



# I-COW-CARE COW MONITORING DEVICE

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# MEET THE TEAM



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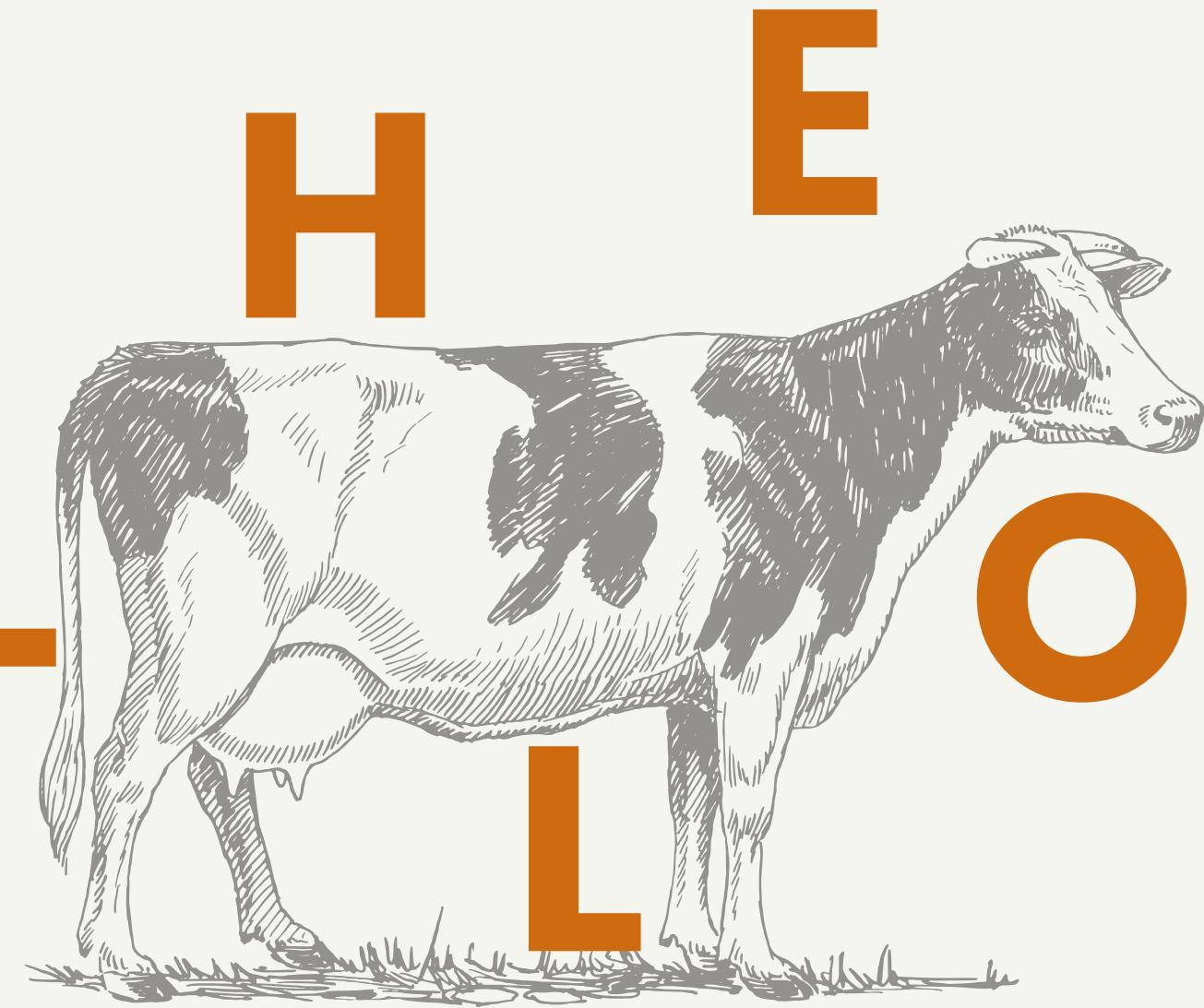
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# PROJECT CONTEXT

## WHAT IS ESTRUS AND ESTRUS DETECTION?



The Estrus ( commonly known as Heat ) comes with a multitude of behavioural and physiological changes notably:

- A sudden increase in body temperature.
- Lack of interest for food.
- Mounting acceptance.
- Stress and restlessness.

