Internet of Things

Introduction to IoT

IoT Team, BFCAI

IoT Applications: Smart Umbrella

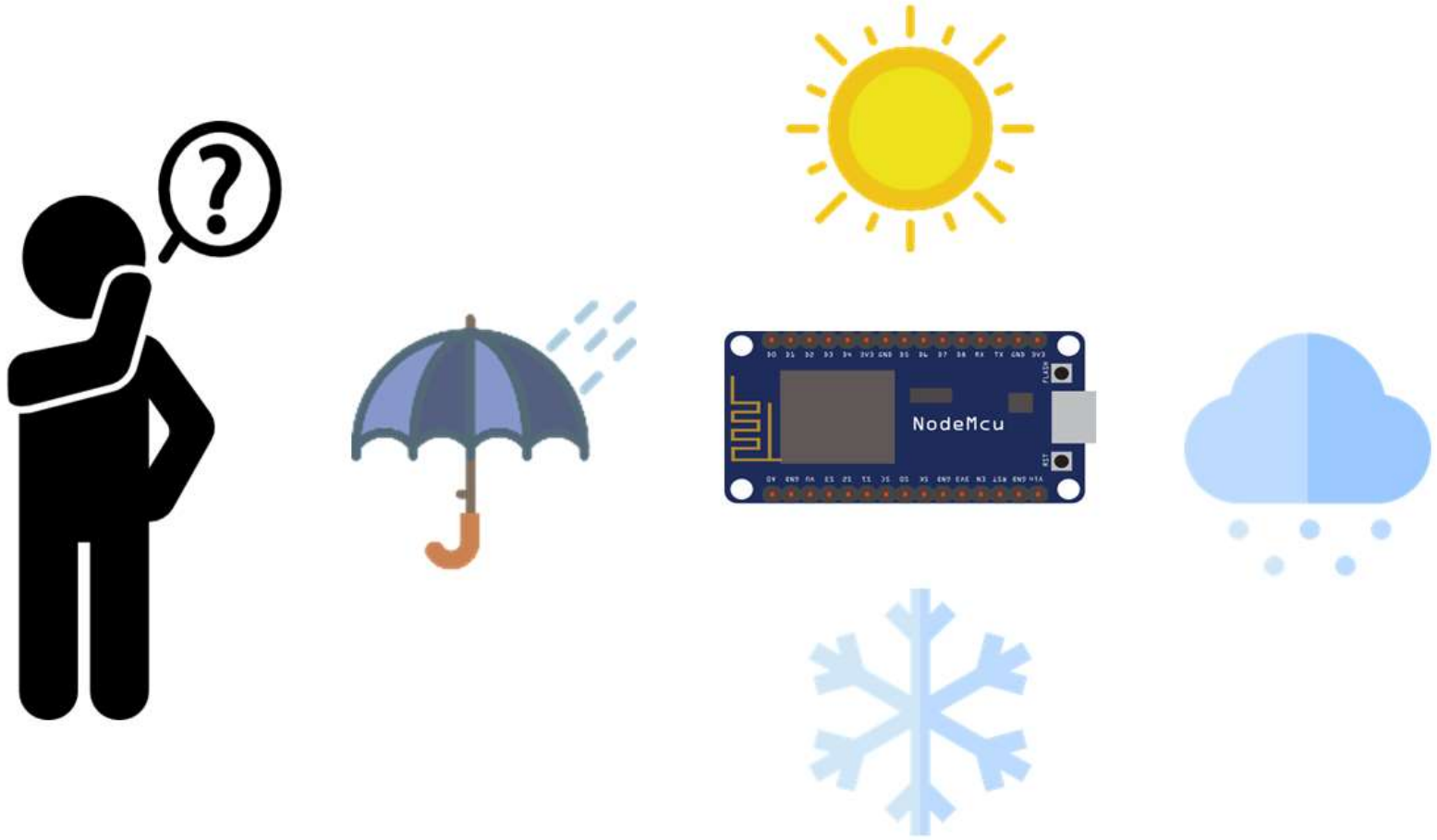
- An umbrella that provides information about the likelihood of rain so that users can make a simple decision about whether to take the umbrella with them as they leave their home.

IoT Applications: Smart Umbrella

- The umbrella has a handle that would illuminate when snow or rain was in the forecast.

IoT Applications: Smart Umbrella

- Using existing Wi-Fi technology to pull information about the weather from the Internet.



IoT Applications: Quirky Egg Minder

- When your egg supply gets low, this IoT application will send info directly to your phone to remind you to buy more eggs.

IoT Applications: WELT

- WELT cares user's overall health by measuring waist size, steps, sitting time and overeating habits with the sensing technology.

IoT Applications: Yucky Diaper Sensor

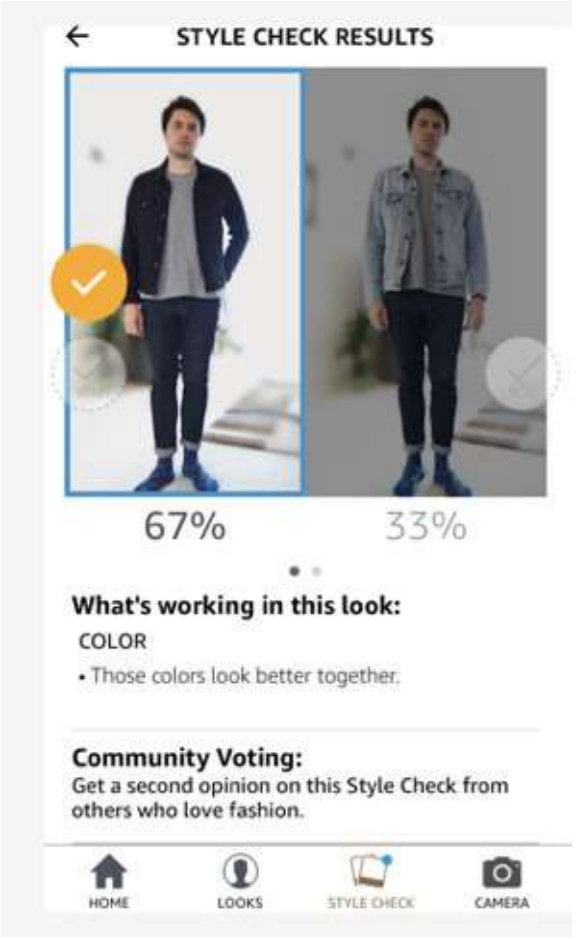
- New startup 24eight has created "wireless diapers" that contain a cellular chip that sends a text message to the lucky mom or dad tasked with cleaning up the mess.

IoT Applications: Smart Toaster

- You can use your smart phone to set the darkness of your toast, and if a friend has the same toaster you can send them a picture on toast.

IoT Applications: Amazon Echo Look

- Amazon's Echo Look will judge how you look.
- It compares two outfits and rate which one is better.



IoT Applications: HapiFork

- The HapiFork is a Bluetooth-enabled "smart fork" that vibrates when it senses you're eating too fast.

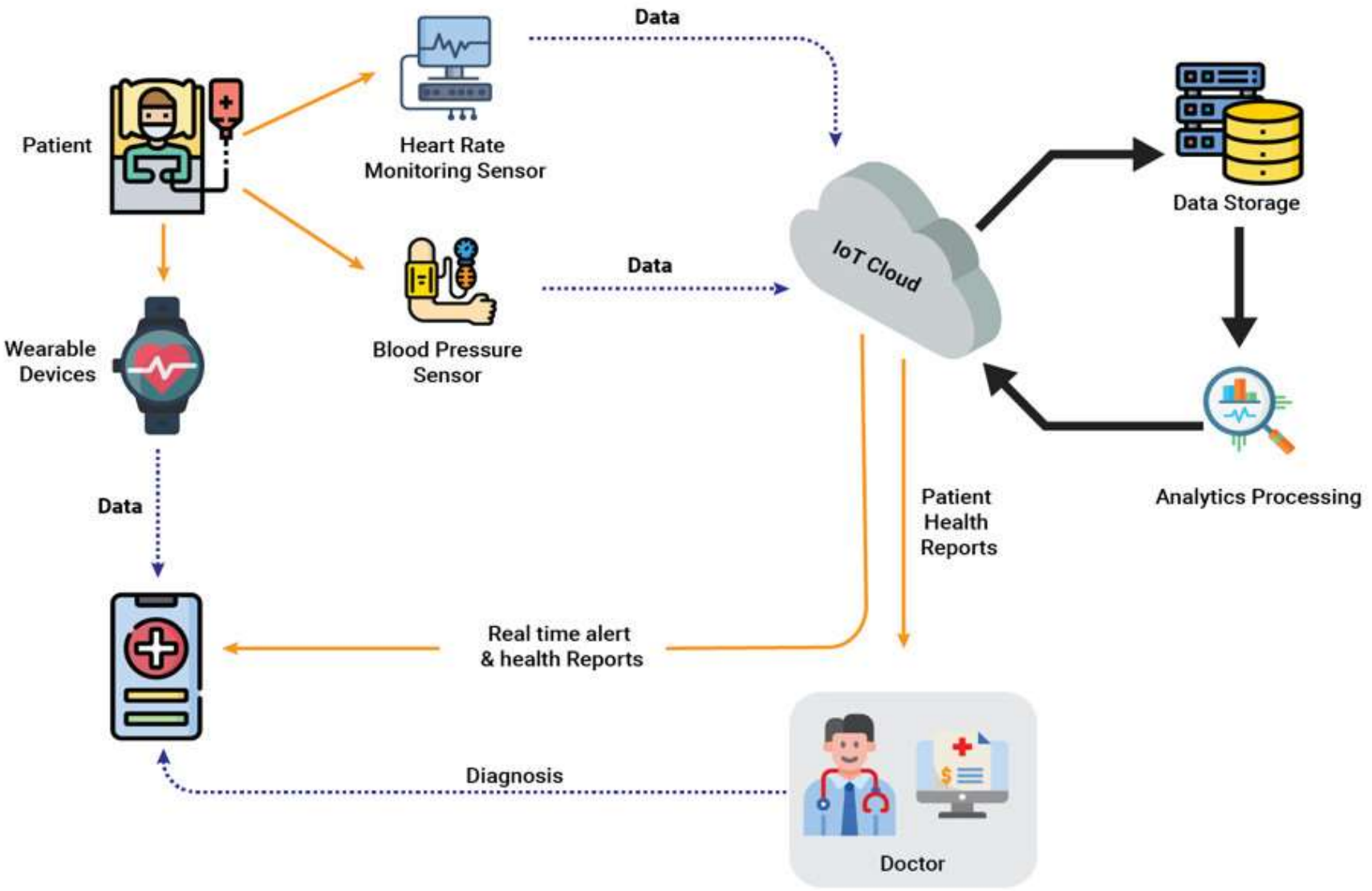
IoT Applications: Smart Refrigerators

- A refrigerator with a Wi-Fi enabled touch screen that lets you manage your groceries.

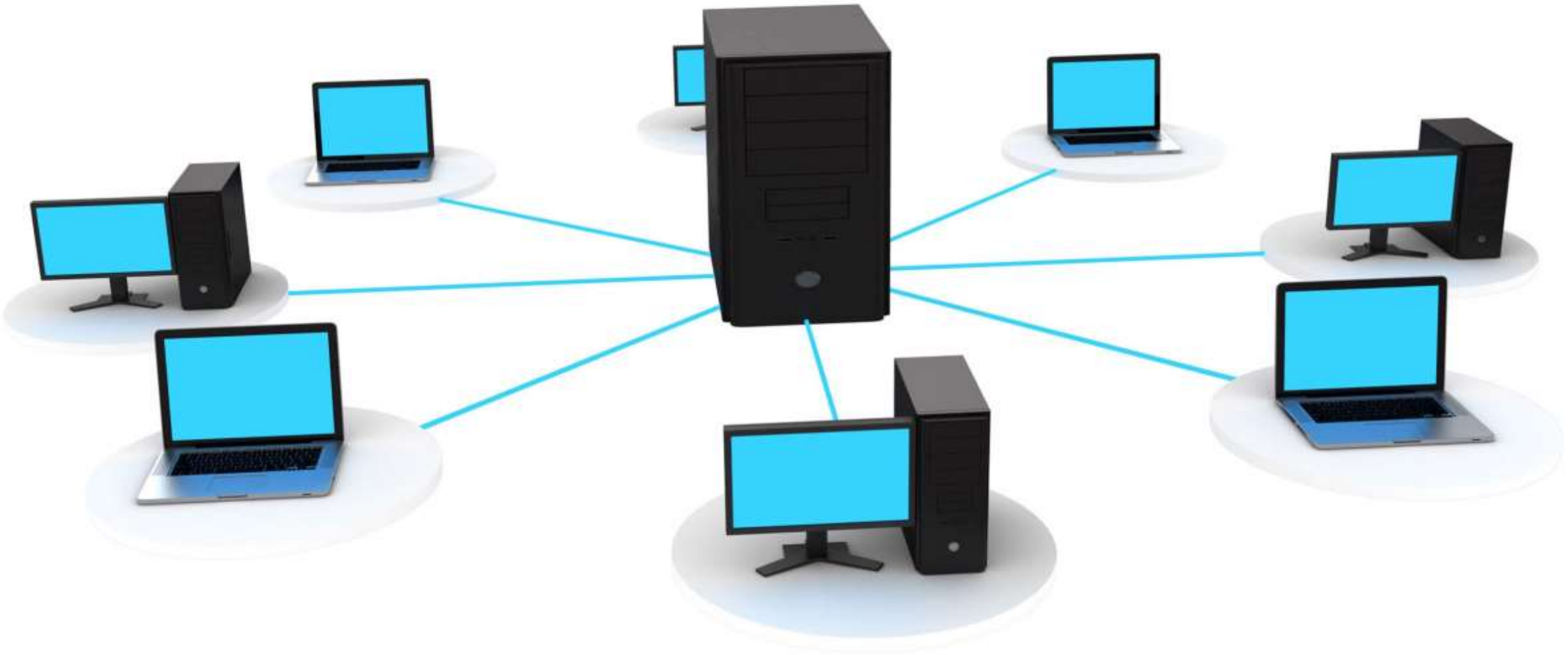
IoT Applications: Smart Shoes

- Smart shoes allow users to change the color of the shoe with one tap on their smartphone.

