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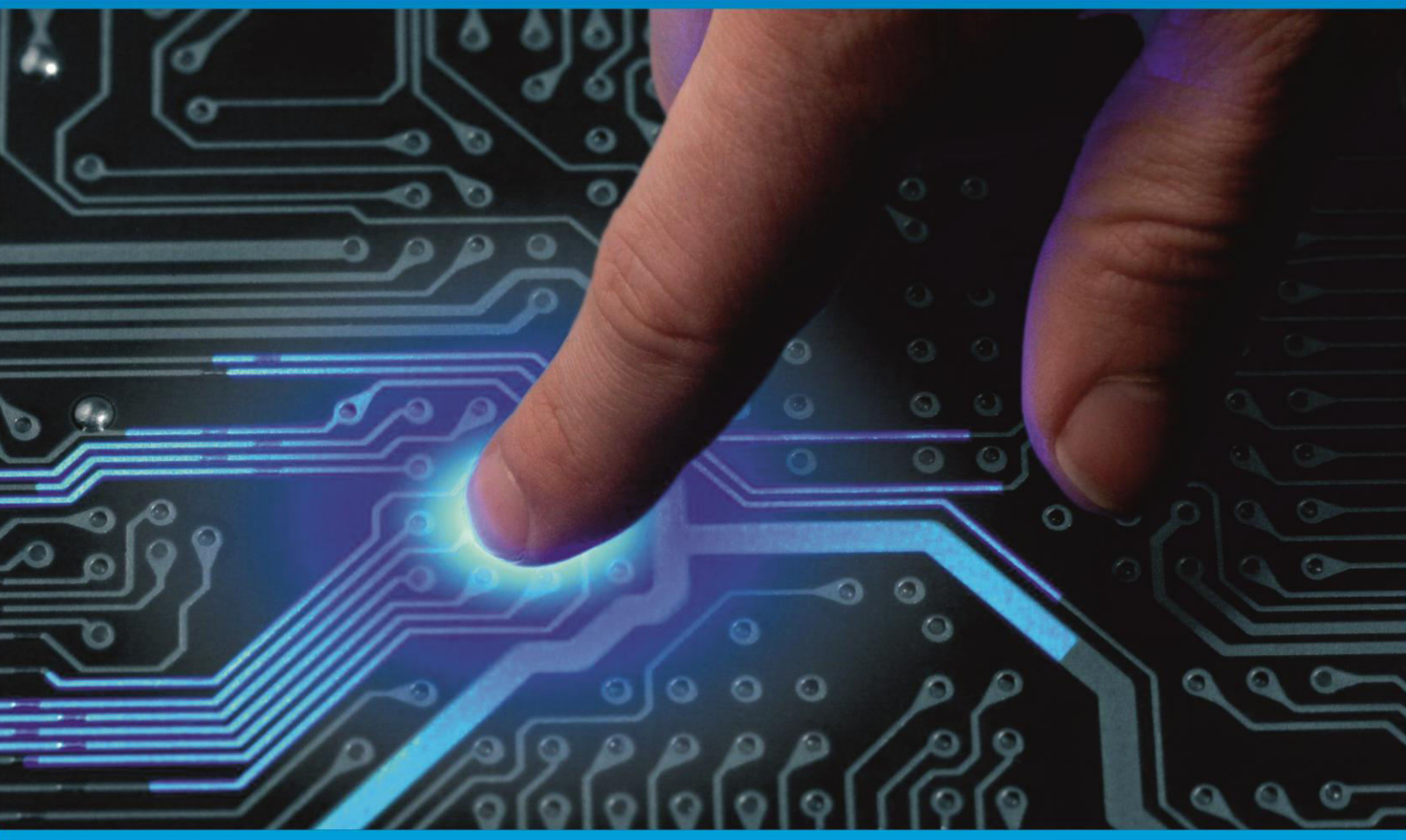

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Real-Time Weather Monitoring System Using Node MCU

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ABSTRACT: Weather monitoring plays an important part in human life, so the collection of information about the temporal dynamics of weather changes is very significant The basic aim of this project is to develop an embedded system to design a weather monitoring system which enables the monitoring of weather parameters. a real-time weather monitoring system designed for a smart home, for industry that displays weather parameters such as the intensity of light, temperature, air pressure and humidity obtained from the sensors to the cloud by implementing message queuing telemetry transport protocol. The stored data is of great advantage where weather forecasting is required. The NodeMCU is used as an MQTT client to transfer the sensed data to the Thingspeak cloud platform.

