Weather Monitoring System

B. TECH
COMPUTER SCIENCE AND ENGINEERING

CSE3009 - Internet of Things

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VIT
Vellore Institute of Technology
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PROBLEM IDENTIFICATION:

This project presents a design of a weather monitoring system. It stores data collected at some predetermined sampling interval, with date and time stamps for later retrieval with real-time notifications for supervision and analysis of different environmental parameters like temperature,humidity, atmospheric pressure, wind speed, wind direction, air quality, light intensity, amount of rainfall and co-ordinates of the location.

It consists of an Arduino UNO (microprocessor) which acts as a gateway to collect data and information through different probes. Such a system can be used in controlled environments like agriculture farms and aquaculture. The idea behind it is mainly weather monitoring and forecasting at micro ecological level, monitoring upcoming situations to sound alerts during unfavorable circumstances.

APPLICATION RELEVANCE:

Recent years have seen a lot of interest in environmental monitoring and climatic change. Man wants to be aware of the most recent weather conditions in any location, such as a college campus or any other specific facility. There should be weather stations because the planet is changing so quickly. We provide a weather station that is highly useful for any location in this essay. Based on IOT, this weather station (internet of things). It has environmental sensors that can measure the environment at any location and upload the results in real time to the cloud. The sensors continuously sense the weather parameters and communicate. The weather parameters are uploaded, where they are used to report weather conditions in real time. It is the technology of the future that will connect the entire world in one location. In order to coordinate applications like traffic signaling, mobile health monitoring in medical applications, industrial safety ensuring methods, etc., all the items, entities, and sensors can be connected to share the data obtained in multiple locations and process/analyze that data. By 2020, the IOT is expected to connect 50 billion things, according to specialists in the field. IOT provides a wide variety of device connectivity with numerous protocols and application features to achieve full machine-to-machine interaction.

TOOLS IDENTIFICATION:

1. Arduino
2. Water Sensor
3. Temperature Sensor
4. LED
5. Connecting Wires
6. Breadboard
7. LCD Display
8. Resistors

LITERATURE REVIEW:

S.No	Authors and Year	Methodology Used/Model	Relevant Finding	Limitations/Future Research/Gaps
1	Ferdin Joe John Joseph "IoT Based Weather Monitoring System for Effective Analytics"ISSN: 2249 – 8958(2019)	It displays the hardware that is attached to the Raspberry Pi and the software that is used to control the data that is gathered from the sensors. Although the implementation of this framework reports on data availability through an intranet of a particular subnet, its scope is to store data in a cloud server. The newest weather information is made accessible in JSON format for sharing data online over the network, and the collected data is made available for download in CSV format.	According to the aforementioned standards, a weather monitoring system employing a Raspberry Pi is implemented, and data insights are generated on a web-based portal. With the current level of implementation, this data is accessible over the intranet, and when it is made to be stored on cloud servers or other sources on the internet, it may become public.	The Raspberry Pi has limited connectivity options, with only a few USB ports and no Ethernet port on the latest model.
2	Atul Kulkarni	Vehicles driving on the road	Value Company	Remote sensing

	, Debajyoti Mukhopadhyay "Internet of Things Based Weather Forecast Monitoring System"ISSN : 2502-4752(2018)	will wirelessly transfer the weather data, which includes air temperature, visibility or light, and other data required, to weather systems with IoT capabilities. This information aids in creating more precise forecasts and monitoring throughout a range of time frames. placed sensors in cars and on roadways. The collection of weather data is aided by the sensors used with IoT technology.	uses high-temperature forecasts to estimate the exact temperature for the upcoming days. Weather forecasts are used by a variety of people. Since they are meant to preserve lives and property, weather warnings are significant forecasts. We are aware of how to install remote condition sensing equipment on automobiles. All of this was made feasible by developments in satellite technology, a sharp acceleration in global communication, and astronomical rises in computing power.	technology can be affected by atmospheric conditions such as cloud and atmospheric gasses, which can limit its accuracy in gathering weather data.
3	Mohd Rusyaidi bin Mohd Ridzwan, Syed Mohammed Uddin, Mohd Izhar A Bakar "Development of IoT Weather Monitoring System"ISSN 2231-	A power supply, a Wi-Fi module, a Cloud Database (Blynk), a Raspberry Pi, a Raindrops Module, a DHT22 Temperature and Humidity Sensor, and an LCD Display make up the Raspberry Pi-based Internet of Things (IoT) enabled weather monitoring system. The gadget will immediately begin looking for a Wi-Fi connection as soon as it is turned on.	Each sector, including individuals, companies, and the government, can adopt this device to take safety precautions against hazardous weather conditions with the aid of developed system devices. Users will benefit from having more time to prepare for	The DHT22 sensor has a slow sampling rate compared to other sensors, which means that it may not be suitable for applications that require real-time data.

	8798(2022)		impending weather and avoid any inconveniences.	
4	P.Susmitha, G.Sowmya Bala “Design and Implementation of Weather Monitoring and Controlling System”ISSN :0975 – 8887(2014)	The model used in the design and execution of weather monitoring and controlling systems can perform data collecting on attached temperature, gas, humidity, and accelerometer sensors. And it can transmit data from these sensors to the LPC1768's ADC Port. With the aid of an RS232 cable and an Excel spreadsheet running under LabVIEW, it can also send and receive SMS messages.	This paper describes the design and implementation of a weather monitoring and control system that is used to both monitor and control devices. When it comes to delivering remote control and sensing for environmental monitoring systems, embedded controlled sensor networks have shown to be a dependable solution.	adding more sensors to keep track of additional environmental factors such soil pH, CO2, and oxygen levels while allowing present sensors to be replaced if a larger range of measurements is necessary.
5	Andriy Holovatyy “Development of IoT Weather Monitoring System Based on Arduino and ESP8266 Wi-Fi ModulE”(2021)	The purpose of this work is to create hardware and software IoT system for monitoring weather parameters. For the development of the hardware of the IoT weather monitoring system the Arduino Mega2560 board based on the ATmega2560 microcontroller, BME280 digital atmospheric pressure, humidity and temperature sensor, ESP-01 Wi-Fi module built on the ESP8266 chip and an alphanumeric 16×2 LCD module based on the HD44780 controller is used. The microcontroller device has to measure weather parameters and transmit them over Wi-Fi	The IoT weather monitoring systems' hardware and software have been developed in this work. The microcontroller device that measures weather data like temperature, relative humidity, and air pressure and delivers them to the IoT platform for additional processing and display makes up the hardware of the IoT weather monitoring system.	The hardware used consumes a relatively large amount of power, especially when running multiple devices or executing complex programs.