IoT Applications: Healthcare

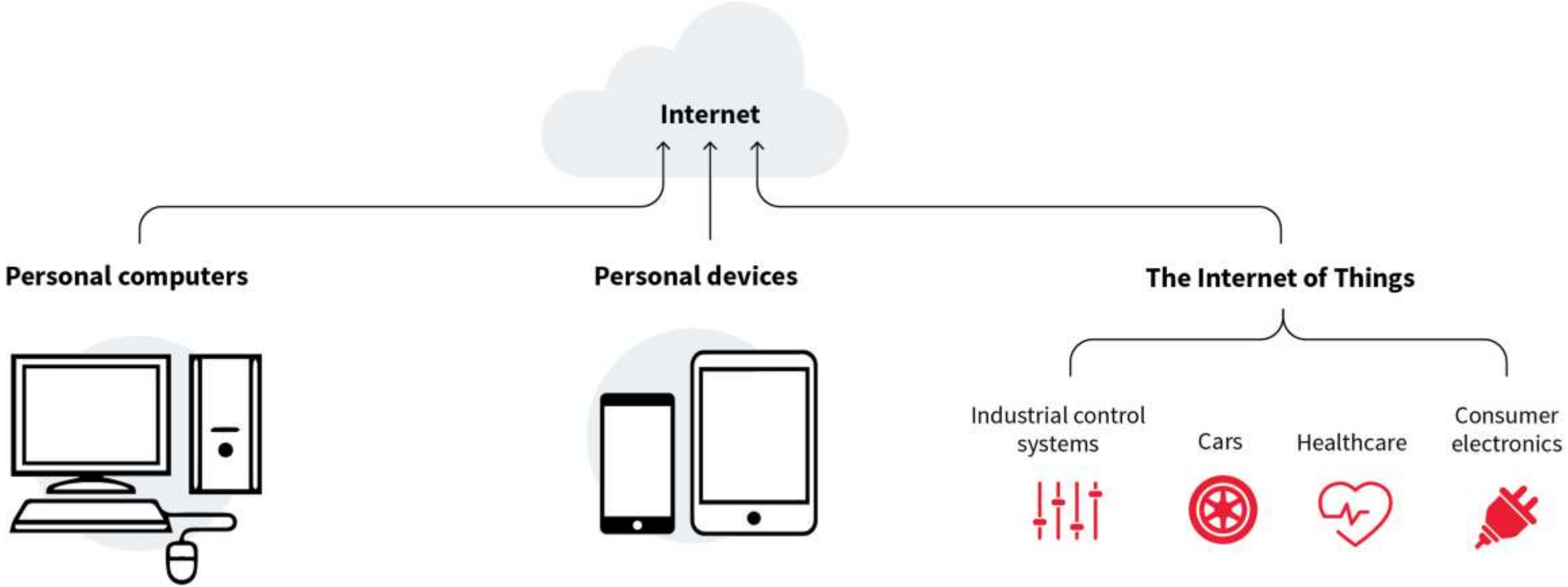


Network



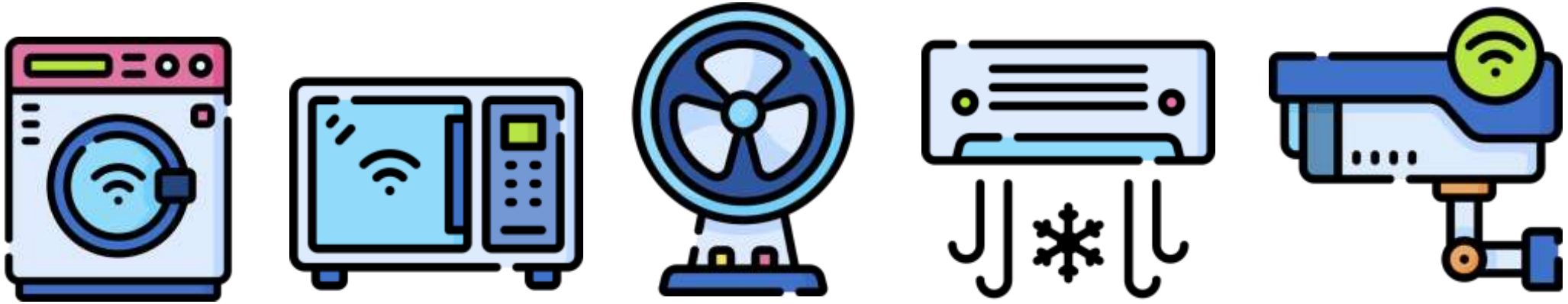
Internet

Things

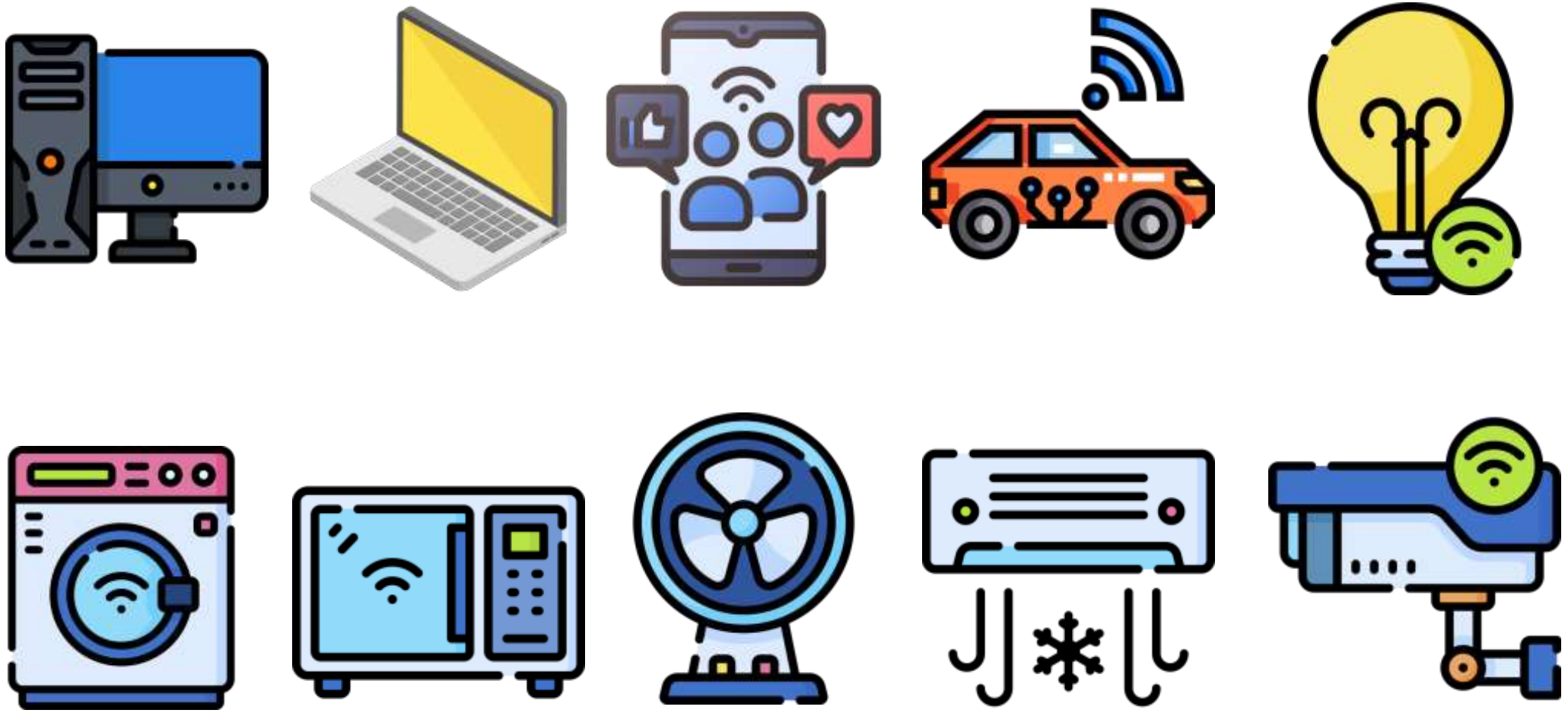

Internet
Personal computers
Personal devices
The Internet of Things
Industrial control systems
Cars
Healthcare
Consumer electronics

Things

- "Things" are a generic set of entities, including smart devices, sensors, human beings, and any other object that is aware of its context and is able to communicate with other entities, making it accessible at anytime, anywhere.



Things



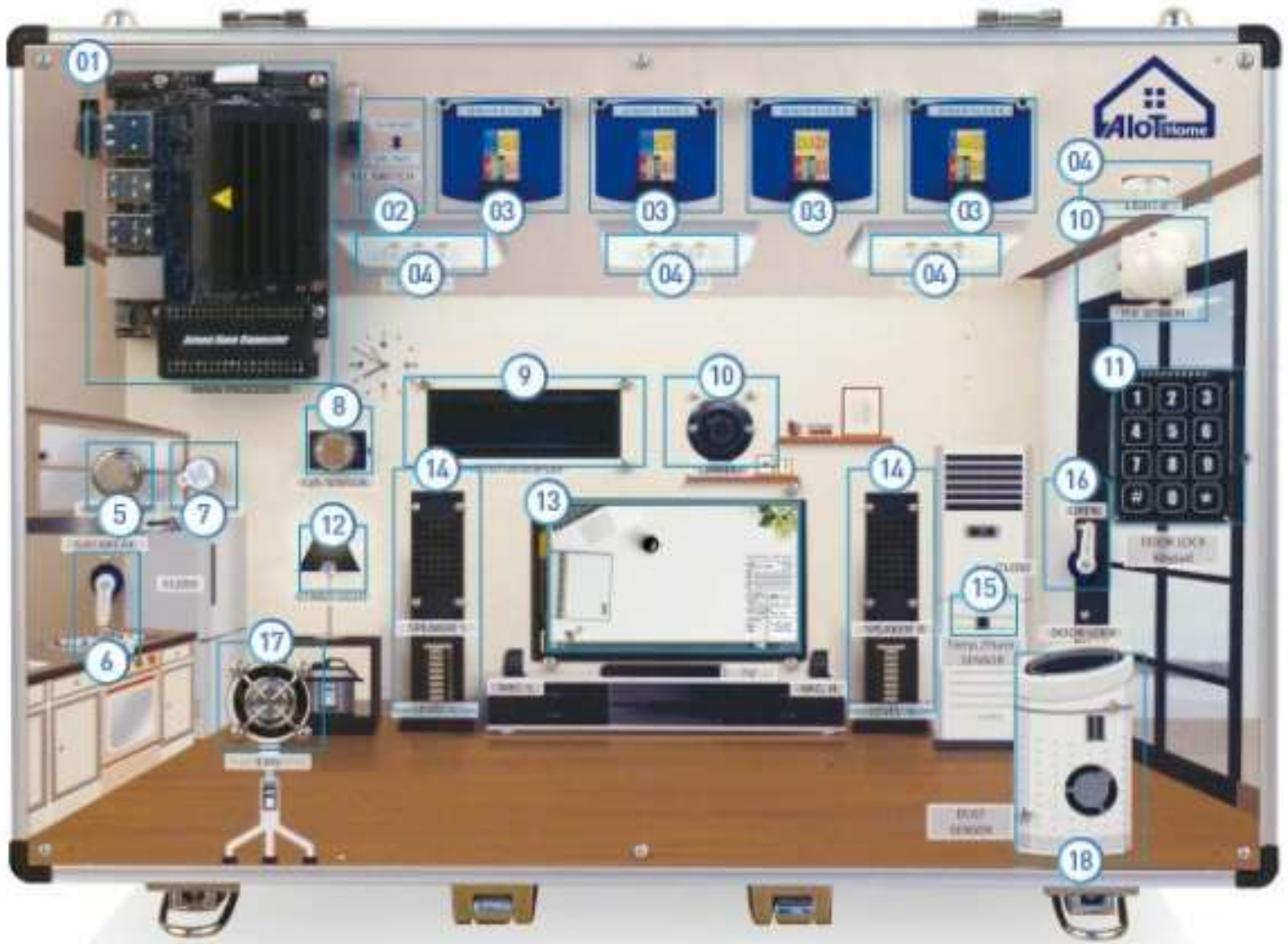
Things

- The Internet of Things (IoT) represents the network of physical objects "Things" that are integrated with sensors, software and other technologies for the purpose of exchanging data with other devices on the Internet.