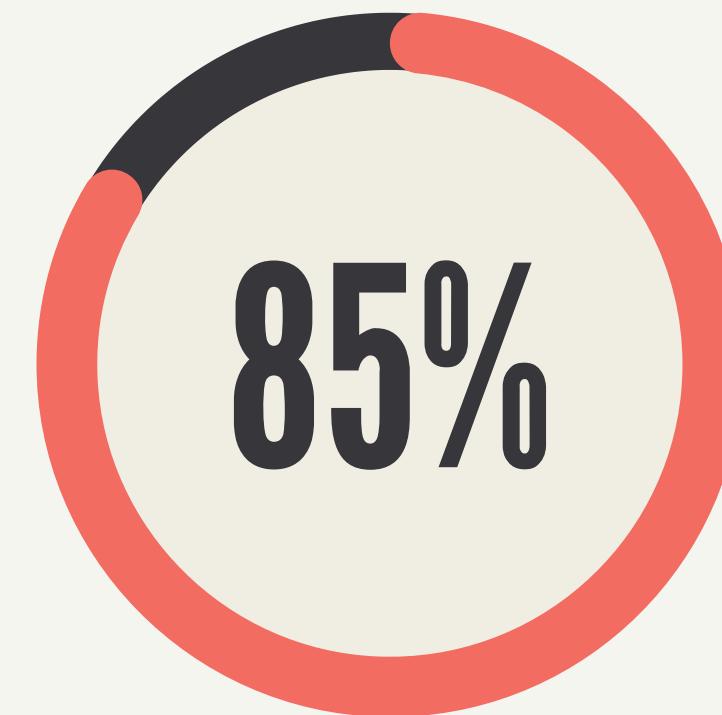


## ESTRUS DETECTION SUCCESS RATE

Traditional  
Observation-Based  
Detection



Cow monitoring  
devices Detection rate



# PROBLEM STATEMENT



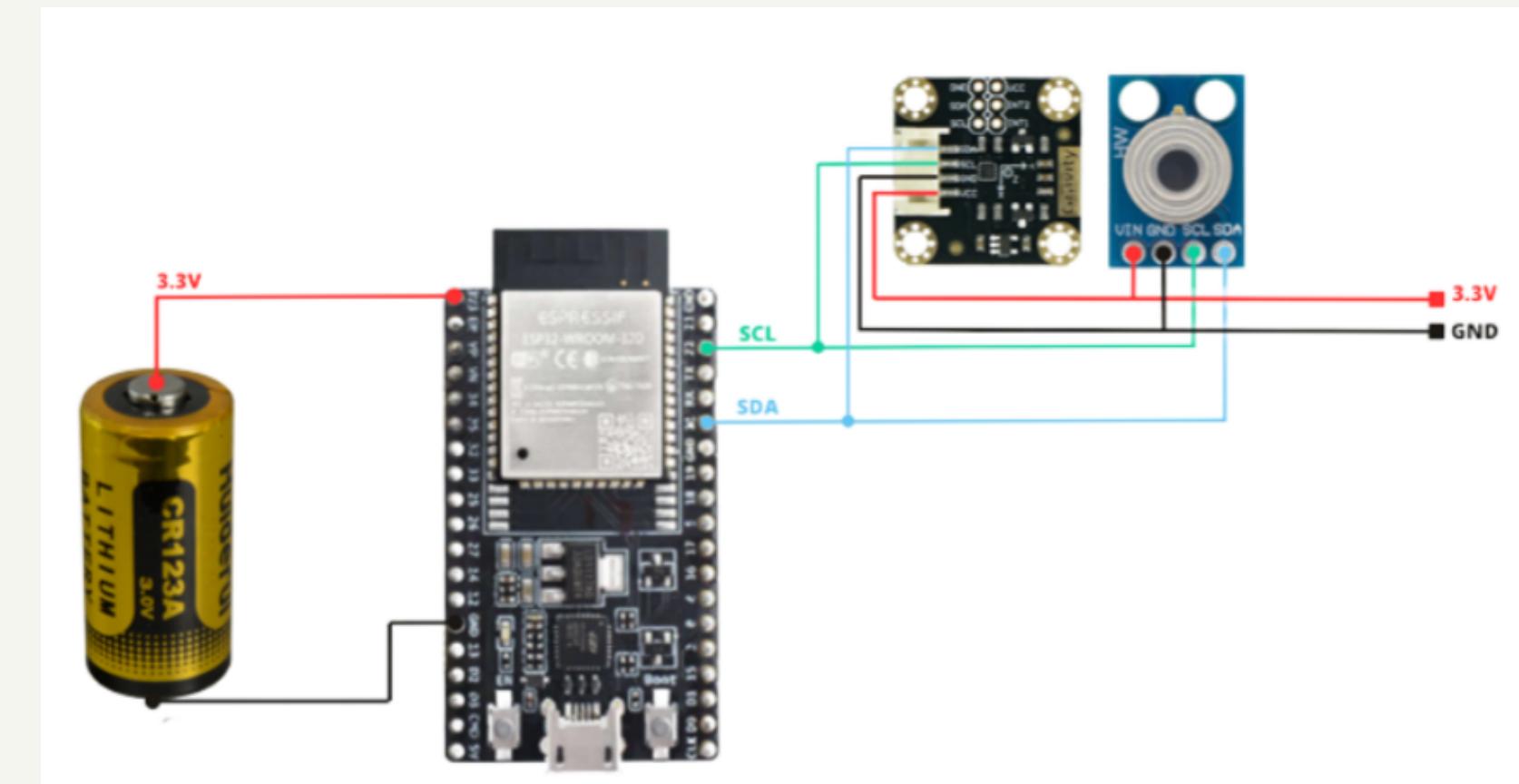
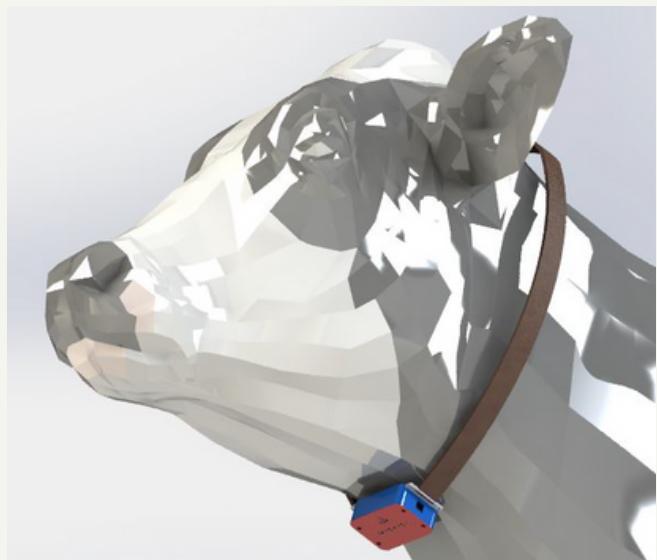
Cattle monitoring systems are needed to collect data 24/7 and provide valuable information to manage the herd effectively. By using IoT and Machine Learning techniques, we can detect significant details and improve cow productivity.