KEYWORDS: Weather monitoring system, Nodemcu, Thingspeak, MQTT.

I. INTRODUCTION

With the drastically changing climate, it becomes very important to collect weather parameters and monitor it continuously to predict future weather. Typical weather conditions-based database can be formed using weather monitoring. Weather events can be predicted or explained using this information. It thus helps people to plan their day-to-day activities. Weather forecasting plays a very crucial role in the Agriculture sector. Crop harvesting and planting require weather information. Accurate knowledge of real-time weather parameters such as temperature, humidity, precipitation helps protect crops and produces a good yield. Also, Life and property can be protected by weather forecasting [1].IoT has made it possible to connect things and places in the world. It establishes a connection between not only humans but devices that can communicate among themselves [2]. The weather parameters can be easily measured with the help of sensors and can be communicated to humans through the internet. Therefore, IoT enables us to monitor real-time data remotely.

IoT operates on various protocols. To communicate between microcontrollers, low power sensors, and various computing devices, the lightweight attribute of MQTT makes it suitable forall the IoT based applications. It is designed for low bandwidth-constrained devices. It is based on the publish-subscribe model.It has three essential components: Publisher, Broker, and Subscriber. The Publisher/client publishes the data. NodeMCU works as a client to publish the data sensed by the various sensors to the Thingspeak. The broker is responsible for sharing the published data to interested subscribers. The subscribers can access the data through a webpage. This paper describes an IoT based system consisting of various weather measuring sensors like Temperature and Humidity (DHT11), Air Pressure (BMP180), Rain Sensor,. The sensed data is published to cloud platform Thingspeak through the MQTT protocol. The data is stored for analysis and visualized suitably to be displayed through a webpage.

II. LITERATURE SURVEY

P. Kapoor and F. A. Barbhuiya, "Cloud-Based Weather Station using IoT Devices," *TENCON 2019 - 2019 IEEE Region 10 Conference (TENCON)*, 2019. In this paper, they proposed the cloud-based weather monitoring system using Raspberry Pi, for collecting and observing weather data. The system is designed to effectively monitor the ambient weather conditions such as temperature, humidity, wind speed, pressure, and rainfall etc. The Raspberry Pi 3 then further transmits the data over WiFi to the cloud database and this data is further used to train a new Machine Learning model deployed in the cloud for prediction of the effect and to observe and study various weather patterns and trends. The users can access the weather data and insights remotely, and in real-time through a web application that is built using the Django Framework and is deployed in the cloud[1].

K. S. Nikhilesh, Y. H. Raaghavendra, P. M. Soothanan, and R. Resmi, "Low-cost IoT based weather monitoring system for smart community," *2020 Fourth International Conference on Inventive Systems and Control (ICISC)*, 2020. In this paper they proposed the real-time weather monitoring system for the smart home. in which system display s

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weather parameters such as the intensity of rainfall, temperature, wind speed, and light intensity obtained from the sensors to the cloud by implementing message queuing telemetry transport protocol. they had used the nodemcu and different sensors as hardware and MQTT protocol for communication with thingspeak[2].

Madhuri Prakash Patil, . K P Rane, "Cloud Based Weather Monitoring System" 2016 International Journal on Recent and Innovation Trends in Computing and Communication. in this paper they proposed a weather monitoring system for industry during certain hazards.The basic aim of this paper is to develop an embedded system to design a weather monitoring system which enables the monitoring of weather parameters. Such a system contains pair of sensors like Humidity, temperature, wind speed, wind direction data can be logged into cloud so that any one (authenticated person) from any place can observe the specific data. In case of any disasters like fire, heavy rain, heavy wind, temperature or humidity may be uncontrollable, in these cases the instant information can be conveyed throughout the world using cloud to the authenticated persons, even if his hardware is destroyed in emergency[3].