AIoT Home


AIoT Home
SENSOR BLOCK 1
SENSOR BLOCK 2
SENSOR BLOCK 3
SENSOR BLOCK 4
On BOARD
EXT. Port
SEL SWITCH
LIGHT 1
LIGHT 2
LIGHT 3
LIGHT 4
Jetson Nano Connector
MAIN PROCESSOR
PIR SENSOR
1 2 3
4 5 6
7 8 9
0 *
CdS SENSOR
STATUS DISPLAY
CAMERA
GAS SENSOR
BUZZER
GAS BREAK
CLOSE
OPEN
STAND LIGHT
SPEAKER L
SPEAKER R
TV
MIC. L
MIC. R
LEVEL L
LEVEL R
FAN
OPEN
DOOR LOCK Keypad
CLOSE
DOOR LOCK
Temp./Humi. SENSOR
DUST SENSOR

AIoT Home

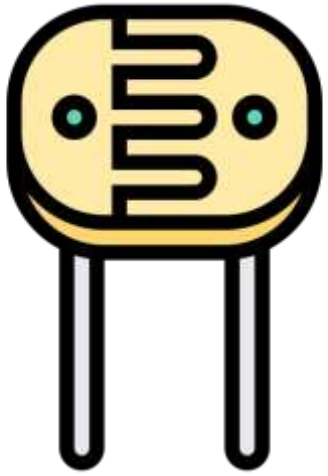


01 Main Processor
02 Connection Select Switch
03 Sensor Block
04 LED Block
05 GAS Sensor
06 GAS Break(Servo Motor)
07 Buzzer
08 CdS Sensor
09 Text LCD
10 Camera
11 Touch Keypad(3 x 4 key)
12 RGB LED
13 TFT LCD
14 Audio Block
(Sound/Speaker/Mic/Level Bar)
15 Temperature/Humidity Sensor
16 Door Lock(Servo Motor)
17 FAN
18 Dust Sensor

Sensors

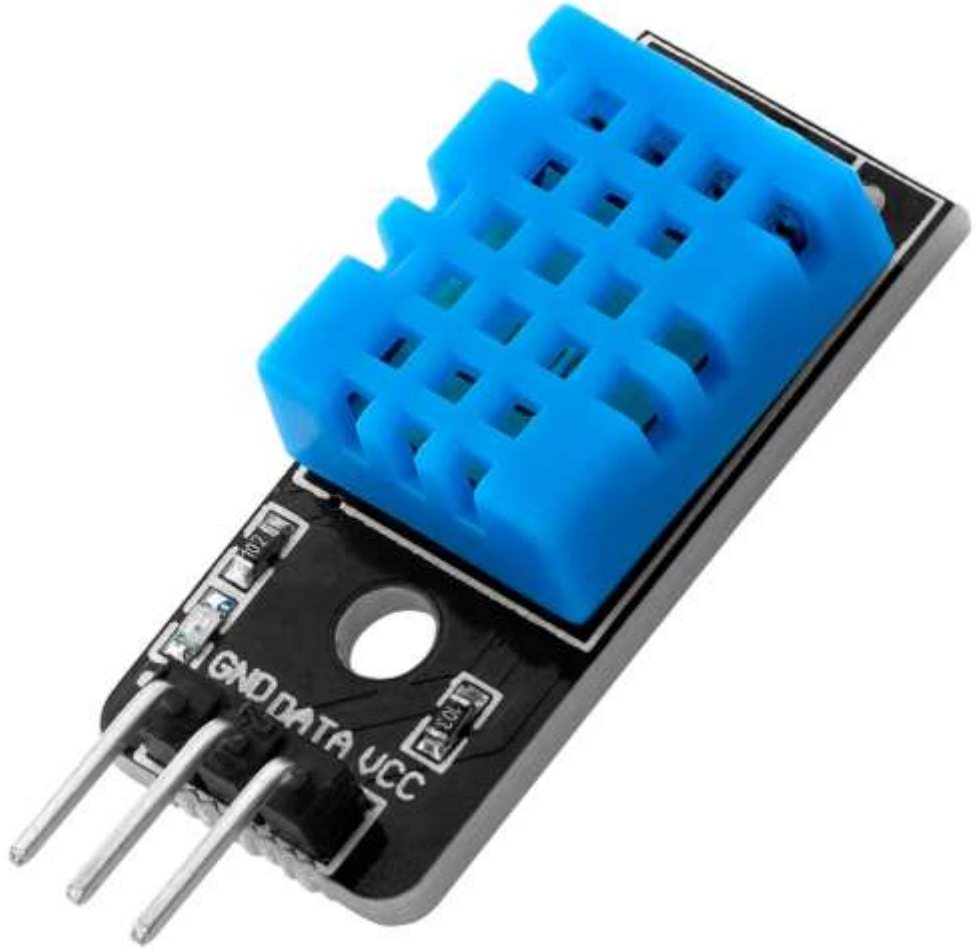
- A sensor is a device that detects some type of input from the physical environment.
- The input can be light, heat, motion, pressure or any number of other environmental phenomena.



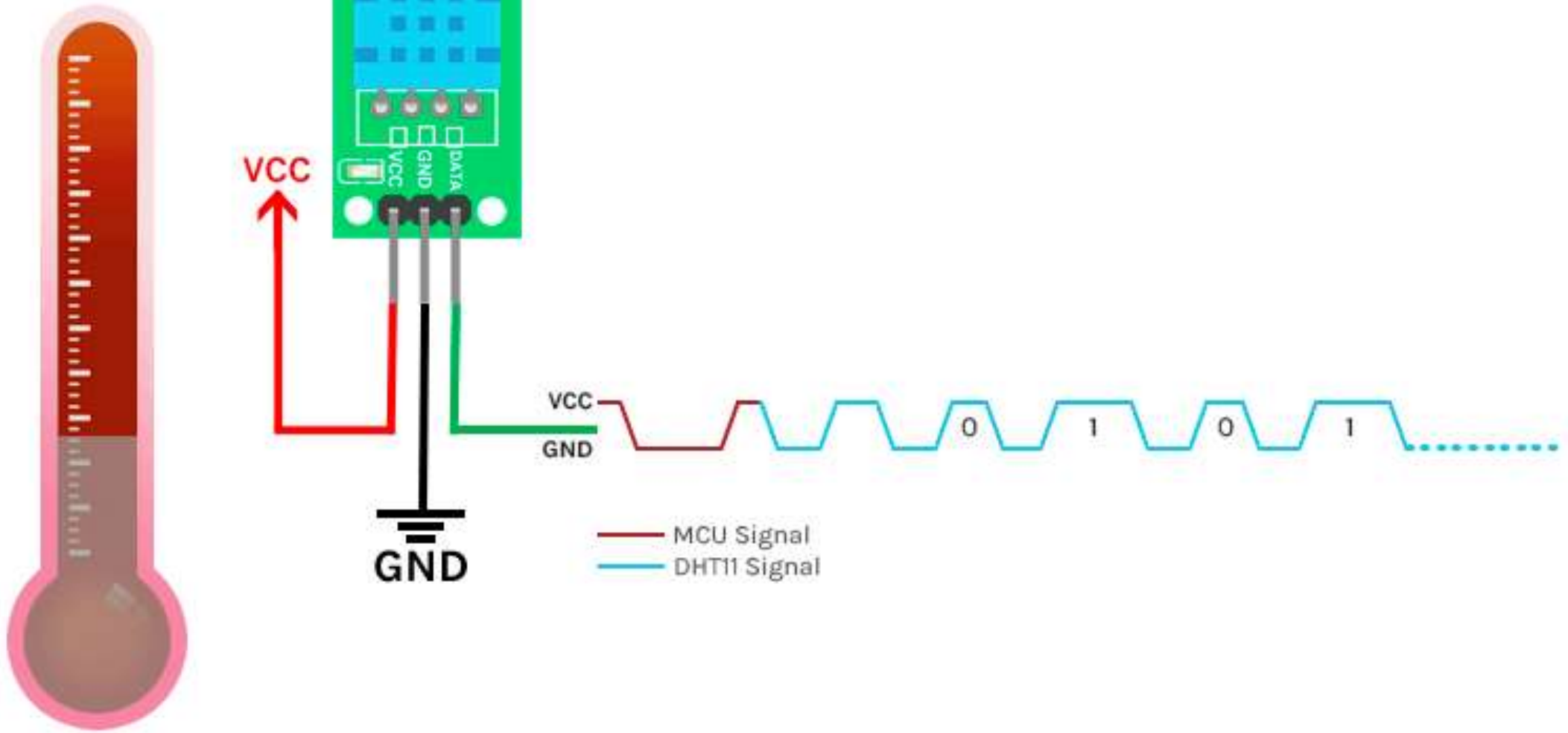



Sensors: Temperature/Humidity Sensor (DHT11)

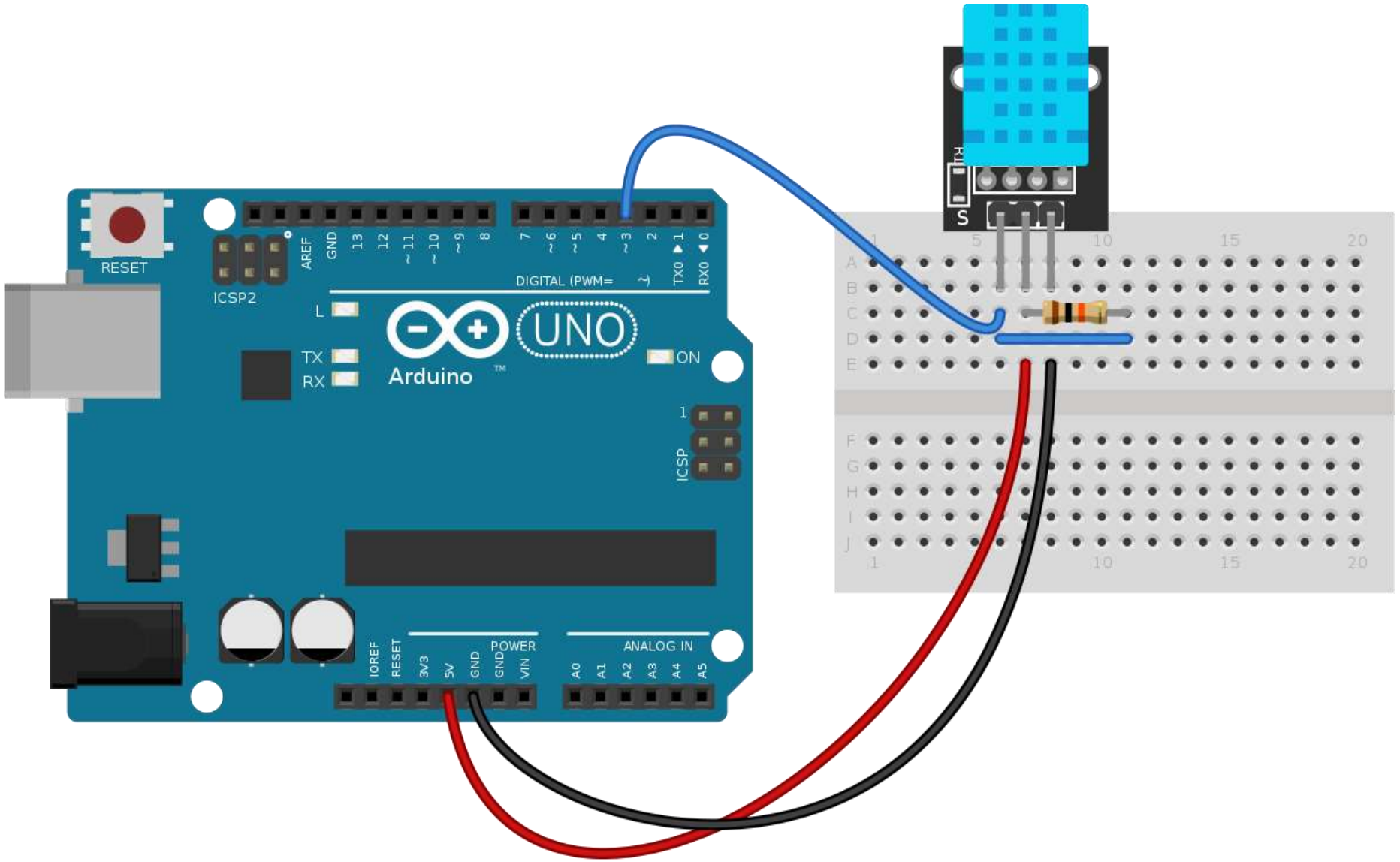
- The DHT11 sensor measures temperature and humidity.