# SOLUTION OVERVIEW

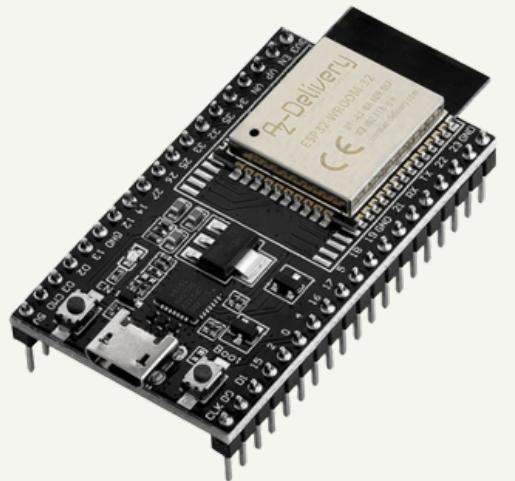


## KEY FEATURES AND INSIGHTS

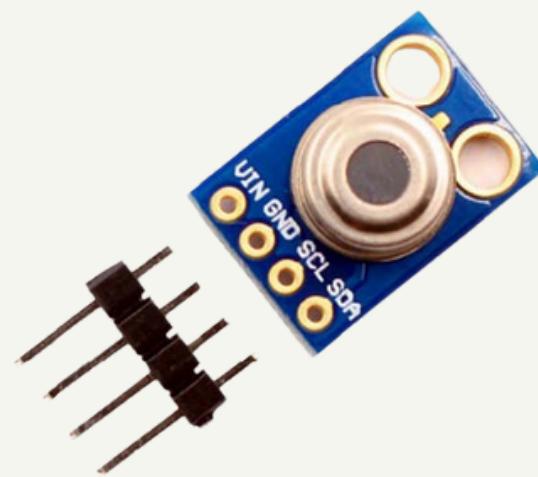
Our collar is equipped with temperature and movement sensors, allowing it to constantly gather real-time data. It is also equipped with a battery that assures long-lasting life.