N. Kumari, Sakshi, S. Gosavi, and S. S. Nagre, "Real-Time Cloud based Weather Monitoring System," *2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA)*, 2020. In this paper they proposed the cloud based weather monitoring system for drastically changing the climate. Weather parameters can be easily accessed remotely using IoT applications. This is an IoT based system to collect the real-time weather parameters and store the data to the cloud platform. The collected data is displayed through the webpage. The stored data is of great advantage where weather forecasting is required. The weather parameter includes temperature, humidity, dew point, light intensity, air pressure, precipitation, and smoke percentage.they had used The NodeMCU is used as an MQTT client to transfer the sensed data to the Thingspeak cloud platform[4].

Mohit Tiwari, Deepak Narang, Priya Goel, Anupma Gadhwal, Abhinav Gupta And Ankush Chawla," WEATHER MONITORING SYSTEM USING IOT AND CLOUD COMPUTING "2020 International Journal of Advanced Science and Technology Vol. 29, No. 12s, (2020). In this paper, they proposed an IoT and cloud-based Weather Monitoring System. The aim of this paper is to detect, record and display various weather parameters such as temperature, humidity. This system makes use of sensors for detecting and monitoring weather parameters and then this collected information is sent to the cloud which can be accessed using the internet[5].The data displayed as an output can be observed and forecasted.This system engages an Arduino UNO board, sensors, WIFI Module which sends data to cloud computing services. A web page is also created which exhibits the data and displays it to users.

Yashaswi Rahut, Rimsha Afreen, Divya Kamini ."Smart weather monitoring and real time alert system using IoT",2018 International Research Journal of Engineering and Technology (IRJET).This paper proposed system for sudden climate change and deals with weather monitoring changes like temperature, humidity, wind speed, moisture, light intensity, UV radiation and even carbon monoxide levels in the air; using multiple sensors. These sensors send the data to the web page and the sensor data is plotted as graphical statistics. The data uploaded to the web page can easily be accessible from anywhere in the world. The data gathered in these web pages can also be used for future references. The project even consists of an app that sends notifications as an effective alert system to warn people about sudden and drastic weather changes. This project can be of great use to meteorological departments, weather stations, aviation and marine industries and even the agricultural industry[6].

III. SYSTEM ARCHITECTURE

A. Hardware Specifications

Components Required

- NodeMCU
- DHT11 sensor
- BMP180 sensor
- Rain Sensor
- Breadboard
- Jumper Wires

NodeMCU: The NodeMCU (Node MicroController Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266

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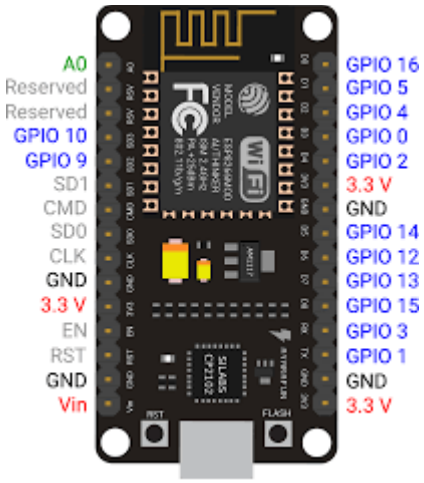

Fig.1.Node-Mcu

DH11 sensor :The DHT11 module features a humidity and temperature complex with a digital calibrated signal output, meaning that the DHT11 sensor module is a hybrid humidity and temperature sensing module that has a digital calibrated output signal. DHT11 provides us with very reliable humidity and temperature values and promises high reliability and long-term stability. This sensor has a humidity measurement component of the resistive type and a temperature measurement component of the NTC type with an integrated 8-bit microcontroller that has a fast response and is cost-effective and available in a single-row of 4 pins.

The DHT11 module, i.e. single wire communication, operates on serial communication. This module sends data in pulse form.

