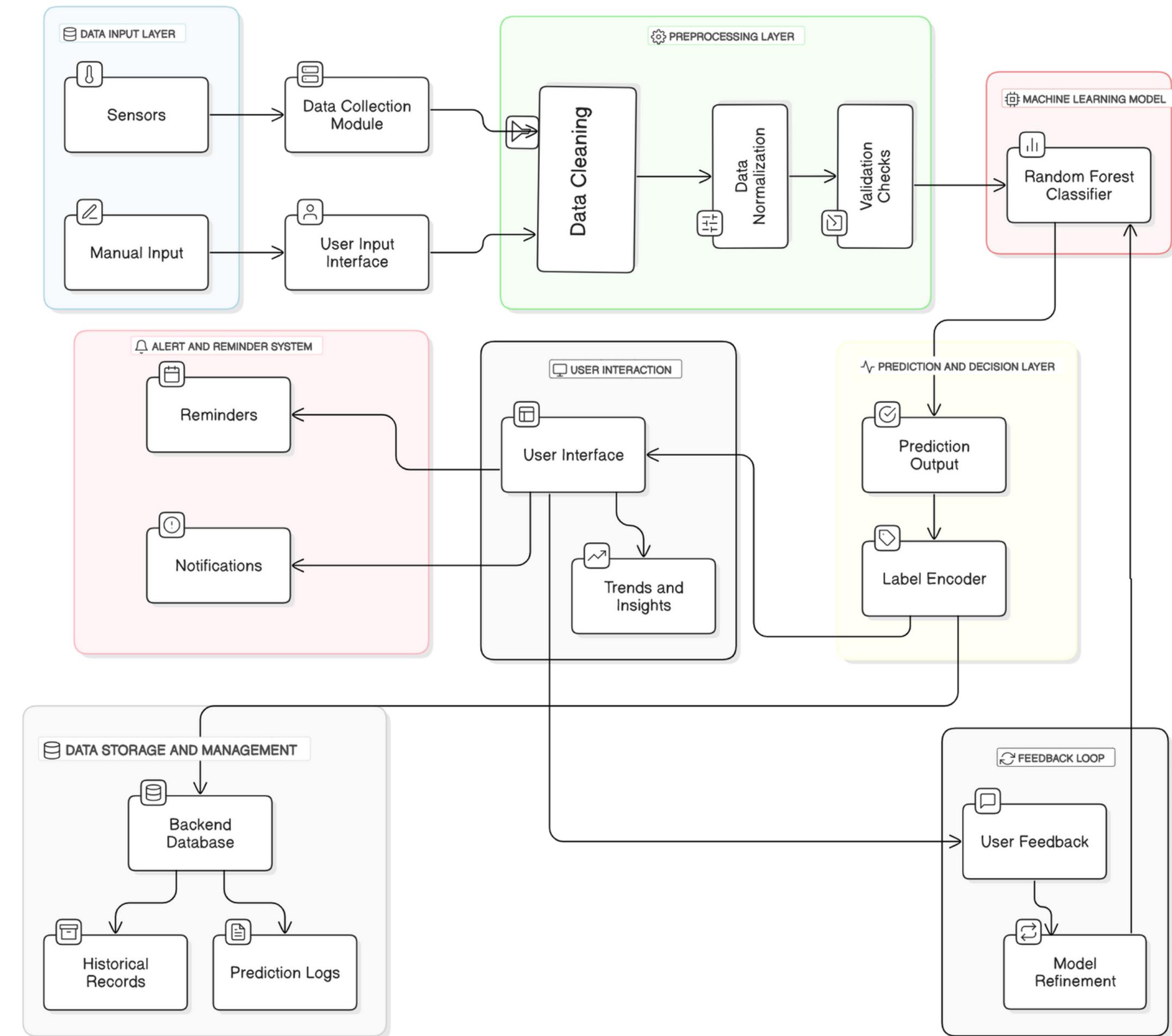
To present a holistic approach to cow care by integrating the management of cow profiles, nutrition tracking, and automated reminders using Machine Learning, focusing primarily on enhancing cow productivity.

## ***Sub Objectives***

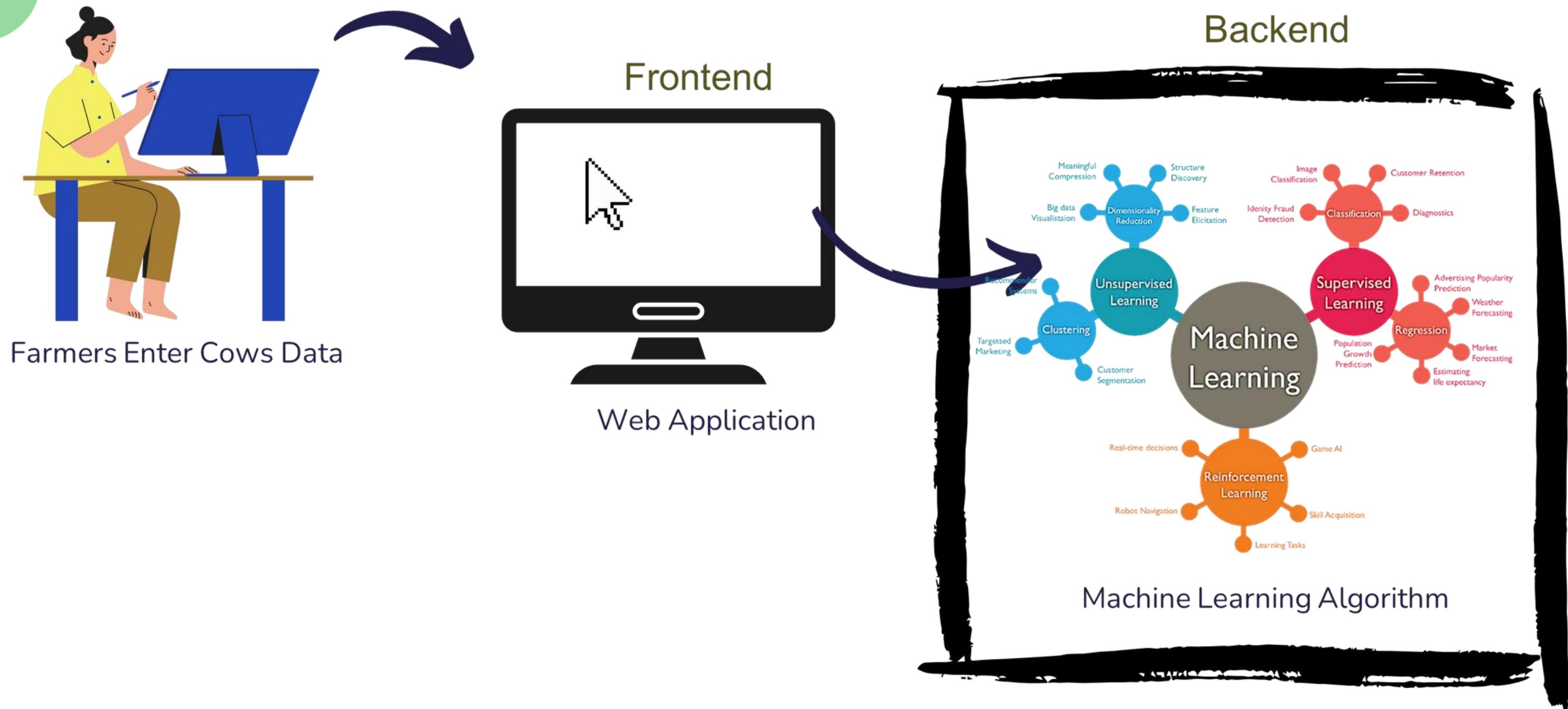
-  **Develop Comprehensive Cow Profile Management**
-  **Implement Personalized Nutrition and Diet Tracking**
-  **Leverage Machine Learning for Predictive Analytics**
-  **Improve Overall Cow Welfare and Management Efficiency**
-  **Create Automated Reminder Systems**

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



# 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 profiles.
- 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.
- Backend system for storing and managing health records.
- Algorithms for analyzing nutritional data.
- Notification system for reminders and alerts.

## Non-Functional Requirements

- Scalability to manage increasing data without performance degradation.
- Ensure secure data handling and user authentication.

## Personal Requirements

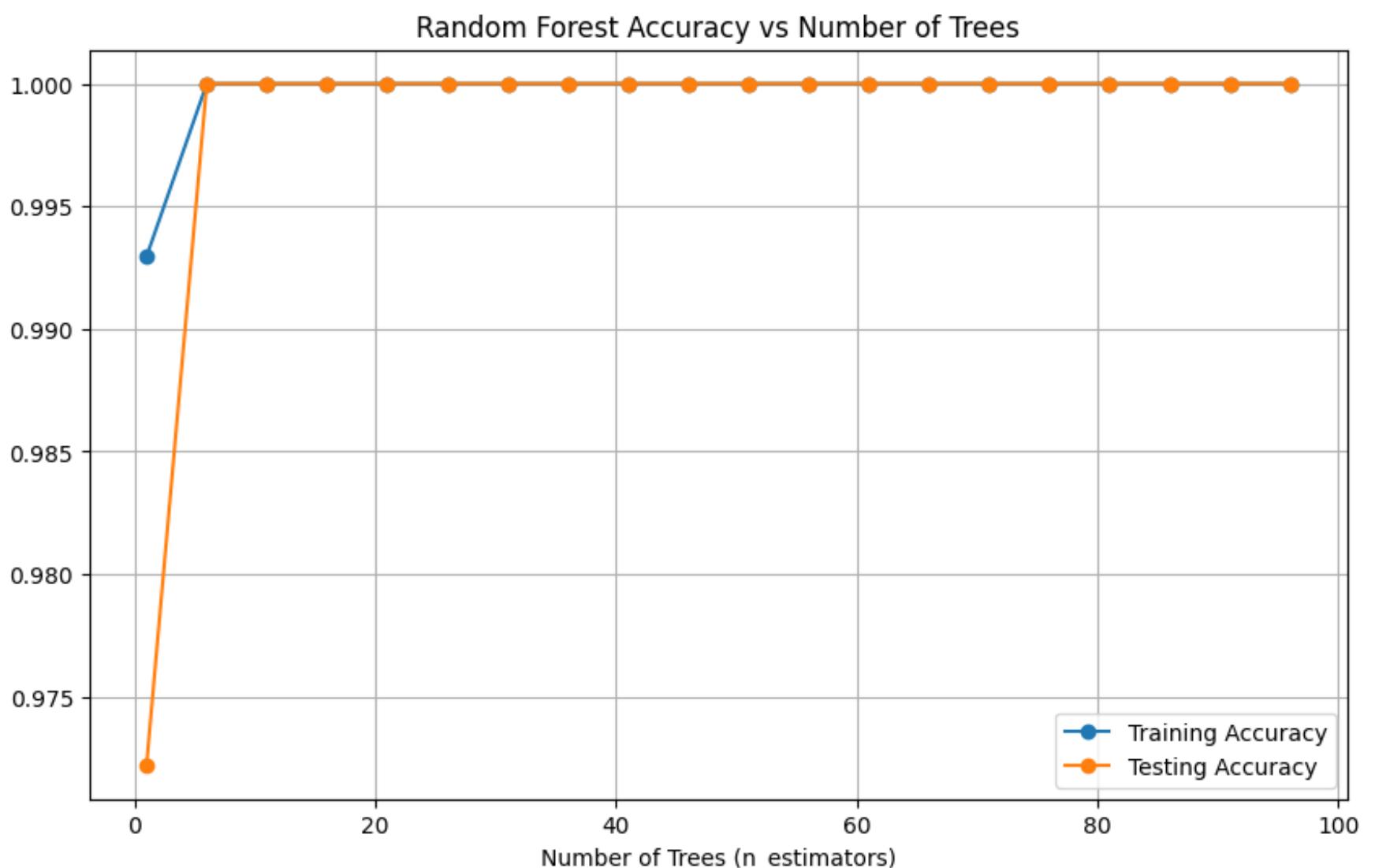
- Knowledge in UI/UX design.
- Experience in backend development and data management.
- Understanding of animal nutrition and health metrics.

