ESW PROJECT- SMART FARMING

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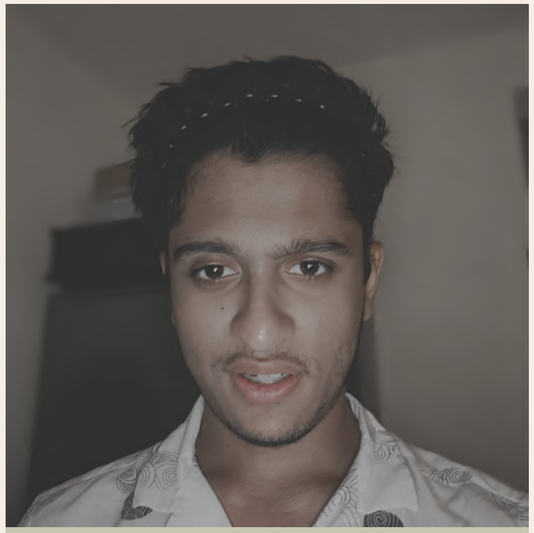
Our team

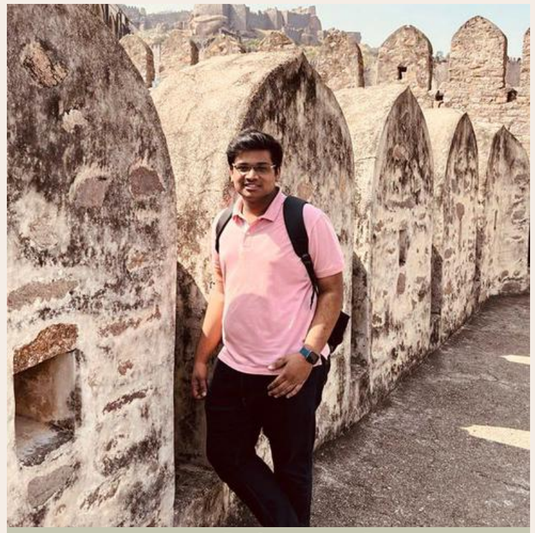
Chirag Dhamija

- DHT-22
- LDR
- SGP-30 code
- Solenoid valve connections
- pH Sensor



Aditya Mishra

- User Interface Designer and Software
- SGP30-hardware
- Solenoid valve code



Sanchit Jalan

- Resistive soil moisture sensor
- LDR
- SGP 30 code
- Solenoid valve connections
- pH señsor
- Data visualization and Analysis

Namrata Baliga

- DHT-22
- Resistive soil moisture sensor
- SGP30-hardware
- Solenoid valve code
- pHsensor

SCOPE

of a smart farming project

- **Real time data monitoring:** Advanced sensors provide real-time data on soil conditions, moisture levels, temperature, and crop health, forming the foundation of smart farming initiatives.
- **Enhanced efficiency:** Connected devices, including sensors, enable remote monitoring and data-driven decision-making, enhancing efficiency in agriculture.
- **Data Processing and analysis:** Utilizing data analytics and big data processing, farmers gain insights into historical trends and employ predictive analytics for more informed crop management.
- **Automation:** Automation streamline tasks such as planting and watering, reducing reliance on manual labor and ushering in a new era of sustainable, data-driven agriculture.

Motivation

- **Integration of Conventional and Tech:** Smart farming is an evolving concept seamlessly blending traditional farms with innovative technologies like IoT, aiming to enhance agricultural product quality while minimizing human intervention.

- **Addressing Farmer Challenges:** Dedicated efforts and research are underway to overcome challenges faced by farmers, focusing on improving both the quality and quantity of agricultural products through the implementation of connected and intelligent practices in smart farming.

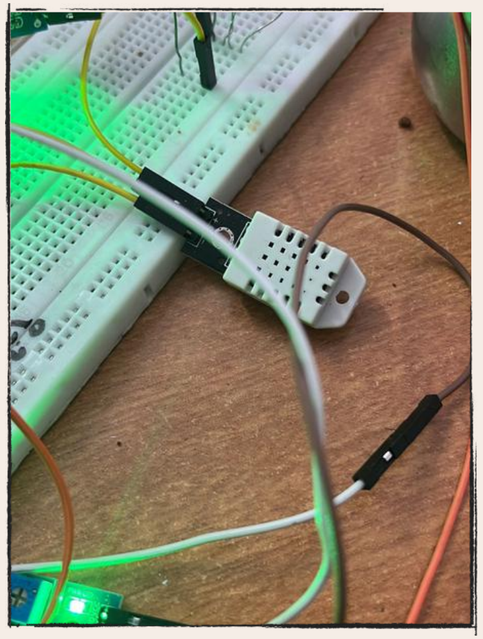
- **IoT-Driven Crop Monitoring:** Leveraging IoT technology, smart farming employs a data-driven approach, allowing farm managers to conduct meticulous monitoring of crops. This facilitates timely actions against pests and diseases, ensuring enhanced crop protection.

- **Comprehensive Crop Production Oversight:** Smart farming solutions provide detailed oversight of every aspect of crop production. This includes real-time alerts on health, condition, and temperature requirements, all readily accessible on interconnected smart devices, fostering proactive and informed agricultural management.

Sensors- DHT22

The sensor is measures the values of temperature and humidity .

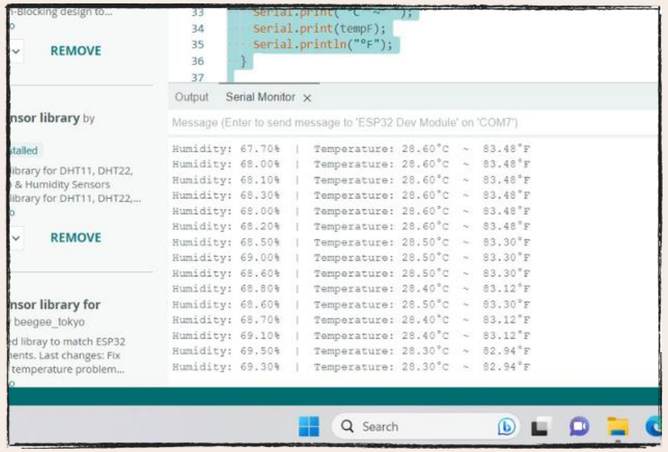
In our project, it is being used to measure the temperature of the soil.