		network using the MQTT protocol to the Mosquitto server (broker) or to the ThingsBoard IoT platform.		
6	Kirankumar G.Sutar “Low cost wireless weather monitoring system”ISSN : 2454-1907(2015)	The objective was to create a low-cost wireless weather monitoring system based on a microcontroller. To do this, KEIL created hardware and suitable software to allow for parameter monitoring. The hardware is easy to use, reasonably priced, and accurate when used with compatible software. It can be seen that the temperature sensor exhibits a high degree of precision and stability.	The employment of many sensors, namely those that can continually read certain characteristics that indicate the weather conditions, such as temperature, humidity, and light intensity, is the main topic of this study. Signal or data from the sensor unit will then be wirelessly communicated to the base monitoring system because the monitoring is designed to be carried out in a remote place with limited access.	The range of the Zigbee wireless communication system can be limited, especially in areas with interference from other wireless devices or physical obstacles.
7	Kulkarni, Atul, and Debajyoti Mukhopadhyay. "Internet of things based weather forecast monitoring system." Indonesian	This paper deals with the development of a weather display system using small cost components that can be constructed by an electronics hobbyist. The system retrieves weather data from weather stations around the world through a global weather data supplier. The authors propose the use of IoT technology to collect weather data from	The study concludes that weather warnings are important forecasts that are used to protect life and possessions, and the use of remote sensing technology and IoT can improve the efficiency and	No specific limitations

	Journal of Electrical Engineering and Computer Science 9.3 (2018): 555-557.	vehicles on the road and sensors deployed on roads, which contributes to building a more accurate weather forecast.	accuracy of weather forecasting.	
8	Ioannou, Konstantinos, et al. "Low-cost automatic weather stations in the internet of things." Information 12.4 (2021): 146.	This paper provides a review of the current and emerging technologies used for implementing Automatic Weather Stations (AWS). The World Meteorological Organization (WMO) provides guidelines for the use and implementation of AWS. There are 4 categories of AWS defined by WMO, ranging from light AWS to extended AWS that measure additional variables. The paper also presents the use of technologies such as Internet of Things, Edge Computing, Deep Learning, LPWAN in future AWS-based observation systems.	A case study of a testbed AWS (project AgroComp) developed by the authors' research team is presented, with results from low-cost sensors and Deep Learning algorithms running locally.	Reliance on battery power, which can limit the deployment of IoT devices in remote locations.
9	Talavera, Jesús Martín, et al. "Review of IoT applications in agro-industrial and environmental fields." Computers and Electronics in Agriculture 142 (2017): 283-297.	This paper reviews the use of Internet of Things (IoT) in agro-industrial and environmental applications. It was conducted using a systematic literature review and analyzed academic documents written in English published from 2006 to 2016. The results were clustered into four application domains: monitoring, control, logistics, and prediction. The authors compiled information from each reference to create a distribution of the technologies	The limitations and open challenges of using IoT in agro-industrial and environmental fields are also summarized.	Limited precision of some IoT devices, Reliance on continuous power supply, which can limit the deployment of IoT devices in remote locations.

		used, including sensors, actuators, power sources, edge computing modules, communication technologies, storage solutions, and visualization strategies.		
10	Jaladi, Aarti Rao, et al. "Environmental monitoring using wireless sensor networks (WSN) based on IOT." Int. Res. J. Eng. Technol 4.1 (2017): 1371-1378.	The article describes a project that aims to build a system for monitoring environmental parameters using wireless sensor networks (WSNs). The system consists of Raspberry Pi as the base station that connects to multiple sensor nodes via Zigbee protocol, collecting real-time data from various sensors such as temperature, vibration, pressure, moisture, light, and pollution. The base station stores the data and sends it to the cloud via Ethernet, and clients can visit the base station remotely through a website. The system design includes three types of devices: coordinator, router, and end tags.	The coordinator communicates directly with the base station, while the end tag sends the data to the nearest router, which then communicates with the coordinator.	Need for appropriate security measures to ensure the confidentiality and integrity of data.
11	Senthilkumar, R., P. Venkatakrishnan, and N. Balaji. "Intelligent based novel embedded system based IoT enabled air pollution monitoring system." Microprocessors and Microsystems 77 (2020):	This paper presents a proposal for an air quality monitoring system using fog computing-based Internet of Things (IoT). The proposed system consists of embedded sensors that collect air quality information and send it to fog nodes, which are virtualized programs hosted on dedicated computing nodes. The fog nodes refine non-actionable data and forward it to the cloud for long-term storage and batch analytics. The cloud is used for running global analytics on information gathered from various shared	The proposed method uses a combination of microprocessors and IoT cloud platforms to analyze the data. The experimental results show that this advanced method is capable of monitoring air quality and detecting changes in air quality patterns. The system is designed to be	Need for additional components for real-time data visualization and storage.

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12	Gubbi, Jayavardhana, et al. "Internet of Things (IoT): A vision, architectural elements, and future directions." Future generation computer systems 29.7 (2013): 1645-1660.	This paper presents a vision for the worldwide implementation of the Internet of Things (IoT) with a focus on Cloud computing. It discusses the current trends and key enabling technologies that drive IoT research and presents a Cloud implementation using the Aneka platform. The paper also discusses the need for convergence of Wireless Sensor Network (WSN), the Internet, and distributed computing in the development of IoT. The authors provide a case study of data analytics on the Aneka/Azure cloud platform and conclude with a discussion of open challenges and future trends in the field.	The paper highlights the importance of smart connectivity and context-aware computation in IoT and the role of cloud computing in providing virtual infrastructure for the seamless processing and presentation of data generated by IoT devices.	Need for privacy and security measures to protect sensitive information and prevent unauthorized access to data.
13	Development of a Cost-Effective IoT-Based Weather Monitoring System	This paper is a study exploring the development and deployment of a cost-effective IOT platform to monitor atmospheric pressure, temperature , humidity and dust particles present in a residential area. They make the use of open source technologies to do so. They have also conducted a study to determine the most cost-effective hardware components.	This paper highlights two weather management systems to showcase the merits of their lower priced cost efficient build by comparing it to a build with higher priced hardware components.	Assuming the basic functionality to cost-effectiveness criteria are met this project can be expanded by the addition of more features
14	IoT Based Weather Monitoring System for	This paper is as the title suggests a detailed comprehensive review of existing IoT based weather	This paper acts as a reliable well organized source of information on	This study can be continued and expanded by adding in more classification factors as