# Evidence of completion

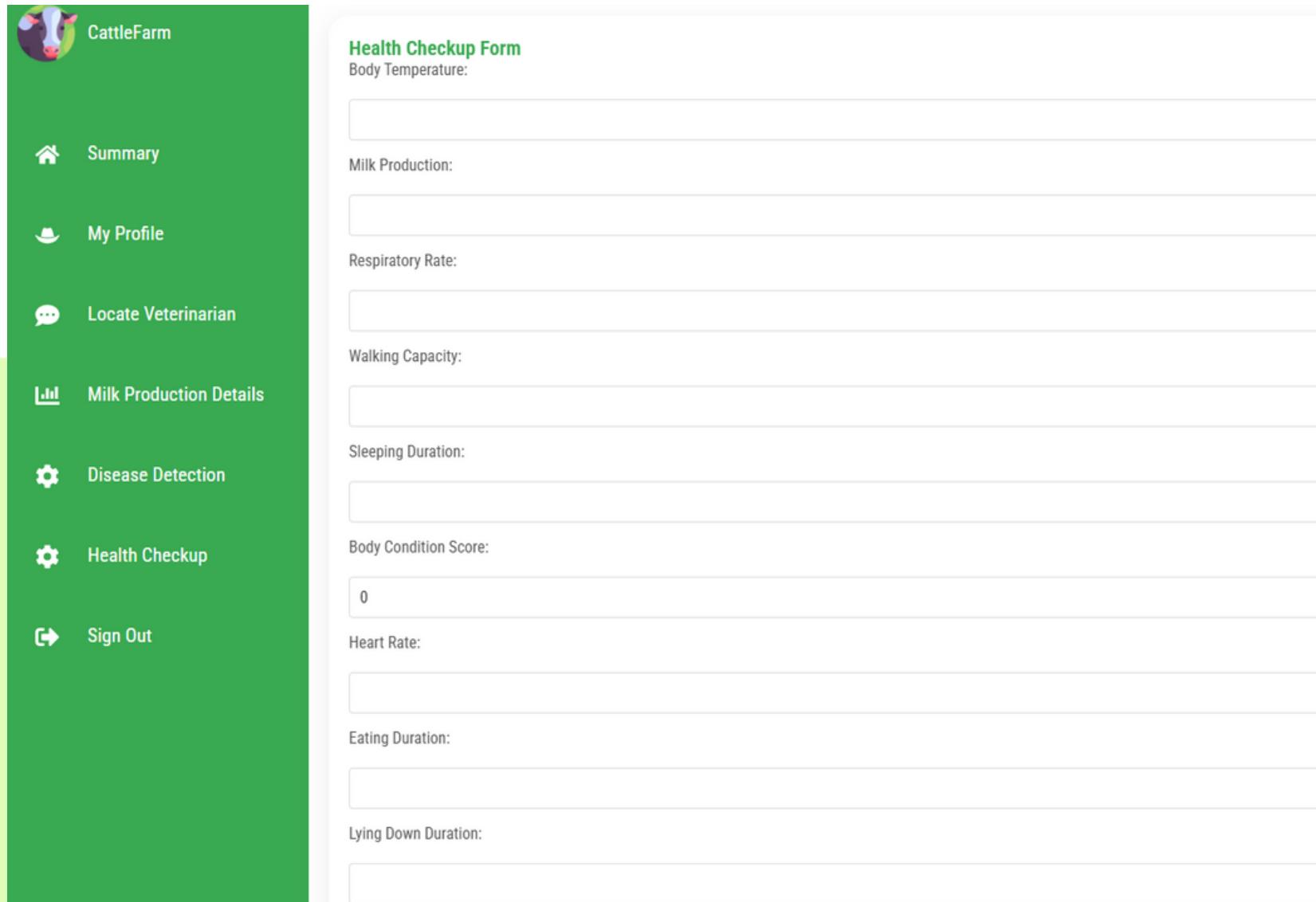
## Dataset collection

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	body_temperature	breed_type	milk_production	respiratory_rate	walking_capacity	sleeping_duration	body_condition_score	heart_rate	eating_duration	lying_down_duration	ruminating	rumens_fill	faecal_consistency	health_status
1	39.7	Normal Breed	22.5	48	10352	4.6	2	63	3.1	13.5	6.3	5	ideal	healthy
2	40	Cross Breed	10.9	24	9302	3.9	1	60	3.5	12.2	5.5	1	Fresh blood in faeces	unhealthy
3	38.8	Normal Breed	25.6	32	11948	5.6	5	56	3.1	15	6.1	4	ideal	healthy
4	38	Normal Breed	22.5	27	12255	3.7	2	49	3	12.2	5.8	2	ideal	healthy
5	38.1	Normal Breed	25.6	33	13257	3.8	5	52	4.6	12.8	7	4	ideal	healthy
6	38.2	Normal Breed	24	36	13030	3	3	56	3.2	13.6	6.2	3	ideal	healthy
7	38.3	Normal Breed	21.3	46	12261	3.7	1	63	2.6	12.5	4.9	2	ideal	healthy
8	38.4	Normal Breed	26.5	26	12291	4.4	5	50	4.9	13.8	6	3	ideal	healthy
9	38.5	Normal Breed	23.2	45	12065	3.3	2	76	3	13.7	5.2	2	ideal	healthy
10	38.2	Normal Breed	25.8	54	11855	2.9	5	52	5.5	12.5	6.1	2	ideal	healthy
11	38	Normal Breed	25	38	12179	3.3	3	76	3.7	13.3	5.9	3	ideal	healthy
12	38.5	Normal Breed	20.4	31	12457	3.6	1	59	2.7	12	5	1	ideal	healthy
13	38.5	Normal Breed	26.1	35	13136	4	5	71	3.8	14	4.8	4	ideal	healthy
14	38.2	Normal Breed	25.7	28	12658	3.9	6	53	3.5	11.9	6.5	5	ideal	healthy
15	38.5	Normal Breed	23.7	32	11832	2.8	2	68	3	13	5.5	2	ideal	healthy
16	38	Normal Breed	22.7	44	11167	3	1	73	2.2	13.7	5.6	2	ideal	healthy
17	38.3	Normal Breed	24.5	42	12397	3.5	9	77	4	11.9	5.9	3	ideal	healthy
18	38.4	Normal Breed	26.2	36	11762	3.9	4	54	3.6	12.6	6	4	ideal	healthy
19	38.1	Normal Breed	25	32	12046	3.4	5	60	3.5	12.9	6.7	5	ideal	healthy
20	35.5	Normal Breed	23.7	29	11734	4.2	2	62	2.9	13	5.2	3	ideal	healthy
21	38.1	Normal Breed	24.9	27	12694	3.3	3	81	4	14.3	6.3	3	ideal	healthy
22	38.4	Normal Breed	71.2	46	12753	4.1	1	82	1.9	13.8	4.2	1	ideal	healthy
23	38.2	Normal Breed	25.2	34	12087	3.2	3	65	3.3	12.4	5.7	3	ideal	healthy
24	39.5	Normal Breed	13.5	15	4872	6	5	58	2.7	15.3	4.7	3	very liquid faeces	unhealthy
25	39.7	Normal Breed	16.8	19	6622	6.2	2	42	1.8	6	3.6	2	extremely firm	unhealthy
26	39.6	Normal Breed	15.5	24	5732	6.2	5	45	2	15.8	4.1	2	Black faeces	unhealthy
27	39.9	Normal Breed	13.3	28	5698	6.3	1	39	1.3	16.4	3.1	1	Fresh blood in faeces	unhealthy
28	40.2	Normal Breed	12.9	20	5092	6.9	5	46	2.9	14.2	4.8	4	extremely firm	unhealthy
29	39.8	Normal Breed	17.7	23	6132	6.4	3	47	2.1	15.5	3.9	3	Black faeces	unhealthy
30	39.5	Normal Breed	17.6	24	6962	6.1	2	44	1.8	15.1	3.3	3	Fresh blood in faeces	unhealthy
31	40	Normal Breed	14.1	19	5173	7	1	39	1.6	15.4	3	2	extremely firm	unhealthy
32	39.5	Normal Breed	16.6	17	6721	6.4	4	42	2.4	15.2	4.2	2	very liquid faeces	unhealthy
33	39.8	Normal Breed	15.9	16	6294	6.8	2	42	1.7	15.5	3.4	3	Fresh blood in faeces	unhealthy
34	40.1	Normal Breed	12.5	14	5237	6.9	2	39	1.8	15.3	3.3	2	Black faeces	unhealthy
35	40.6	Normal Breed	13.2	29	5139	7	5	40	2.4	15.6	4.1	2	Black faeces	unhealthy
36	39.9	Normal Breed	14.9	24	6019	6.6	4	45	2.3	15.1	4.4	3	very liquid faeces	unhealthy
37	39.5	Normal Breed	10.3	23	6257	6.3	1	46	1.5	15.2	3	2	Fresh blood in faeces	unhealthy
38	39.7	Normal Breed	13.5	22	5532	6.5	3	43	2.6	14.9	3.6	3	Black faeces	unhealthy
39	40	Normal Breed	15.2	16	5004	6.8	5	37	2.8	14.4	3.6	2	extremely firm	unhealthy
40	39.6	Normal Breed	15.9	28	6835	5.9	2	47	2.1	16	3.5	3	very liquid faeces	unhealthy
41	39.8	Normal Breed	17.7	14	5835	6.1	1	41	1.7	16.2	3.3	2	Black faeces	unhealthy
42	39.6	Normal Breed	16.8	26	6595	6.7	4	48	2.8	14.5	4.4	3	extremely firm	unhealthy
43	40.3	Normal Breed	13.2	26	5336	7.2	3	47	2.4	14.4	3.5	2	Fresh blood in faeces	unhealthy
44	38.4	Cross Breed	10.5	37	11687	3.2	3	55	3.2	12.6	5.4	3	ideal	healthy
45	38.2	Cross Breed	11.2	42	12654	3.1	5	56	3.3	13.8	5.6	2	ideal	healthy
46	38.1	Cross Breed	14.9	32	12697	3.3	4	49	3.9	12.1	6.2	4	ideal	healthy
47	38.8	Cross Breed	13.8	26	15024	4	2	62	3.1	13.9	6	3	ideal	healthy

## Random Forest Accuracy



# Evidence of completion



CattleFarm

Health Checkup Form

Body Temperature:

Milk Production:

Respiratory Rate:

Walking Capacity:

Sleeping Duration:

Body Condition Score:

0

Heart Rate:

Eating Duration:

Lying Down Duration:

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

```
import matplotlib.pyplot as plt

n_estimators_range = range(1, 101, 5)
train_accuracies = []
test_accuracies = []

for n_estimators in n_estimators_range:
    rf = RandomForestClassifier(n_estimators=n_estimators, random_state=42)
    rf.fit(X_train, Y_train)
    Y_train_pred = rf.predict(X_train)
    train_accuracies.append(accuracy_score(Y_train, Y_train_pred))

    Y_test_pred = rf.predict(X_test)
    test_accuracies.append(accuracy_score(Y_test, Y_test_pred))

plt.figure(figsize=(10, 6))
plt.plot(n_estimators_range, train_accuracies, label='Training Accuracy', marker='o')
plt.plot(n_estimators_range, test_accuracies, label='Testing Accuracy', marker='o')
plt.xlabel('Number of Trees (n_estimators)')
plt.ylabel('Accuracy')
plt.title('Random Forest Accuracy vs Number of Trees')
plt.legend()
plt.grid(True)
plt.show()
```

# Completion and Future works

## Completion of the Components

Collect dataset on Health Monitoring

Cattle health Monitoring model develop

Health Monitoring User Interface

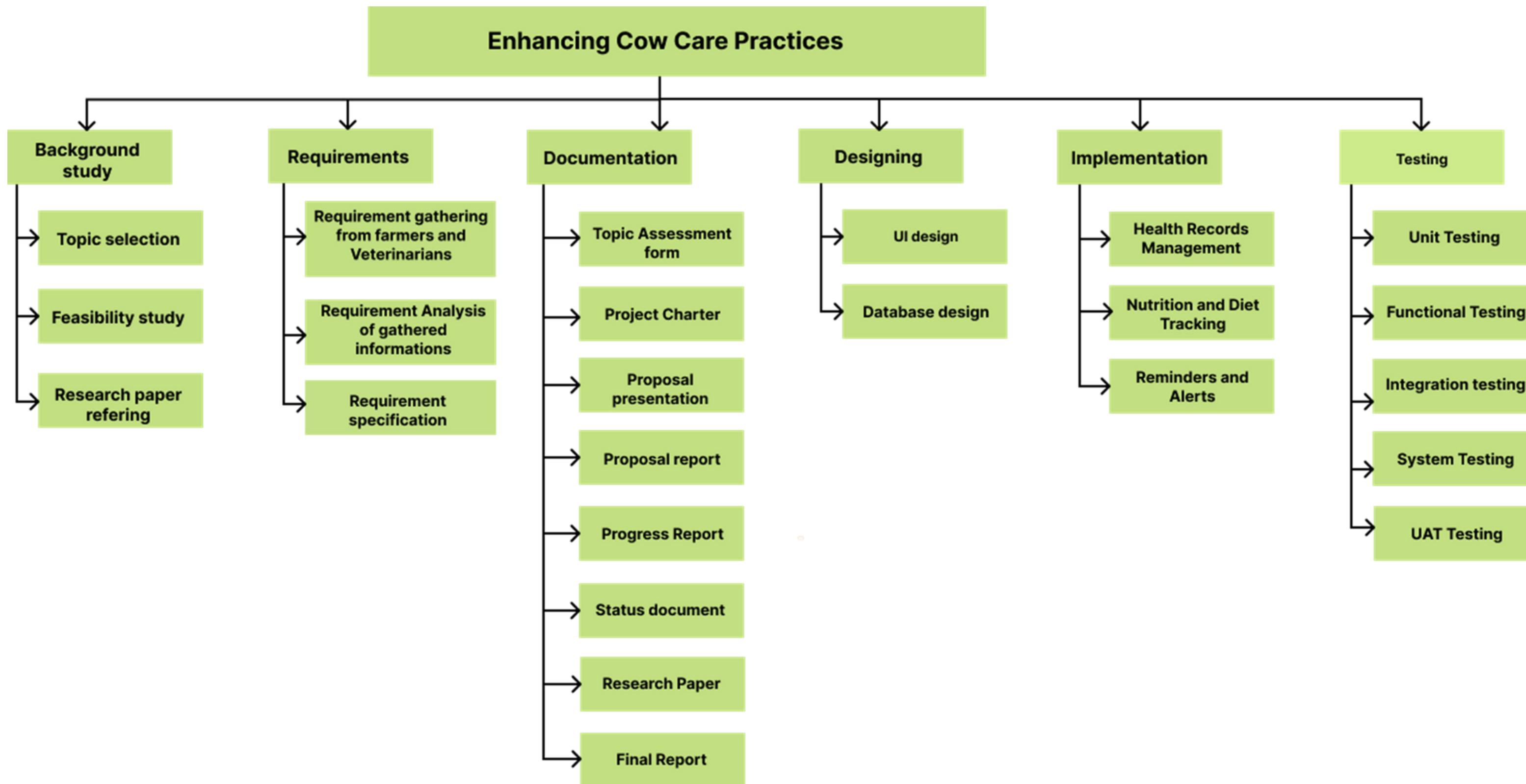
## Future Implementations

Implement a comprehensive Cow profile

Implement automated reminders based on medical and health conditions.

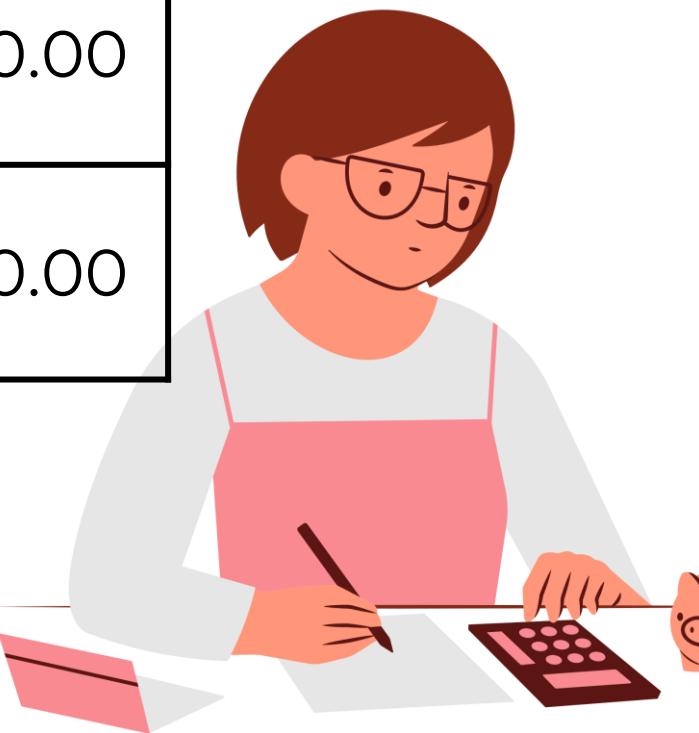
The health monitoring function is integrated with the personalized nutrition plan function.

# Work Breakdown Structure

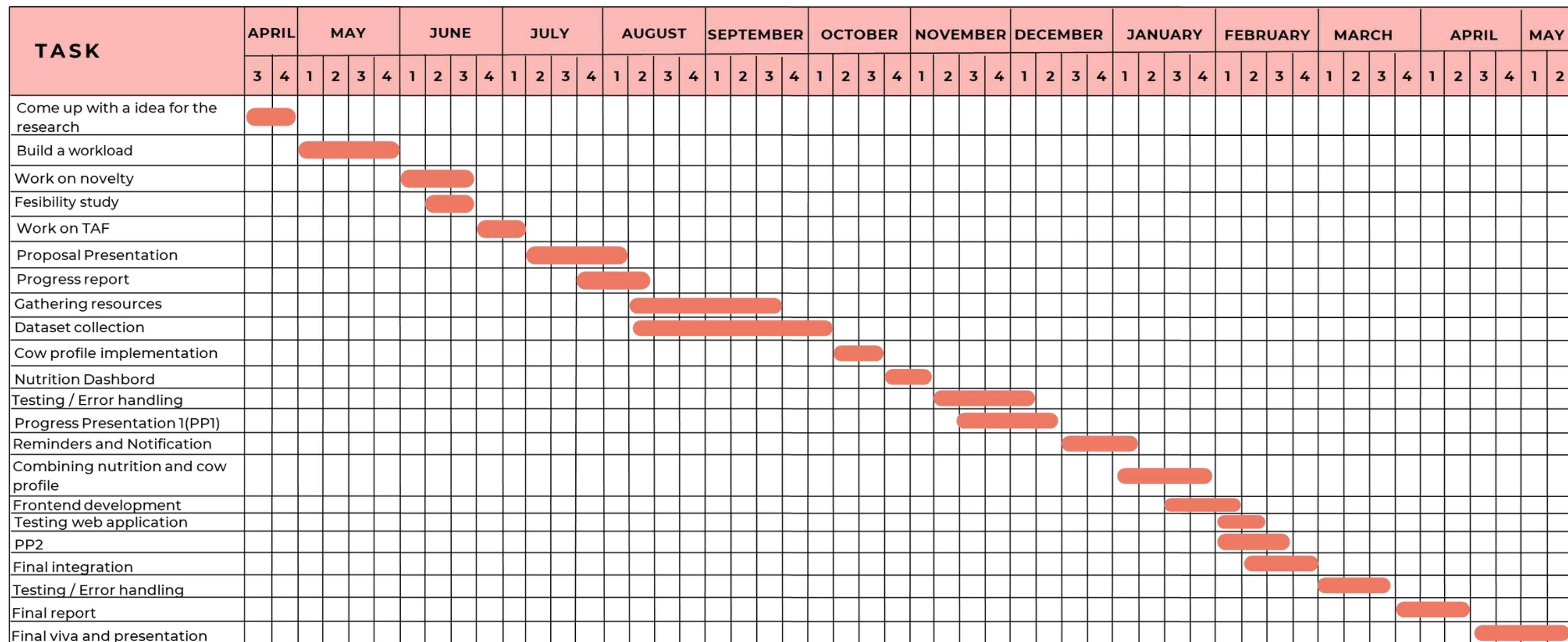


# Estimated Budget per month

	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)	3500.00
Electricity	3000.00
Documentation and Printing Cost	500.00
Total	11000.00



# Gantt Chart



# References

- [1 ] C. M. A. D. J. D. G.-W. G. Curtis, "The impact of early life nutrition and housing on growth and reproduction in dairy cattle," [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5812595/>.
- 2 ] M. A. a. Z. B. Ismail, "National Library of Medicine," 2022. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9880831/>.
- [3 ] Y. W. M. H. L. S. Y. S. X. Z. H. S. Dihua Wu, "sciencedirect," 2021. [Online]. Available: <https://www.sciencedirect.com/science/article/abs/pii/S016816992100034X>.
- [4 ] R. J. V. S. DVM, "Dry Cow Nutrition: The Key to Improving Fresh Cow Performance," sciencedirect, [Online]. Available: <https://www.sciencedirect.com/science/article/abs/pii/S0749072015307854>.

**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 Question

- How do seasonal changes affect milk production?
- How to use past performance data to forecast future production?
- How to use technology to improve milk production predictions?
- What are the economic implications of milk production predictions?
- What are the best practices for herd management to optimize milk production?



