Smart weather monitoring system

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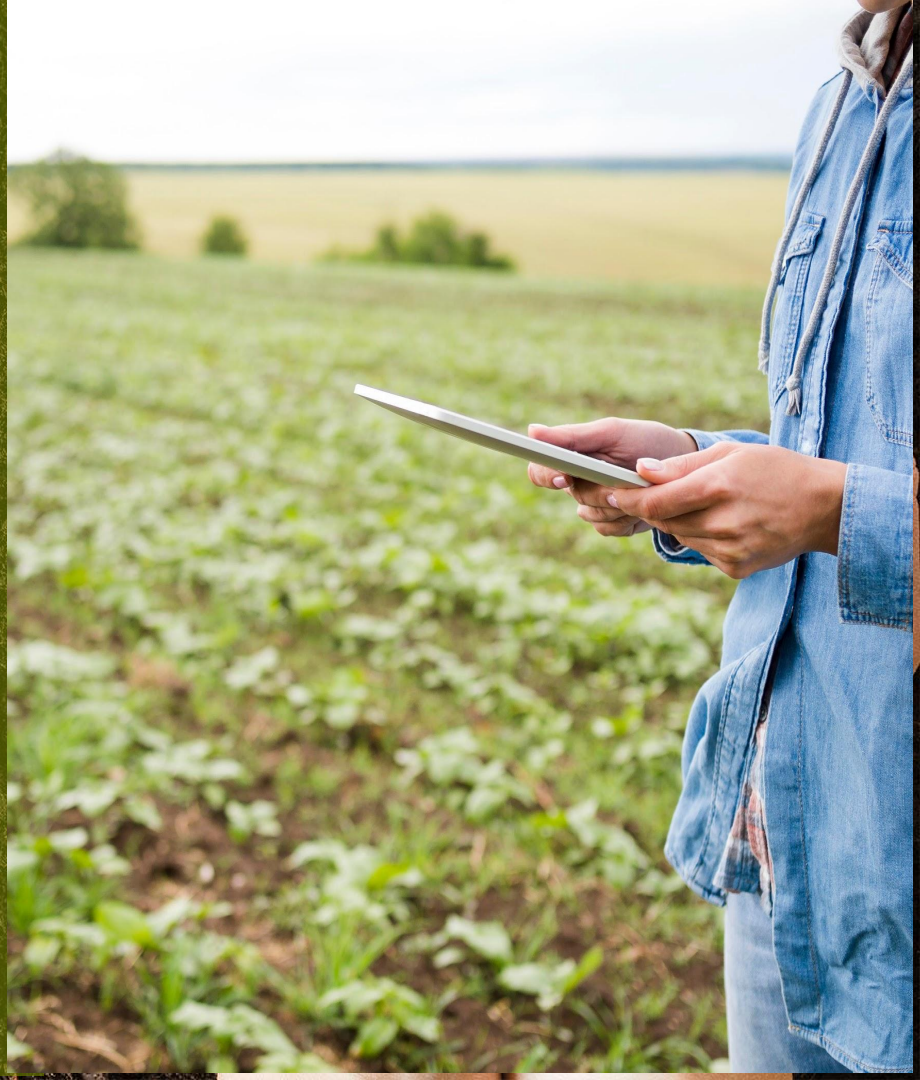
Introduction



Introduction:

- The Weather Monitoring System plays a crucial role in measuring and recording To provide dependable and precise weather information for informed decision-making.
- meteorological conditions and Key parameters include temperature, gas concentration, wind speed, and rain.
- Users include meteorologists, farmers, pilots, sailors, and various organizations relying on real-time weather information.

Technologies Used:

- Simulation: Tinkercad for virtual testing and validation, ensuring system functionality before physical implementation.
- Data Visualization: ThingSpeak for efficient storage and presentation, offering a user-friendly interface for interpreting meteorological data.
- Mobile App: ThingSpeak App extends accessibility, allowing users to monitor weather conditions on-the-go through mobile devices.
- Machine Learning: Colab is employed for developing predictive models based on historical weather data, enhancing the system's forecasting capabilities.
- API for Data Exchange: Colab is utilized to create an API, facilitating seamless data exchange for the Weather Monitoring System.