	Smart Cities: A Comprehensive Review	management systems and also provides feature based classification.	current established smart iot based weather systems and hence acts as reference material for our project.	well as newly developed weather monitoring systems
15	IoT Based Air Quality and Weather Monitoring System with Android Application	This paper documents the implementation of an android application integrated with an air quality and weather monitoring system. They have used an arduino UNO microcontroller with modules such as a Wifi module and an LCD display paired with the appropriate sensors	This project successfully demonstrates integration of an IoT device with an android application using the MIT app inventor service to assist them with the software development required.	The future modifications sensing wind speed and directions are to be added and the prototype is to be deployed onto an agricultural field.
16	LoRa based intelligent soil and weather condition monitoring with internet of things for precision agriculture in smart cities	This paper proposes the design of a smart irrigation system using IoT devices and Machine Learning The soil and weather parameters are selected through various research articles in Agriculture 4.0 and ML. The article also juxtapositions the designed weather station with the various patents developed. The system developed in this article provides a cost-effective and state-of-the-art solution to local weather monitoring.	This paper investigates the use of IoT, remote sensing, and ML in agriculture. The articles provide an overview of the various WSN technologies for IoT, ML, and agriculture applications. The relevance of soil and weather conditions in irrigation planning as well as the factors in the environment that have the biggest impact on irrigation planning were also covered in the article.	Precision Irrigation poses many challenges such as Data Availability, Scalability,Model Uncertainties, Producer participation. The opportunities for further improvement lie in the use of satellites, inexpensive sensor networks and statistical machine learning models.

17	Weather monitoring and forecasting system using IoT by Balakrishnan Sivakumar and Chikkamadaiah Nanjundaswamy	The methodology used in this is that in order to achieve the weather monitoring and forecasting system, sensor devices must be placed in the environment for data collection and processing. It will capture real-time data by placing sensor devices in the surrounding area. Through the network, it can function together with other items. The user will then have access to the gathered data and the analysis' findings over Wi-Fi. This research study presents various concepts for an efficient, low-cost entrenched system and a smart way to monitor the environment.	In this work, hardware and software for IoT weather monitoring systems have been developed. The hardware of the IoT weather monitoring system consists of the microcontroller device that gathers weather information, such as temperature, relative humidity, and air pressure, and transmits it to the IoT platform for further processing and display.	No specific Limitations.
18	Smart weather monitoring and real time alert system using IoT by Yashaswi Rahut, Rimsha Afreen and Divya Kamini.	The methodology used is that the functions of each individual module established for monitoring the various weather parameters can be implemented in the proposed system as a 4-tier model. The environment is in layer 1, followed by sensor devices in tier 2, decision-making using sensor data in tier 3, and warning notification in tier 4. In this case, Tier 1 offers details regarding the parameters inside the region that must be monitored. The sensors in Tier 2 have the necessary characteristics and features, and each of them is operated and regulated according to their sensitivity and sensing range.	In order to demonstrate the model's effectiveness in comparison to other models on the market, this article emphasises its implementation as tiers, with each tier handling a different portion of the model.	By incorporating other classification elements and newly created weather monitoring technologies, this study can be continued and expanded.

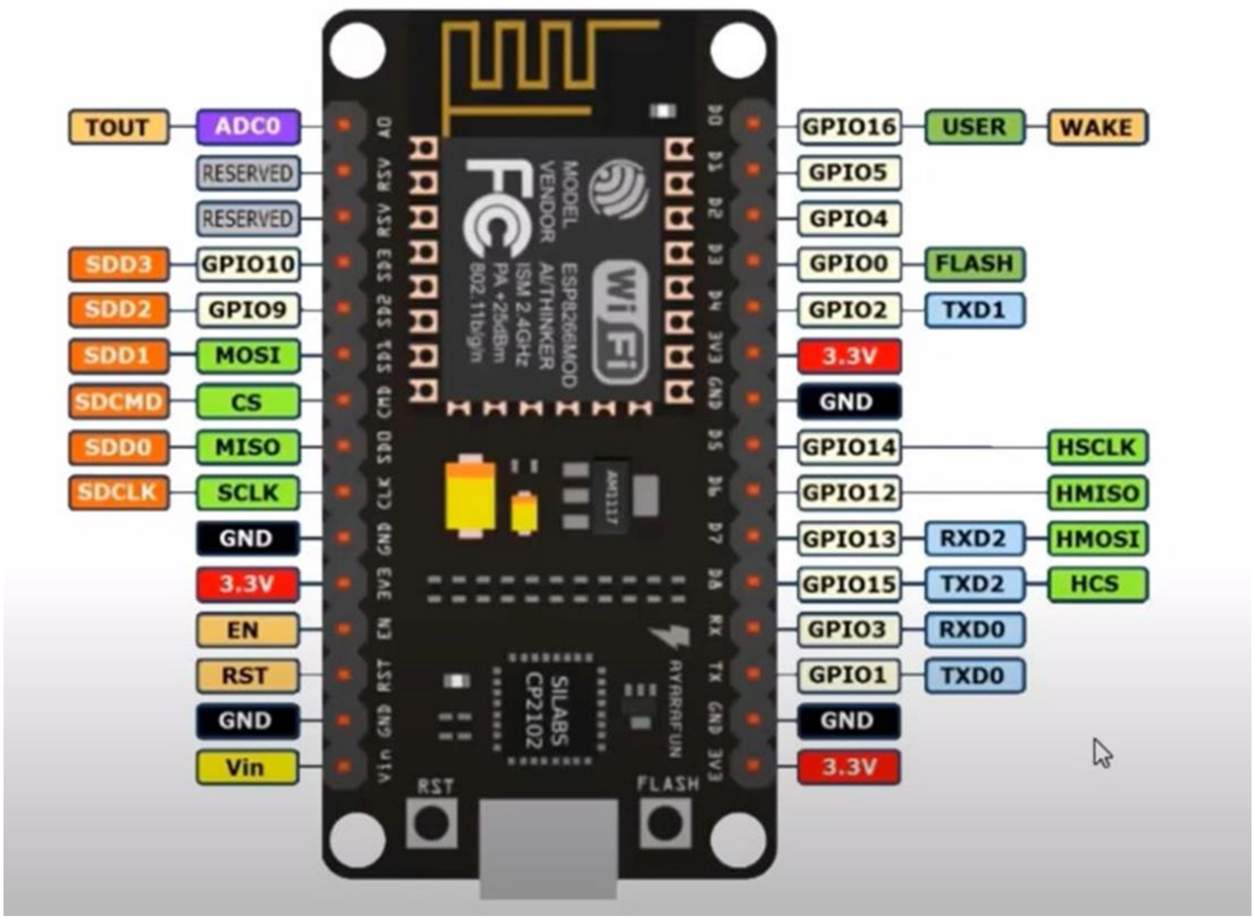
19	Weather Monitoring system using IoT and Cloud computing by Mr. Mohit Tiwari, Deepak Narang, Priya Goel, Anupma Gadhwal, Abhinav Gupta And Ankush Chawla.	ESP8266-based wifi module Nodemcu, Microcontroller, Temperature and Humidity Sensor (DHT11), Barometric Pressure Sensor (BMP180), LDR, Raindrop Module, Mobile Phone to Receive Email and SMS, and Software Components Amazon AWS for Cloud are all included in the model. The numbers are examined when the sensor measurements are uploaded to the cloud, and then an alert is sent if a particular parameter's value deviates from its expected range. Additionally, a graph is drawn to display the trends.	When cloud computing and IoT are combined, the model is more effective and has a better possibility of being employed than other models. The Arduino IDE was the primary programme we used to programme our microcontroller board. It offers a built-in library with several input and output options. Additionally, the programme is open source. It demonstrates how cloud computing and IoT may be effectively combined in a single device.	The suggested cloud-based and IoT-based weather monitoring system can be expanded to include a wide range of functions. We may also incorporate a GPS device into the design so that, in addition to the environment's other attributes, such as temperature, humidity, pressure, and light intensity, the user will also receive information on the environment's location by email or text message. For detecting several other weather characteristics, such as sun radiation and visibility, we can add more sensors.
20	IoT based weather monitoring system using arduino-uno by Mr. S. M. Gosavi, Mr. S. D. Bhide and Mr. D. N. Bhosale.	To assess climatic and environmental variables like temperature, humidity, light intensity, dew point, and thermal index, this novel system uses three sensors. The Arduino microcontroller processes the values that the sensors read and saves them in a text file that may be analysed for analysis. For convenient viewing, the readings are also shown on an integrated LCD panel. The weather features of a certain area can be derived from an analysis of all these readings, which can also be used to record the weather profile. These saved settings	This model will offer a practical method for storing real-time weather parameters and benefit farmers, businesses, regular people, and other people whose everyday lives are impacted by weather and its parameters. For many years, it can be utilised to obtain the necessary information for each location. If we are talking about	In order to obtain information about a specific location, other sensors, such as soil moisture sensors, gas sensors, and pressure measuring sensors, can be interfaced with the current system. The device can also be powered by solar energy. In order to reduce condensation, which benefits sensors, silica gel can be used.

