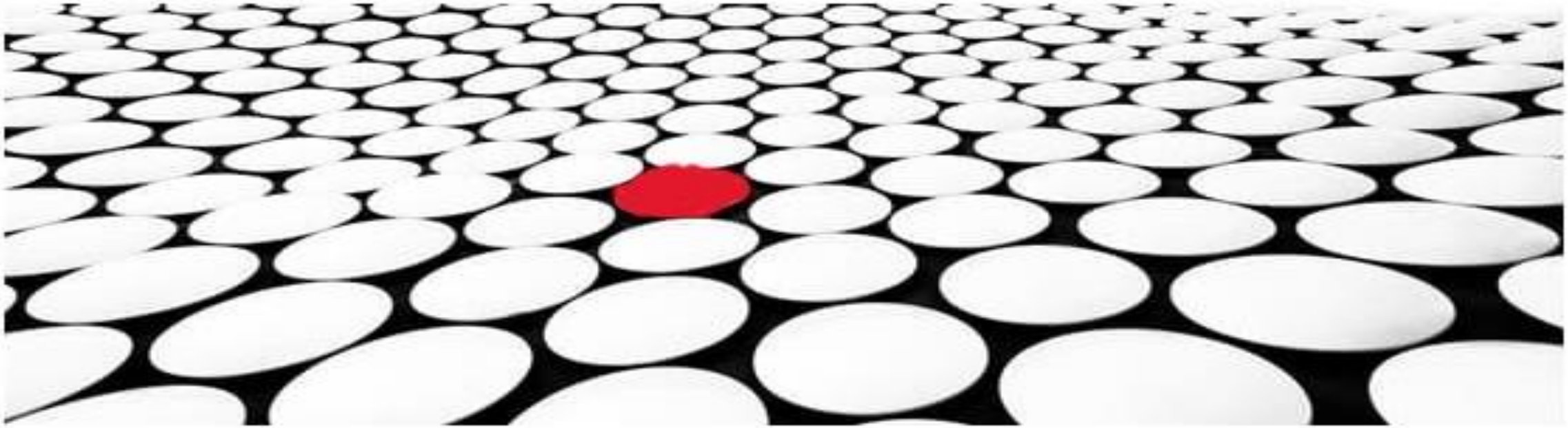
N180730-Ch.Hemantha Rajasri

ANOMALY DETECTION

— USING ISOLATION FOREST



INTRODUCTION

By integrating various hardware and software components, communication protocols, cloud or server platforms and security measures, a DAQ system can be configured to meet the specific needs of various industries and applications.

INTERFACING OF SENSORS:

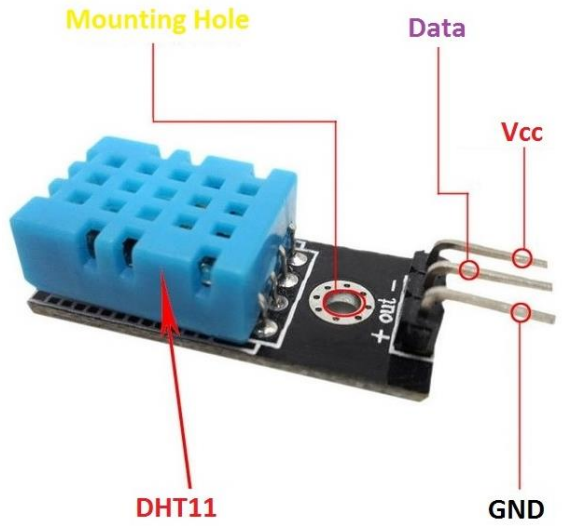
In this presentation, we will explore the exciting possibilities of connecting sensors to Nodemcu and transmitting data to the cloud. We interface a temperature and humidity sensor with Nodemcu and transmit the data to Thingspeak. By the end of this presentation, we will have a clear understanding of the concept of interfacing sensors, Nodemcu, and Thingspeak.