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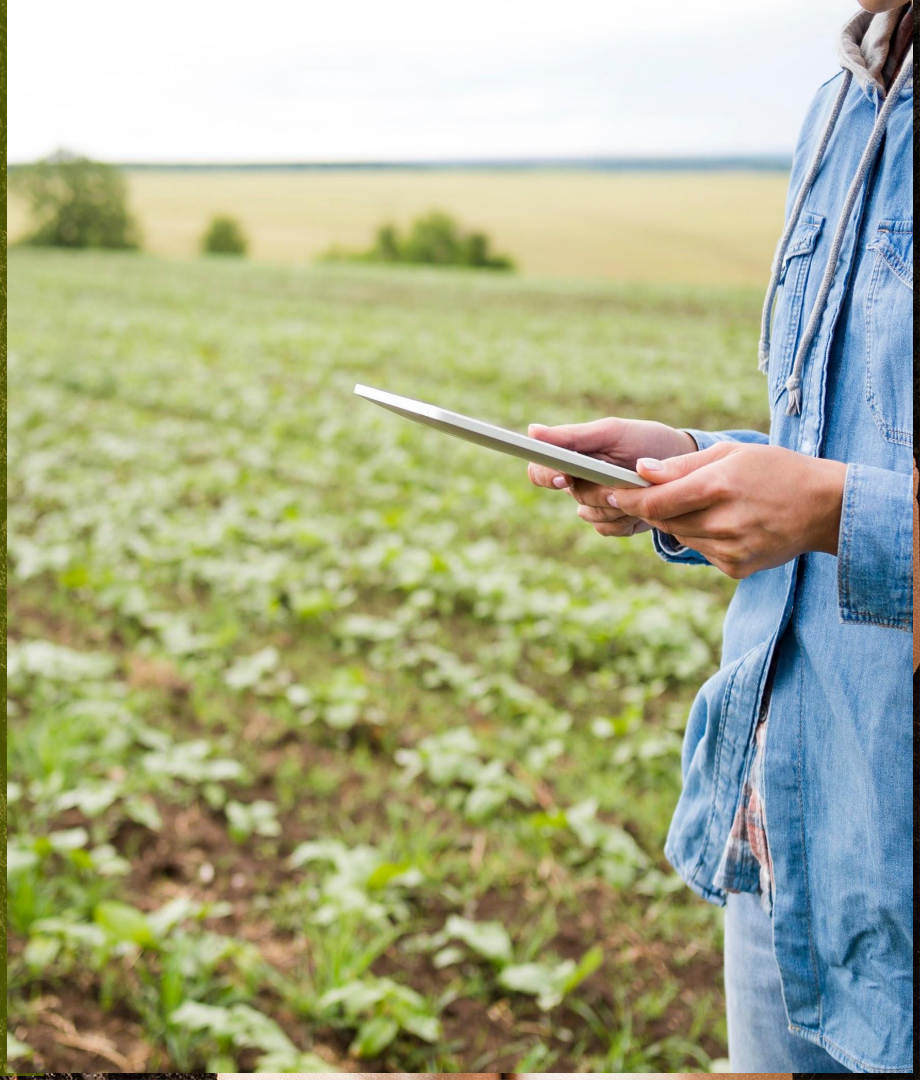
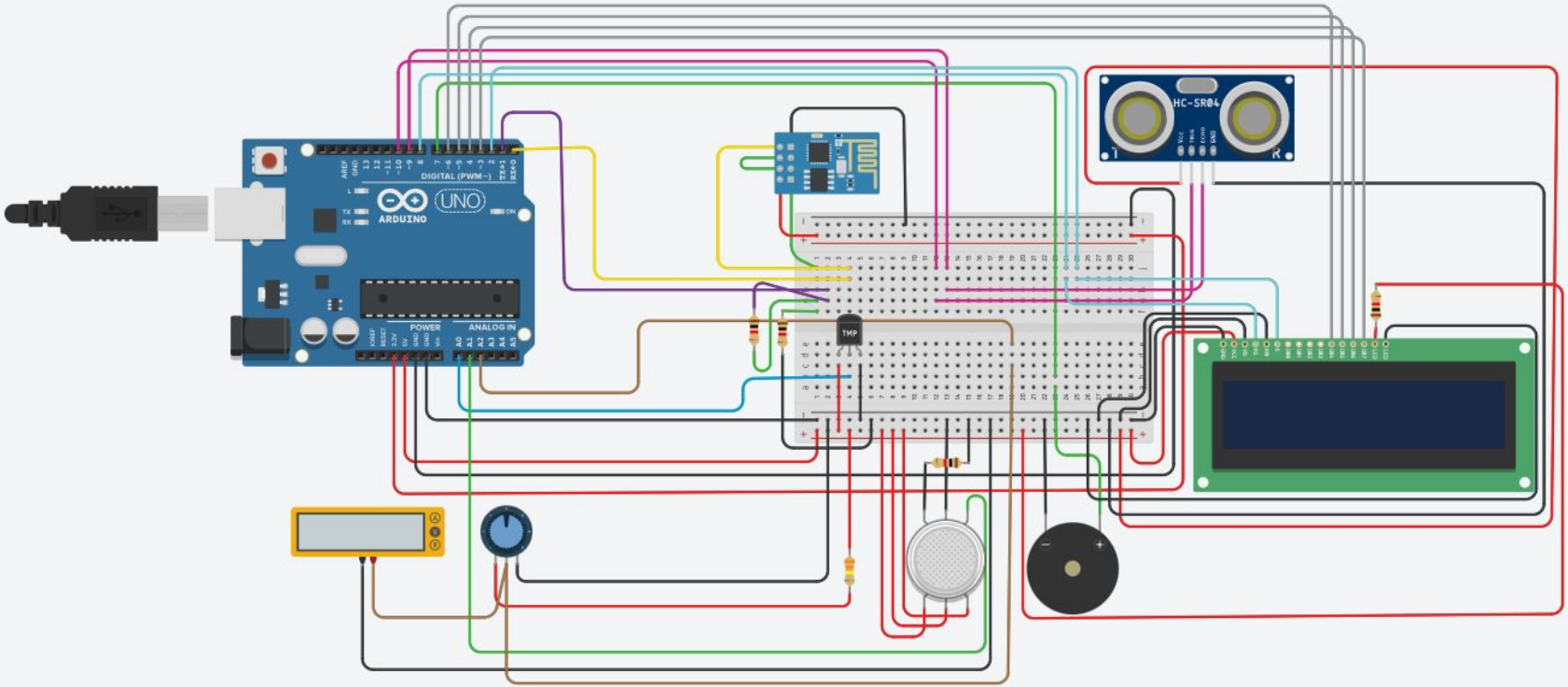
Sensors