		are crucial and change depending on the location. All of these specifications are recorded in the database, and these numbers, which are crucial, are kept track of over time. We may create a weather map for a certain area and time using these input information.	agriculture, the information gathered will be used to identify the ideal circumstances needed for plant growth, and the farmer can change the environmental factors to make it more conducive to plant growth. This will have a significant impact on agriculture and farmers all over the world. This system will assist in keeping an eye on the state of a specific area and assisting people in acting appropriately.	
21	Real Time Weather Monitoring System Using Iot by Puja Sharma and Shiva Prakash.	The basic methodology of the proposed system is to gather data from numerous sensors and communicate it all to a webpage using the HTTP request protocol on a web server. Multiple sensors are used in this weather monitoring system to measure the variables. Three separate sensors are arranged in various bundles throughout the system. The microcontroller node MCU and sensor connections are described in the model. The architecture's node mcu8266 is coupled to sensors. The system is set up so that information is automatically fetched from sensors, uploaded while using wi-fi, and shown on the	The suggested system uses cheap devices to detect meteorological conditions. The client-side architecture model underlies how the proposed system operates. The suggested method made use of numerous sensors to observe different environmental data. The system that was designed utilised fewer sensors than the model that was previously in use. The key goal of the	No specific Limitations.

		webpages. The suggested model makes use of three sensors to measure temperature, pressure, humidity, and rainfall, which are represented by modes 1, 2, and 3. So, The proposed system is an effective weather monitoring system with less no. of sensors.	suggested model is to make the system inexpensive and cost-effective so that anyone can use it without restriction.	
22	Internet of Things (IOT) based Weather Monitoring System by Girija C, Harshalatha H, Andreanna Grace Shires and Pushpalatha H P.	The methodology is gathering information from various sensor devices positioned in a certain area of interest. When a proper connection is made with the server device, the detected data is automatically delivered to the web server. The webpage on the web server that we can use to monitor and manage the system. The website provides data on changes in local temperature, humidity, and CO levels in the area where the embedded monitoring system is installed. The collected data will be kept on the cloud (Google Spread Sheets). The data kept in the cloud can be used for parameter analysis and ongoing monitoring.The air's temperature, humidity, and carbon monoxide content at regular intervals. In order to give trends of temperature, humidity, and CO levels in a specific location at any moment, all the aforementioned data will be saved in the cloud.	In order to achieve this, sensor devices must be placed in the environment for data collection and processing. We can make the environment more realistic by placing sensor devices there, allowing the environment to communicate with other things across a network. The user will then have access to the gathered data and the analysis' findings over Wi-Fi. The Internet of Things (IoT) idea has been tested experimentally for monitoring three parameters: temperature, humidity, and CO value. This information can be	To alert the user in the event of excessive smoke conditions, a smoke alarm can be added to the circuit. Clients can receive notifications about the temperature, humidity, and smoke characteristics via SMS. This model can be improved so that it can monitor the weather in industrial areas and growing cities. to safeguard the general public's health against pollution.

			easily shared with other users and will be useful for upcoming analyses.	

Module:



COMPONENTS:

Sensors: The production line used a variety of sensors to detect and measure various parameters such as temperature, pressure, and motion. For example, thermocouples were used to measure the temperature of the production line, and photoelectric sensors were used to detect the presence of components on the conveyor belt.

Actuators: The production line used several types of actuators to control various stages of the production process. For example, solenoid valves were used to control the flow of air in the pneumatic system, and motors were used to drive the conveyor belts.

Controllers: The production line used programmable logic controllers (PLCs) to automate and optimize the production process. The PLCs were responsible for controlling the actuators based on the data collected from the sensors.

Connectivity devices: The production line used Ethernet switches and routers to establish communication between different components of the IIoT system.

Cloud-based platforms: The article does not mention the use of any cloud-based platforms in this case study.