TEMPERATURE AND HUMIDITY SENSOR (DHT11)

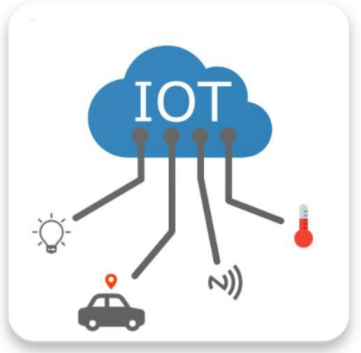
- Normal temperature sensor range will be -55 to +125 degree celsius.
- Normal temperatures during pregnancy, one study found that body temperature peaks at 96-99.5°F (35.6-37.5°C) around the 12th week of pregnancy. The average body temperature reaches its lowest point of around 95.5-99.1°F (35.3- 37.3°C) just after the 33rd week.

Range of Humidity Sensor:

- Most importantly, keep humidity levels between 30 and 50% to prevent excess moisture.



INTRODUCTION TO THINGSPEAK



ThingSpeak

- Thingspeak is an open-source Internet of Things (IoT) platform that enables the collection, visualization, and analysis of sensor data.
- It provides a simple and easy-to-use interface for users to upload their data and create custom applications for data analysis.
- With Thingspeak, users can monitor and control devices remotely, receive alerts based on sensor data, and automate tasks based on specific conditions.
- For example monitoring air quality in a city using sensors and visualizing the data on Thingspeak's platform.

Temperature Monitoring

Channel ID: **2215294**
Author: mwa0000029671625
Access: Private

Import

Upload a CSV file to import data into this channel.

File Choose File No file chosen

Time Zone (GMT+00:00) UTC

Upload

Export

Download all of this Channel's feeds in CSV format.

Time Zone (GMT+00:00) UTC

Download

Help

Import

The correct format for data import is provided in this CSV Import Template File. Use the field names *field1*, *field2*, and so on, instead of custom field names.

CSV Import Format

```
created_at,field1,field3,field4,field8,elevation
2019-01-01T10:11:12-05:00,11,33,44,88,10
```

Other Import and Export Options

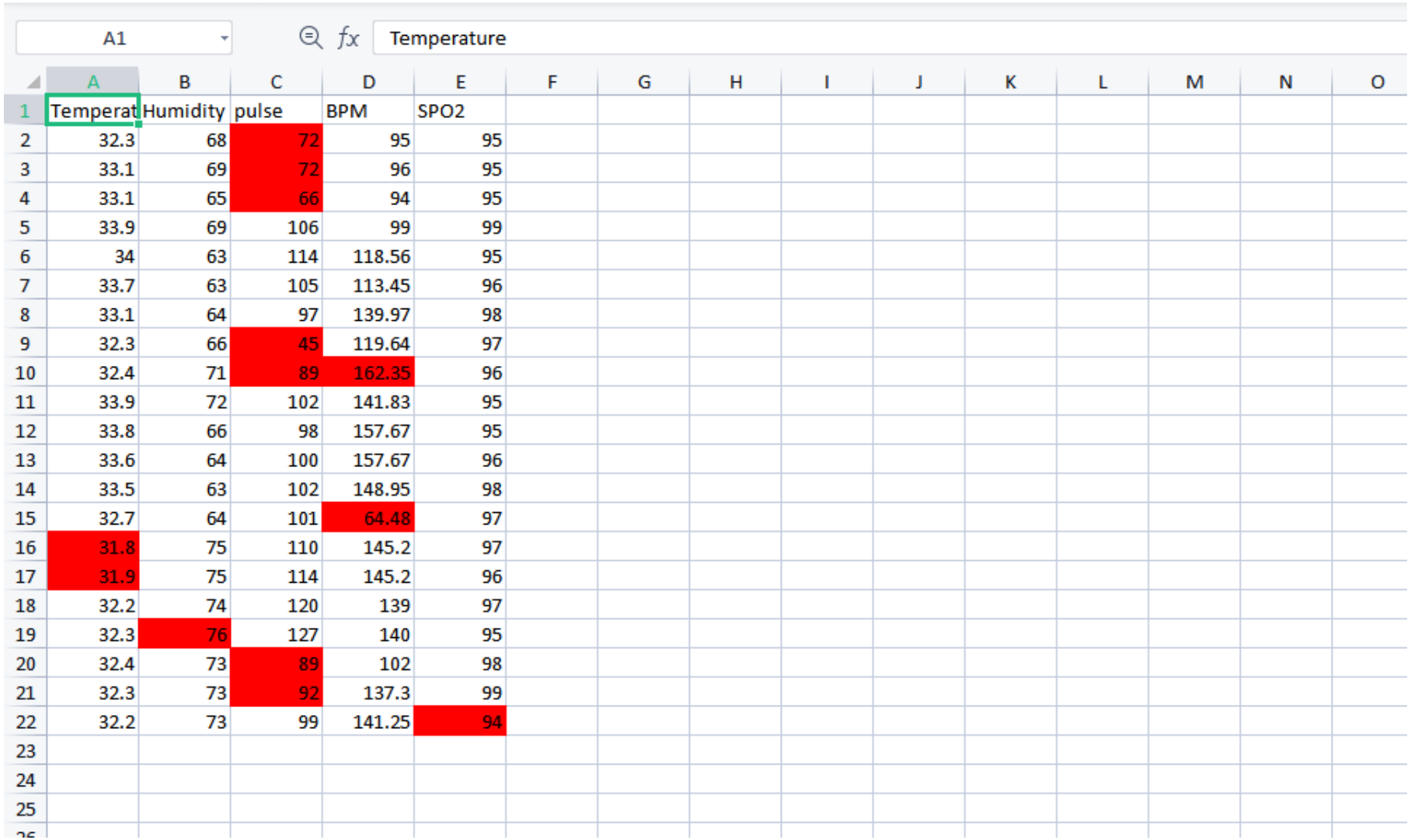
You can also use MATLAB, the REST API, or the MQTT API to import and export channel data.