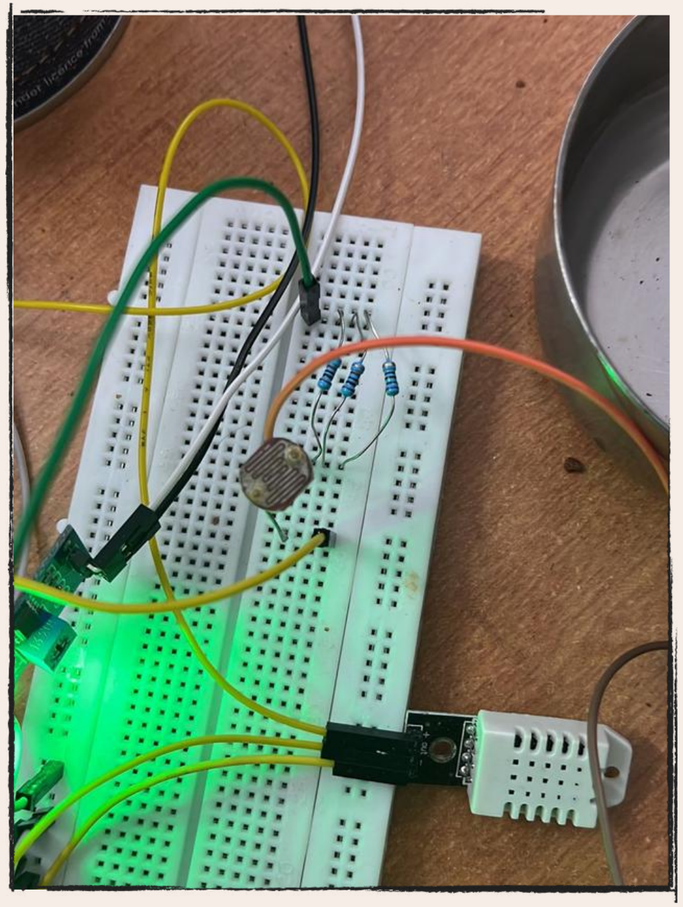
Consists of 2 different components:

- NTC thermistor for measuring temperature
- Capacitive humidity sensing element measures humidity- *has dielectric moisture holding substance between two electrodes*

- Data from DHT22 being sent to *Thingspeak*
- Data from DHT22 being sent to **OM2M** for collection
- This way also indirectly being updated to website



Sensors- LDR



The sensor is measures the values of moisture in the soil.

It is for the exact same purpose that we use it in our project.

- consists of a fork shaped probe and a module
- each prong is a exposed conductors acting as a variable resistor whose resistance varies with the soil's moisture content.
- The sensor produces an output voltage according to the resistance, which by measuring we can determine the soil moisture level.

- Data from DHT22 being sent to Thingspeak
- Data from DHT22 being sent to **OM2M** for collection
- This way also indirectly being updated to website

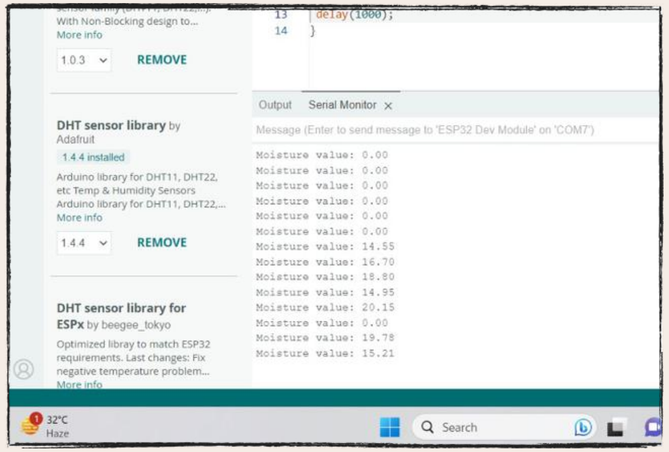
Sensors- Resistive soil moisture

The sensor is measures the values of moisture in the soil.

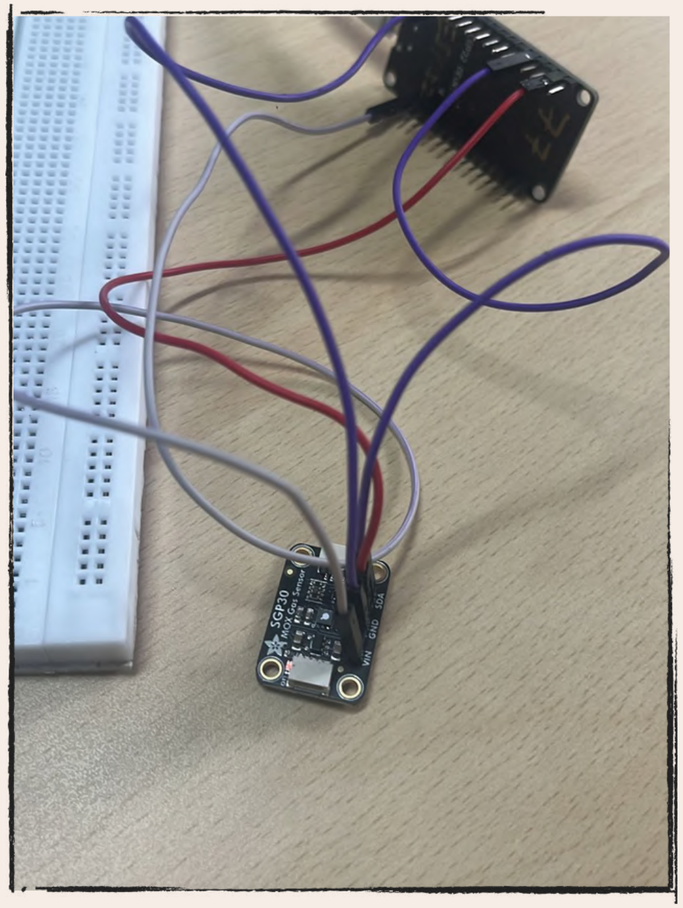
It is for the exact same purpose that we use it in our project.

- consists of a fork shaped probe and a module
- each prong is a exposed conductors acting as a variable resistor whose resistance varies with the soil's moisture content.
- The sensor produces an output voltage according to the resistance, which by measuring we can determine the soil moisture level.

- Data from DHT22 being sent to Thingspeak
- Data from DHT22 being sent to **OM2M** for collection
- This way also indirectly being updated to website



SENSORS- SGP30



This is used for measuring CO2 and VOCs

In our project also it is being used to measure ambient CO2 and VOC levels.

- Through detecting changes in conductivity for metal oxide sensing element
- Measurement in ppm or ppt

- Data from DHT22 being sent to **Thingspeak**
- Data from DHT22 being sent to **OM2M** for collection
- This way also indirectly being updated to website

Sensors- pH Sensor

This sensor is being used to measure the pH.

We use it to measure soil pH.

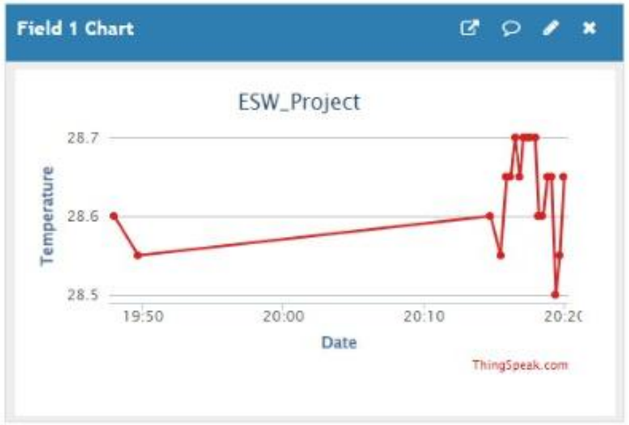
- The sensor compares the electric potential of a pH-sensitive system to the potential of a stable reference system.
- The sensing system uses a pH-sensitive glass bulb which changes voltage proportionally to the concentration of hydrogen ions.
- A sensing electrode measures the potential of the glass bulb.