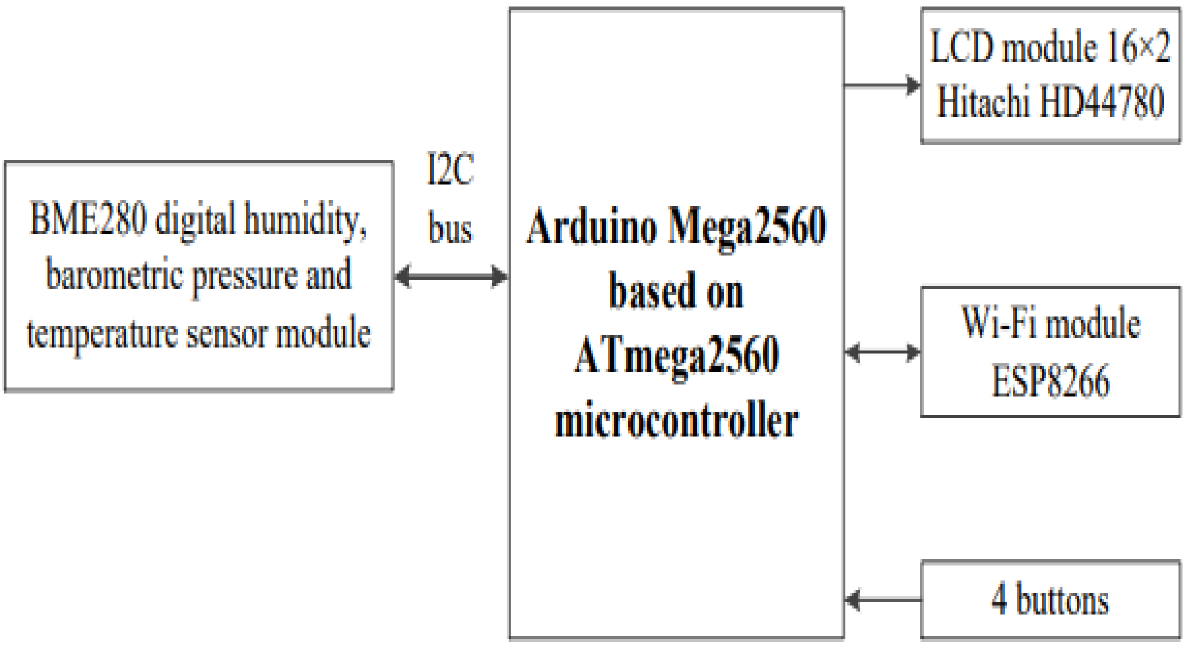
User interfaces: The production line used a web-based user interface to allow operators to monitor and control the production process. The user interface displayed real-time data from the sensors and allowed operators to control the actuators and PLCs.

Description:

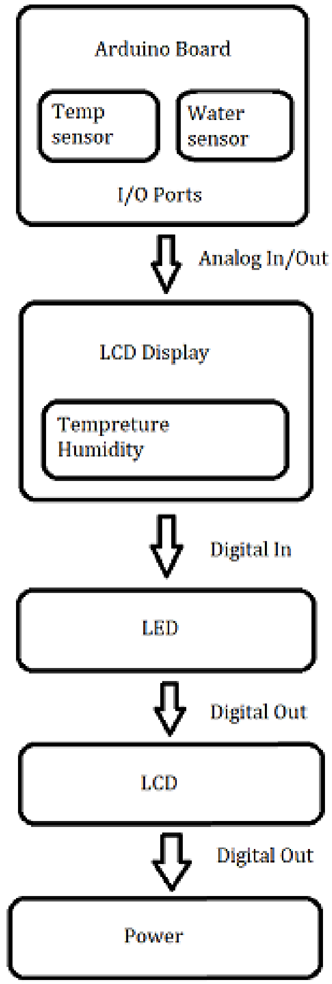
- Arduino Board: The Arduino board serves as the central processing unit (CPU) for the system. It is responsible for collecting data from the sensors, processing it, and sending it to the LCD display and LED.
- Water Sensor: The water sensor is used to detect the presence of water or moisture in the environment. It is connected to the Arduino board via the connecting wires and provides analog data that can be read by the board.
- Temperature Sensor: The temperature sensor is used to measure the temperature of the environment. It is connected to the Arduino board via the connecting wires and provides analog data that can be read by the board.
- LED: The LED is used to indicate when the temperature or humidity levels exceed a certain threshold. It is connected to the Arduino board via the connecting wires and can be controlled by the board.
- Connecting Wires: The connecting wires are used to connect the components of the system to the Arduino board and breadboard.

- Breadboard: The breadboard is used to connect the various components of the system and ensure proper voltage regulation and current flow.
- LCD Display: The LCD display is used to display the temperature and humidity readings collected by the sensors. It is connected to the Arduino board via the connecting wires and can be controlled by the board.
- Resistors: The resistors are used to regulate the voltage and current in the circuit and prevent damage to the components.

The weather monitoring system is implemented by writing the code for the Arduino board to read the data from the sensors and display it on the LCD display. The code also include instructions to turn on the LED if the temperature or humidity levels exceed a certain threshold. The system is tested by pouring water on the water sensor and measuring the temperature with the temperature sensor. The LCD display should show accurate readings, and the LED should turn on when the temperature or humidity levels exceed the threshold.