Read Data

Write Data

USING ISOLATION FOREST ALGORITHM TO DETECT ABNORMAL VALUES

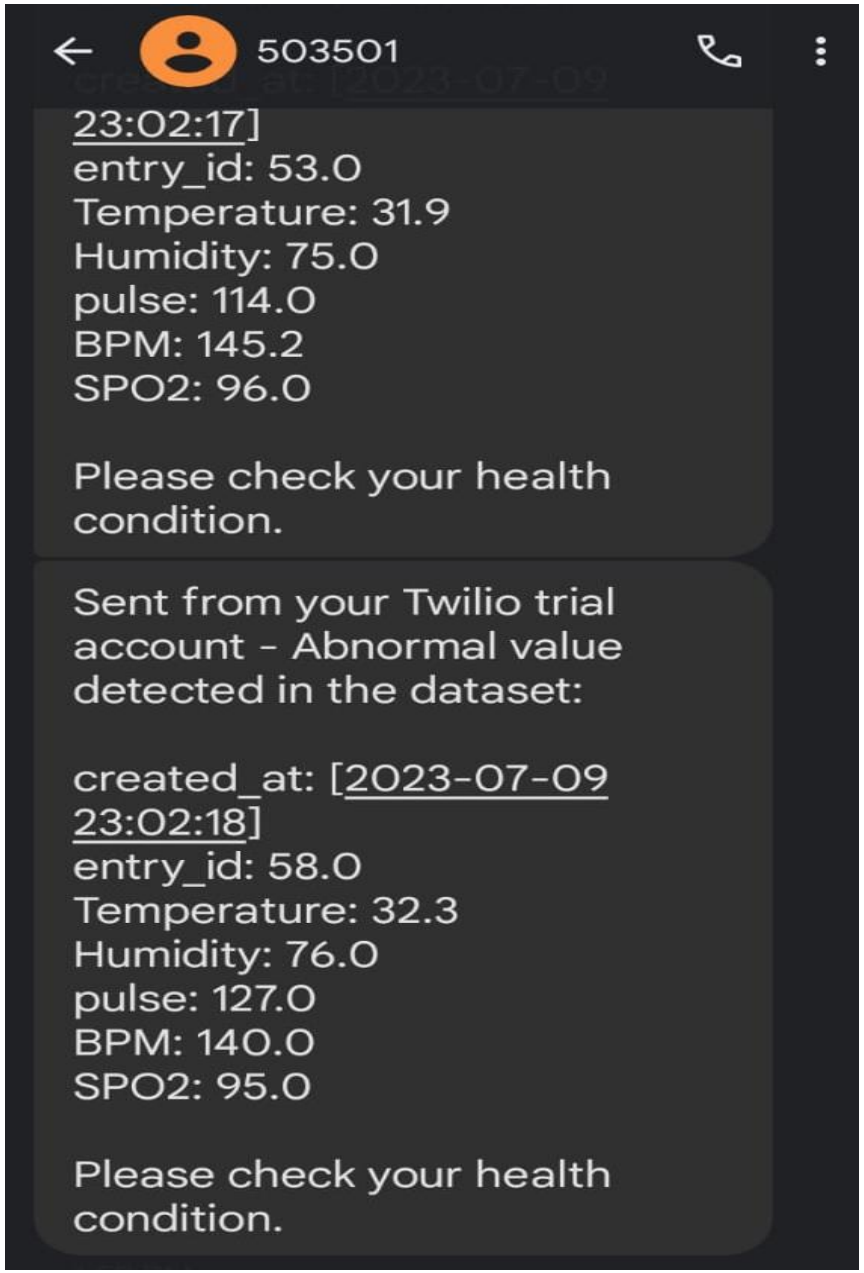
- The isolation forest algorithm is a machine learning technique that can be used to detect anomalies in data.
- It works by isolating observations that are different from other observations in the dataset, making it ideal for identifying outliers.
- This algorithm is particularly useful when dealing with high-dimensional data and can be applied to a wide range of applications, including fraud detection, network intrusion detection, and outlier detection.
- The isolation forest algorithm is based on the principle of randomly partitioning the data into subsets. Each subset is then split again until each observation is in its own subset.
- The number of splits required to isolate an observation is used as a measure of its abnormality. The algorithm is efficient and can be scaled to handle large datasets with millions of observations.
- In our case, we will be using this algorithm to detect abnormal values in temperature and humidity data collected from sensors.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Temperat	Humidity	pulse	BPM	SPO2										
2	32.3	68	72	95	95										
3	33.1	69	72	96	95										
4	33.1	65	66	94	95										
5	33.9	69	106	99	99										
6	34	63	114	118.56	95										
7	33.7	63	105	113.45	96										
8	33.1	64	97	139.97	98										
9	32.3	66	45	119.64	97										
10	32.4	71	89	162.35	96										
11	33.9	72	102	141.83	95										
12	33.8	66	98	157.67	95										
13	33.6	64	100	157.67	96										
14	33.5	63	102	148.95	98										
15	32.7	64	101	64.48	97										
16	31.8	75	110	145.2	97										
17	31.9	75	114	145.2	96										
18	32.2	74	120	139	97										
19	32.3	76	127	140	95										
20	32.4	73	89	102	98										
21	32.3	73	92	137.3	99										
22	32.2	73	99	141.25	94										
23															
24															
25															