Electrical Components

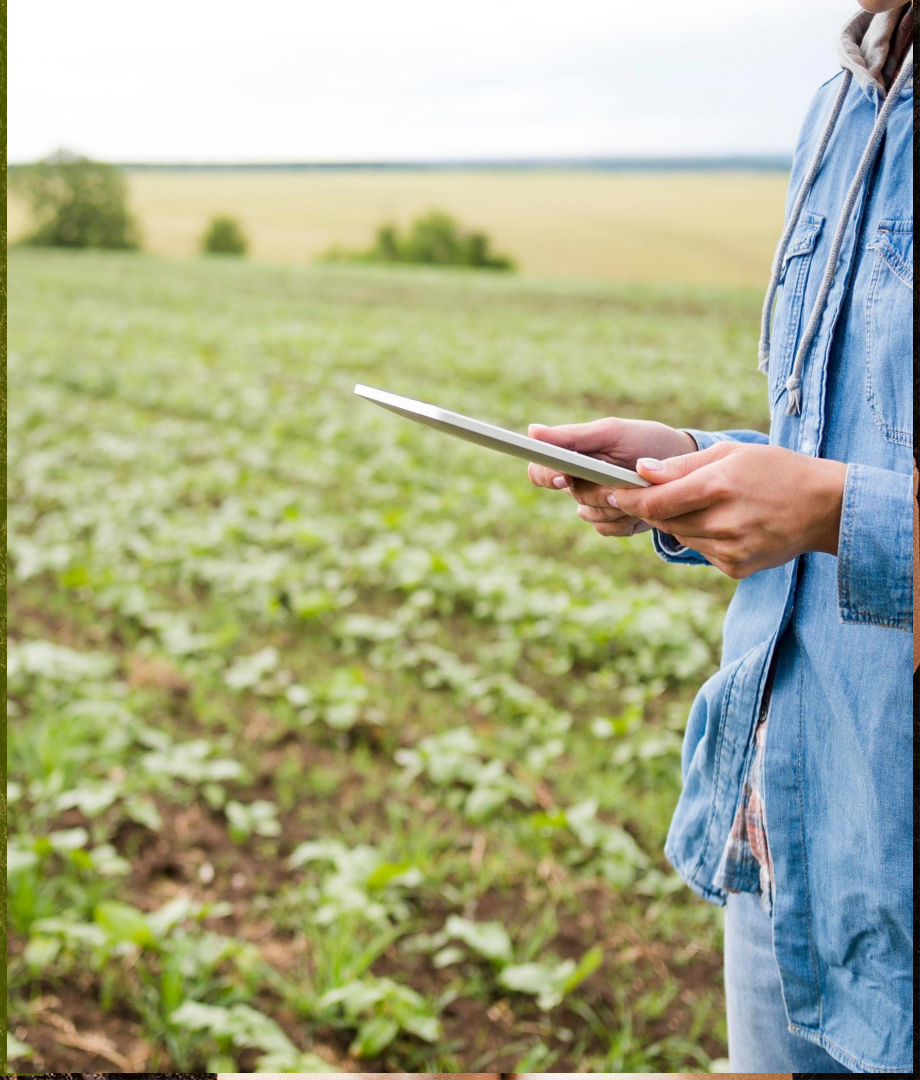
The major components used were:

Arduino Uno R3	Potentiometer
Wi-fi module (ESP8266)	Piezo Buzzer
Temperature Sensor (TMP36)	LCD Screen
Gas Sensor	Voltage Multimeter
Ultrasonic Distance Sensor	Resistors


HC-SR04
UNO
ARDUINO
DIGITAL (PWM~)
POWER
ANALOG IN
TMP

03

Power And Communication



Arduino Uno R3:

Power Consumption: The Arduino Uno R3 typically consumes around 50-60 mA when active.

Optimization Approach:

- Utilize sleep modes
- Disable unnecessary peripherals

ESP8266 WiFi Module:

Power Consumption: The ESP8266's power consumption can range from tens of milliamps to over 200 mA during data transmission, depending on the mode and transmission power.

Optimization Approach:

- Using low-power modes
- Adjusting transmission power:
- Implementing efficient communication protocols

Temperature Sensor (TMP36):

Power Consumption: The TMP36 is a low-power sensor, typically drawing less than 50 µA during measurements.

Optimization Approach:

- Read data at longer intervals
- Power down when not in use

Gas Sensor (GAS):

Power Consumption: Gas sensors usually have a higher power consumption during active sensing, often ranging from 50 mA to a few hundred mA.

Optimization Approach:

- Adjusting sensing frequency
- Powering down during idle periods

Ultrasonic Distance Sensor:

Power Consumption: Ultrasonic sensors typically consume a few milliamps during operation.

Optimization Approach:

- Increasing measurement intervals
- Powering down during idle periods

Piezo Buzzer:

Power Consumption: Piezo buzzers are low-power devices, typically drawing a few milliamps during operation.

Optimization Approach: As the buzzer is usually triggered intermittently, power optimization may not be a primary concern.

16x2 LCD:

Power Consumption: A typical 16x2 LCD might consume around 1-2 mA without backlight and 20-25 mA with backlight.

Optimization Approach:

- Turning off the backlight when not needed.
- Updating the display only when necessary, rather than continuously refreshing.

Potentiometer, Resistor & Multimeter:

Power Consumption: Potentiometers,resistors and voltage multimeter are passive components and do not consume power.

Optimization Approach: No specific optimization is required for power consumption with potentiometers,resistors and voltage multimeter.

COMMUNICATION TECHNOLOGIES:

Physical Layer: Wifi

Internet Layer: TCP/IP

Application Layer: HTTP

POSSIBLE TOPOLOGIES:

- Mesh Topology
- Hierarchical Topology
- Cloud-based topology

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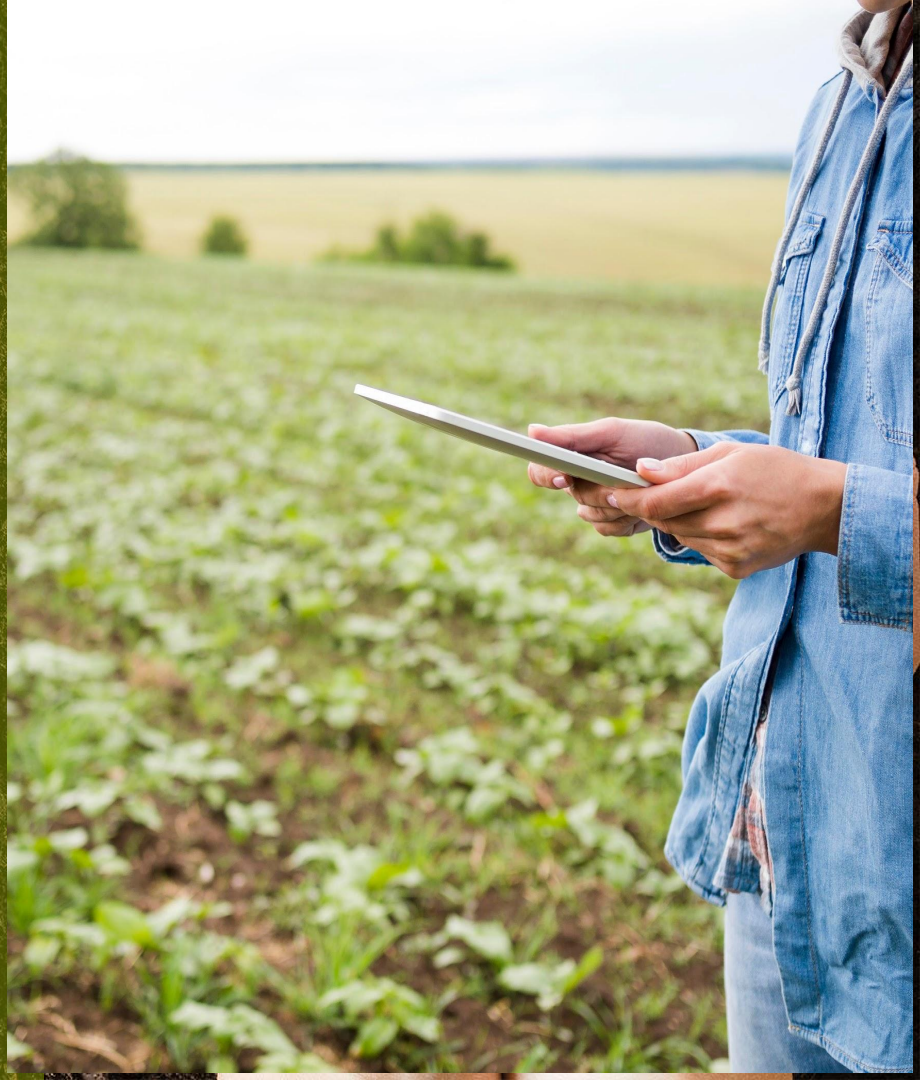
Code



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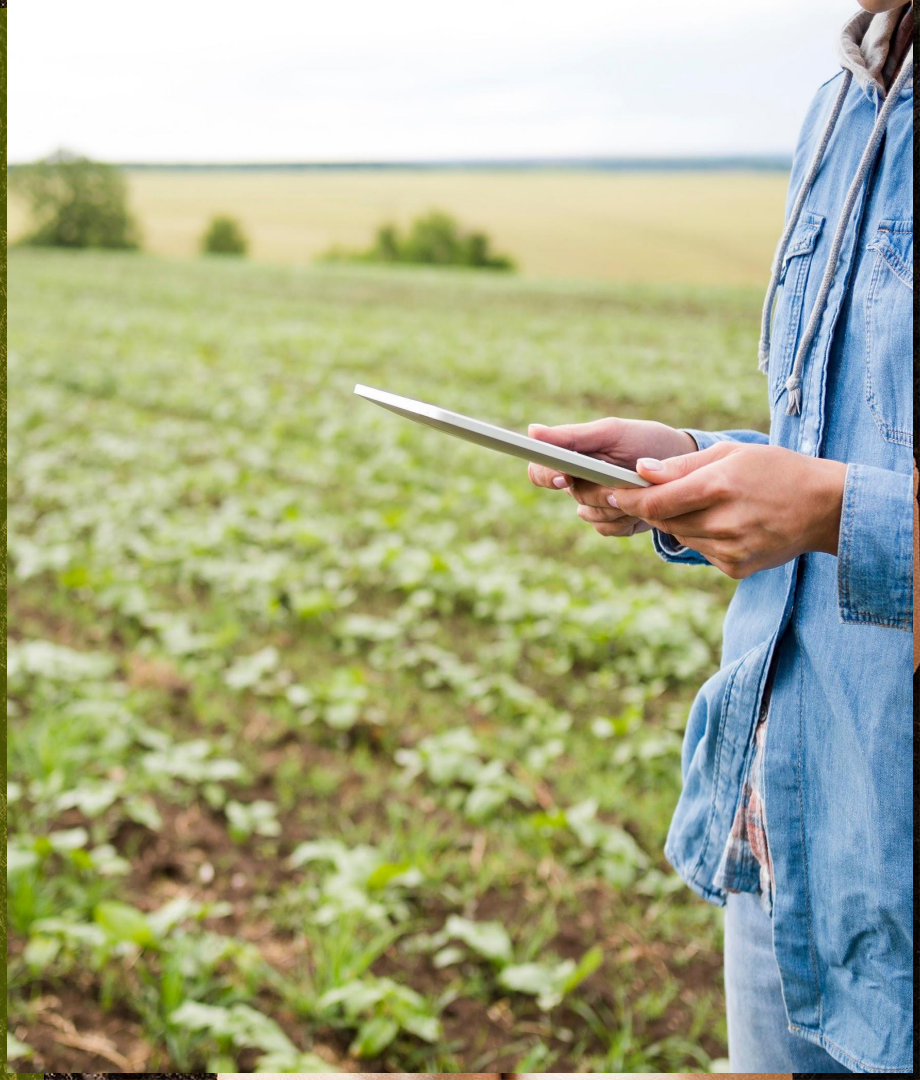
Dashboard/ Interface