## **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.

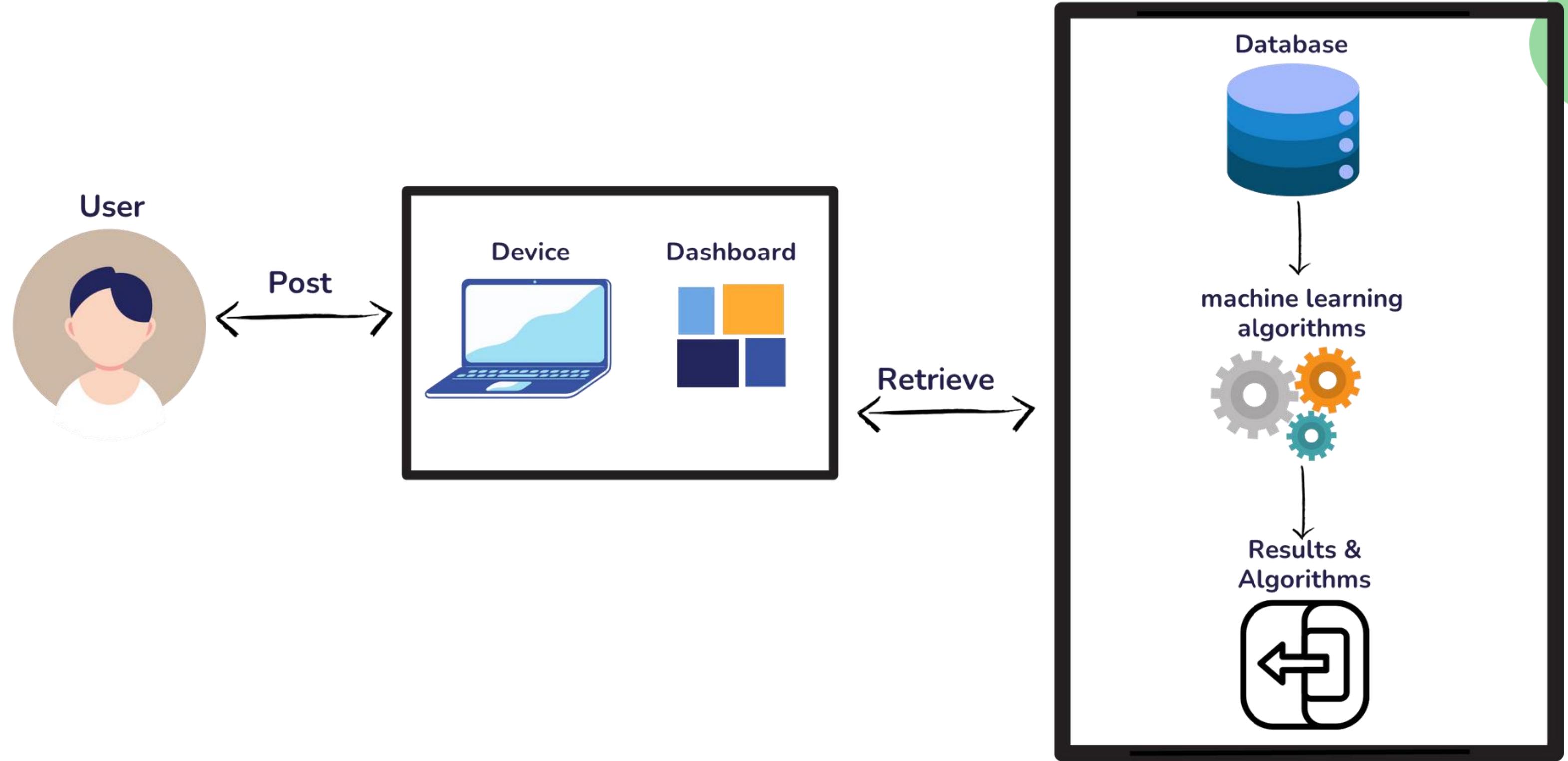
## **Sub Objectives**

-  Select factors like temperature, humidity, and feed quality.
-  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.

# Research Gap

	[1]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	Our Research
<b>Data Prediction</b>	✓	✓	✓	✓	✓	✓	✗	✗	✓
<b>Machine Learning</b>	✓	✓	✓	✓	✗	✗	✗	✗	✓
<b>Weather Parameters</b>	✗	✗	✗	✗	✗	✓	✗	✗	✓
<b>Health Management</b>	✗	✗	✗	✗	✓	✗	✓	✓	✓
<b>Lactation Modeling</b>	✓	✓	✓	✓	✗	✗	✗	✓	✓
<b>Robotic modeling</b>	✗	✗	✗	✓	✗	✗	✗	✗	✓
<b>Genetic Data</b>	✗	✓	✓	✗	✗	✗	✗	✗	✗
<b>Data Accuracy</b>	✓	✓	✓	✓	✓	✓	✗	✗	✓
<b>Individualized Nutrition Plans</b>	✓	✗	✗	✗	✗	✗	✓	✓	✓
<b>Historical Milk Production Data</b>	✓	✓	✓	✓	✓	✓	✗	✗	✓

# Function Diagram



# 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

- Hardware requirements
  - Servers for hosting the web application
  - Storage for database management
  - Smartphones or tablets should be there to enter data.
- System requirements

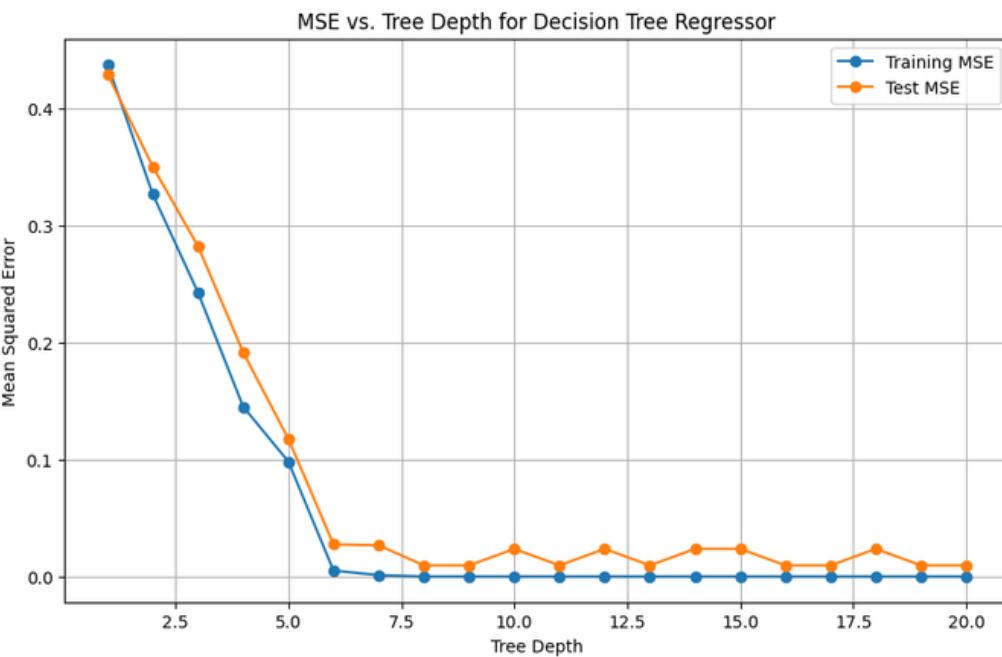
## Personal Requirements

- Skills in data analysis and machine learning.
- Experience in building predictive models.
- Ability to integrate data and develop user interfaces.

# Evidence of completion

## Data collection on Milk yeild

Sl No	Supplier ID	Receipt No	Date	Quantity (L)	Rate (Rs)	Total (Rs)
1	0122	038912	24/06/24	100	144.34	14434.00
2	123	133044	24/06/24	100	144.34	14434.00
3	124	133052	24/06/24	100	144.34	14434.00
4	125	133046	24/06/24	100	144.34	14434.00
5	126	133063	24/06/24	100	144.34	14434.00
6	127	133099	24/06/24	100	144.34	14434.00
7	128	133116	24/06/24	100	144.34	14434.00



Sl No	Supplier ID	Receipt No	Date	Quantity (L)	Rate (Rs)	Total (Rs)
1	0120	039050	24/06/24	100	144.34	14434.00
2	0121	039051	24/06/24	100	144.34	14434.00
3	0122	039052	24/06/24	100	144.34	14434.00
4	0123	039053	24/06/24	100	144.34	14434.00
5	0124	039054	24/06/24	100	144.34	14434.00
6	0125	039055	24/06/24	100	144.34	14434.00
7	0126	039056	24/06/24	100	144.34	14434.00
8	0127	039057	24/06/24	100	144.34	14434.00
9	0128	039058	24/06/24	100	144.34	14434.00
10	0129	039059	24/06/24	100	144.34	14434.00
11	0130	039060	24/06/24	100	144.34	14434.00
12	0131	039061	24/06/24	100	144.34	14434.00
13	0132	039062	24/06/24	100	144.34	14434.00
14	0133	039063	24/06/24	100	144.34	14434.00
15	0134	039064	24/06/24	100	144.34	14434.00
16	0135	039065	24/06/24	100	144.34	14434.00
17	0136	039066	24/06/24	100	144.34	14434.00
18	0137	039067	24/06/24	100	144.34	14434.00
19	0138	039068	24/06/24	100	144.34	14434.00
20	0139	039069	24/06/24	100	144.34	14434.00
21	0140	039070	24/06/24	100	144.34	14434.00
22	0141	039071	24/06/24	100	144.34	14434.00
23	0142	039072	24/06/24	100	144.34	14434.00
24	0143	039073	24/06/24	100	144.34	14434.00
25	0144	039074	24/06/24	100	144.34	14434.00
26	0145	039075	24/06/24	100	144.34	14434.00
27	0146	039076	24/06/24	100	144.34	14434.00
28	0147	039077	24/06/24	100	144.34	14434.00
29	0148	039078	24/06/24	100	144.34	14434.00
30	0149	039079	24/06/24	100	144.34	14434.00
31	0150	039080	24/06/24	100	144.34	14434.00
32	0151	039081	24/06/24	100	144.34	14434.00
33	0152	039082	24/06/24	100	144.34	14434.00
34	0153	039083	24/06/24	100	144.34	14434.00
35	0154	039084	24/06/24	100	144.34	14434.00
36	0155	039085	24/06/24	100	144.34	14434.00
37	0156	039086	24/06/24	100	144.34	14434.00
38	0157	039087	24/06/24	100	144.34	14434.00
39	0158	039088	24/06/24	100	144.34	14434.00
40	0159	039089	24/06/24	100	144.34	14434.00
41	0160	039090	24/06/24	100	144.34	14434.00
42	0161	039091	24/06/24	100	144.34	14434.00
43	0162	039092	24/06/24	100	144.34	14434.00
44	0163	039093	24/06/24	100	144.34	14434.00
45	0164	039094	24/06/24	100	144.34	14434.00
46	0165	039095	24/06/24	100	144.34	14434.00
47	0166	039096	24/06/24	100	144.34	14434.00
48	0167	039097	24/06/24	100	144.34	14434.00
49	0168	039098	24/06/24	100	144.34	14434.00
50	0169	039099	24/06/24	100	144.34	14434.00
51	0170	039100	24/06/24	100	144.34	14434.00
52	0171	039101	24/06/24	100	144.34	14434.00
53	0172	039102	24/06/24	100	144.34	14434.00
54	0173	039103	24/06/24	100	144.34	14434.00
55	0174	039104	24/06/24	100	144.34	14434.00
56	0175	039105	24/06/24	100	144.34	14434.00
57	0176	039106	24/06/24	100	144.34	14434.00
58	0177	039107	24/06/24	100	144.34	14434.00
59	0178	039108	24/06/24	100	144.34	14434.00
60	0179	039109	24/06/24	100	144.34	14434.00
61	0180	039110	24/06/24	100	144.34	14434.00
62	0181	039111	24/06/24	100	144.34	14434.00
63	0182	039112	24/06/24	100	144.34	14434.00
64	0183	039113	24/06/24	100	144.34	14434.00
65	0184	039114	24/06/24	100	144.34	14434.00
66	0185	039115	24/06/24	100	144.34	14434.00
67	0186	039116	24/06/24	100	144.34	14434.00
68	0187	039117	24/06/24	100	144.34	14434.00
69	0188	039118	24/06/24	100	144.34	14434.00
70	0189	039119	24/06/24	100	144.34	14434.00
71	0190	039120	24/06/24	100	144.34	14434.00
72	0191	039121	24/06/24	100	144.34	14434.00
73	0192	039122	24/06/24	100	144.34	14434.00
74	0193	039123	24/06/24	100	144.34	14434.00
75	0194	039124	24/06/24	100	144.34	14434.00
76	0195	039125	24/06/24	100	144.34	14434.00</td