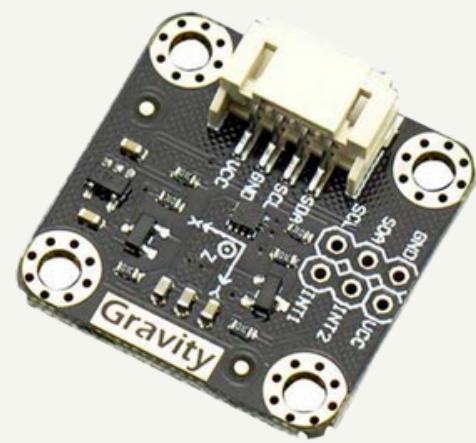
# HARDWARE CHOICES



ESP32 DEVKITC V4



GY-906 MLX90614



DFROBOT GRAVITY  
LIS2DH

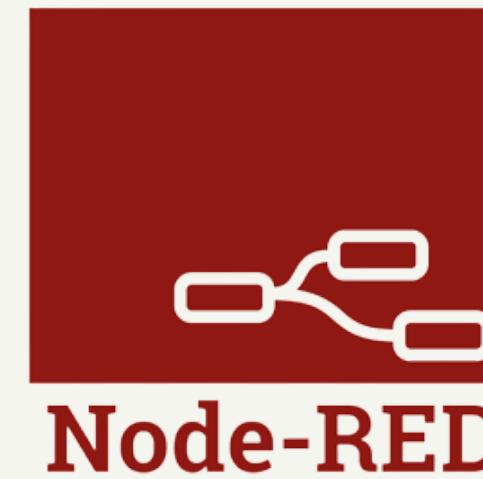


CR123A 3V 1300MA

## SOFTWARE CHOICES



ARDUINO IDE



NODE-RED

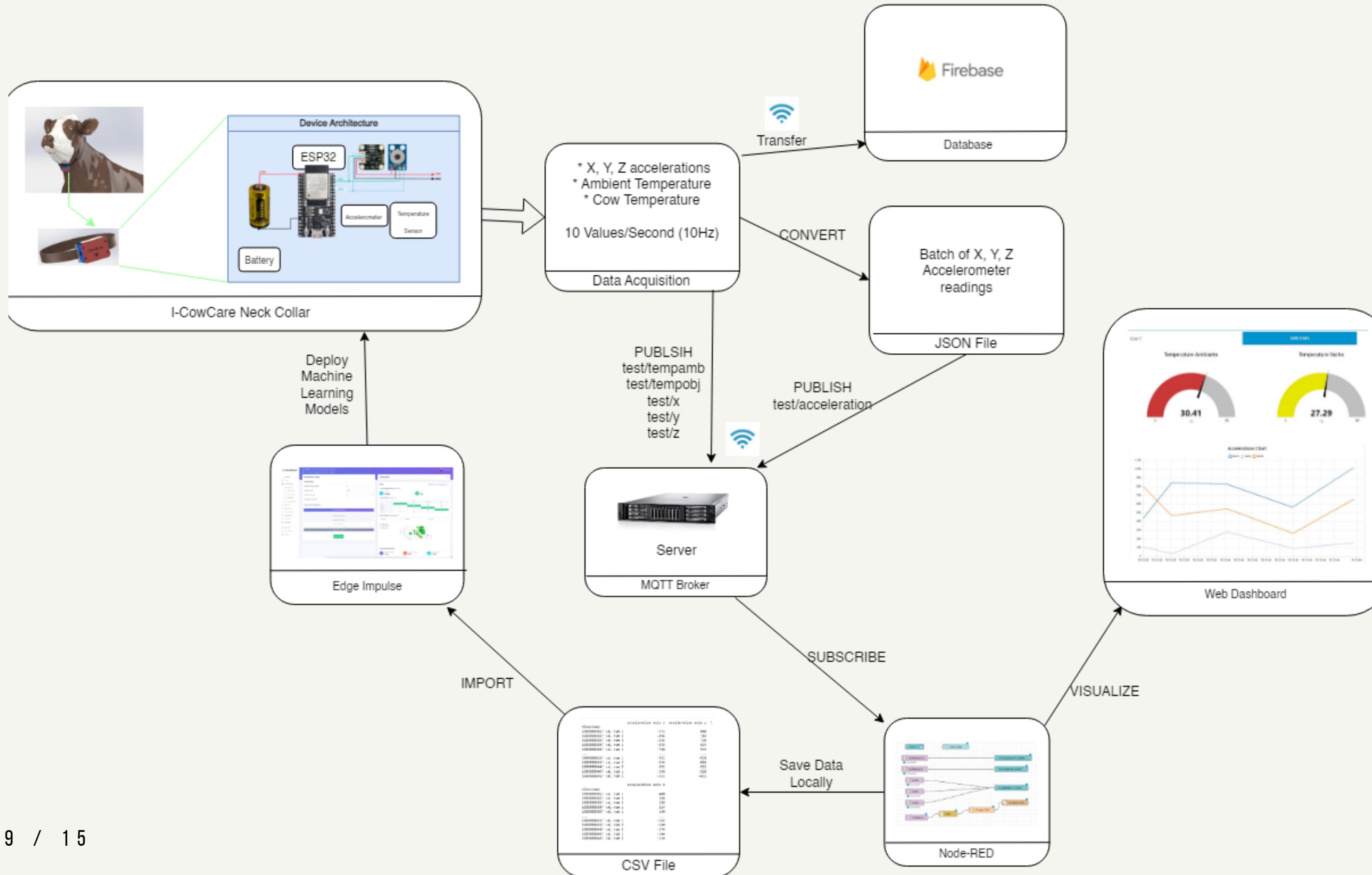


MOSQUITTO MQTT



FIREBASE

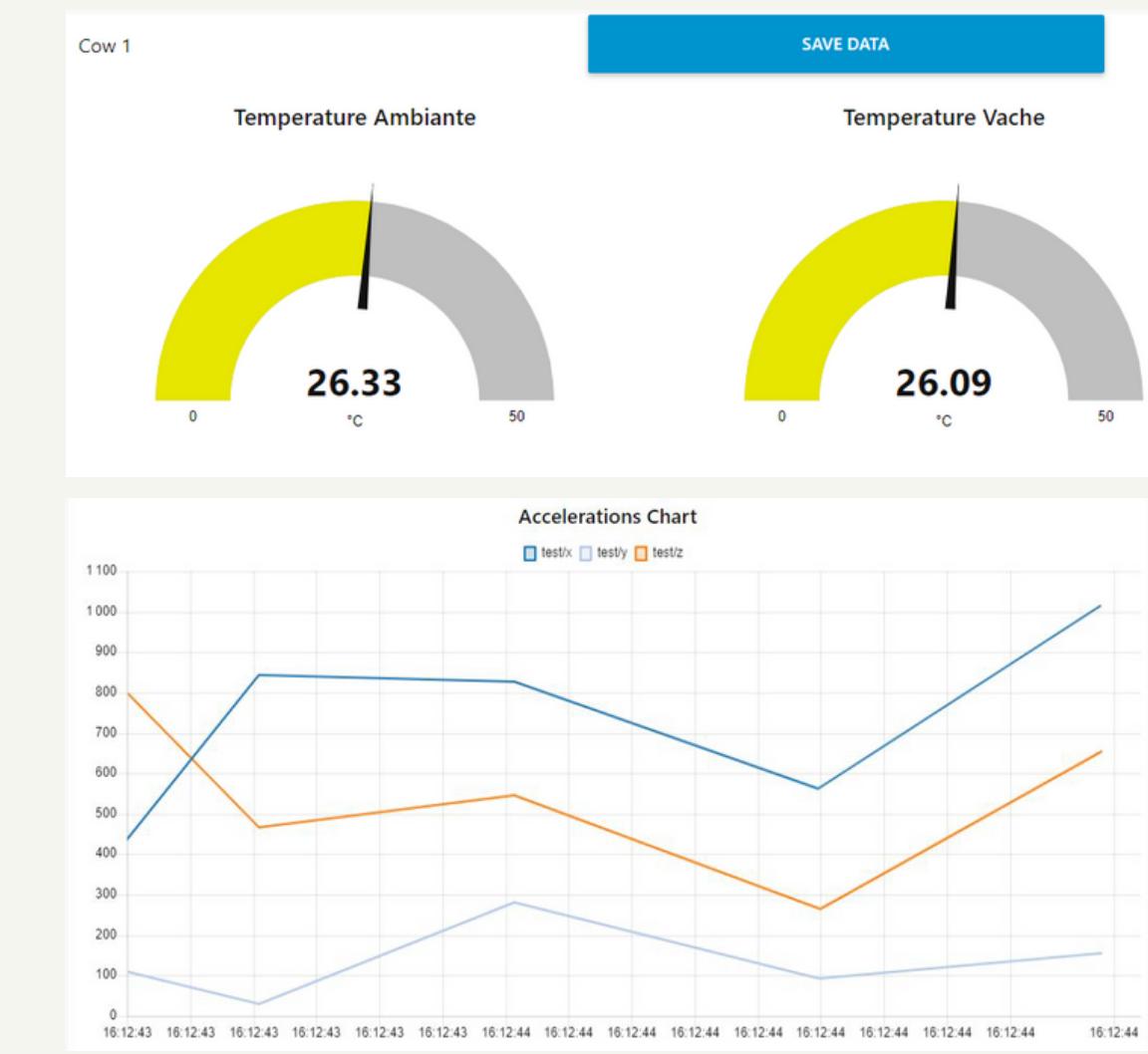
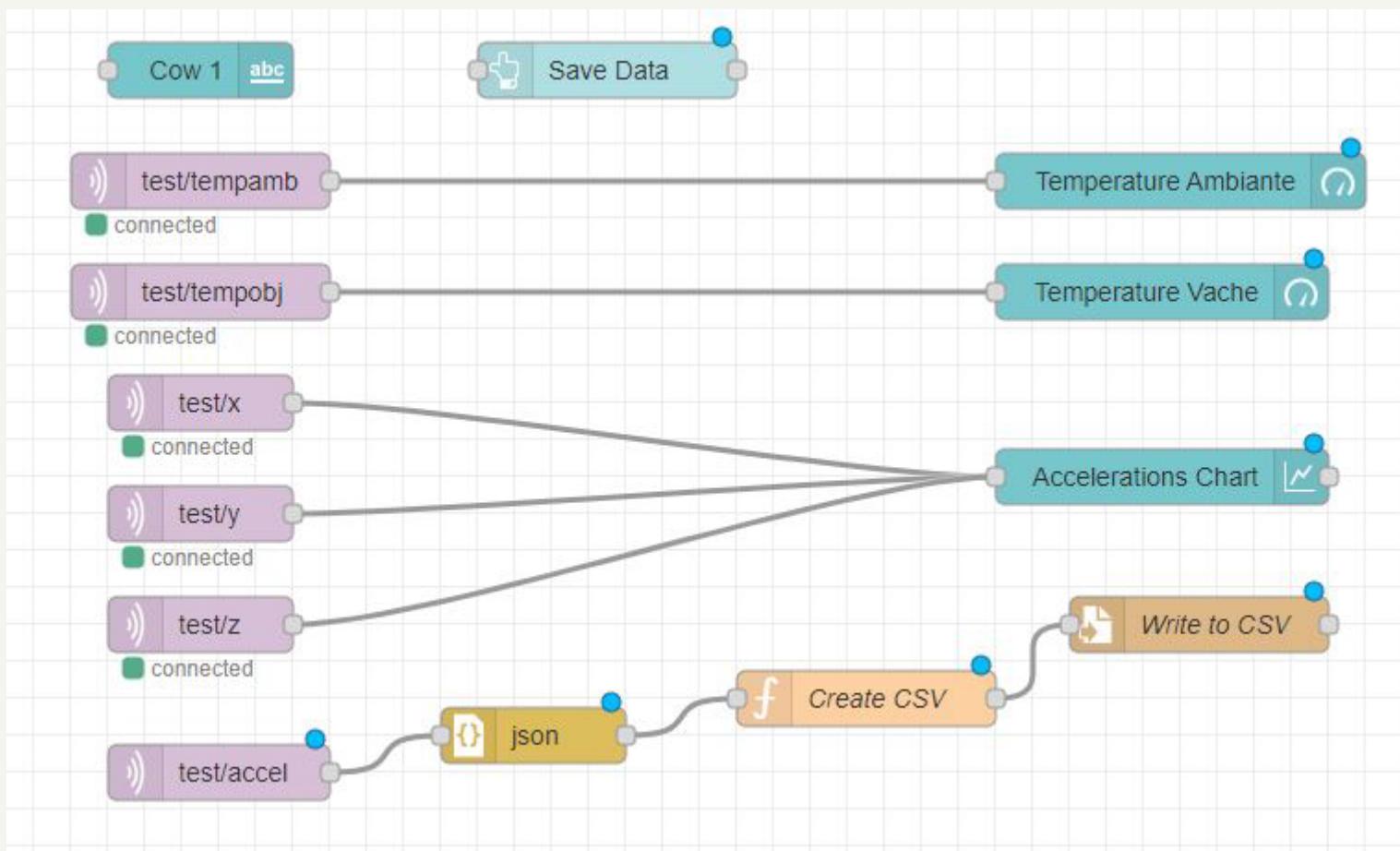
# THE SOLUTION USE CASE: FLOW DIAGRAM



# TEST AND VALIDATION

## Node-Red Dashboard

We utilized our MQTT subscription to receive data for various topics, including ambient temperature, object temperature, and acceleration values in the X, Y, and Z axes



## Firebase

The data collected from the accelerometer and the temperature sensor is transmitted to the Firebase in real time.