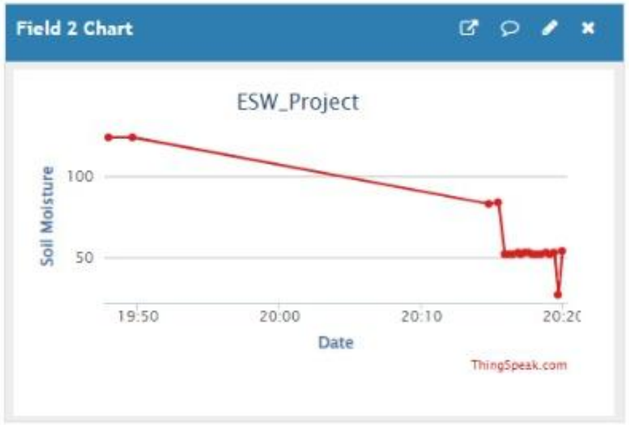
- Data from DHT22 being sent to Thingspeak
- Data from DHT22 being sent to **OM2M** for collection
- This way also indirectly being updated to website

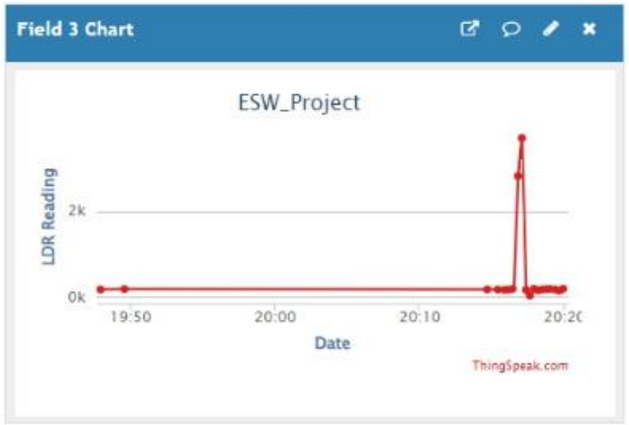
ThingSpeak

ThingSpeak™ Channels Apps Devices Support Commercial Use How to Buy

Created: about 19 hours ago
Last entry: less than a minute ago
Entries: 19





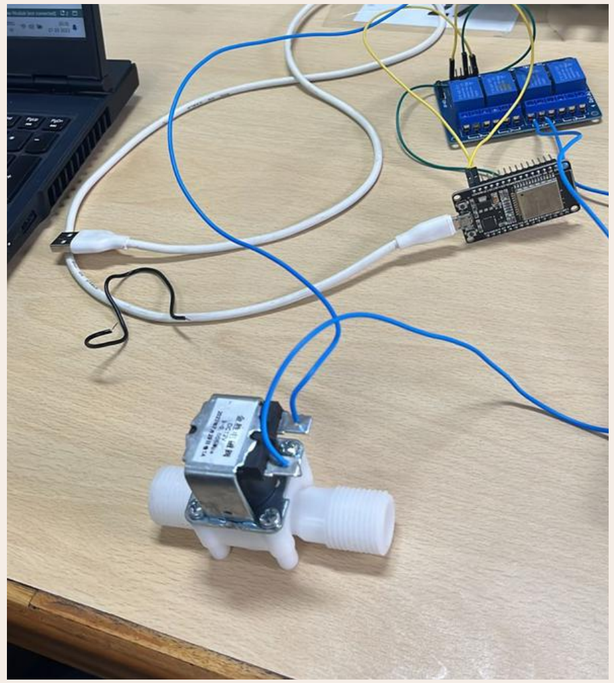


Actuation via Solenoid Valve

Consists of 2 parts:

1. Solenoid Valve consisting of power terminals
   - water inlet and outlet
   - Power required: 12V
2. Relay module

- **Objective:** to control water flow to plants, likely allows water when amount below fixed point
- Lets water flow through one end and can block also
- Coil of insulated copper wire which turns into an electromagnet when you supply the power to it.
- The valve is open for the flow of liquid when the coil produces a magnetic field around it and cuts the flow when there is no power.
- The inner mechanism returns to its home position in the absence of electricity.



Final hardware connections

Data Analysis: Plant Profile

Plant scientific name: *Cordyline fruticose*

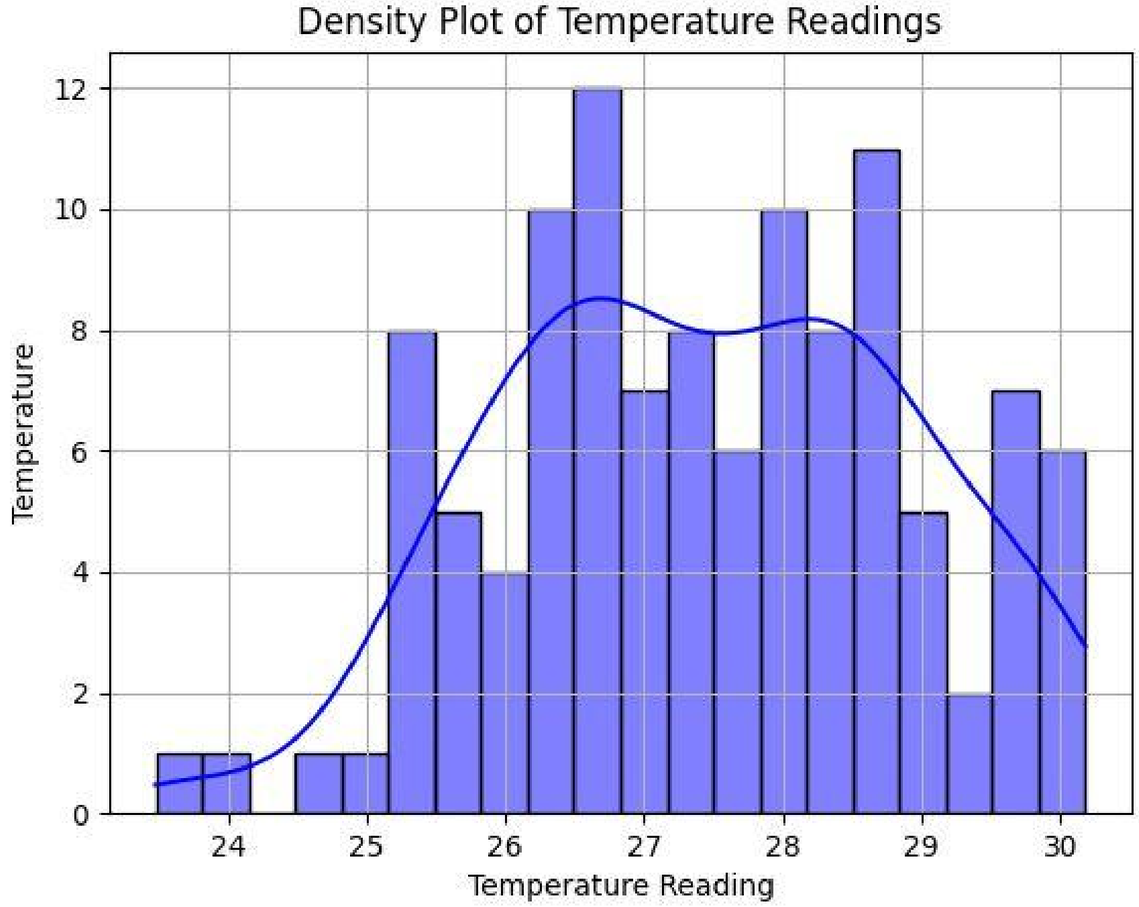
- **Native habitat: Tropical and subtropical regions of world**
- **Growing conditions:**
  - bright, indirect light
  - well draining and rich soil
  - warm temperatures above 18 degrees Celsius
- **Potential common problems with this plant:**
  - susceptible to pests like mealyworms
  - overwatering can cause root rot