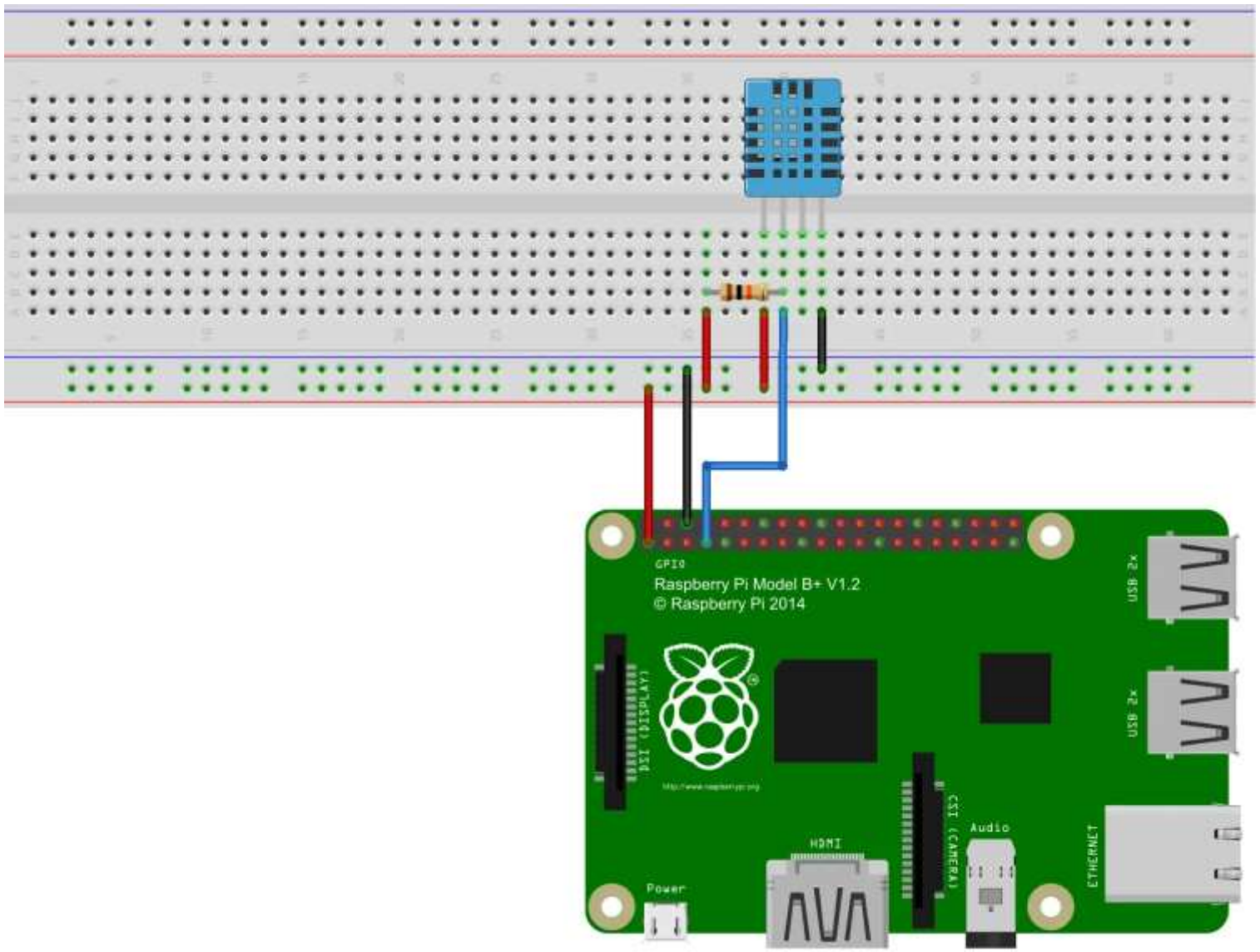
Sensors: Temperature/Humidity Sensor (DHT11)



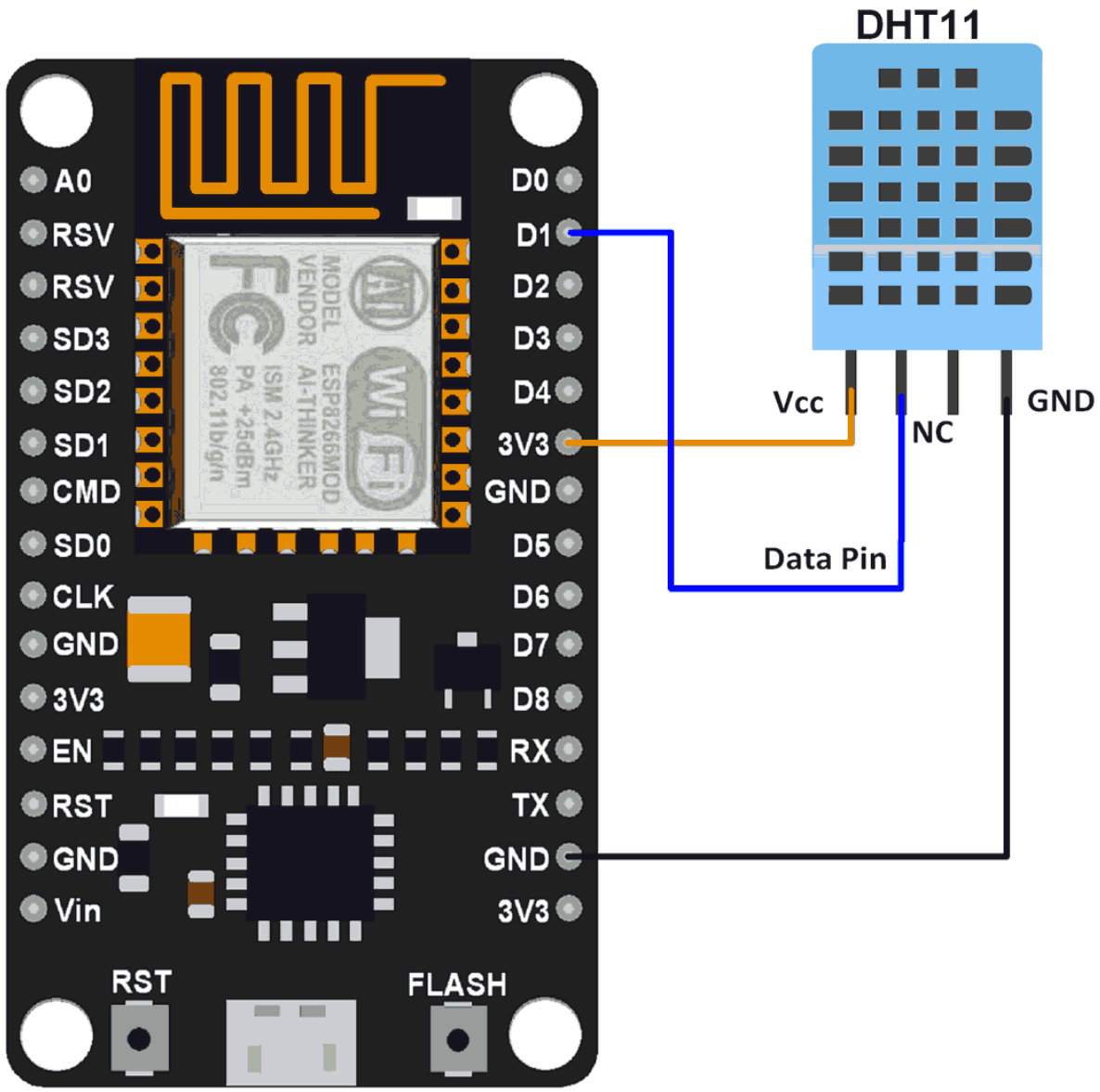
Sensors: Temperature/Humidity Sensor (DHT11)



Sensors: Temperature/Humidity Sensor (DHT11)



Sensors: Temperature/Humidity Sensor (DHT11)



Sensors: Temperature/Humidity Sensor (DHT22)

- The DHT22 sensor has better specifications than DHT11.

Sensors: PIR Motion Detection Sensor

- The PIR (Passive Infrared) sensor allows you to sense motion.
- PIR is used to detect whether a human has moved in or out of the sensor's range.