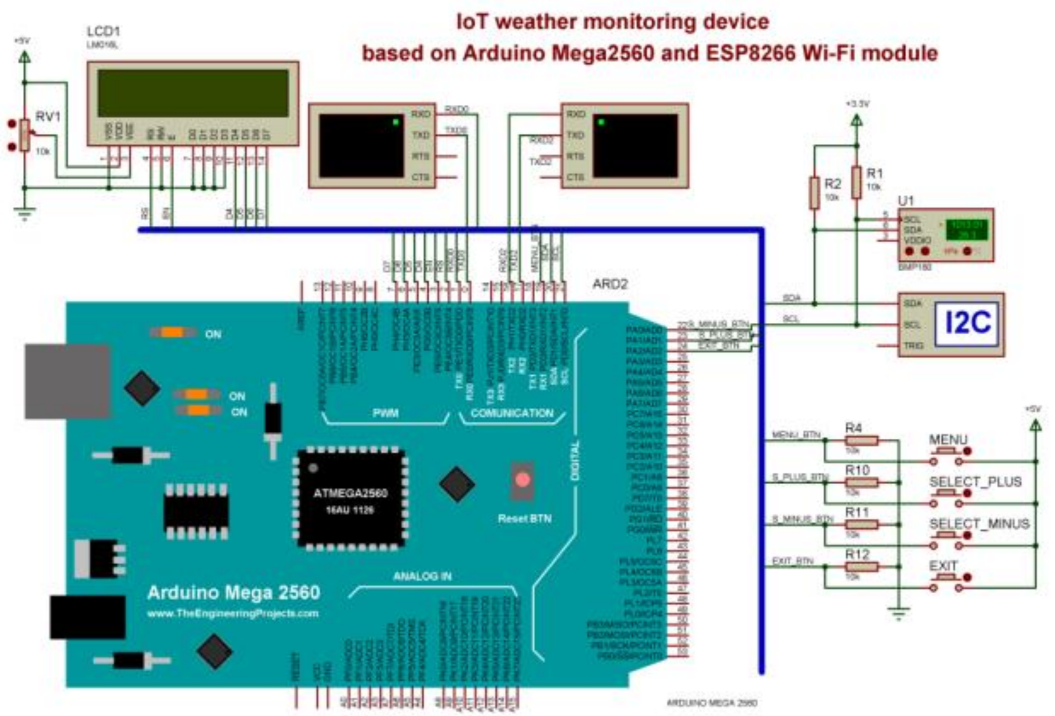


Hardware Block Diagram:



- In this block diagram, the main components of the IoT weather monitoring system are shown, including the Arduino board, sensors, LED, LCD, and power supply.
- The Arduino board serves as the central processing unit for the system, receiving analog input data from the sensors and processing it to generate digital output signals that control the LED and LCD.
- The sensors in this system include a water sensor and temperature sensor. The water sensor detects the presence of water or moisture in the environment and provides analog input data to the Arduino board. The temperature sensor measures the temperature of the environment and also provides analog input data to the board.
- The LED is used to indicate when the temperature or humidity levels exceed a certain threshold. It receives digital output signals from the Arduino board and is turned on when the threshold is exceeded.
- The LCD display is used to display the temperature and humidity readings collected by the sensors. It receives digital output signals from the Arduino board and displays the readings in real-time.

- The power supply is used to provide power to the various components of the system, including the Arduino board, sensors, LED, and LCD.
- Overall, this hardware block diagram provides a high-level overview of the IoT weather monitoring system and how its components interact to collect and display real-time environmental data.



CODES:

PYTHON FILE:

Genrate.py

```python
#!/usr/bin/env python3
"""
this module creates the server and provides the text
"""

from flask import Flask, render_template
from process import processH, processT

app = Flask(__name__)


@app.route('/')
```

```python
def index():
    return render_template('index.html')


@app.route('/apih', methods=['POST'])
def apih():
    output_h = processH()
    return render_template('index.html', output_w=output_h)


@app.route('/apit', methods=['POST'])
def apit():
    output_t = processT()
    return render_template('index.html', output_w=output_t)


if __name__ == "__main__":
    app.run(debug=True)
```