Data Analysis

- We worked with our plant directly for a couple of days
- The final data collection and analysis was done in context to this plant and the atmospheric conditons present then.
- The plant and soil type are constant variables with respect to the analysis
- Data analysis is possible using the colllected data from OM2M
- We did analysis for a chunk of the data collected; present in the next few slides

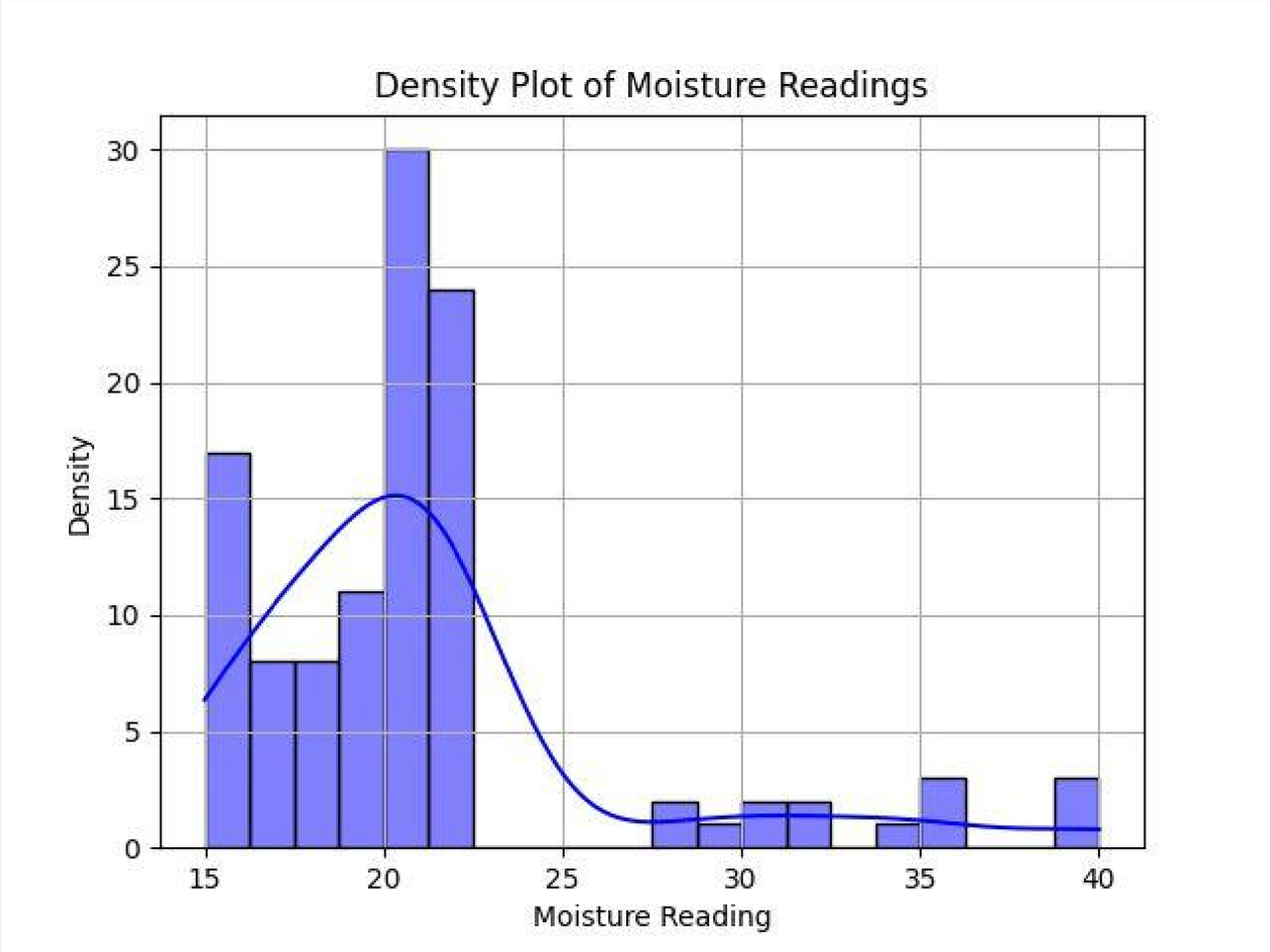
Data Visualisation

DATA FROM DHT-22



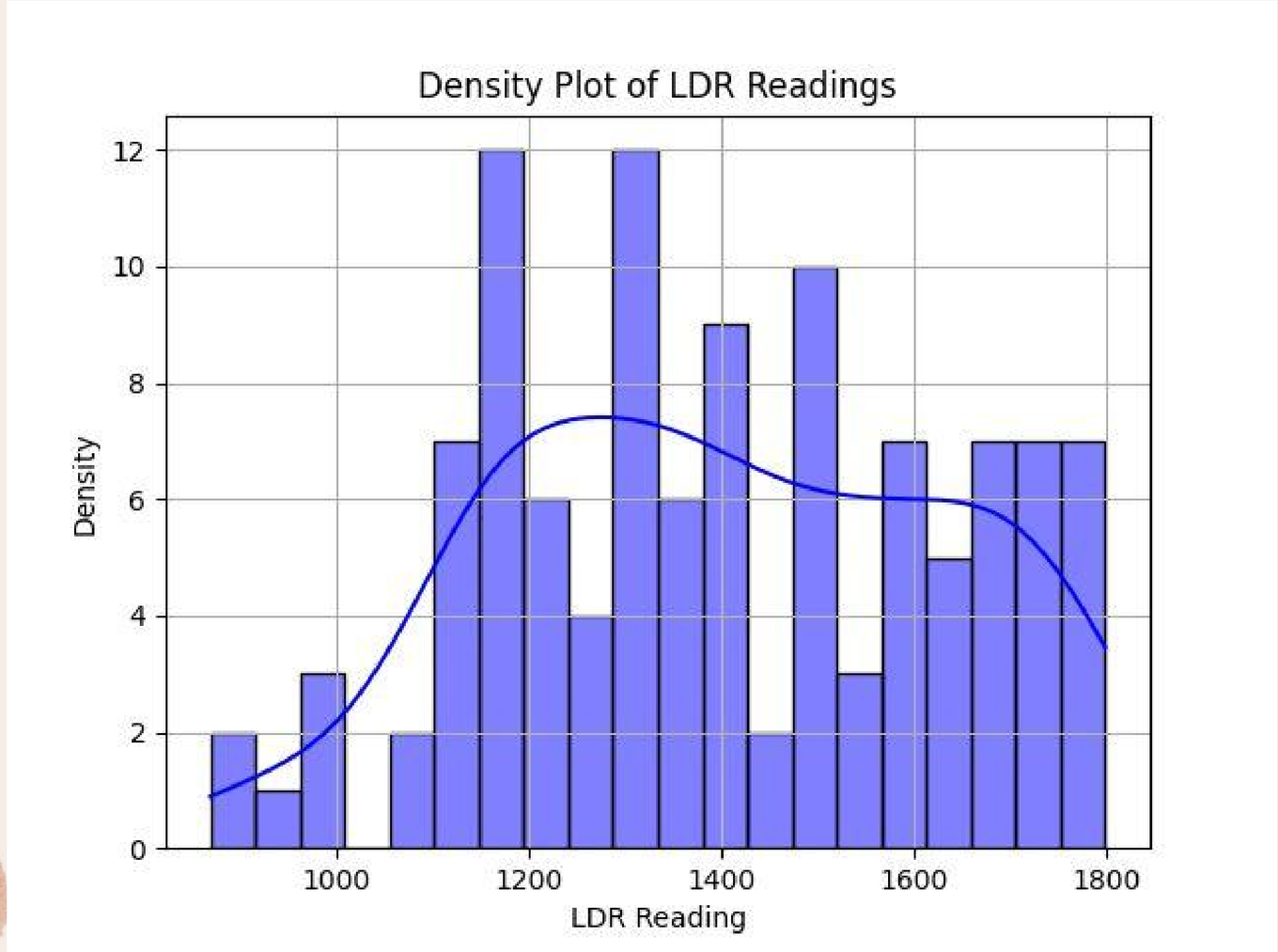
Data Visualisation

DATA FROM SOIL RESITIVE MOISTURE SENSOR



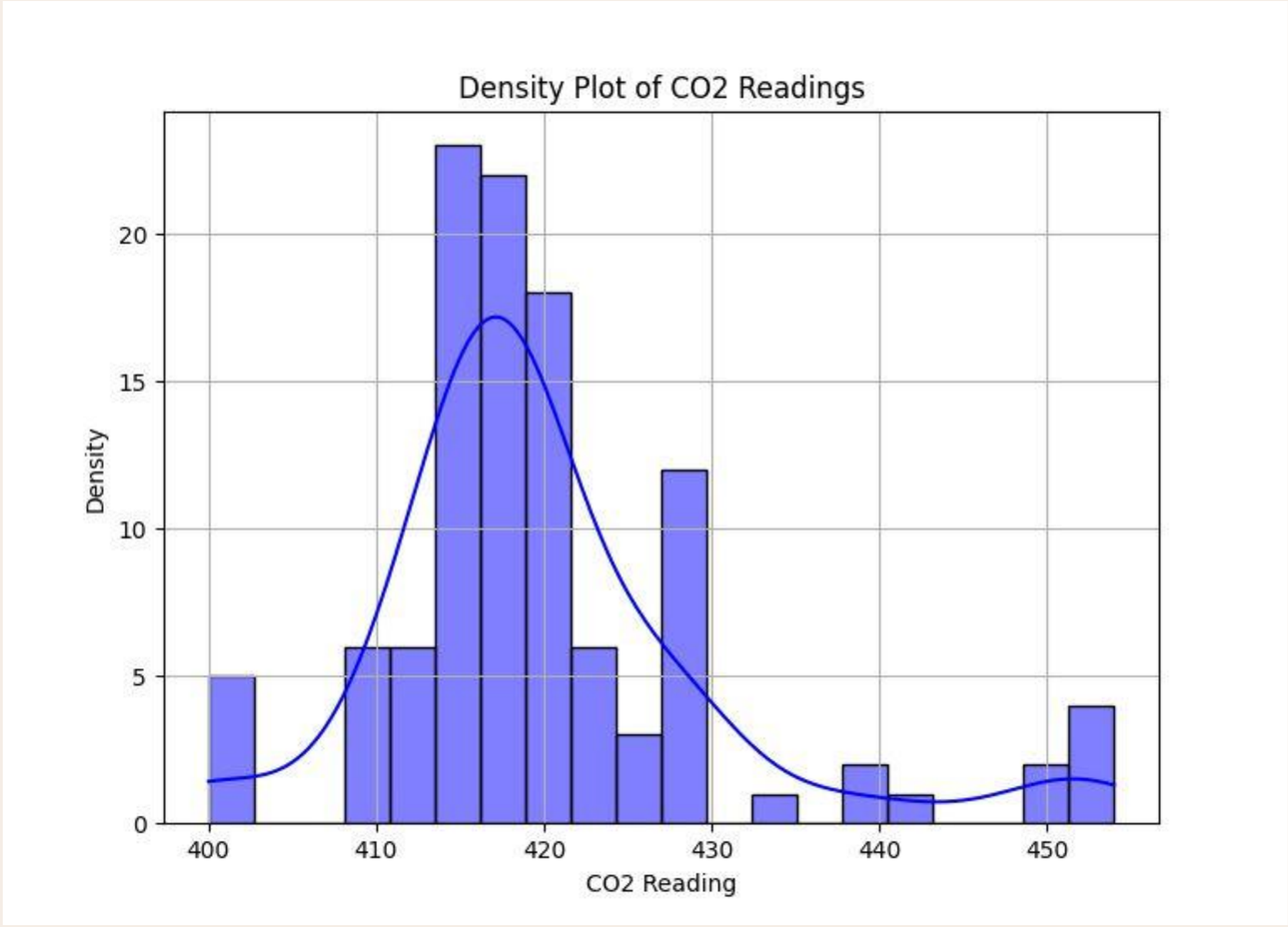
Data Visualisation

DATA FROM LDR



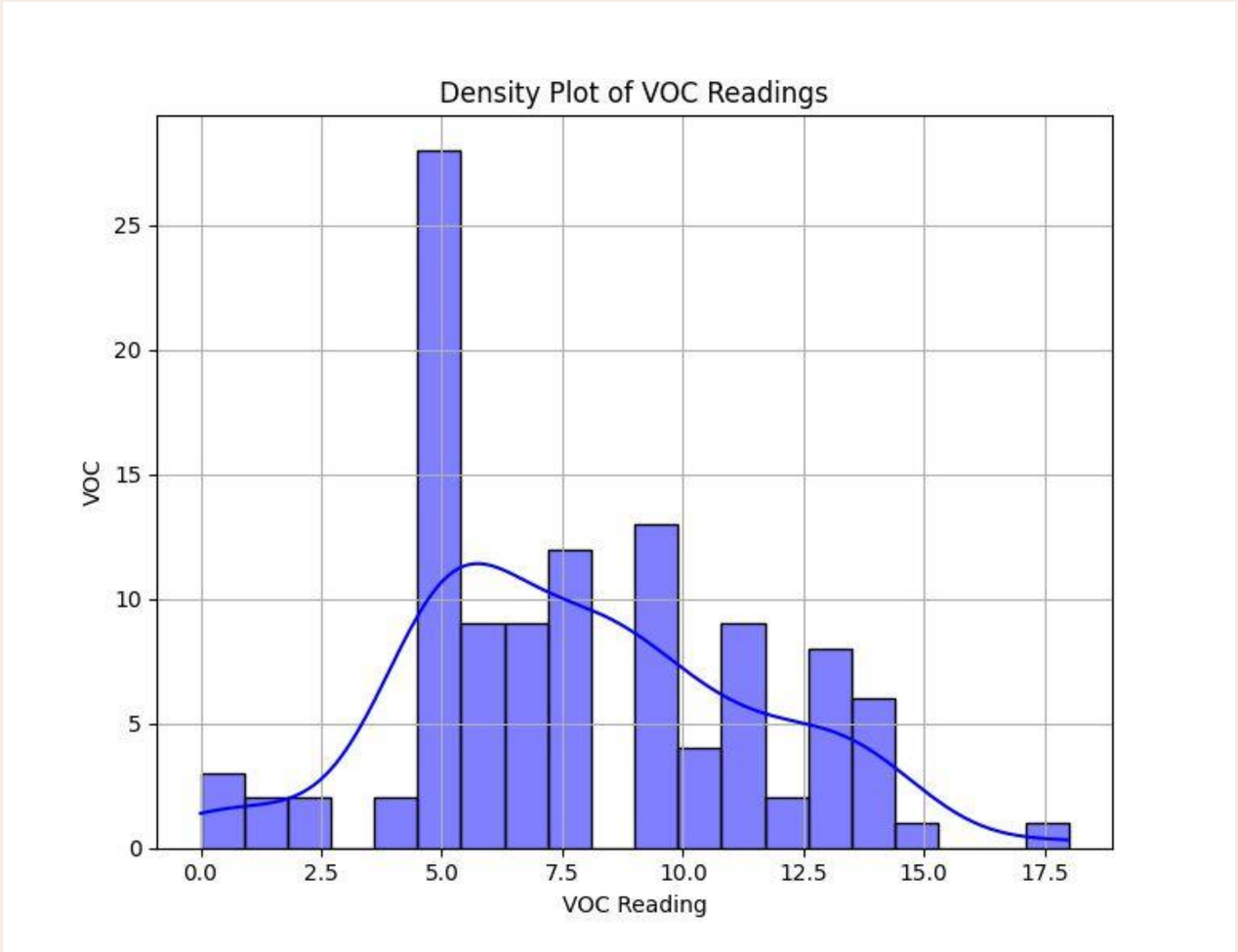
Data Visualisation

DATA FROM SGP30- CO2



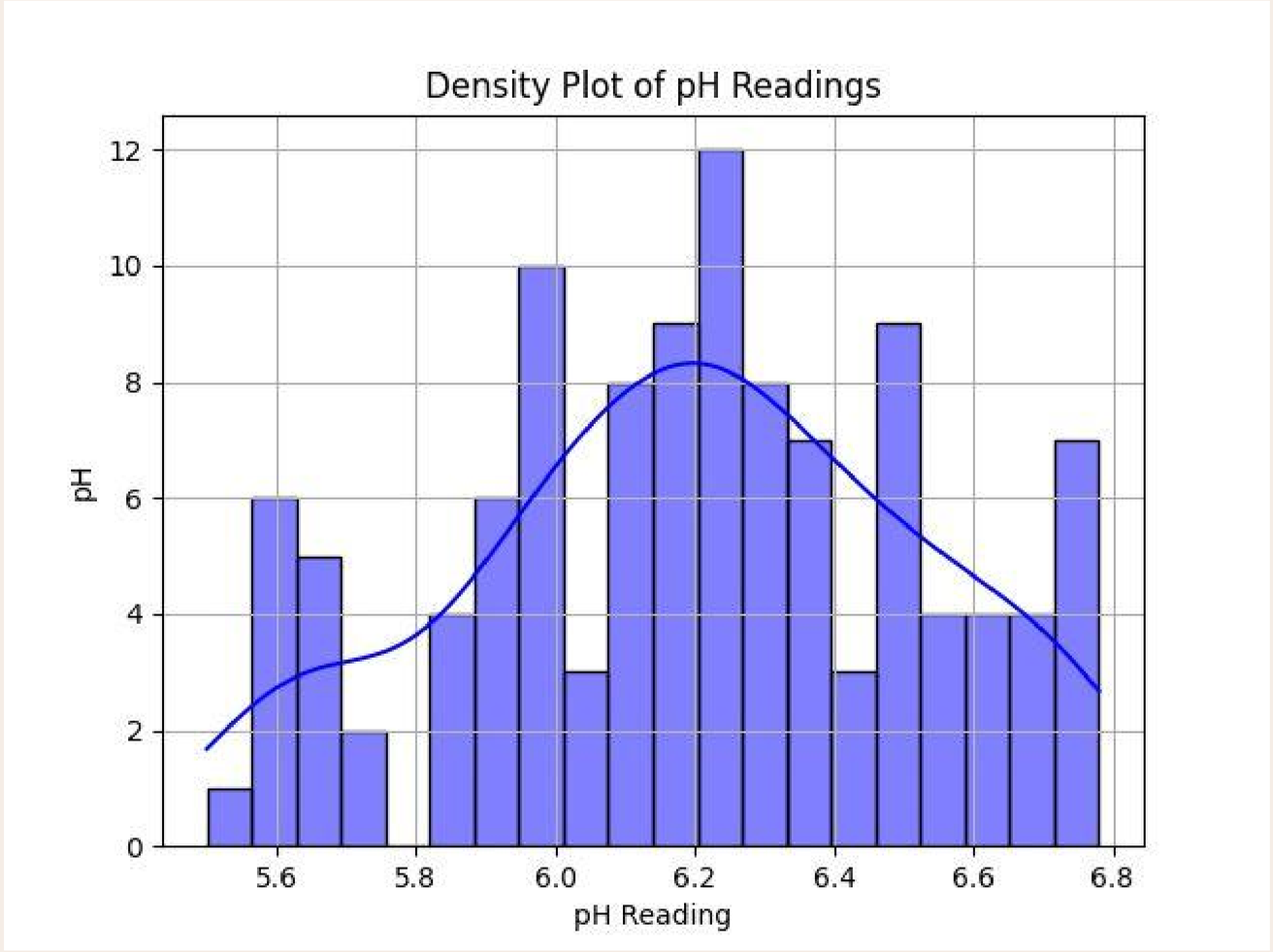
Data Visualisation

DATA FROM SGP30- VOC



Data Visualisation

DATA FROM pH sensor



DATA ANALYSIS

Based on graphs created from sensor data on OM2M; graphs in previous slides

1. Temperature values from DHT22