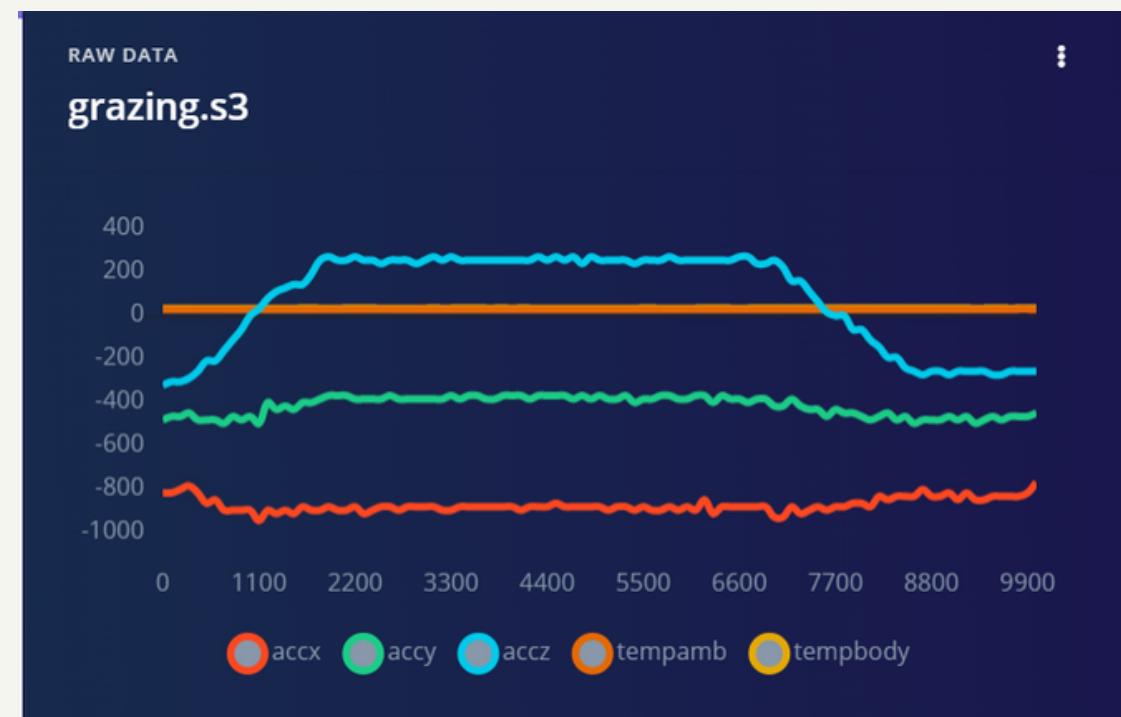


# FINAL IMPLEMENTATION

## Data Acquisition

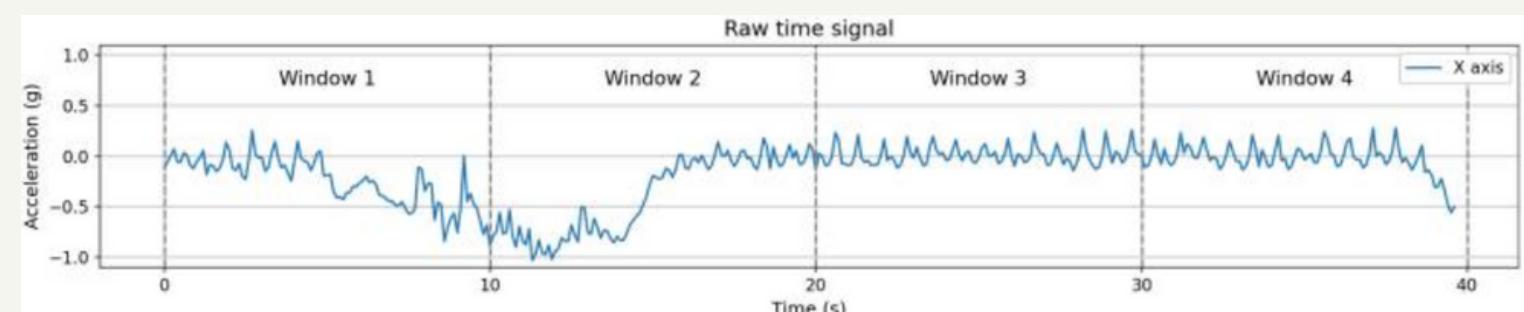
We will utilize two distinct procedures to monitor and analyze animal behavior:

- Tracking movement
- Measuring body temperature



## Data Preprocessing

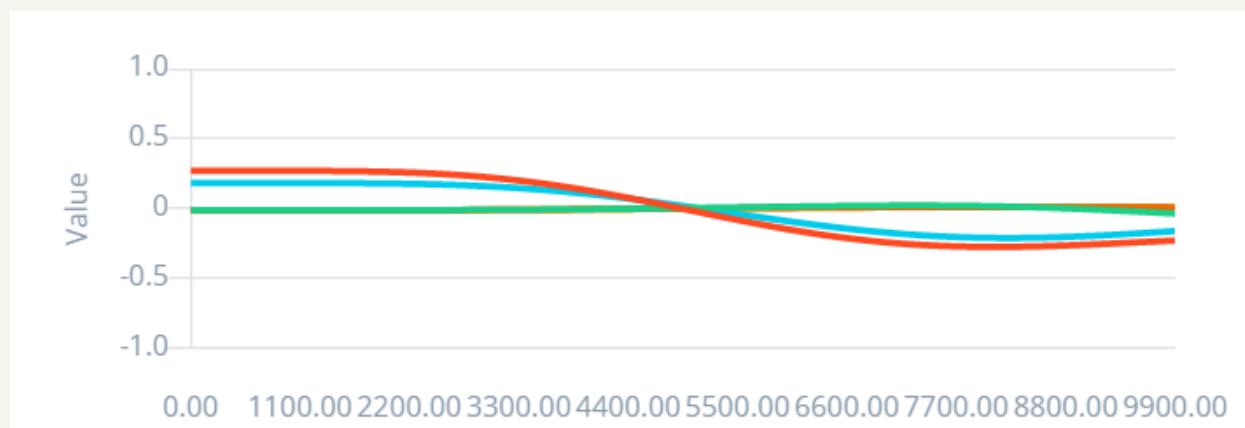
- The process involves dividing each time signal on each axis into consecutive time windows of 10 seconds each. This results in intervals containing 100 samples, with a sampling rate of 10 Hz providing 10 samples per second.