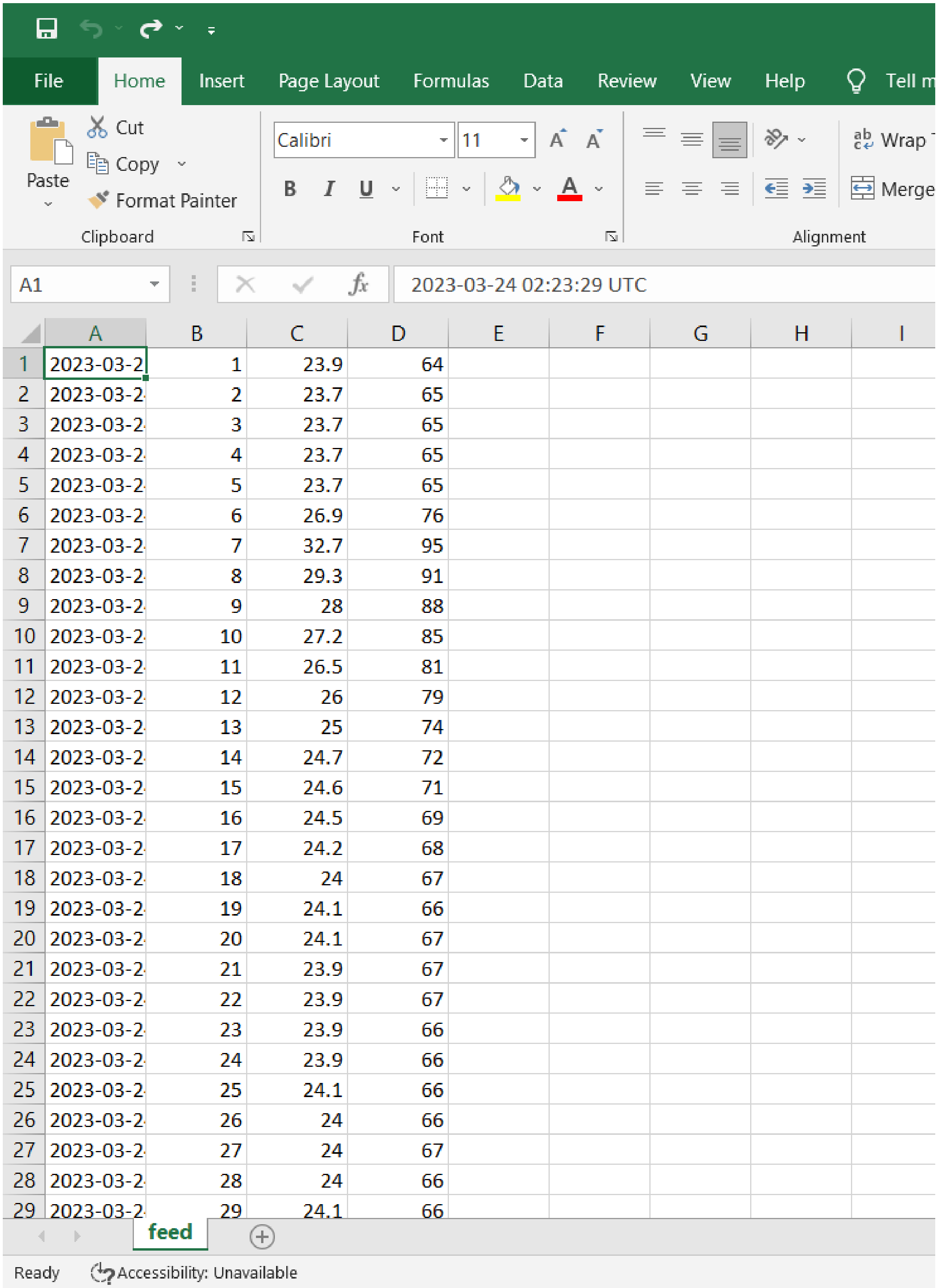
process.py:

```python
#!/usr/bin/env python3
"""
this module predicts weather
"""

import pandas as pd
from sklearn.linear_model import LinearRegression
from datetime import datetime, timedelta


def processH():
    # Read data from file
    df = pd.read_csv("D:\VIT\Sem_6\IOT -
CSE3009\Project/WeatherPrediction/feed.csv",
                     header=None, names=["datetime", "id", "temperature",
"humidity"])

    # Convert datetime string to datetime object
    df["datetime"] = pd.to_datetime(df["datetime"])

    # Sort data by datetime
    df = df.sort_values(by="datetime")
```

```python
    # Create new features for hour of day and day of week
    df["hour"] = df["datetime"].dt.hour
    df["day_of_week"] = df["datetime"].dt.dayofweek

    # Create X and y for linear regression
    X = df[["hour", "day_of_week"]]
    y = df["humidity"]

    # Fit linear regression model
    model = LinearRegression()
    model.fit(X, y)

    # Predict humidity for next 1 week
    last_datetime = df["datetime"].max()
    next_week_dates = [last_datetime + timedelta(hours=i) for i in range(168)]
    next_week_hours = [date.hour for date in next_week_dates]
    next_week_days_of_week = [date.dayofweek for date in next_week_dates]
    next_week_X = pd.DataFrame(
        {"hour": next_week_hours, "day_of_week": next_week_days_of_week})
    next_week_y = model.predict(next_week_X)

    # Print predicted humidity values
    wed = [[] for _ in range(3)]
    for date, humidity in zip(next_week_dates, next_week_y):
        wed.append(
            [formatDate(date.strftime('%Y-%m-%d %H:%M:%S %Z')), humidity])

    return wed


def processT():
    # Read data from file
    df = pd.read_csv("D:\VIT\Sem_6\IOT -
CSE3009\Project/WeatherPrediction/feed.csv",
                     header=None, names=["datetime", "id", "temperature",
"humidity"])

    # Convert datetime string to datetime object
    df["datetime"] = pd.to_datetime(df["datetime"])

    # Sort data by datetime
    df = df.sort_values(by="datetime")

    # Create new features for hour of day and day of week
    df["hour"] = df["datetime"].dt.hour
```

```python
    df["day_of_week"] = df["datetime"].dt.dayofweek

    # Create X and y for linear regression
    X = df[["hour", "day_of_week"]]
    y = df["temperature"]

    # Fit linear regression model
    model = LinearRegression()
    model.fit(X, y)

    # Predict temperature for next 1 week
    last_datetime = df["datetime"].max()
    next_week_dates = [last_datetime + timedelta(hours=i) for i in range(168)]
    next_week_hours = [date.hour for date in next_week_dates]
    next_week_days_of_week = [date.dayofweek for date in next_week_dates]
    next_week_X = pd.DataFrame(
        {"hour": next_week_hours, "day_of_week": next_week_days_of_week})
    next_week_y = model.predict(next_week_X)

    # Print predicted temperature values
    wed = [[] for _ in range(3)]
    for date, temperature in zip(next_week_dates, next_week_y):
        wed.append(
            [formatDate(date.strftime('%Y-%m-%d %H:%M:%S %Z')), temperature])

    return wed


def formatDate(date_string):
    date_obj = datetime.strptime(date_string, '%Y-%m-%d %H:%M:%S %Z')
    formatted_date = date_obj.strftime('%A, %d %B %Y at %I:%M %p %Z')
    return formatted_date
```

feed:


A1: 2023-03-24 02:23:29 UTC

	A	B	C	D
1	2023-03-2	1	23.9	64
2	2023-03-2	2	23.7	65
3	2023-03-2	3	23.7	65
4	2023-03-2	4	23.7	65
5	2023-03-2	5	23.7	65
6	2023-03-2	6	26.9	76
7	2023-03-2	7	32.7	95
8	2023-03-2	8	29.3	91
9	2023-03-2	9	28	88
10	2023-03-2	10	27.2	85
11	2023-03-2	11	26.5	81
12	2023-03-2	12	26	79
13	2023-03-2	13	25	74
14	2023-03-2	14	24.7	72
15	2023-03-2	15	24.6	71
16	2023-03-2	16	24.5	69
17	2023-03-2	17	24.2	68
18	2023-03-2	18	24	67
19	2023-03-2	19	24.1	66
20	2023-03-2	20	24.1	67
21	2023-03-2	21	23.9	67
22	2023-03-2	22	23.9	67
23	2023-03-2	23	23.9	66
24	2023-03-2	24	23.9	66
25	2023-03-2	25	24.1	66
26	2023-03-2	26	24	66
27	2023-03-2	27	24	67
28	2023-03-2	28	24	66
29	2023-03-2	29	24.1	66

feed

ML Model to Predict Weather:

Output:

Weather Forecast

Click to generate Humidity (in $g.m^{-3}$): Humidity

Click to generate Temperature (in ^{o}C): Temperature

Result:

Date/Time	Value
Friday, 24 March 2023 at 09:22 AM	61.00000000000001
Friday, 24 March 2023 at 10:22 AM	59.835548172757484
Friday, 24 March 2023 at 11:22 AM	58.671096345514954
Friday, 24 March 2023 at 12:22 PM	57.50664451827243
Friday, 24 March 2023 at 01:22 PM	56.34219269102991
Friday, 24 March 2023 at 02:22 PM	55.17774086378738
Friday, 24 March 2023 at 03:22 PM	54.013289036544855