- With respect to the chunk of data analysed, the temperature of the surroundings stayed around the range 24 to 30 degree celsius
- Most frequently, a higher density is concentrated at around 26.5 degrees
- For the particular plant, this is an optimum temperature range

2. Moisture values from soil resistive sensor

- This showed more variation in the range
- Ideally for the plant, the values should be in the range 15-24
- While the highest density is here and the vast amount of time it stays this high, there were stimulated data points for which it went above this range
- This could tell the farmer to avoid watering or close the valve using an actating process like ours

3. Light intensity values for LDR

- With respect to the chunk of data analysed, the LDR readings were in a relatively small range and showed some but not much variation
- This could be related to changes in the light for that time of the day

DATA ANALYSIS

Based on graphs created from sensor data on OM2M; graphs in previous slides

1. C02 values from SGP30

- The CO2 values measured were in the range 400 - 453 ppm
- Plants require C02 for photosynthesis, and it is often a limiting factor for growth
- The normal range of C02 in environment is around 400 ppm
- The environment in which the plant was kept had a higher concentration, which could encourage plant growth

2. VOC values from SGP30

- The range VOCs measured was from 0-17.5 ppb
- These are relatively very low values
- An increase in VOCs near plants apart from ambient values could be indicative of a problem such as release in response to a pest infestation.
- Here the values are very low, with mode of around 5, which is the ideal value

3. pH values from pH sensor

- The range of pH values varied from just below 5.6 to 6.8
- The most commonly measured pH was 6.2
- The ideal pH of the soil varies based on which plant is growing in it,
- The plant chosen prefers acidic soil, hence this range of values is acceptable and wouldn’t need to prompt any change

To recap

Since last time...