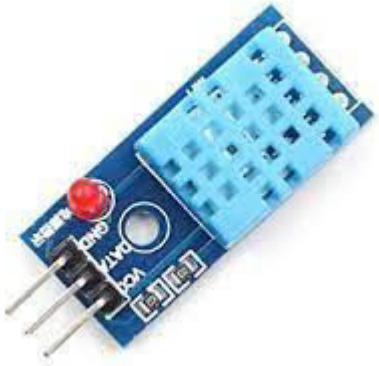

Fig.2. DHT11

BMP180 sensor :It is a barometric pressure sensor and an I2C interface operates with it. The absolute pressure of the air above it is determined by this sensor. Both the weather and altitude depend on the pressure value. It depends on how the data is perceived and can effectively track weather adjustments, calculate altitude, or any other activities involving a precise reading of the pressure.

There are 5 pins in it: I2C pins, Vcc, Gnd and IO. There are only 4 pins commonly used. For very low voltage microcontrollers, a fifth pin labeled as IO helps one to modify the I/O voltage. By default, it is disabled. You should leave this pin disconnected.

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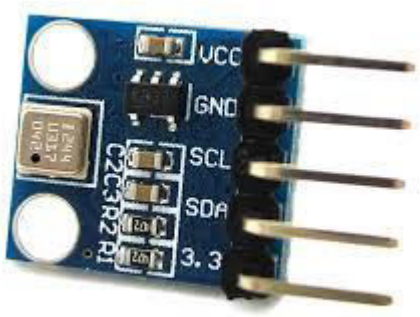

Fig.3. BMP180

rain sensor:In order to detect rain, the rain sensor is used as a switching system. It has two parts: an interactive board and a board for collectors. The nickel-coated collector board is responsible for sensing the raindrops. The theory of varying resistance acts on it. When the collector is dry, more resistance and less wet resistance are seen. This sensor is used to denote the percentage of overall precipitation for a given period.

Fig.4.Rain Sensor

A breadboard is a solderless system with electronics and research circuit designs for temporary experiments. Most electrical components may be interconnected in electronic circuits by placing their leads or terminals into the holes and, where possible, making contacts by wires.

Jumper wires are essentially wires that at each end have connector pins, allowing them to be used without soldering to connect two points to each other. With breadboards and other prototyping equipment, jumper wires are usually used to make it easy to modify a circuit if desired.