Weather Forecast

Click to generate Humidity (in $g.m^{-3}$): Humidity

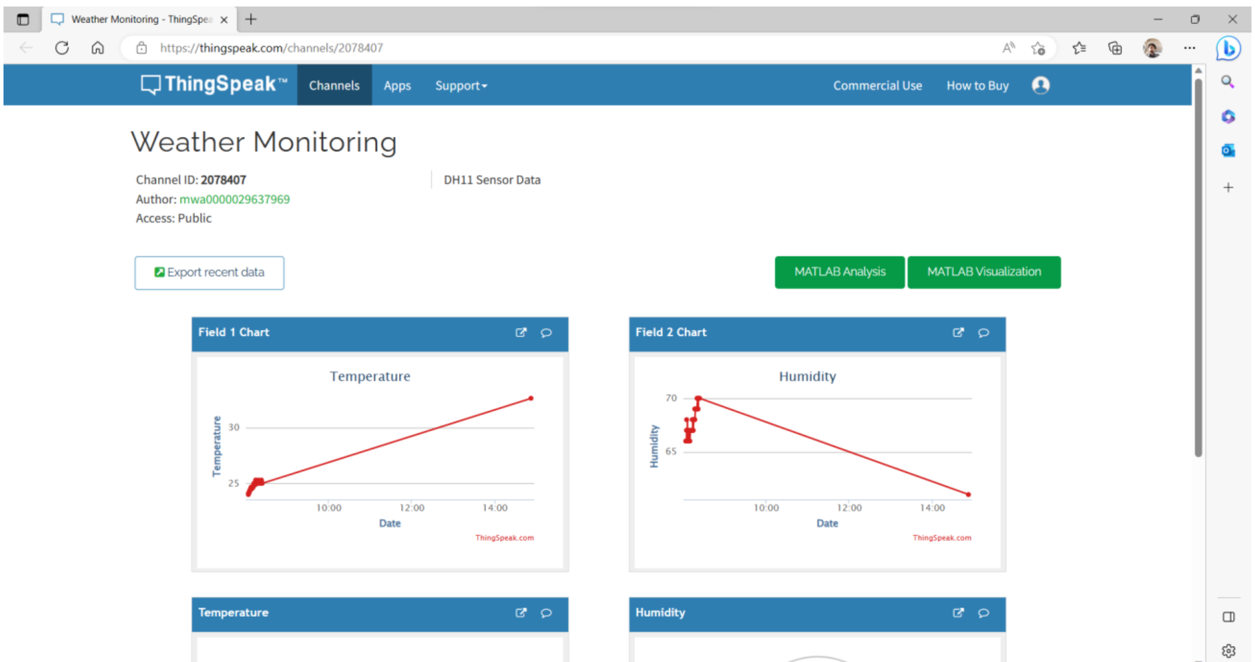
Click to generate Temperature (in ^{o}C): Temperature

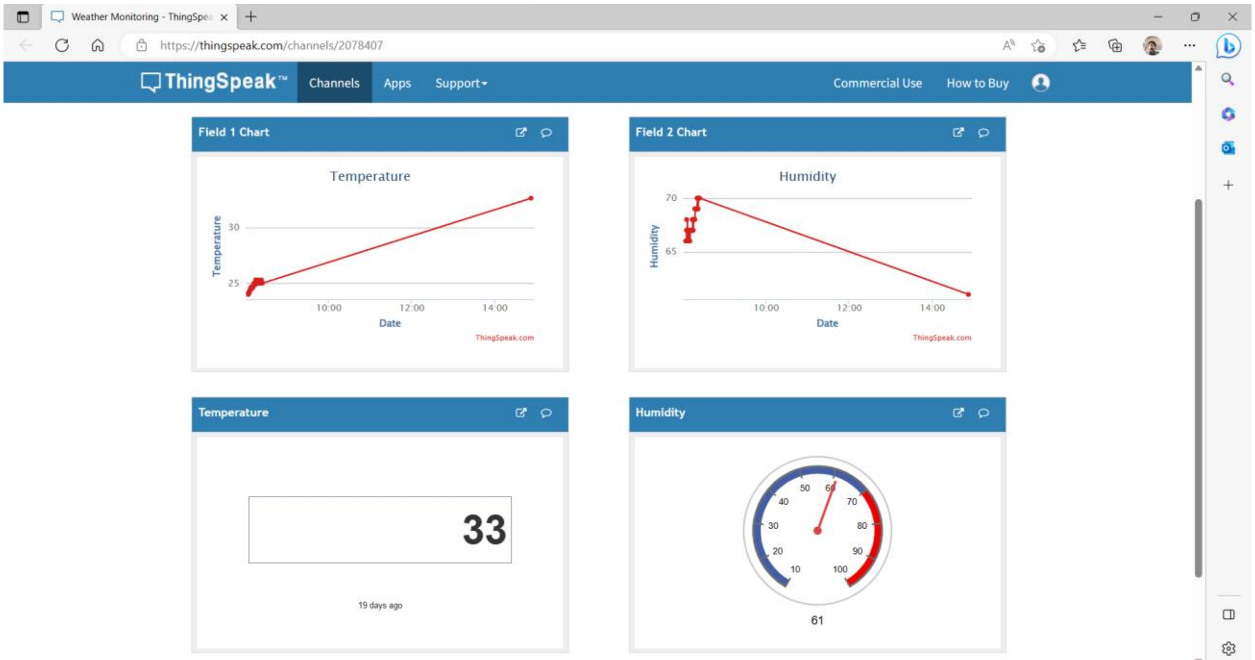
Result:

Date/Time	Value
Friday, 24 March 2023 at 09:22 AM	32.599999999999994
Friday, 24 March 2023 at 10:22 AM	33.69368770764119
Friday, 24 March 2023 at 11:22 AM	34.78737541528238
Friday, 24 March 2023 at 12:22 PM	35.88106312292358
Friday, 24 March 2023 at 01:22 PM	36.97475083056477
Friday, 24 March 2023 at 02:22 PM	38.06843853820597
Friday, 24 March 2023 at 03:22 PM	39.16212624584716

Thursday, 30 March 2023 at 05:22 PM	41.34950166112955
Thursday, 30 March 2023 at 06:22 PM	42.44318936877075
Thursday, 30 March 2023 at 07:22 PM	43.53687707641195
Thursday, 30 March 2023 at 08:22 PM	44.63056478405314
Thursday, 30 March 2023 at 09:22 PM	45.724252491694344
Thursday, 30 March 2023 at 10:22 PM	46.81794019933554
Thursday, 30 March 2023 at 11:22 PM	47.91162790697673
Friday, 31 March 2023 at 12:22 AM	22.75681063122923
Friday, 31 March 2023 at 01:22 AM	23.850498338870423
Friday, 31 March 2023 at 02:22 AM	24.94418604651162
Friday, 31 March 2023 at 03:22 AM	26.037873754152816
Friday, 31 March 2023 at 04:22 AM	27.13156146179401
Friday, 31 March 2023 at 05:22 AM	28.22524916943521
Friday, 31 March 2023 at 06:22 AM	29.318936877076403
Friday, 31 March 2023 at 07:22 AM	30.412624584717598
Friday, 31 March 2023 at 08:22 AM	31.506312292358793

THINKSPEEK:





LINK: [Weather Monitoring - ThingSpeak IoT]

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