INTEGRATING ISOLATION FOREST AND TWILIO

- By connecting sensors to Thingspeak, developers can use Twilio to send alerts when values fall outside of a specified range.
- However, not all abnormal values are created equal. Some may be due to natural fluctuations, while others may indicate a serious problem.
- To distinguish between the two, developers can use an isolation forest algorithm.
- This algorithm is designed to identify anomalies in data sets by isolating them from the rest of the data.
- Using Twilio applications and the isolation forest algorithm together allows for more accurate detection of abnormal values.
- Developers can set up customized alerts based on the severity of the anomaly, ensuring that they are notified only when necessary.
- This can help prevent false alarms and ensure that issues are addressed promptly and efficiently.


503501
23:02:17]
entry_id: 53.0
Temperature: 31.9
Humidity: 75.0
pulse: 114.0
BPM: 145.2
SPO2: 96.0
Please check your health condition.
Sent from your Twilio trial account - Abnormal value detected in the dataset:
created_at: [2023-07-09 23:02:18]
entry_id: 58.0
Temperature: 32.3
Humidity: 76.0
pulse: 127.0
BPM: 140.0
SPO2: 95.0
Please check your health condition.

CONCLUSION

- In conclusion, we have learned about the importance of interfacing sensors and Nodemcu with Thingspeak. By doing so, we can collect and analyze data in real-time, enabling us to make informed decisions and take appropriate actions. We have also seen how easy it is to interface a sensor with Nodemcu and transmit the data to Thingspeak using simple step-by-step instructions.By exploring the possibilities of using this technology in their own projects, the audience can create innovative solutions that can benefit society as a whole. Whether it's monitoring environmental conditions, tracking inventory levels or optimizing energy consumption, the applications of this technology are endless. So let's embrace the power of IoT and start building the future today!