Sensors: PIR Motion Detection Sensor

Sensors: PIR Motion Detection Sensor

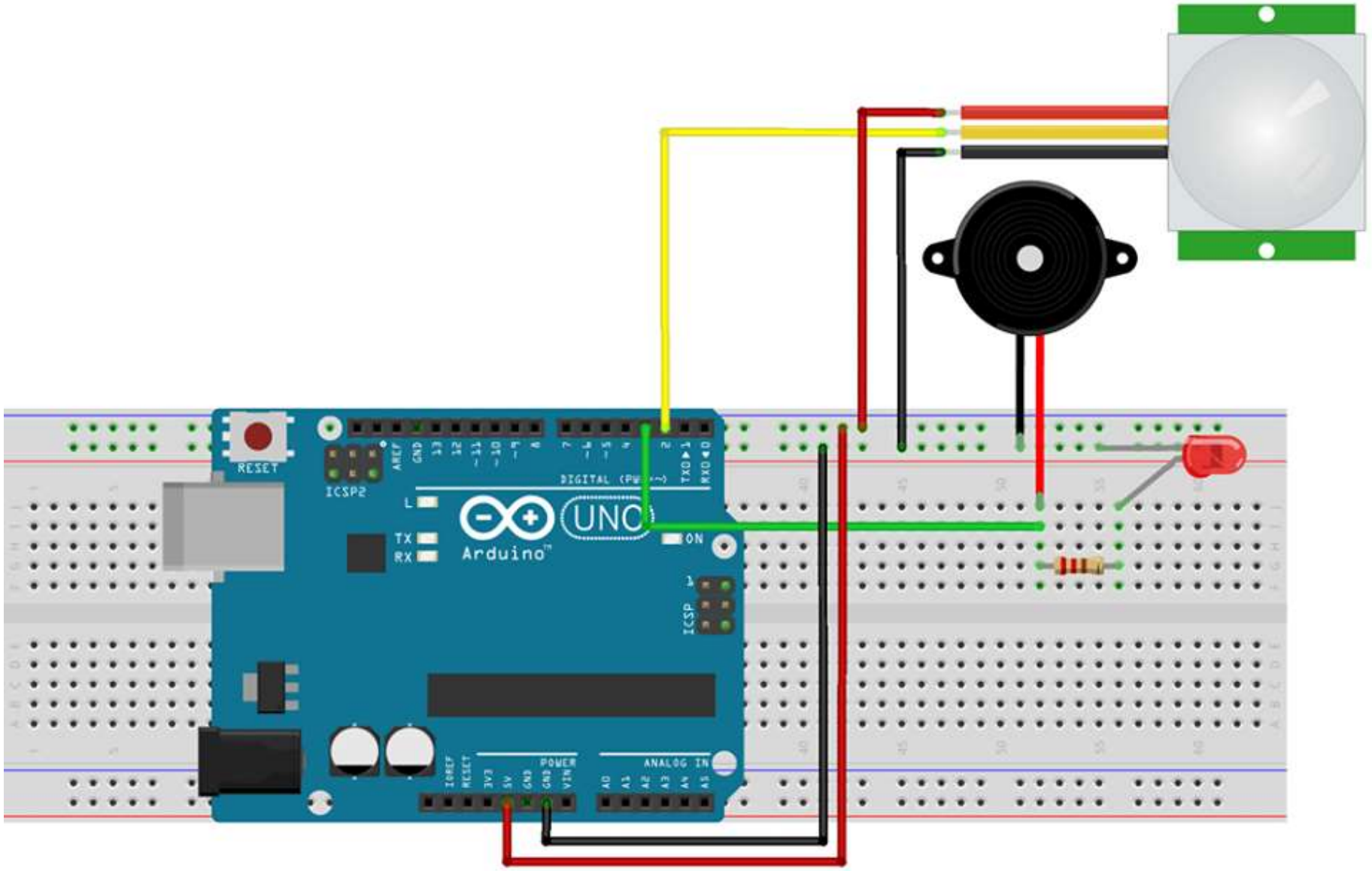
PIR Motion Sensor 180 Degree

Sensors: PIR Motion Detection Sensor

PIR Motion Sensor 360 Degree

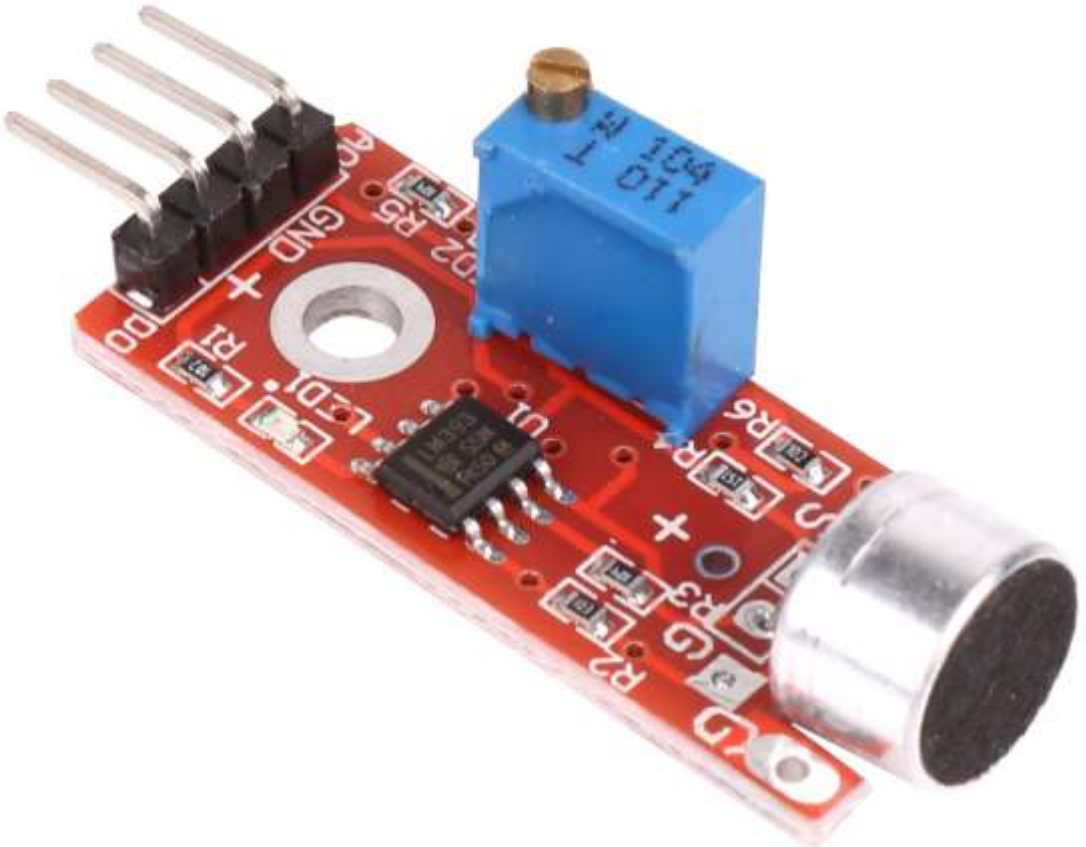
Sensors: PIR Motion Detection Sensor

Sensors: PIR Motion Detection Sensor



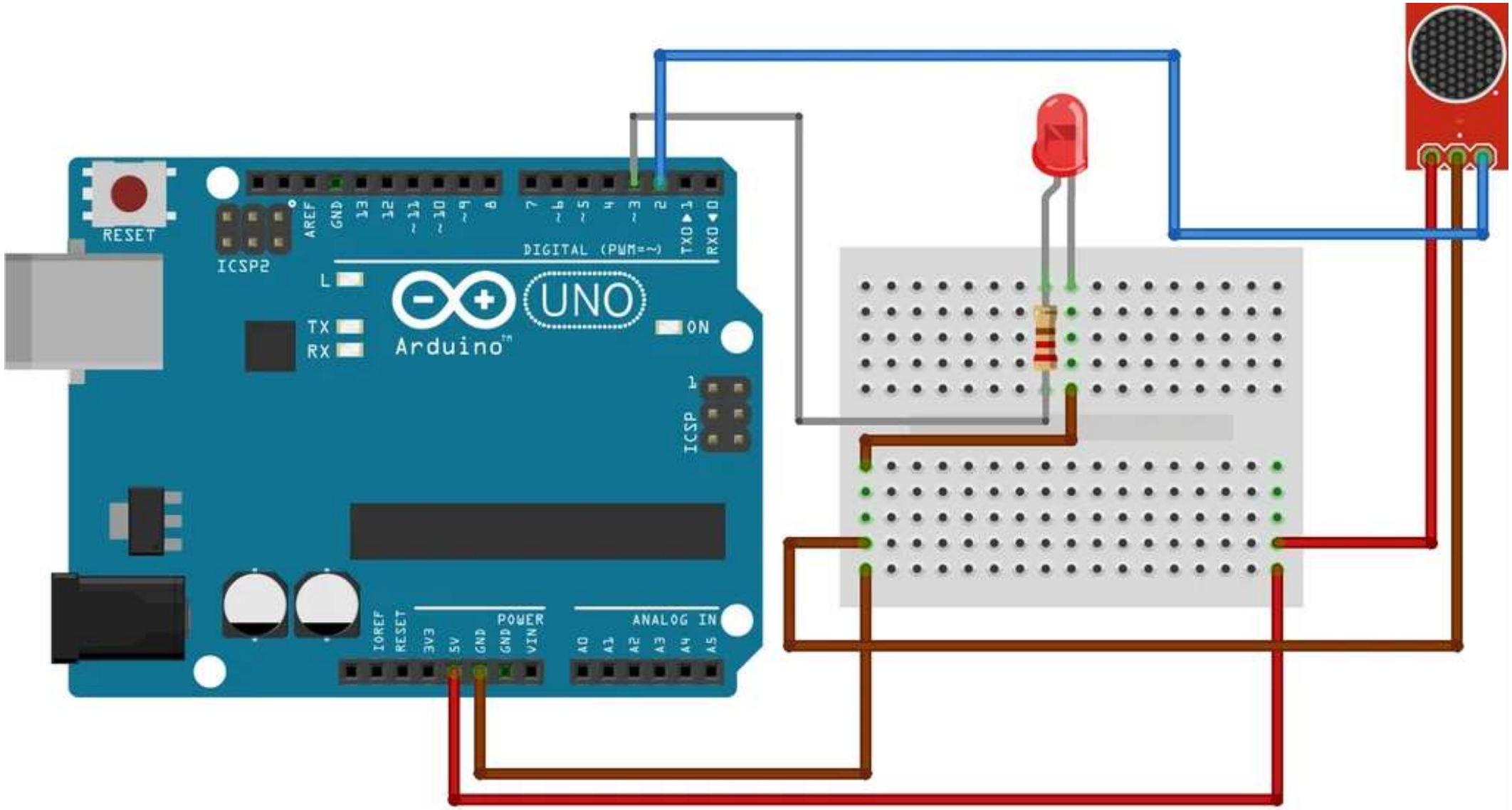
Sensors: Microphone Sound Detection Sensor

- The microphone sound sensor, as the name says, detects sound.
- It gives a measurement of how loud a sound is.



Sensors: Microphone Sound Detection Sensor

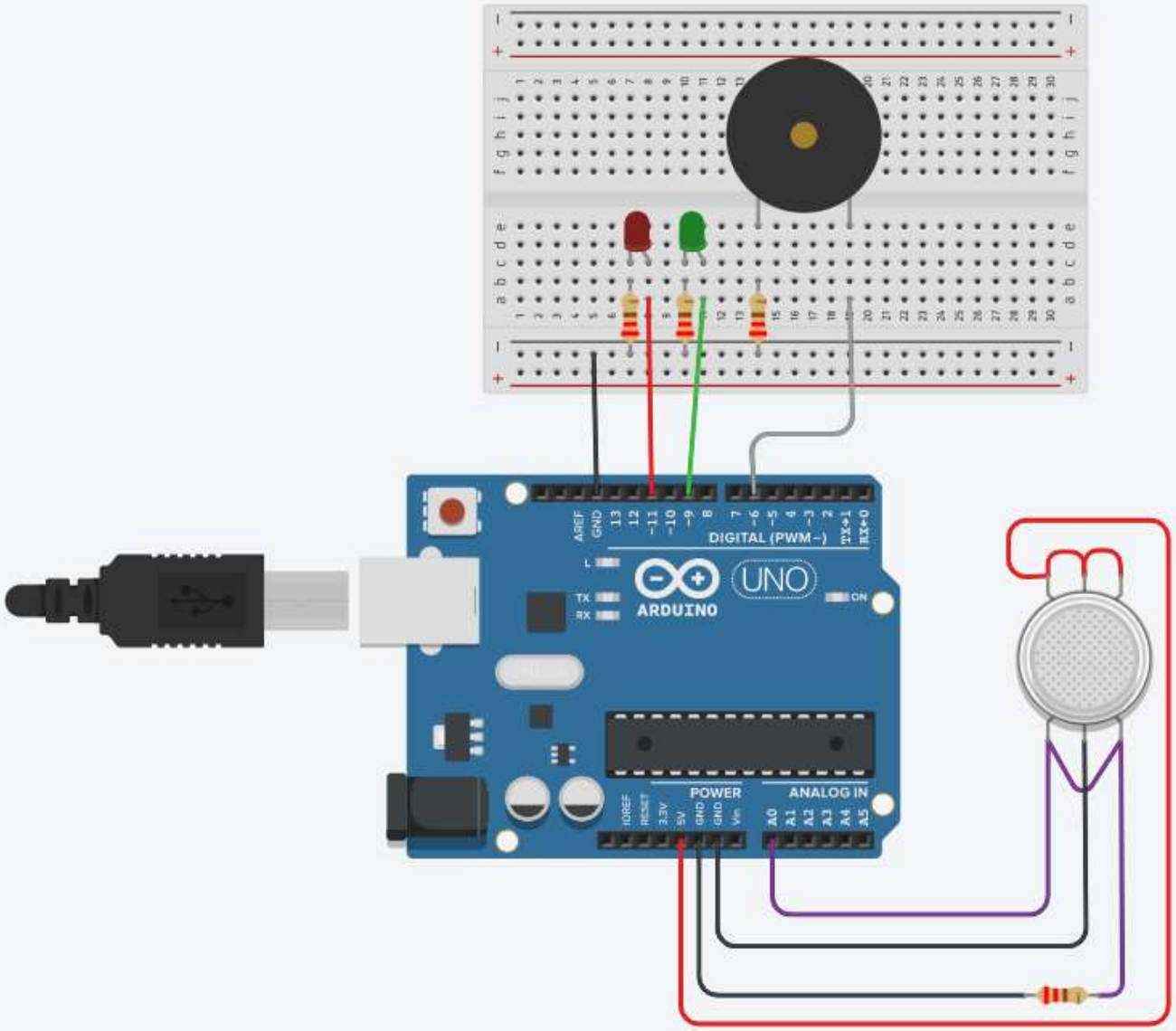
Sensors: Microphone Sound Detection Sensor



Sensors: Gas Sensor (MQ-2)

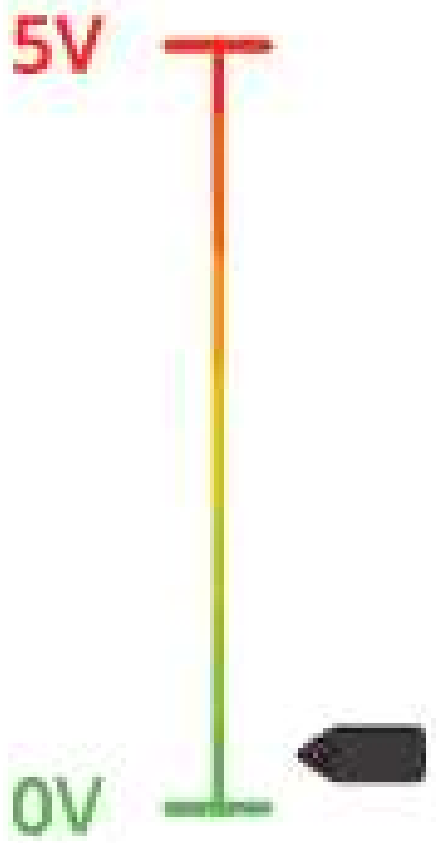
- The MQ-2 gas sensor module is useful for gas leakage detecting.
- The module measures gas such as butane.

Sensors: Gas Sensor (MQ-2)



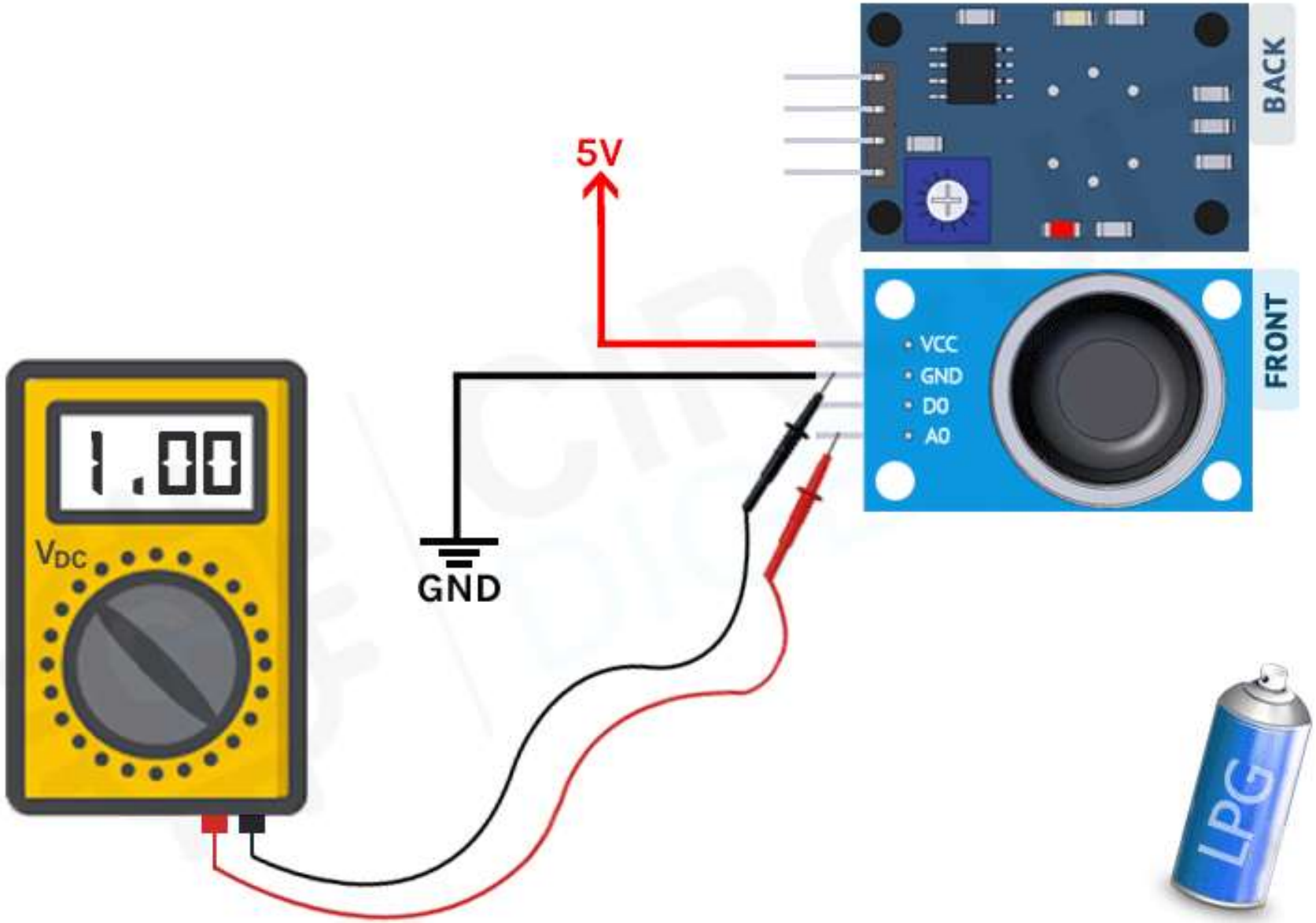
Sensors: Gas Sensor (MQ-2)