Web portal

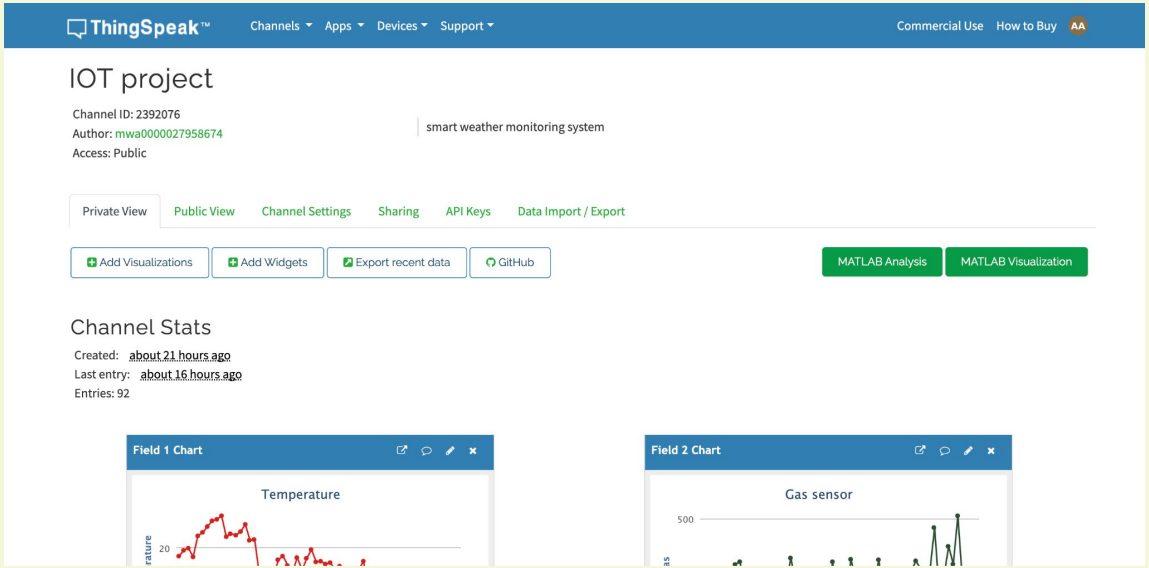
Displays real time graphs from Thinkspeak as soon as new data is uploaded on it.

Dashboard

Thinkspeak to make dashboard to make visualizations of real time data. Data can be sent through API and python script.