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B. Circuit Diagram

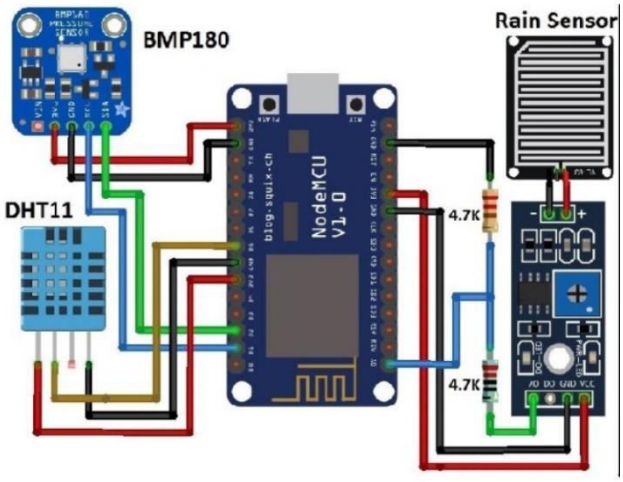

Fig.5.Proto-Type

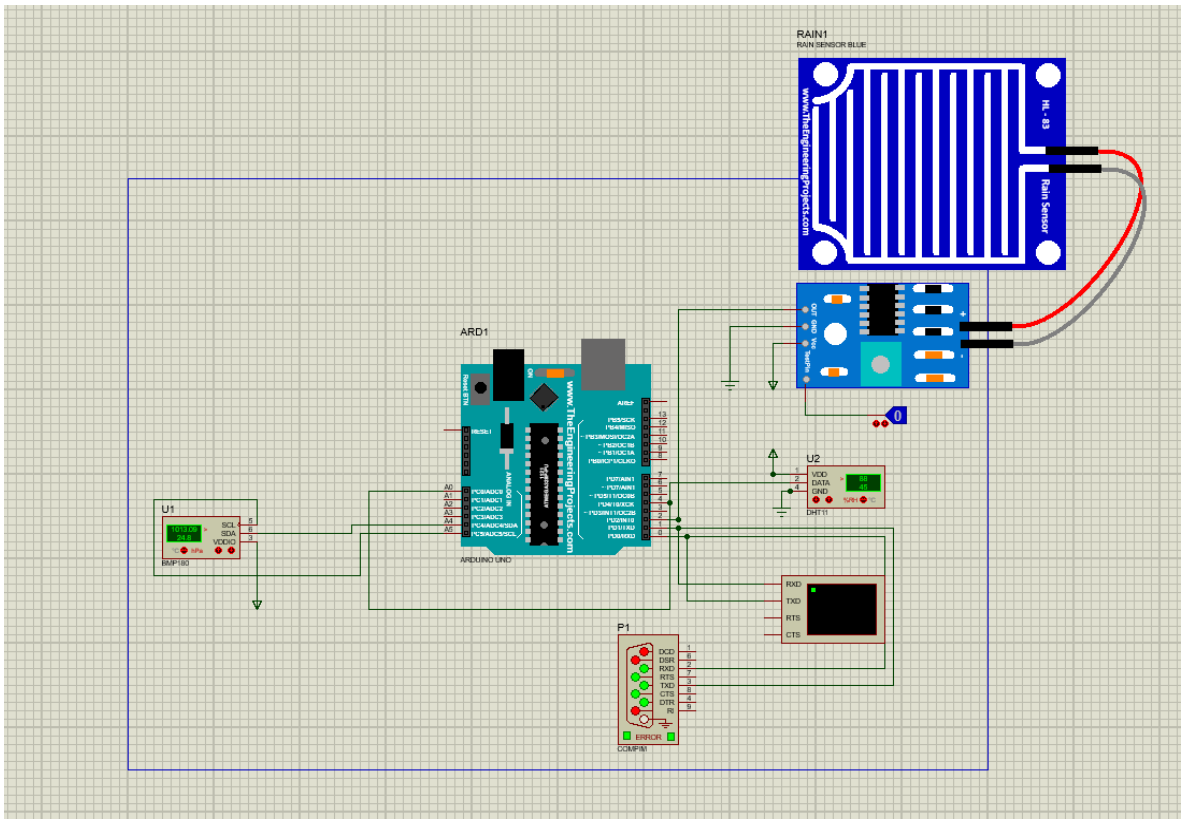

Fig.6.Circuit Diagram

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IV. SIMULATION RESULTS

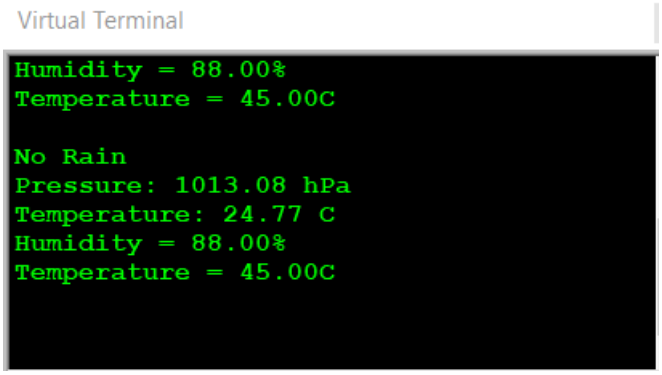

Fig.7.Simulation Output

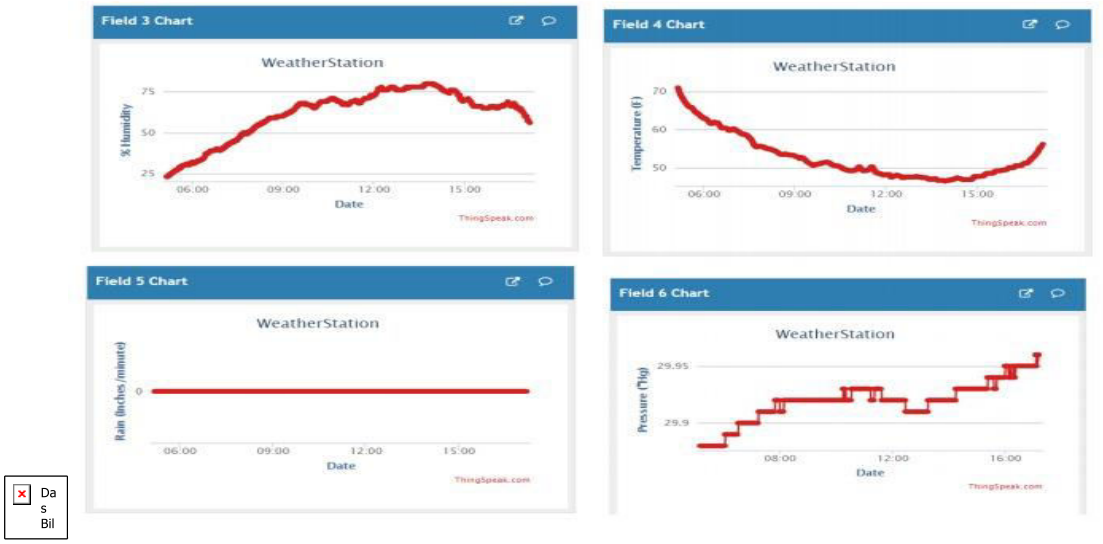

Fig.8.Graph Result

V. CONCLUSION AND FUTURE WORK

In this survey paper we had studied different standard paper for cloud-based weather monitoring system for different purpose like for industry hazards, for smart home and for climate prediction also.also we have studied the different hardware and software used in above papers. most of them used Nodemcu and MQTT protocol to communicate with thingspeak software or cloud.

REFERENCES

1. P. Kapoor and F. A. Barbhuiya, "Cloud-Based Weather Station using IoT Devices," *TENCON 2019 - 2019 IEEE Region 10 Conference (TENCON)*, 2019.
2. K. S. Nikhilesh, Y. H. Raaghavendra, P. M. Soothanan, and R. Resmi, "Low-cost IoT based weather monitoring system for smart community," *2020 Fourth International Conference on Inventive Systems and Control (ICISC)*, 2020.
3. Madhuri Prakash Patil, . K P Rane, "Cloud Based Weather Monitoring System" 2016 International Journal on Recent and Innovation Trends in Computing and Communication
4. N. Kumari, Sakshi, S. Gosavi, and S. S. Nagre, "Real-Time Cloud based Weather Monitoring System," *2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA)*, 2020.
5. Mohit Tiwari, Deepak Narang, Priya Goel, Anupma Gadhwal, Abhinav Gupta And Ankush Chawla," WEATHER MONITORING SYSTEM USING IOT AND CLOUD COMPUTING "2020 International Journal of