- **For 3 old sensors**: DHT22, LDR, Resistive soil moisture, implemented data collection to ThingSpeak and **OM2M**
- **SGP30 sensor** tested

Baseline value initialised
SGP30 data being sent to thingspeak and OM2M

- **pH sensor** tested

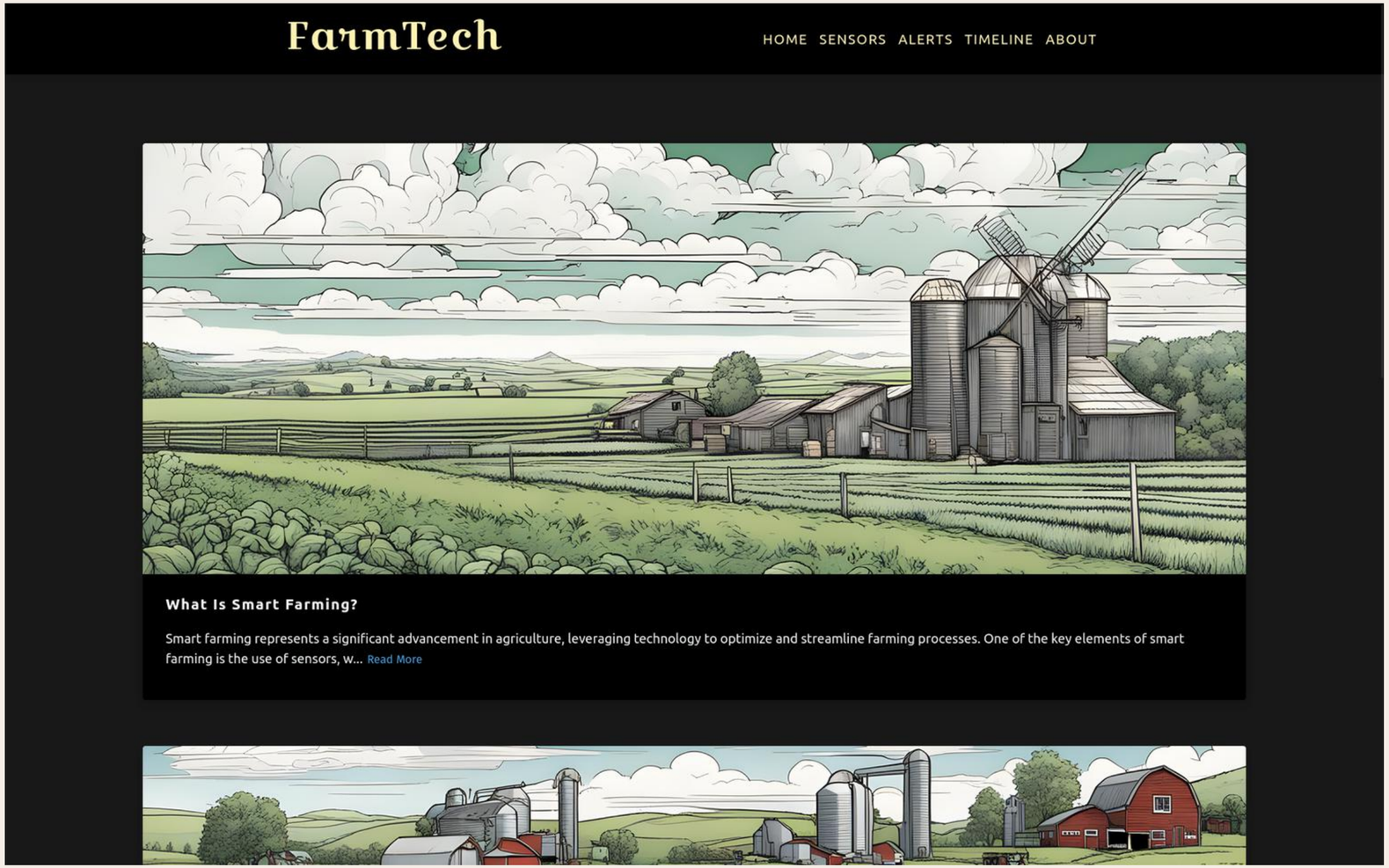
Two sensors did not work, kept testing
Till working one was found.
pH sensor data being sent

- **Data collection complete** and based on that analysis attempted

Software- key features

- **Graphs based on Thingspeak data:** Plots graphs for each sensor which shows the fluctuations in the values over time from the thingspeak data.
- **A separate timeline page** which helps the user monitor a specific day's sensor values from the om2m data
- **Alerts** the user whenever the value read by a sensor falls out of the common range- either the value is too high or too low

Home page


FarmTech
HOME SENSORS ALERTS TIMELINE ABOUT
What Is Smart Farming?
Smart farming represents a significant advancement in agriculture, leveraging technology to optimize and streamline farming processes. One of the key elements of smart farming is the use of sensors, w... Read More

Sensors page

FarmTech

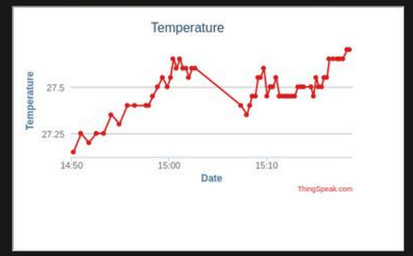
HOME SENSORS ALERTS TIMELINE ABOUT

Sensor Details And Graphs

- DHT22
- Soil Resistive Sensor
- LDR
- PH Sensor
- SGP30 Sensor For CO2
- SGP30 Sensor For VOC