# Estimated Budget per month

	Amount (LKR)
Travel fees for data collection(Government Veterinary Surgeons Office - Homagama, District Agriculture Tranning Center Homagama)	6000.00
Internet charges (the development and technical information learning)	3000.00
Electricity	2000.00
Documentation and Printing Cost	500.00
Total	11500.00



# Completion and Future works

## Completion of the components

The component successfully fetches monthly milk production predictions for a given year.

Predictions are displayed as a chart that is intuitive and customizable.

The component is functional for current needs but may require optimizations like batch data fetching for better performance in the future.

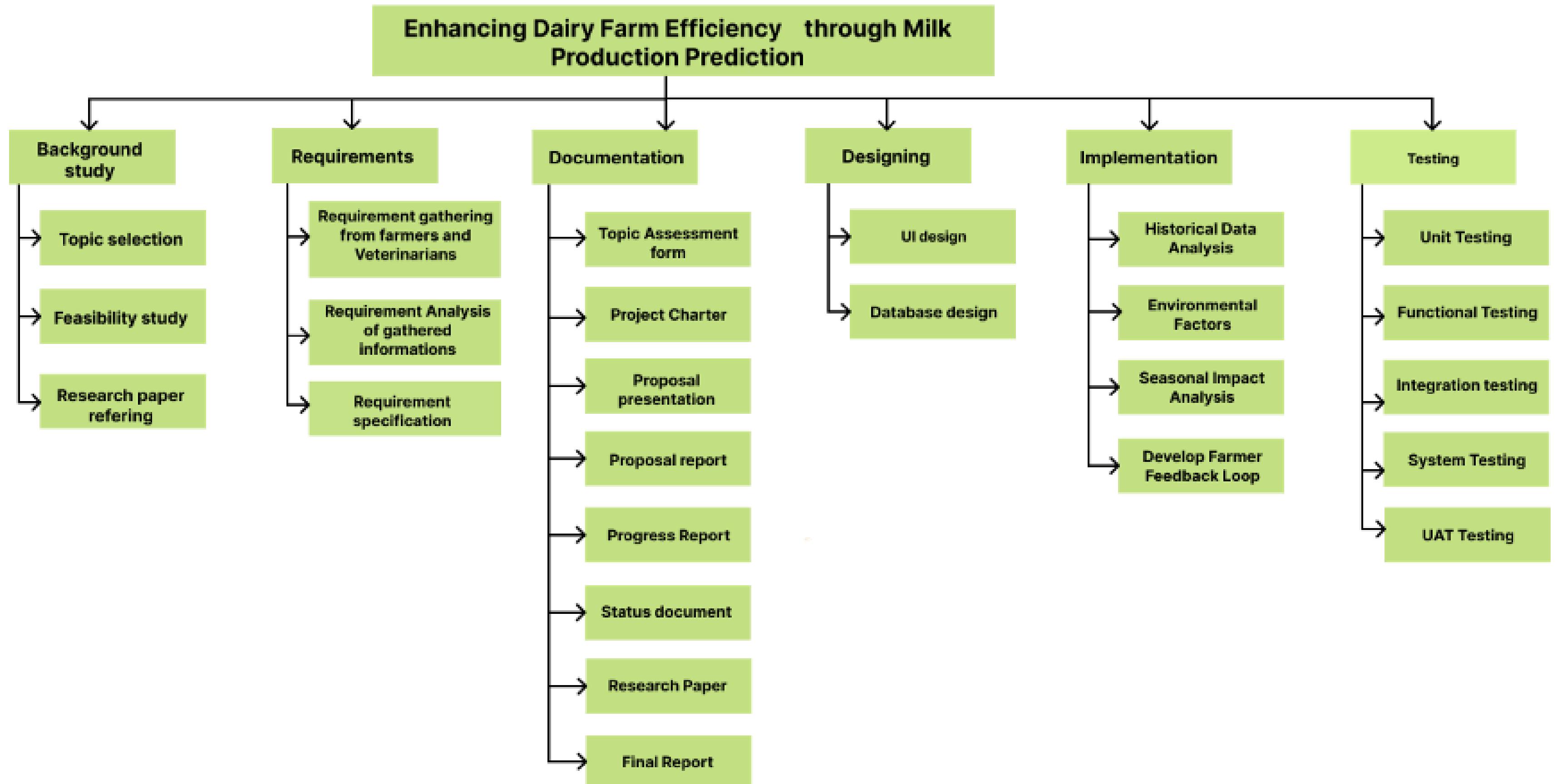
## Future Implementations

Modify the API to handle batch requests for predictions across multiple months, reducing repeated calls.

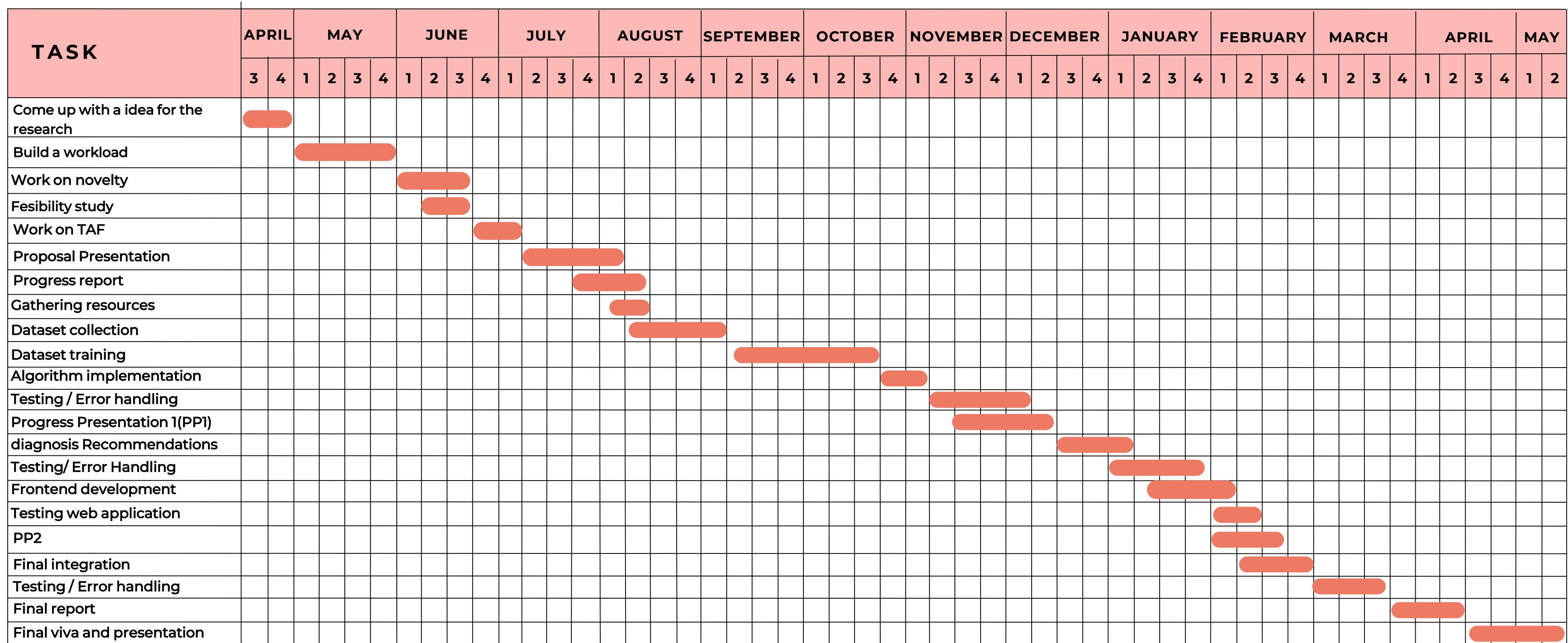
Develop an option to retrain the model periodically or on-demand with the latest data to maintain prediction accuracy over time.

Introduce mechanisms to validate predictions using actual production data, which can then refine the model further.

# Work Breakdown Structure



# Gantt Chart



# References

- [1] (Saleh et al., Prediction of some milk production traits using udder and TEAT measurements with a spotlight on their genetic background in Friesian Cows 2023)
- [2] (Suseendran & Duraisamy, Predication of dairy milk production using machine learning techniques 1970)
- [3](Damunupola et al., Sri Lanka's dairy sector: Where to move and what to do – prediction and a trend analysis 2022)

# **IT21379956**

## **Hettiarachchi V. E**

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

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



# Research Question

- 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?