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Advanced Science and Technology Vol. 29, No. 12s, (2020).

6. Yashaswi Rahut, Rimsha Afreen, Divya Kamini ."Smart weather monitoring and real time alert system using IoT",2018 International Research Journal of Engineering and Technology (IRJET).
7. Bulipe Srinivas Rao,K. Srinivasa Rao, N. Ome "Internet of Things (IOT) Based Weather Monitoring system " International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE)
8. Anita M. Bhagat1, Ashwini G. Thakare1, Kajal A. Molke1, Neha S. Muneshwar1, Prof. V. Choudhary2 "IOT Based Weather Monitoring and Reporting System Project" International Journal of Trend in Scientific Research and Development (IJTSRD)
9. Yash J Joysher1, Jeba Shiny J2, Sathiya Narayanan S3, Pradeepan K "Arduino Based Weather Monitoring System " International Research Journal of Engineering and Technology (IRJET)
10. Mukesh Ranjan Sahay, Muthu Kumar Sukumaran, Sudha Amarnath " Environmental Monitoring System Using IoT and Cloud Service at Real-Time" EasyChair Preprint

BIOGRAPHY

Ms.Archana Chaugle Is an assistant professor at Shah and anchor Kutchhi Engineering College, Her interest is in Internet Of Everything, IOT Applications, Arduino and Raspberry Designing

Harsh Patel is a Student at Shah and anchor Kutchhi Engineering College, he has a interest in Data Science & Machine Learning

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Shubham Sawant is a Student at Shah and anchor Kutchhi Engineering College, he has interest in Internet Of Everything ,MATLAB, Network Designing

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