Clean Air



Output Voltage

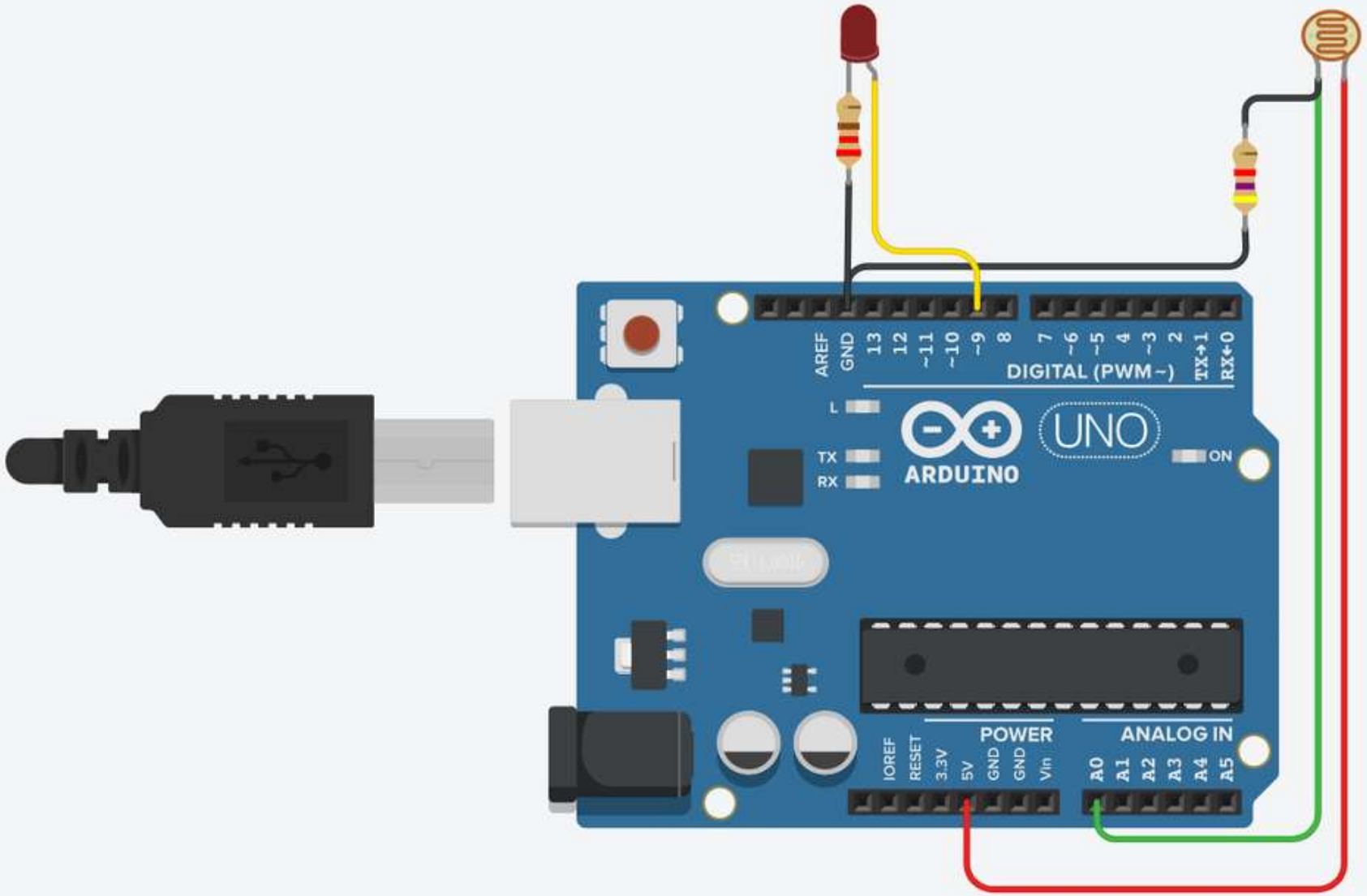
Sensors: Gas Sensor (MQ-2)



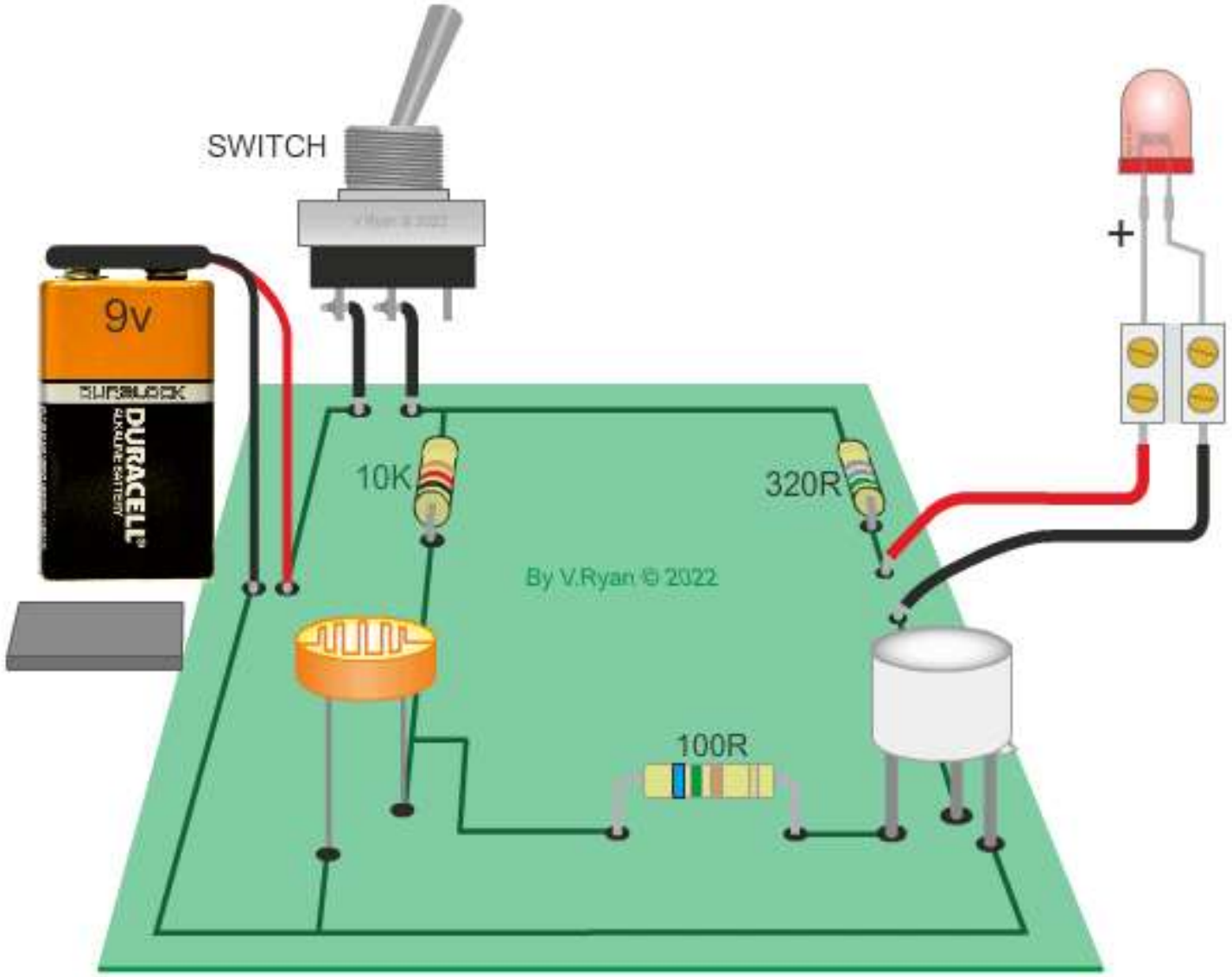
Sensors: Photoresistor (Light Sensor)

- A CdS photocell or Light Dependent Resistor (LDR) is a resistor where the resistance changes based on the amount of light.

Sensors: Photoresistor (Light Sensor)



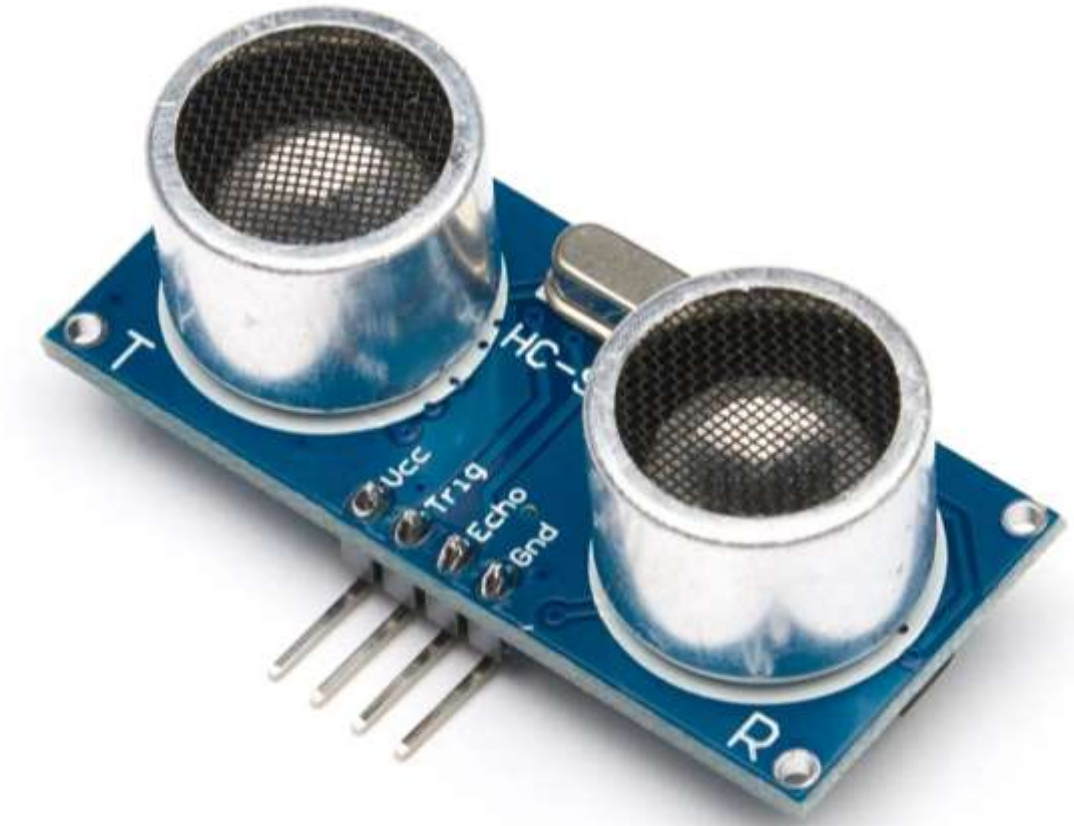
Sensors: Photoresistor (Light Sensor)



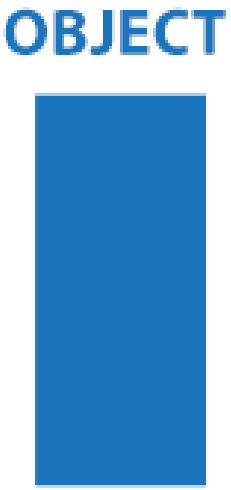
Sensors: Photoresistor (Light Sensor)

Sensors: Ultrasonic Sensor (HC-SR04)

- As the name indicates, ultrasonic sensors measure distance by using ultrasonic waves.

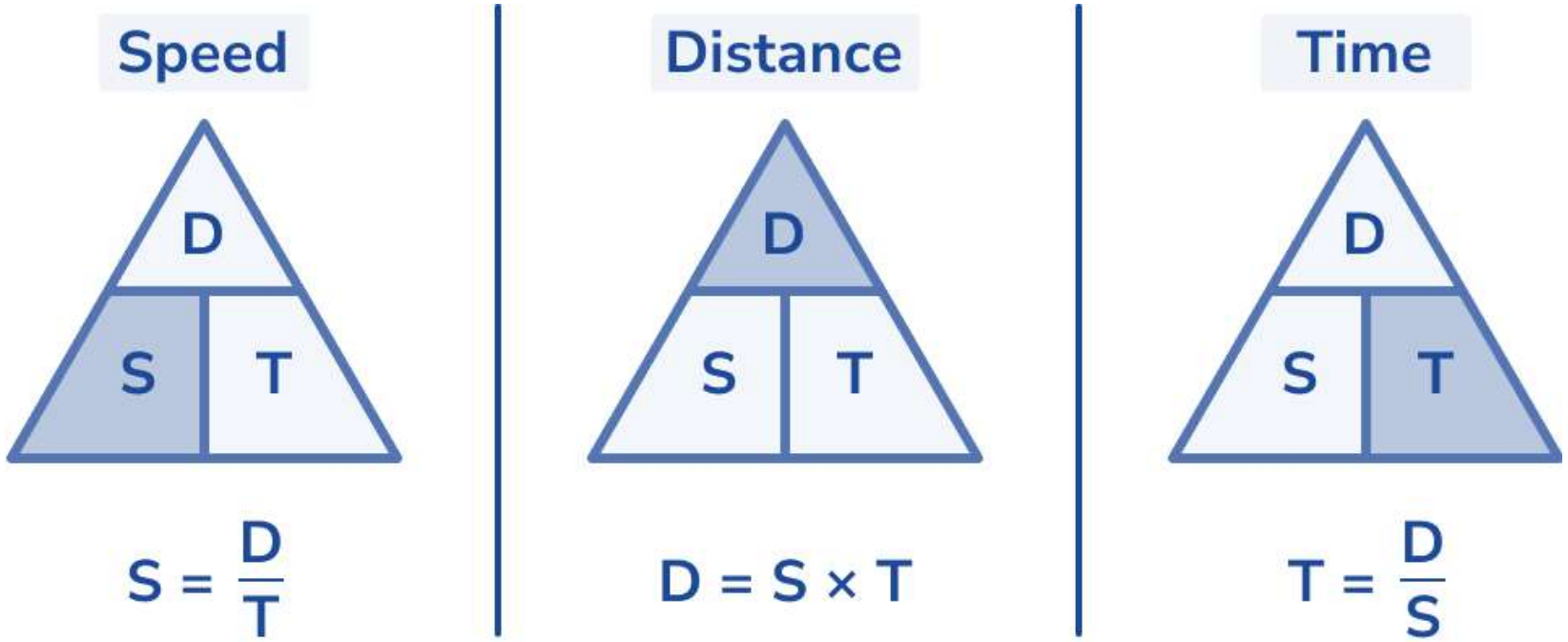


Sensors: Ultrasonic Sensor (HC-SR04)



Sensors: Ultrasonic Sensor (HC-SR04)

- The width of the received pulse is used to calculate the distance from the reflected object.
- This can be worked out using the simple distance-speed-time equation we learned in high school.