## ***Main Objectives***

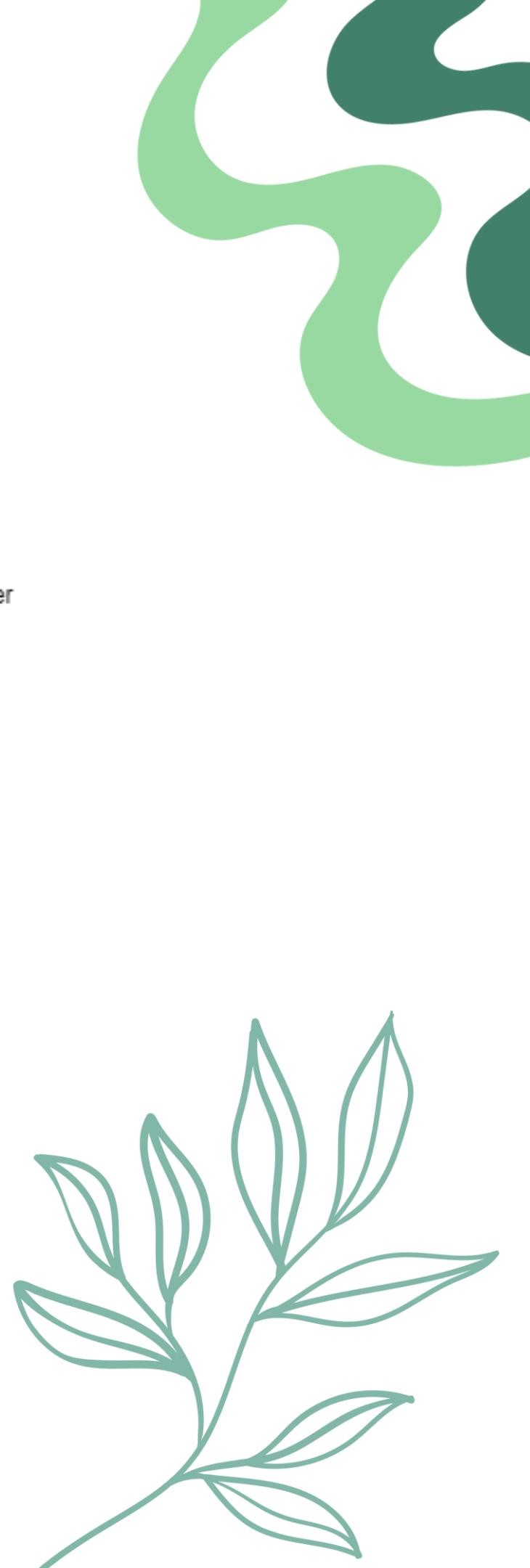
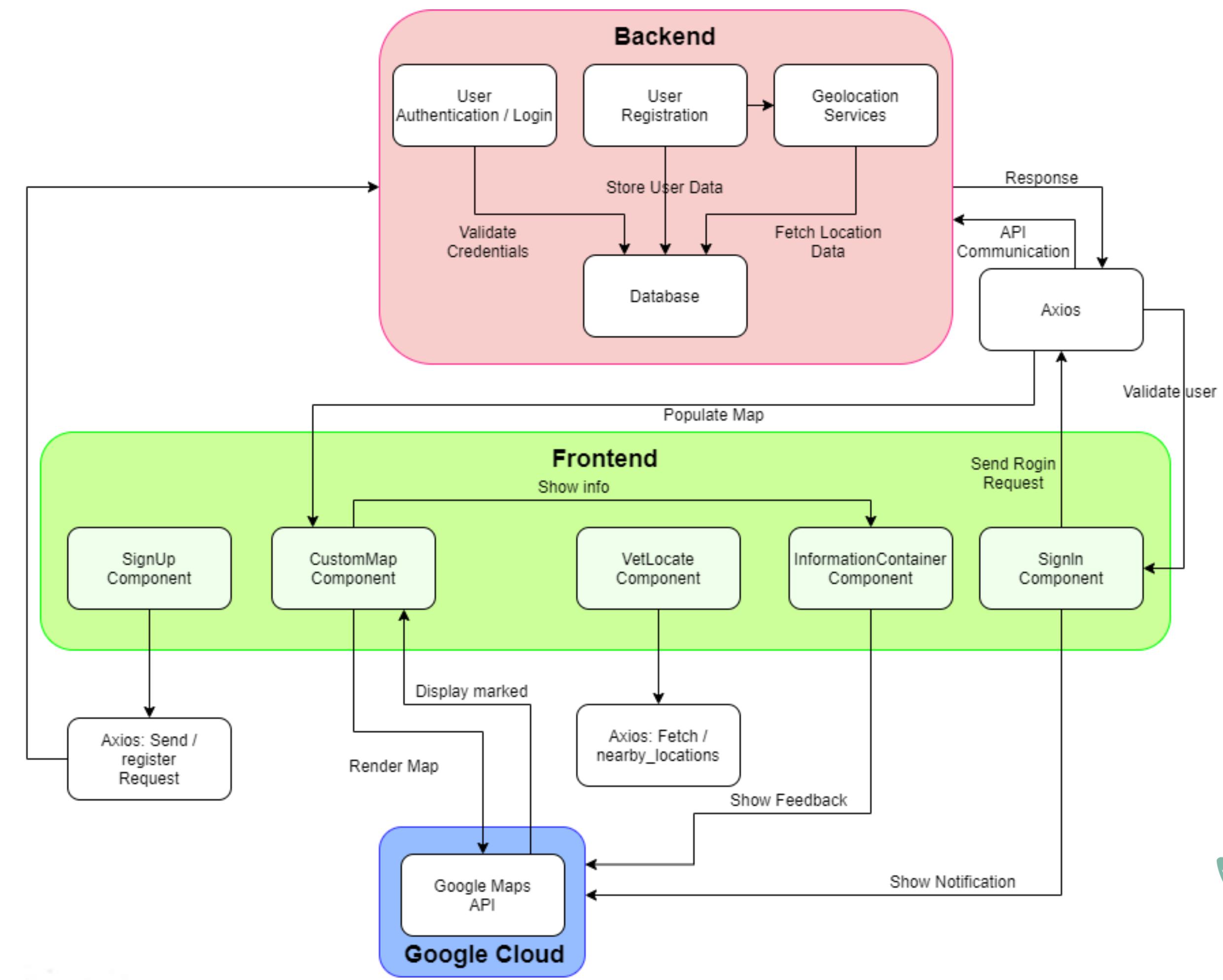
**Creating an application which facilitate the ability to identify nearest available veterinarians in an emergencies and provide the support to communicate easily.**

## ***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



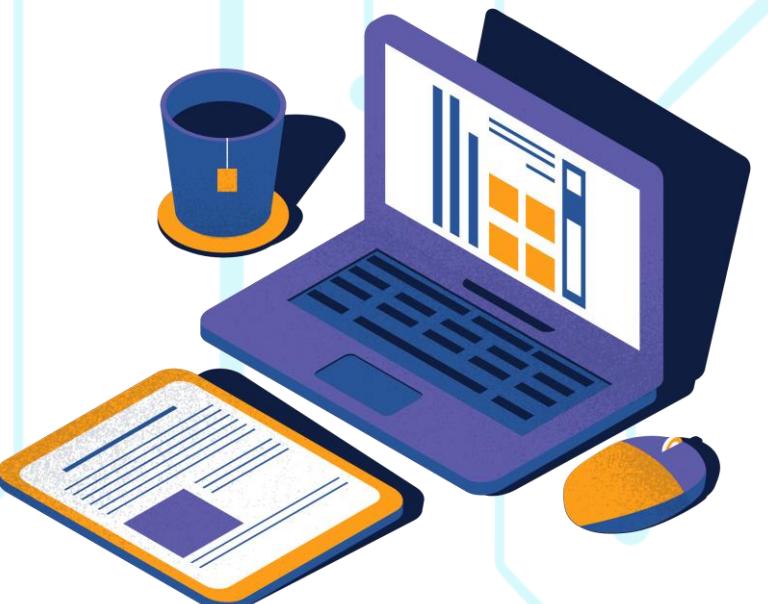
# Technologies and Techniques

## 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

- Provide online scheduling for veterinary appointments.
- Enable emergency assistance requests and quick response.
- Integrate an API to locate and display nearby veterinary clinics.
- Offer real-time information on availability and services.
- Ensure secure transmission and data protection.

## Non-Functional Requirements

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

## System Requirements

- Appointment scheduling system.
- Communication tools for messaging and consultations.
- API integration for locating veterinary clinics.
- Profile management system for veterinarians.

## Personal Requirements

- Experience in developing scheduling systems and communication tools.
- Skills in API integration and data security.
- Familiarity with veterinary practices and services.

# Evidence of completion

## Sign Up (Join now)

**Join Us**



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

### Create an Account

Username

Full Name

Address

NIC

Email

Contact Number

Password

Confirm Password

I agree to the Terms & Conditions

**Sign Up**

Already have an account? [Sign In](#)

```
1 import React, { useState } from 'react';
2 import { Link, useNavigate } from 'react-router-dom';
3 import axios from 'axios';
4 import Notiflix from 'notiflix';
5 import './forms.css';
6
7 const SignUp = () => {
8   const navigate = useNavigate()
9   const [formData, setFormData] = useState({
10     username: '',
11     full_name: '',
12     address: '',
13     email: '',
14     contact: '',
15     password: '',
16     confirmPassword: '',
17     nic: ''
18   });
19
20   const [errors, setErrors] = useState({});
21
22   const validateEmail = (email) => {
23     const re = /^[a-zA-Z0-9._%+-]+@[a-zA-Z0-9.-]+\.[a-zA-Z]{2,}\$/;
24     return re.test(String(email).toLowerCase());
25   };
26
27   const validateForm = () => {
28     let formErrors = {};
29     if (!formData.username) formErrors.username = 'Username is required';
30     if (!formData.full_name) formErrors.full_name = 'Full Name is required';
31     if (!formData.address) formErrors.address = 'Address is required';
32     if (!formData.email) formErrors.email = 'Email is required';
33   };
34
35   const handleSubmit = (e) => {
36     e.preventDefault();
37     validateForm();
38     if (Object.keys(errors).length === 0) {
39       const data = {
40         username: formData.username,
41         full_name: formData.full_name,
42         address: formData.address,
43         email: formData.email,
44         contact: formData.contact,
45         password: formData.password,
46         confirmPassword: formData.confirmPassword,
47         nic: formData.nic
48       };
49       axios
50         .post('http://localhost:3001/signup', data)
51         .then((res) => {
52           if (res.data.success) {
53             navigate('/login');
54           } else {
55             setErrors(res.data.errors);
56           }
57         })
58         .catch((err) => {
59           console.error(err);
60         });
61     }
62   };
63
64   return (
65     <div>
66       <h2>Create an Account</h2>
67       <form>
68         <input type="text" value={username} onChange={(e) => setFormData({ ...formData, username: e.target.value })}/>
69         <input type="text" value={full_name} onChange={(e) => setFormData({ ...formData, full_name: e.target.value })}/>
70         <input type="text" value={address} onChange={(e) => setFormData({ ...formData, address: e.target.value })}/>
71         <input type="text" value={email} onChange={(e) => setFormData({ ...formData, email: e.target.value })}/>
72         <input type="text" value={contact} onChange={(e) => setFormData({ ...formData, contact: e.target.value })}/>
73         <input type="password" value={password} onChange={(e) => setFormData({ ...formData, password: e.target.value })}/>
74         <input type="password" value={confirmPassword} onChange={(e) => setFormData({ ...formData, confirmPassword: e.target.value })}/>
75         <input type="text" value={nic} onChange={(e) => setFormData({ ...formData, nic: e.target.value })}/>
76         <input type="checkbox" checked="checked" value="I agree to the Terms & Conditions" onChange={(e) => setFormData({ ...formData, terms: e.target.checked })}/>
77         <button type="button" onClick={handleSubmit}>Sign Up</button>
78       </form>
79       <small>Already have an account? <a href="/login">Sign In</a></small>
80     </div>
81   );
82 }
```