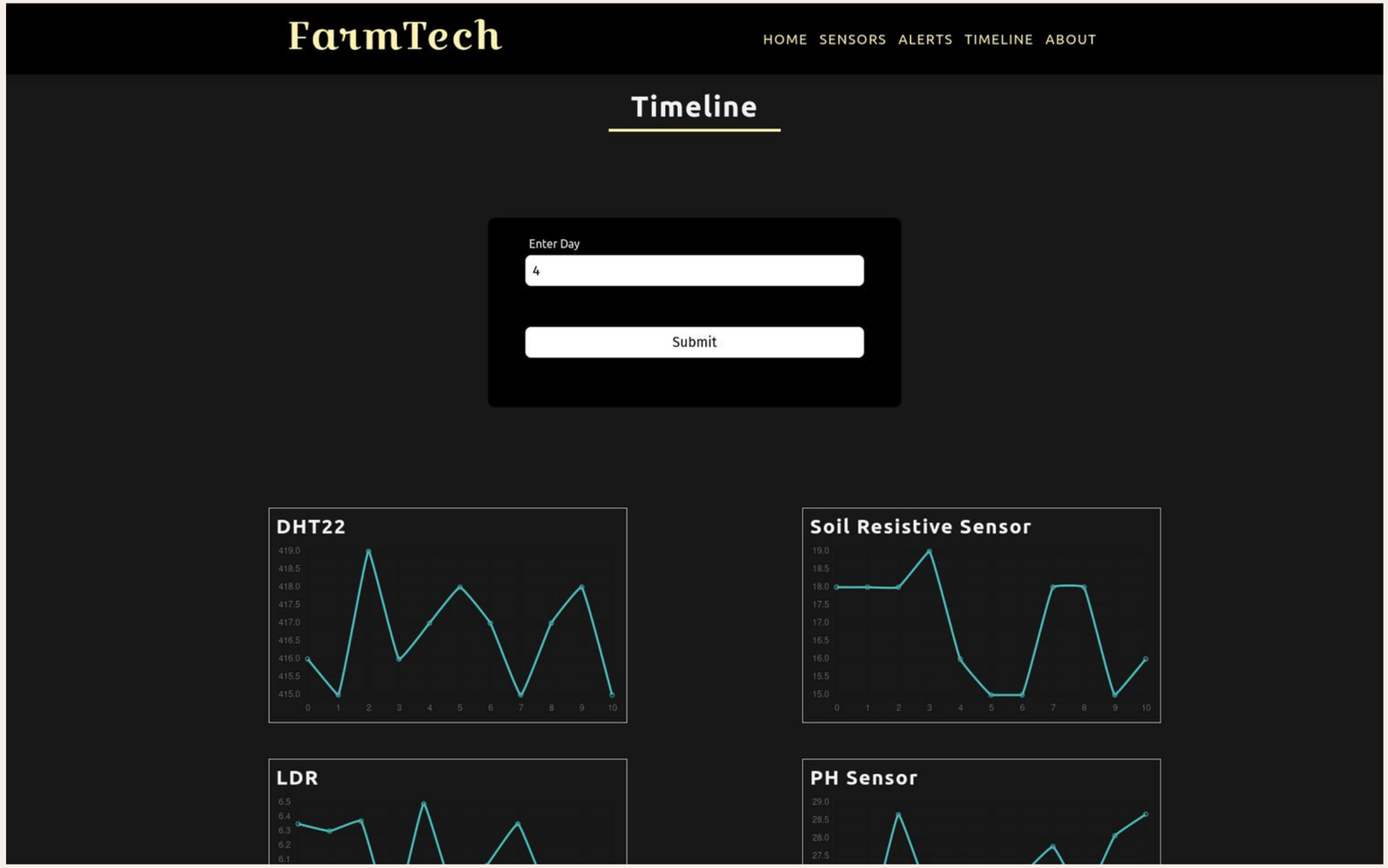
DHT22

MEASURES TEMPERATURE

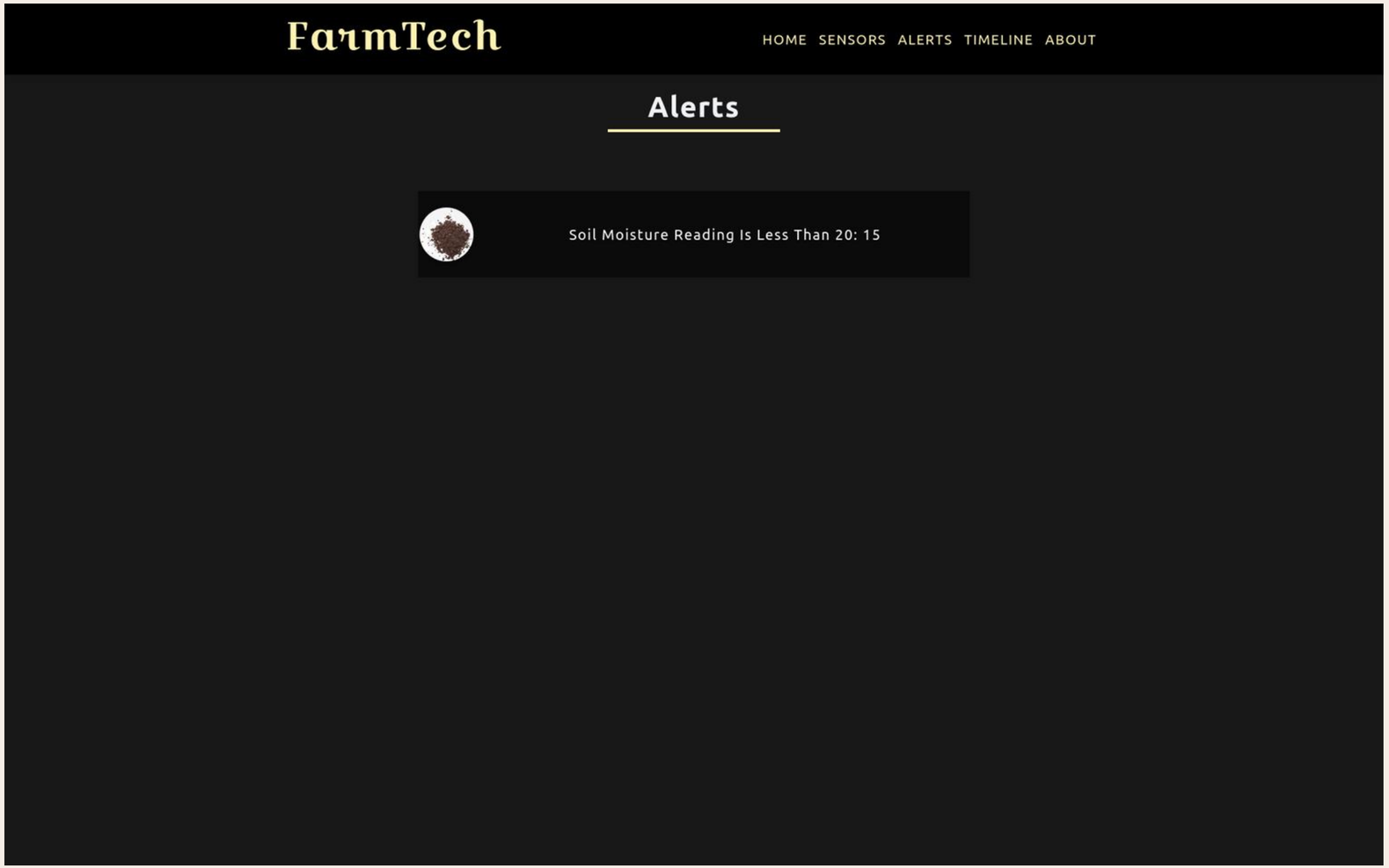


Timeline

Timeline page shows a graph of each sensor depending on which day the user inputs



Alerts



Alerts page notifies the user for any changes based on set values, so the user can take action

THANK YOU