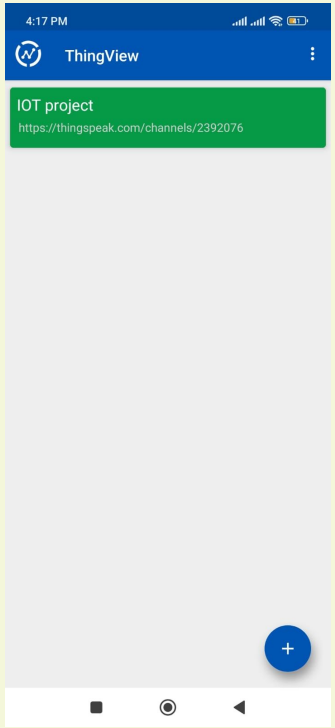
Matlab visualisations

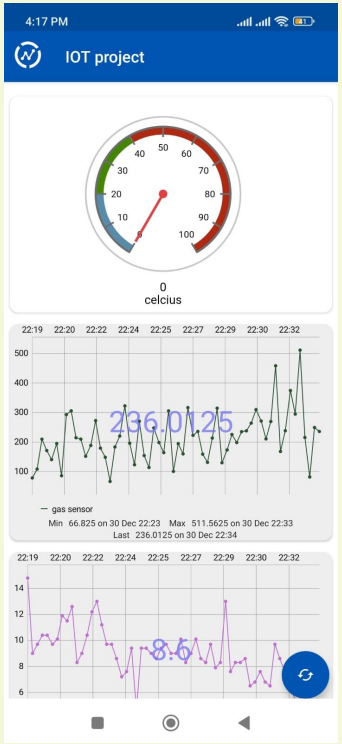
Read/ Write data in real time

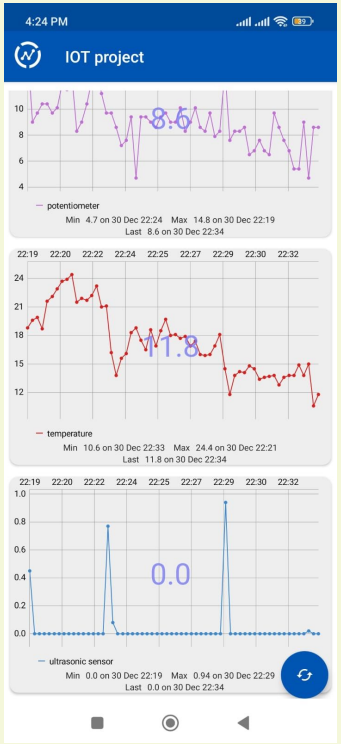


Mobile Application

Thinkspeak app to check updates on mobile phone. This also provides real time data