# Evidence of completion



## Sign In

Username or Email

Enter Username or Email

Password

Enter Password

Sign In

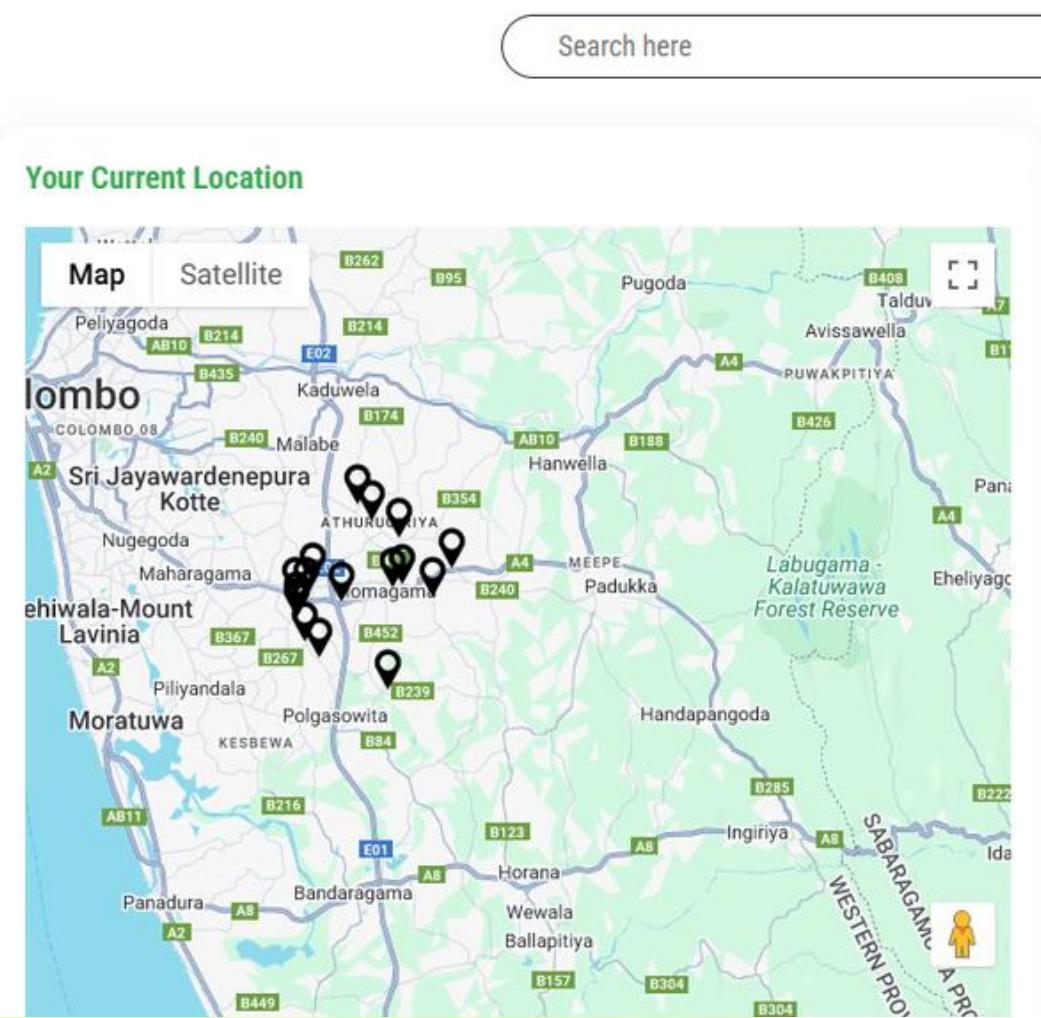
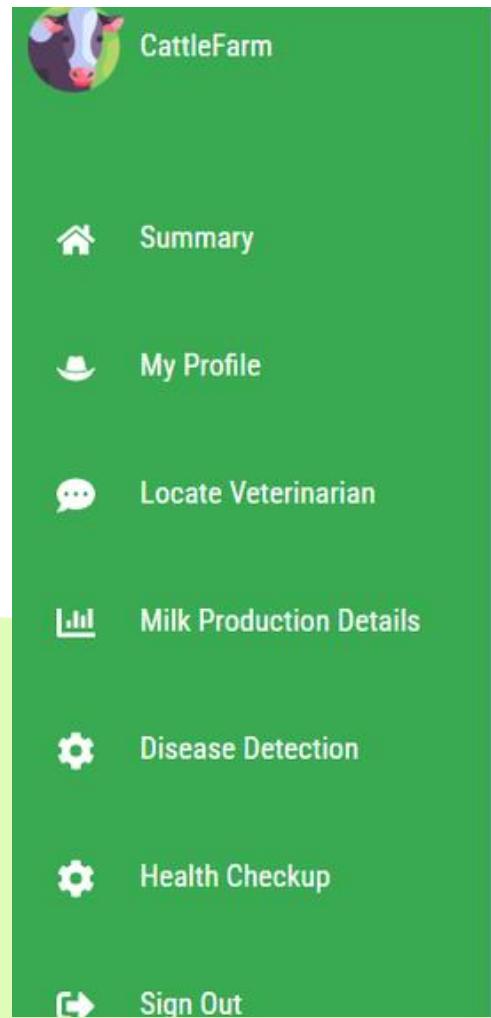
Don't have an account? [Sign Up](#)

[Forgot Password?](#)

## Sign in (Login)

```
39  };
40
41 return (
42   <div className="signup-container">
43     /* Sidebar */
44     <div className="sidebar">
45       <h2>Welcome Back</h2>
46       <img src={`${process.env.PUBLIC_URL}/images/art.png`} alt="Healthcare" />
47       <p>Access your personalized healthcare services by logging into your account.</p>
48     </div>
49
50   /* Form Section */
51   <div className="form-container">
52     <h2>Sign In</h2>
53     <form onSubmit={handleSubmit}>
54       <div className="form-group">
55         <label>Username or Email</label>
56         <input type="text" name="username" placeholder="Enter Username or Email" onChange={handleChange} />
57       </div>
58
59       <div className="form-group">
60         <label>Password</label>
61         <input type="password" name="password" placeholder="Enter Password" onChange={handleChange} />
62       </div>
63
64       <button type="submit" className="signup-button">Sign In</button>
65       <p className="signin-link">Don't have an account? <Link to="/sign-up">Sign Up</Link></p>
66       <p className="forgot-password-link"><Link to="/forgot-password">Forgot Password?</Link></p>
67     </form>
68   </div>
69 </div>
```

# Evidence of completion



## Cattle Management and Care Instructions

- Ensure your cattle have access to clean and fresh water at all times.
- Provide a balanced diet that meets the nutritional needs of the cattle.
- Schedule regular veterinary check-ups to monitor and maintain health.
- Keep the living area clean and dry to prevent infections and diseases.

```
32  if (currentLocation.lat && currentLocation.lng) {  
33  // Fetch nearby locations from your FastAPI backend  
34  const fetchNearbyLocations = async () => {  
35  setLoading(true);  
36  try {  
37  const response = await axios.post('http://localhost:8000/nearby_locations', {  
38  latitude: currentLocation.lat,  
39  longitude: currentLocation.lng,  
40  });  
41  if (response.data.locations) {  
42  setLocations(response.data.locations);  
43  console.log('Nearby locations:', response.data.locations); // Log the locations  
44  }  
45  } catch (error) {  
46  console.error('Error fetching nearby locations:', error);  
47  } finally {  
48  setLoading(false);  
49  }  
50  };  
51  };  
52  fetchNearbyLocations();  
53  }  
54  }
```

## Locate Veterinarians

# Completion and Future works

## Completion of the components

Gathered data related to Veterinarians and their locations

User registration

Locate nearest veterinarian clinics

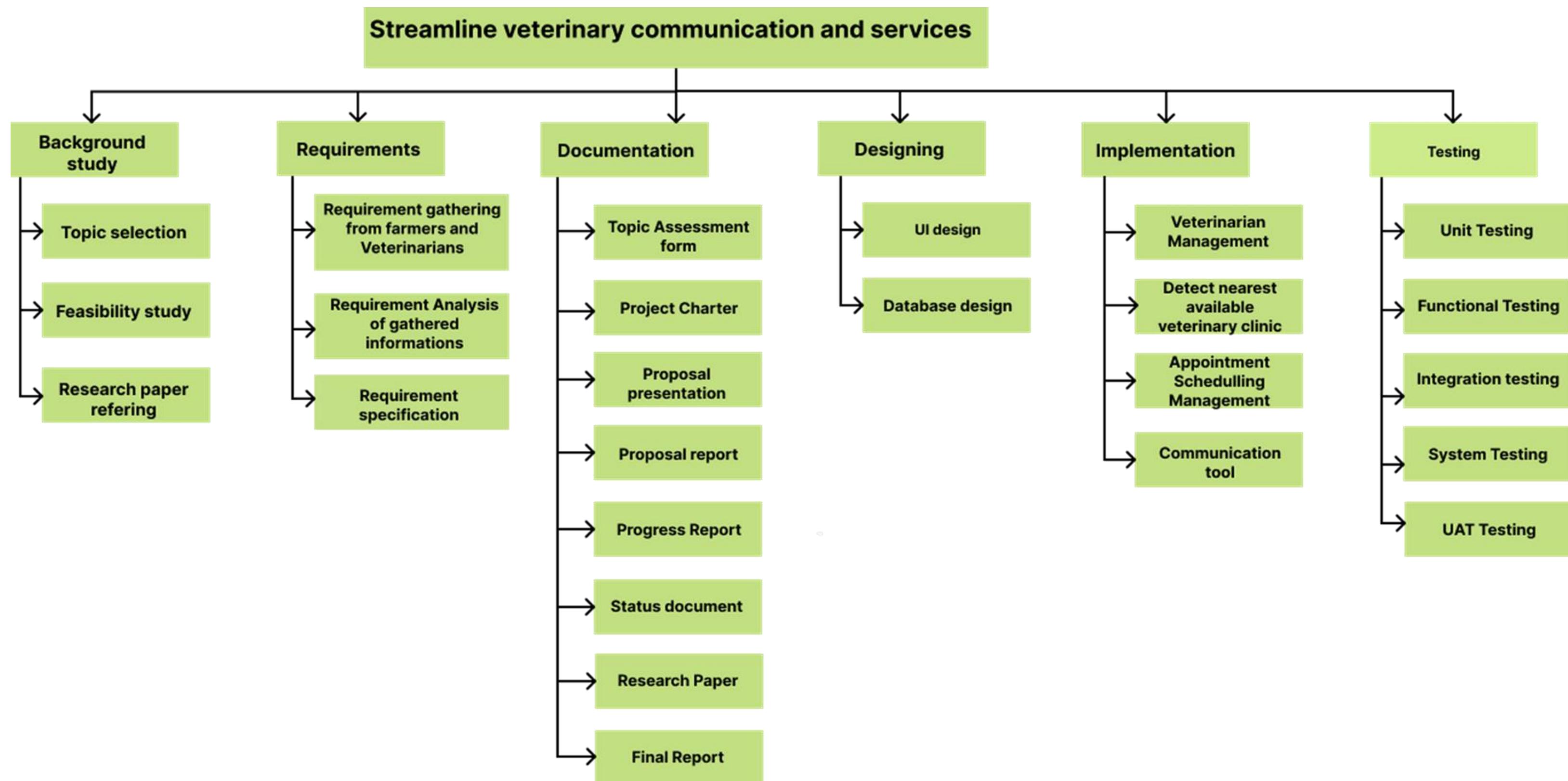
## Future Implementations

Veterinarian profile Management and their availabilities.

Scheduling and managing veterinary appointments with alerts.

Communication tools for consultations and emergency support.