# FINAL IMPLEMENTATION



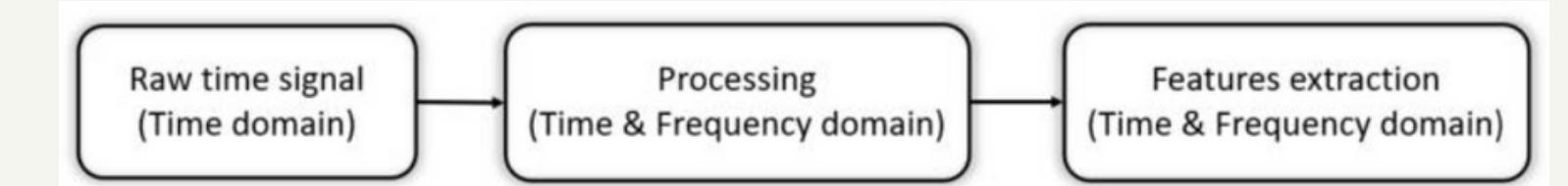
Before Filtering



After Filtering

## Feature Engineering

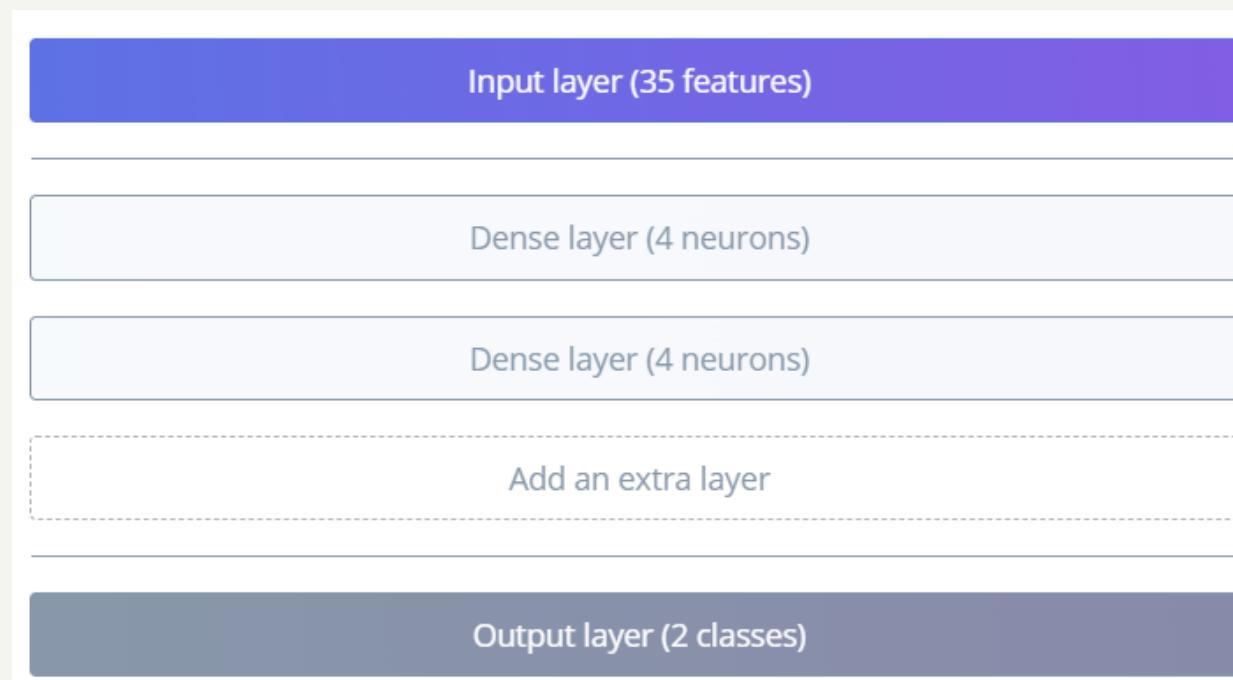
The procedure for accelerometer raw data processing consists of different steps, these steps are shown in the figure below :