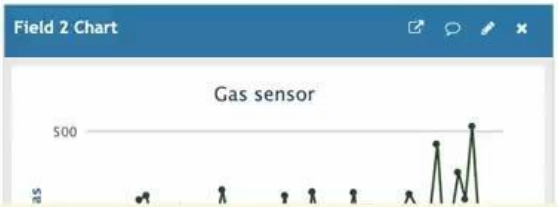
IOT project

Channel ID: 2392076
Author: mwa0000027958674
Access: Public

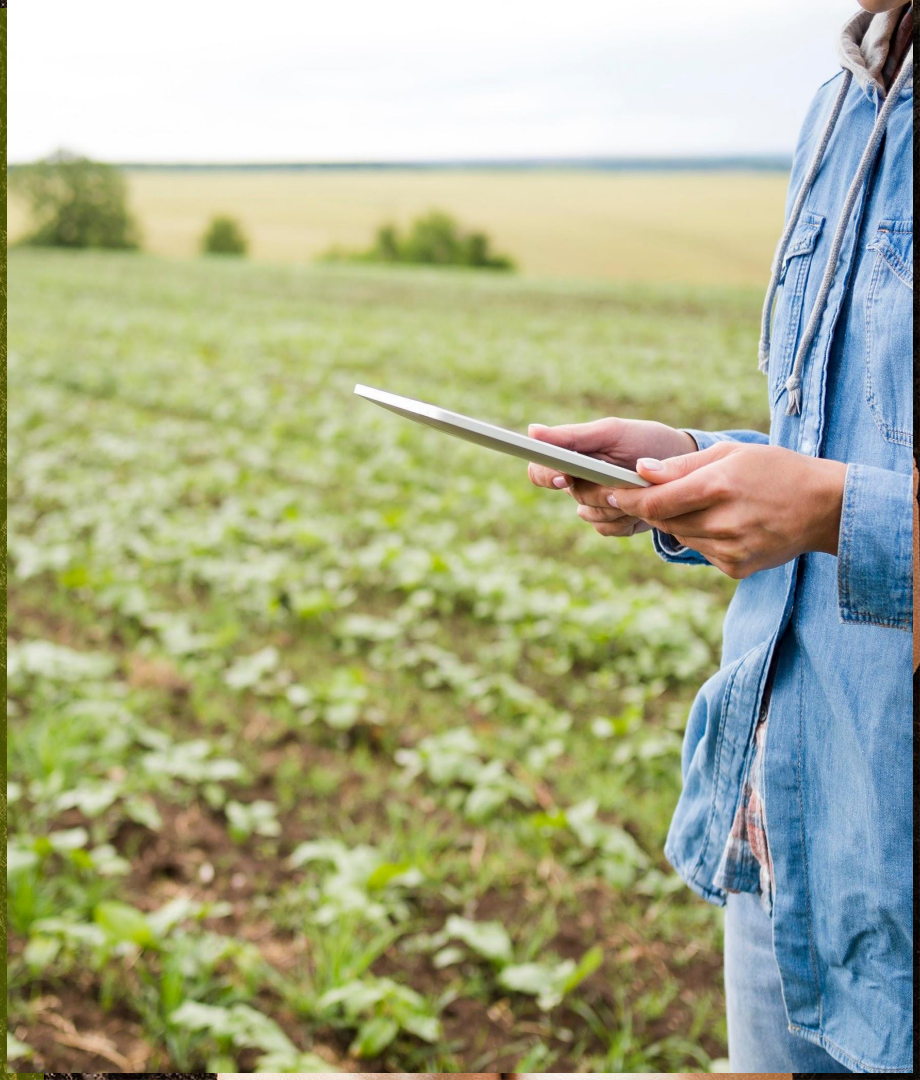
smart weather monitoring system

Channel Stats

Created: about 21 hours ago
Last entry: about 16 hours ago
Entries: 92



06 Machine Learning



Decision Tree

Classification Report for Decision Tree Classifier

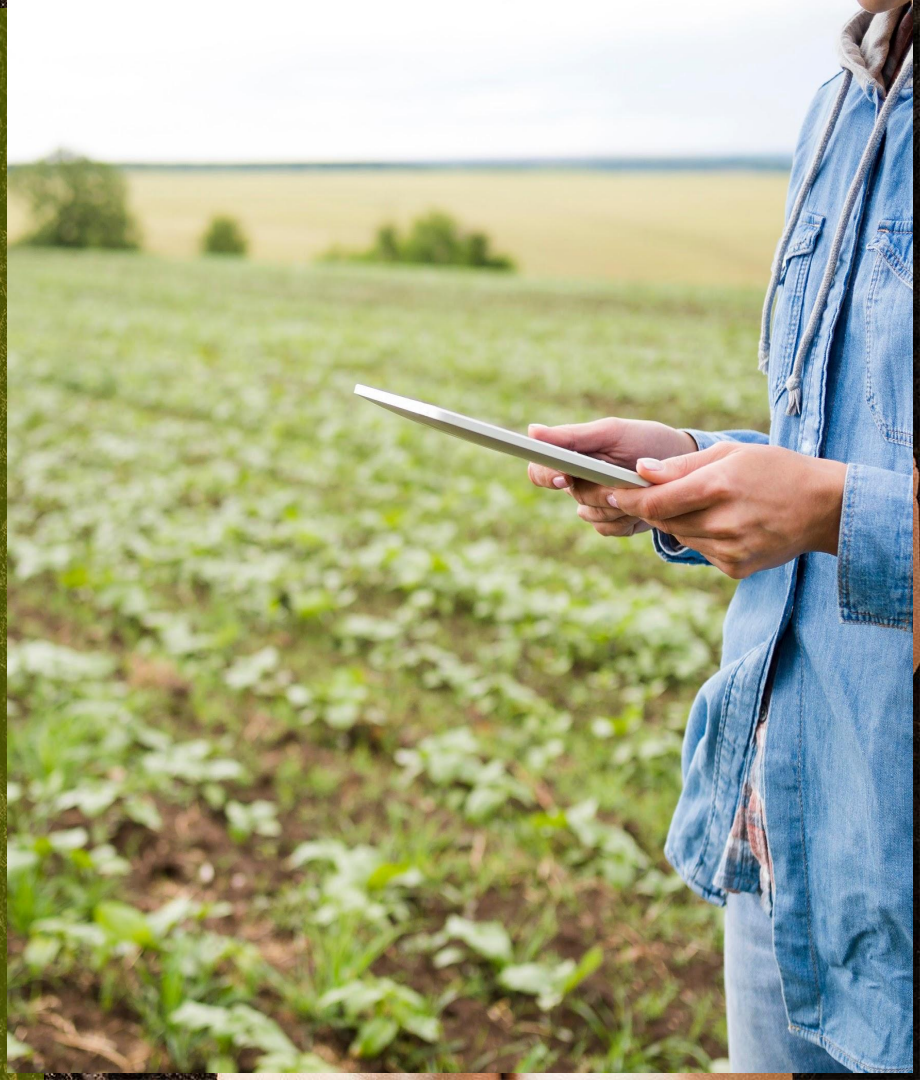
	precision	recall	f1-score	support
0	0.89	0.89	0.89	19
1	1.00	1.00	1.00	1
2	0.50	0.50	0.50	4
accuracy			0.83	24
macro avg	0.80	0.80	0.80	24
weighted avg	0.83	0.83	0.83	24

Random Forest:

	precision	recall	f1-score	support
0	0.95	1.00	0.97	19
1	1.00	1.00	1.00	1
2	1.00	0.75	0.86	4
accuracy			0.96	24
macro avg	0.98	0.92	0.94	24
weighted avg	0.96	0.96	0.96	24

07

Demo



Thanks!

GitHub link: https://github.com/amnaahmad20/Smart-weather-monitoring-system

Channel link: https://thingspeak.com/channels/2392076