# Work Breakdown Structure

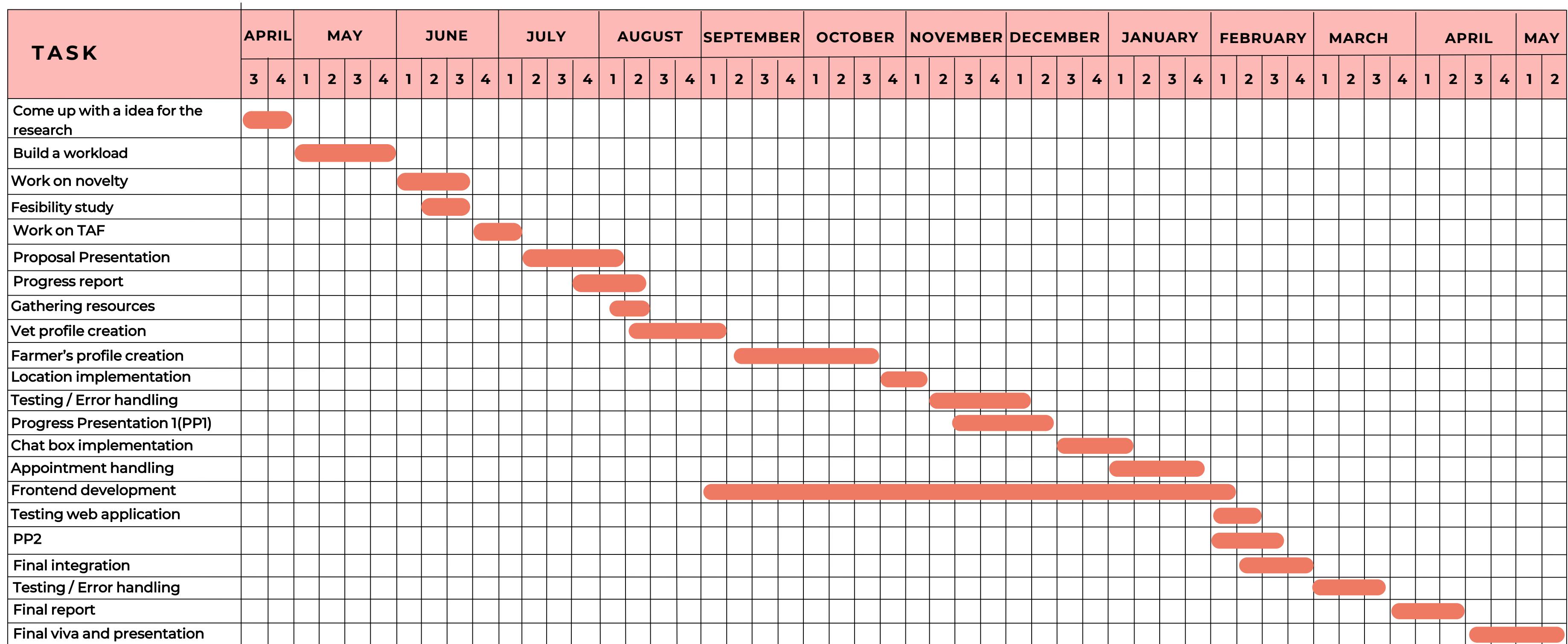


# Estimated Budget per month

	Amount (LKR)
Travel fees for data collection(Government Veterinary Surgeons Office - Homagama, District Agriculture Training 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

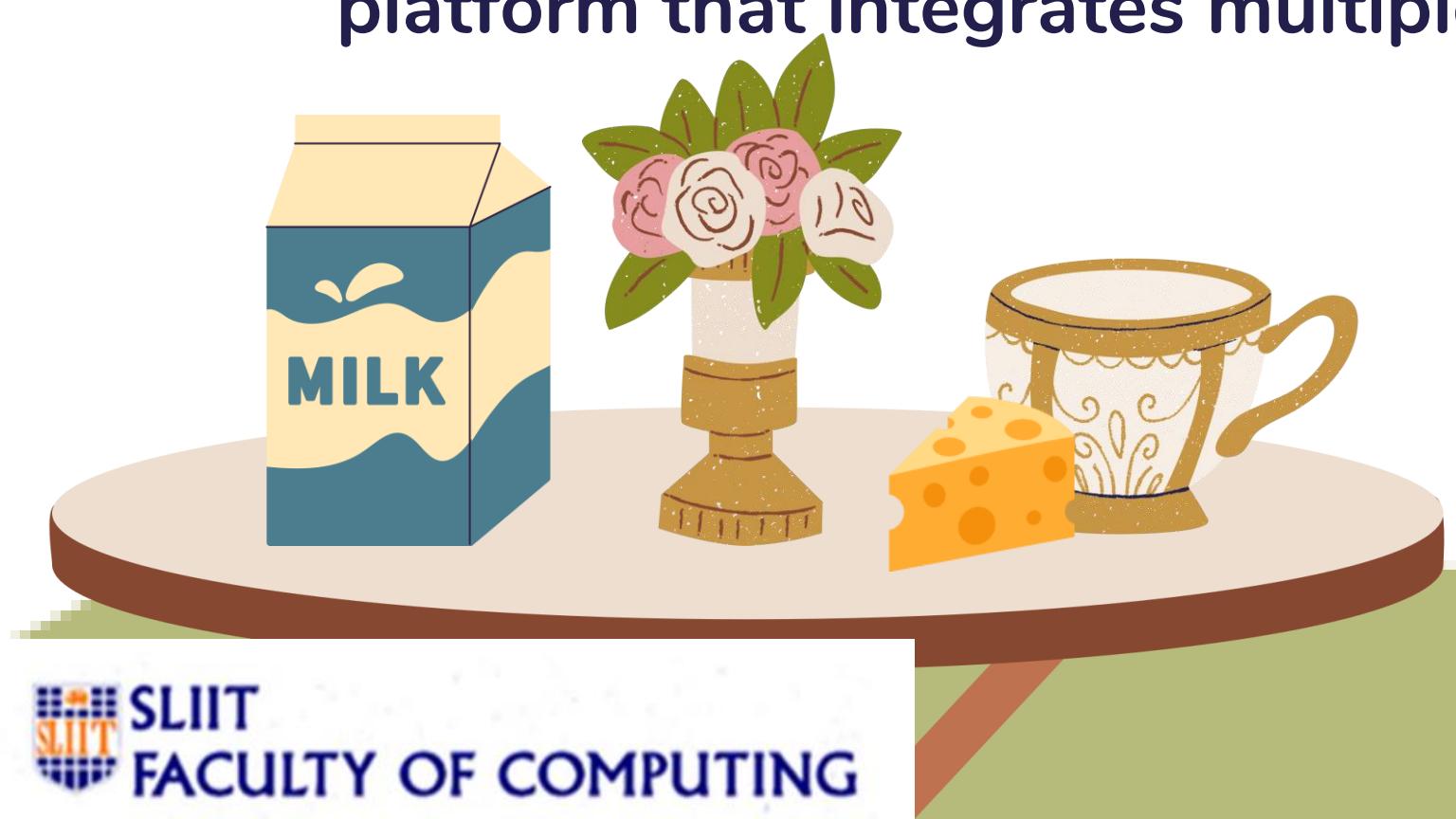


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# Market Need

- 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.

## Veterinarians

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



## Agricultural Enterprises

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



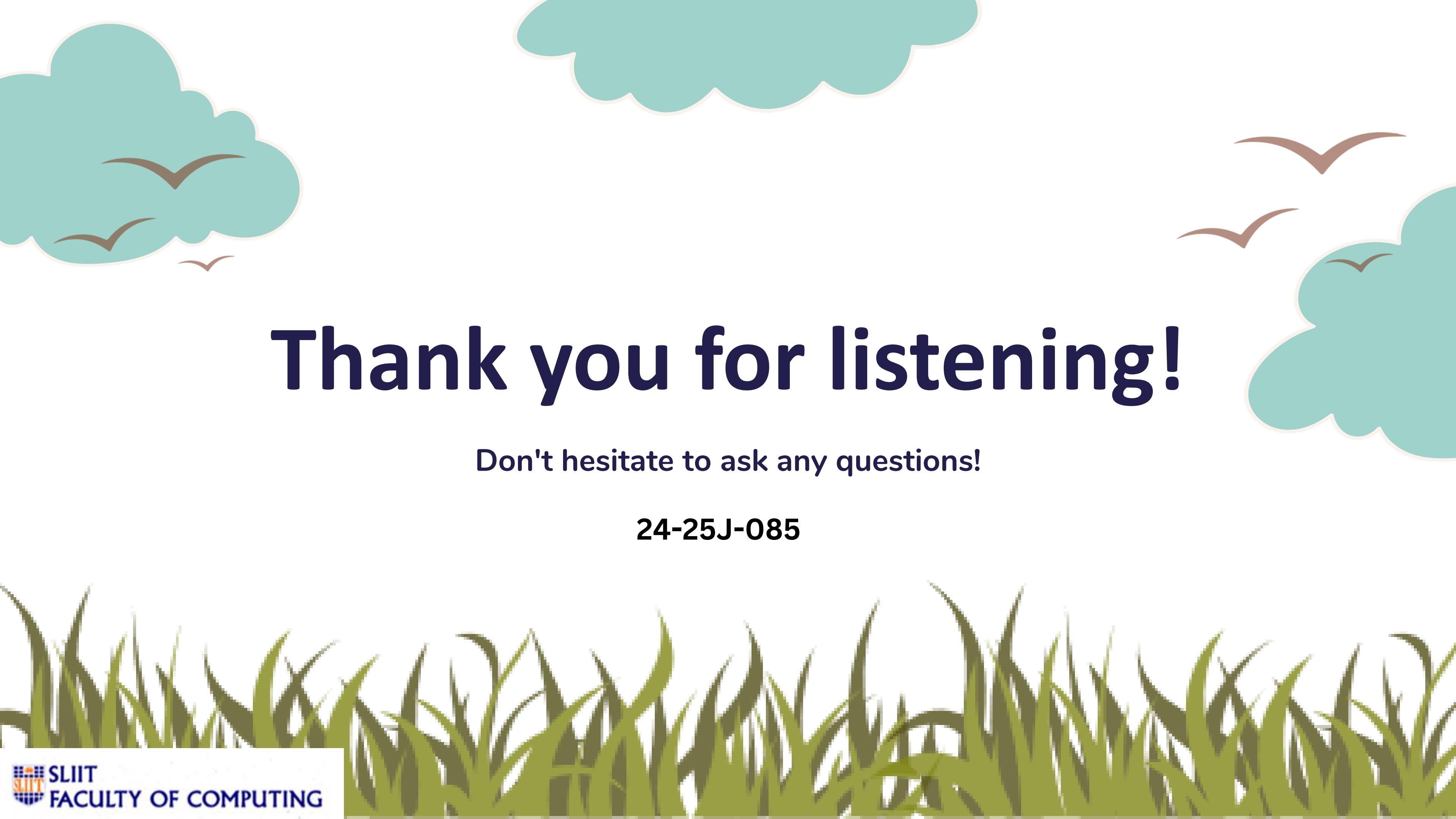
## Animal Health Organizations

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.





# Thank you for listening!

Don't hesitate to ask any questions!

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