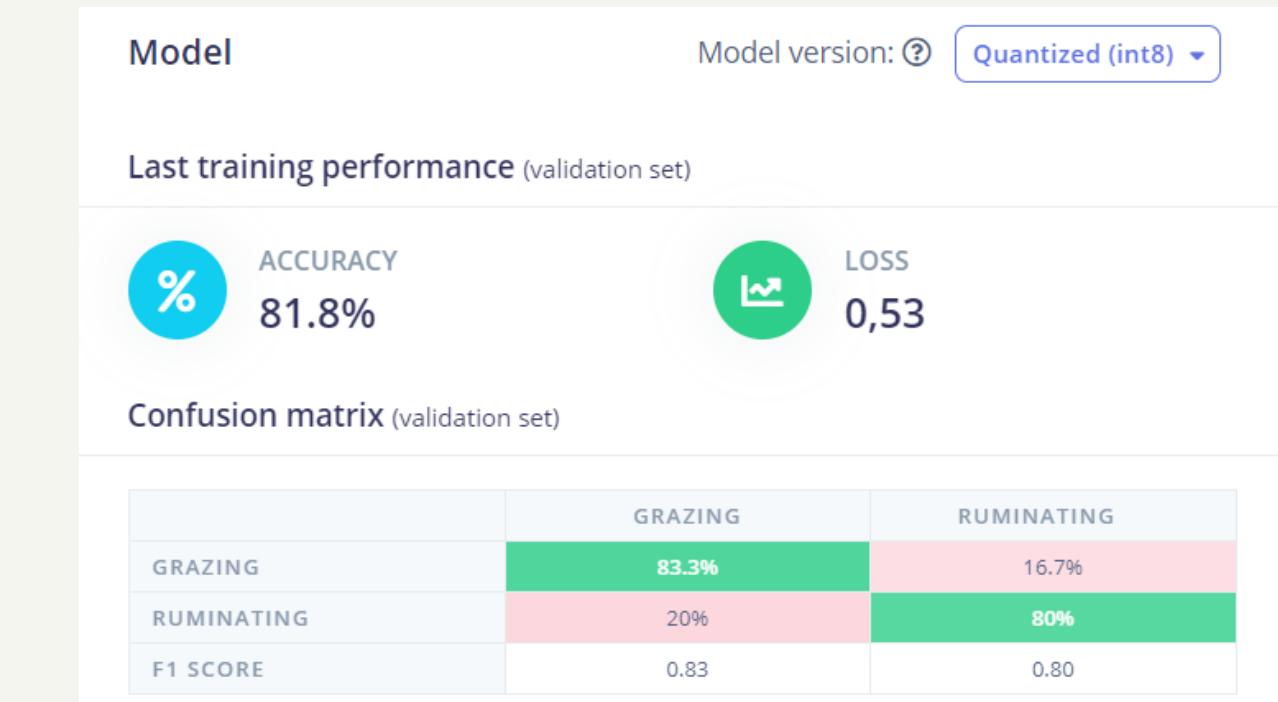
Feature importance ranking

# RESULTS

## Neural Network Architecture



## Model evaluation on Validation Set



## Learning Hyperparameters

### Training settings

Number of training cycles ② 250

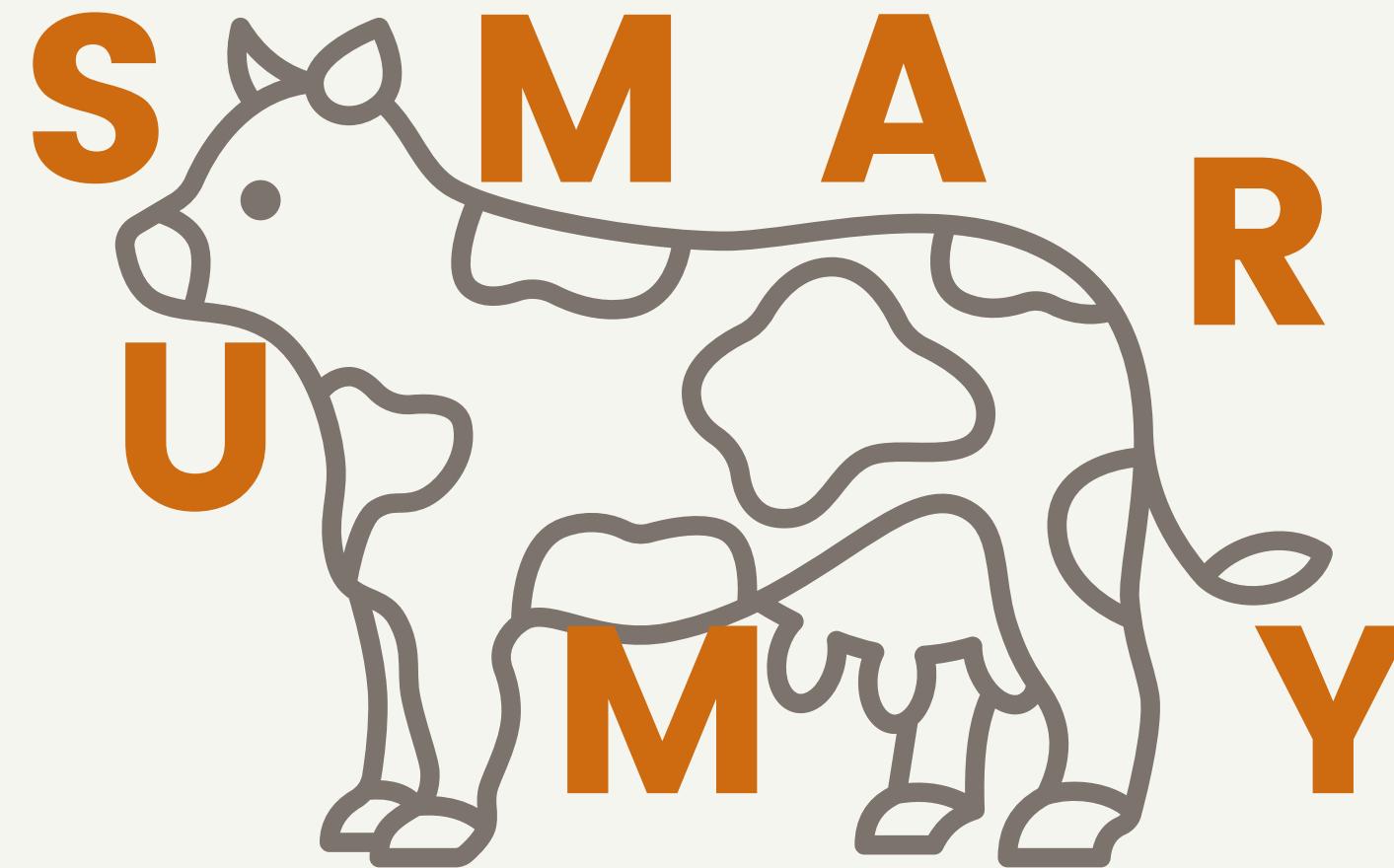
Learning rate ② 0.005

### Advanced training settings

Validation set size ② 20 %

## Model evaluation on Testing Set





Our tests validated the accuracy and reliability of our system. Although our Machine Learning model reached 80% accuracy due to a small dataset, our solution is ready for real-world implementation, enhancing estrus detection and cow health monitoring for improved productivity.

**THANK YOU FOR  
ATTENTION**