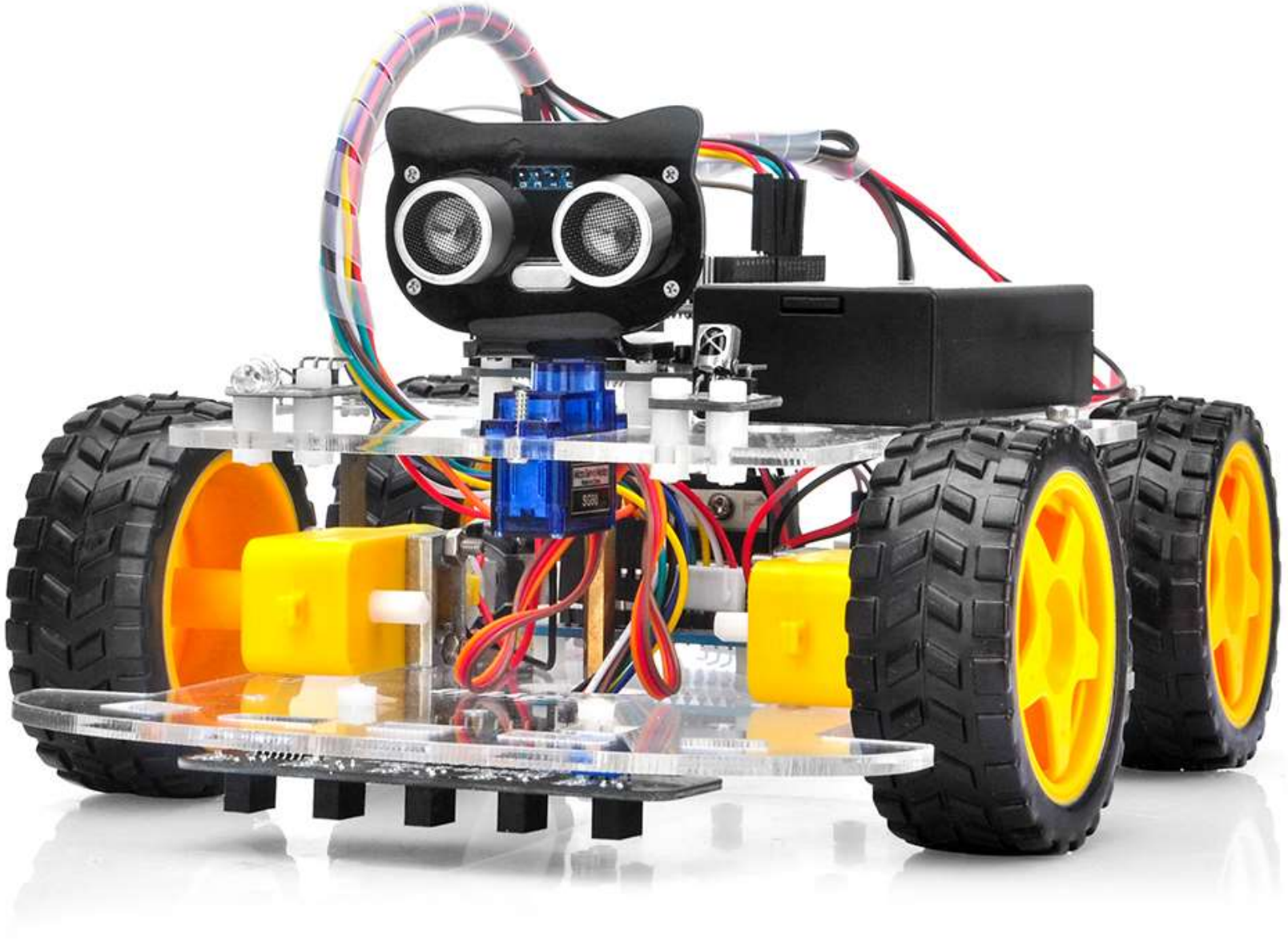
Sensors: Ultrasonic Sensor (HC-SR04)

- For the calculation of the object distance, the sensor measures the time taken by the signal to travel between the transmission of the sound by the transmitter to the reflecting back towards the receiver.

$$\text{Distance} = \frac{1}{2}\text{Time} \times \text{Speed}$$

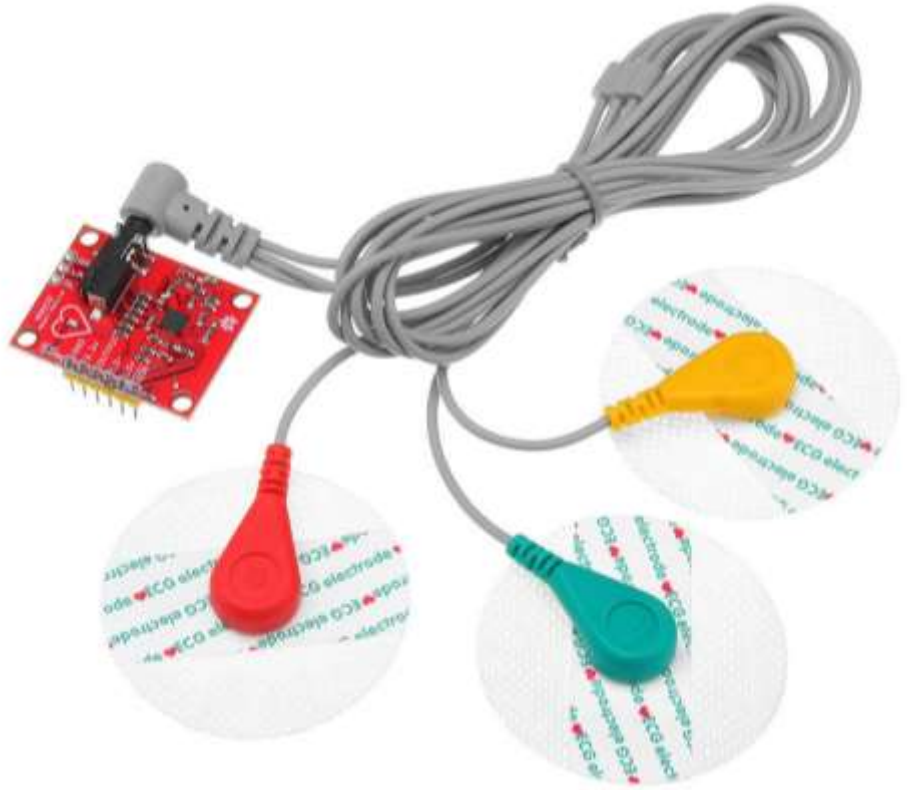
- The speed of sound in the air at 20ºC is 343 m/s.

Sensors: Ultrasonic Sensor (HC-SR04)

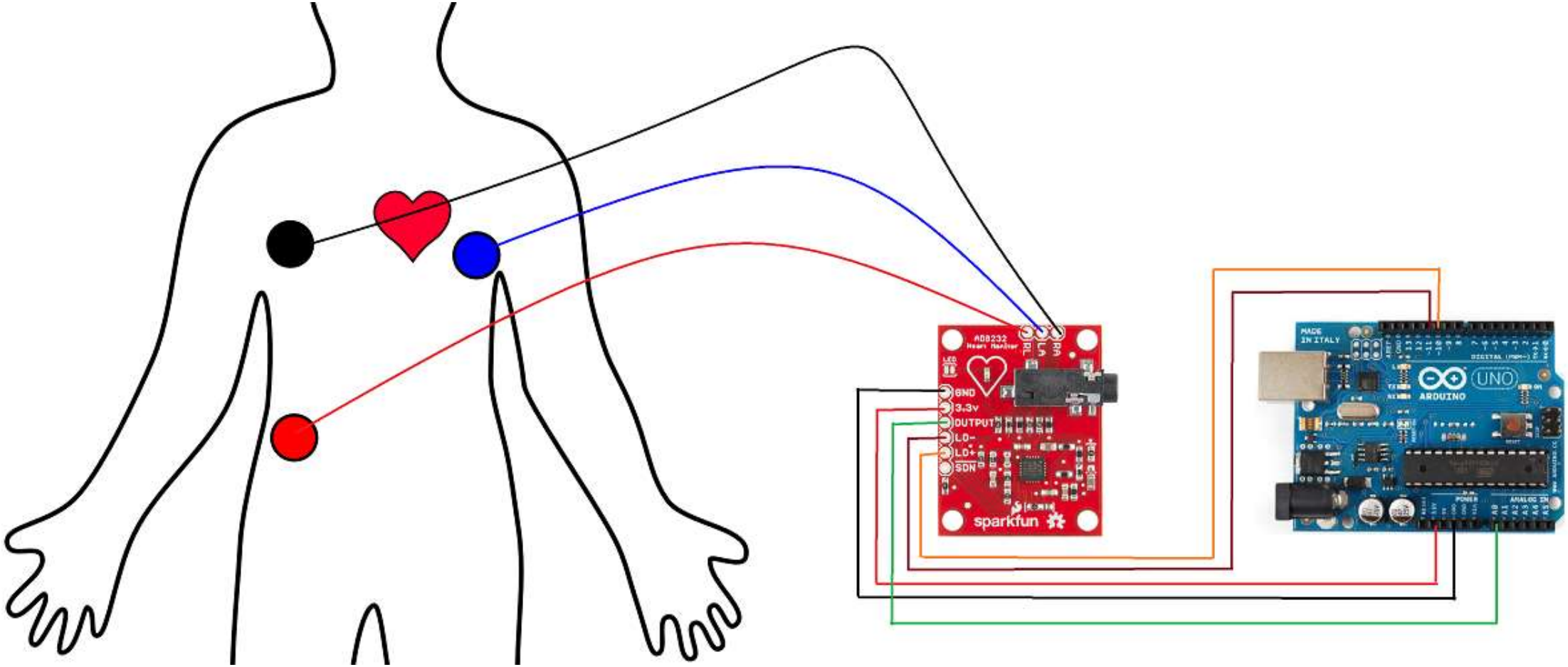


Sensors: ECG AD8232 Heart Rate Sensor

- The heart rate module with the AD8232 is a device which is capable of measuring electrical activity of the heart.
- The activity can be displayed using an ECG type graphic.



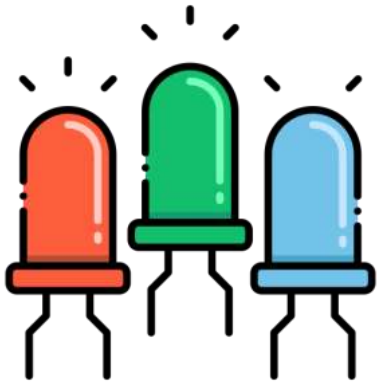
Sensors: ECG AD8232 Heart Rate Sensor



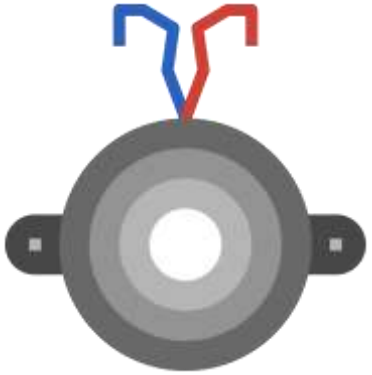
Sensors: ECG AD8232 Heart Rate Sensor

Actuators

- Sensors turn a physical input into an electrical output, while actuators do the opposite.
- Actuators take electrical signals from control modules and turn them into physical outputs.



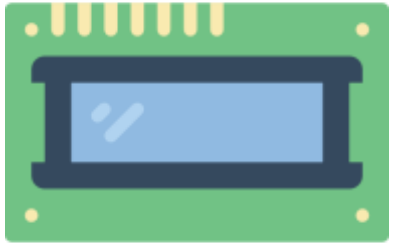
LEDs



Buzzer

DC Fan

Servo Motor



LCD

Actuators: Servo Motor

- A servo motor is an electrical device which can push or rotate an object with great precision.

Actuators: Servo Motor

- The HBE-ROBONOVA AI 3 is an intelligent robot with an MR-C3024 controller board capable of controlling 32 servo motors simultaneously.

Hardware Per Team

No.	Item	Price	Quantity	Subtotal
1	NodeMCU V3 ESP8266 (CH340)	270	1	270
2	Micro USB Charging and Sync Cable	25	1	25
3	DHT11 Humidity Temperature Sensor	65	1	65
4	Photoresistor Sensor (LDR)	12	1	12
5	Breadboard	40	1	40
6	LED (Red)	0.5	5	2.5
7	LED (Green)	0.5	5	2.5
8	LED (Yellow)	0.5	5	2.5
9	Resistor (330 Ohm)	0.3	15	4.5
10	Resistor (10K Ohm)	0.3	5	1.5
11	Jumper Wire (Male to Male)	0.9	25	22.5
12	Jumper Wire (Male to Female)	0.9	25	22.5
13	Jumper Wire (Female to Female)	0.9	25	22.5
	Total			493

Electronics Stores in Egypt

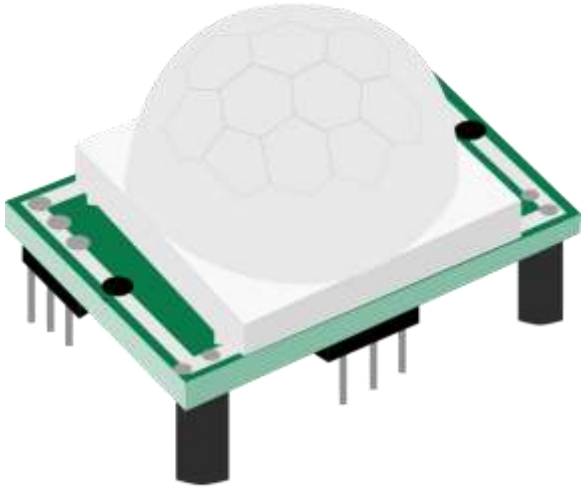
- LampaTronics
- RAM Electronics
- MicroOhm Electronics
- Makers Electronics - Alex
- Most Electronics
- Ampere Electronics
- UGE Electronics
- Circuit Electronics
- Electra Store
- ElAbed Electronics
- Free Electronic

AIoT Home

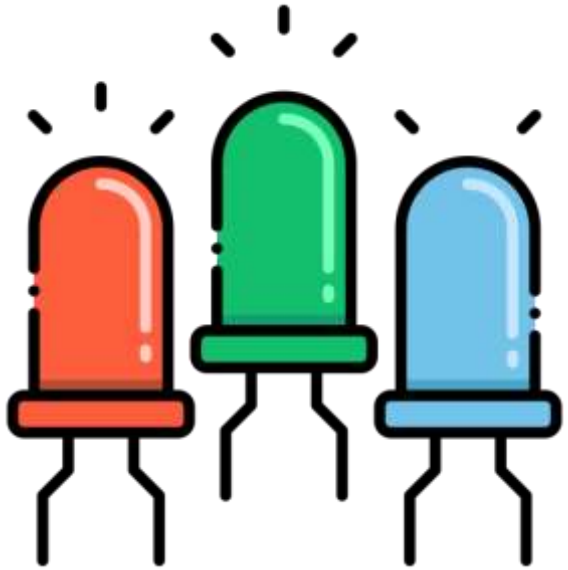

AIoT Home
SENSOR BLOCK 1
SENSOR BLOCK 2
SENSOR BLOCK 3
SENSOR BLOCK 4
On BOARD
EXT. Port
SEL SWITCH
LIGHT 1
LIGHT 2
LIGHT 3
LIGHT 4
Jetson Nano Connector
MAIN PROCESSOR
PIR SENSOR
1 2 3
4 5 6
7 8 9
0 *
CdS SENSOR
STATUS DISPLAY
CAMERA
GAS SENSOR
BUZZER
GAS BREAK
CLOSE
OPEN
STAND LIGHT
SPEAKER L
SPEAKER R
TV
MIC. L
MIC. R
LEVEL L
LEVEL R
FAN
OPEN
DOOR LOCK Keypad
CLOSE
DOOR LOCK
Temp./Humi. SENSOR
DUST SENSOR

AIoT Home: Simple Experiment

- Turn on the light and fan when human being detected.



PIR Sensor



LEDs

DC Fan

AIoT Home: Simple Experiment

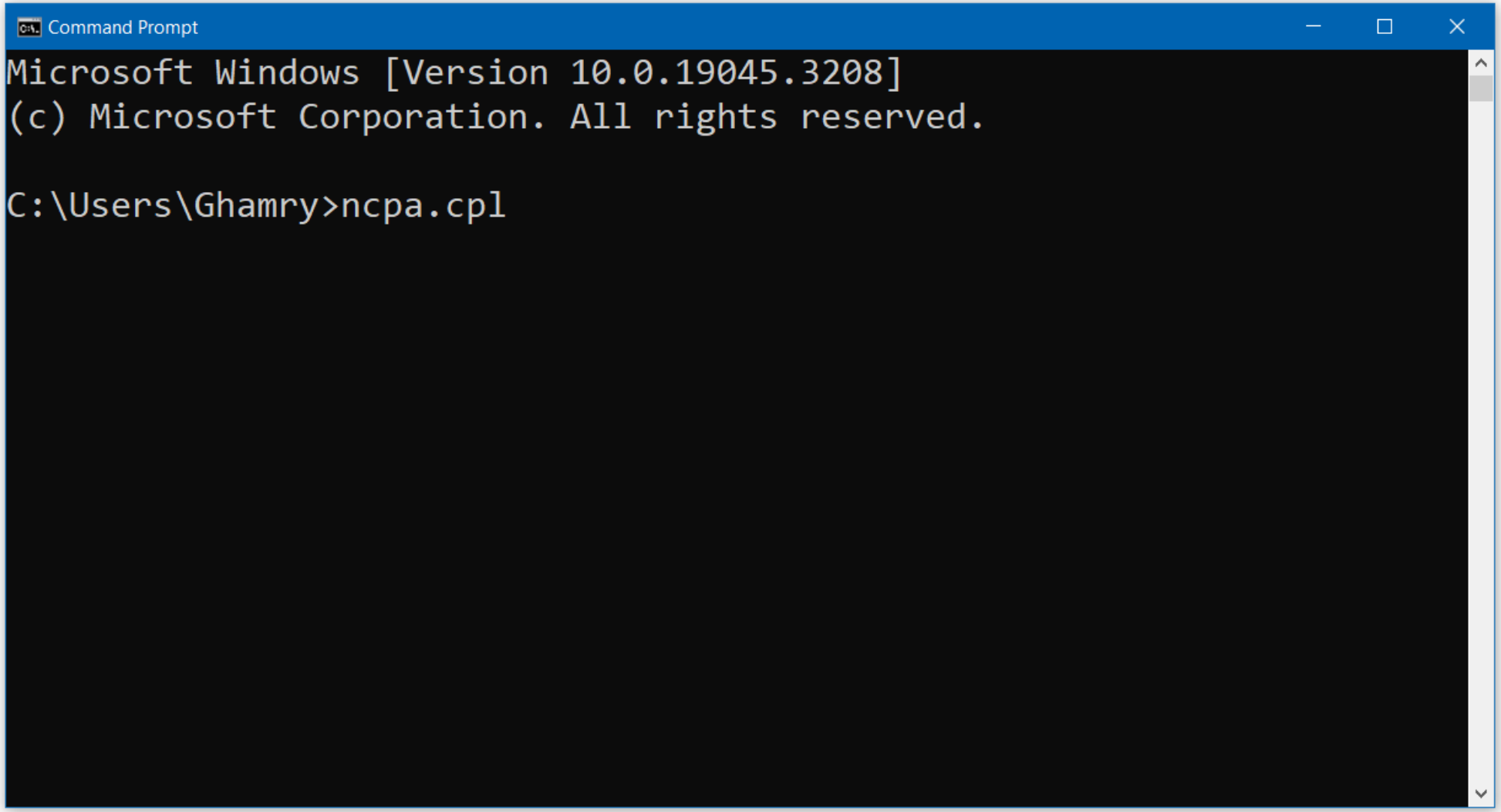
```
from pop import Pir, Fan, Led
import time

pir = Pir(22)                   # Create Pir object and connect to GPIO 22
leds = Led(23)                  # Create Led object and connect in GPIO 23
leds2 = Led(24)                 # Create Led object and connect in GPIO 24
dcfan = Fan(17)                 # Create DC fan object and connect in GPIO 17

while True:
    ret = pir.read()            # Return value read from the PIR sensor
    if (ret == True):           # If a human is detected
        leds.on()                   # Turn on led
        leds2.on()                  # Turn on led2
        dcfan.on()                  # Turn on fan
        time.sleep(2)               # Wait 2 seconds
    else:                       # Else
        leds.off()                  # Turn off led
        leds2.off()                 # Turn off led2
        dcfan.off()                 # Turn off fan
        time.sleep(0.1)             # Wait 0.1 seconds
```

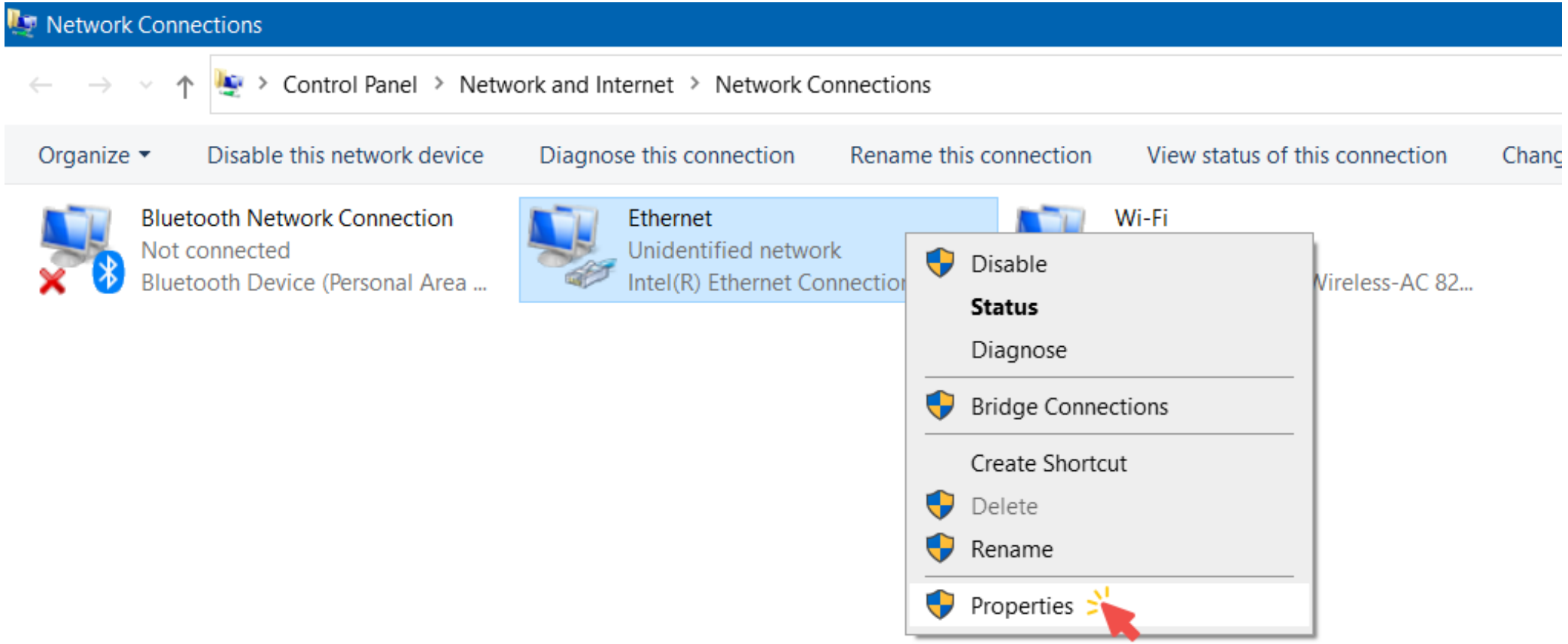
AIoT Home: Configuration

1. Open the CMD, and write the command `ncpa.cpl`.



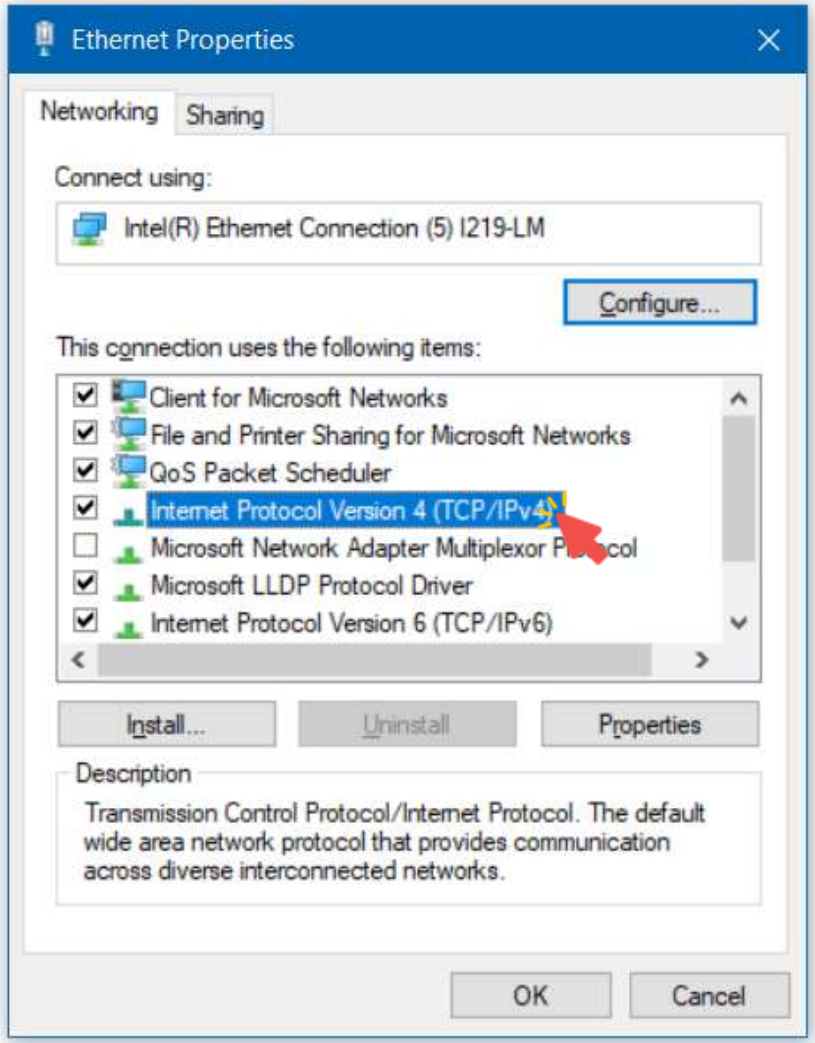
AIoT Home: Configuration

2. Right click on Ethernet, and choose Properties.



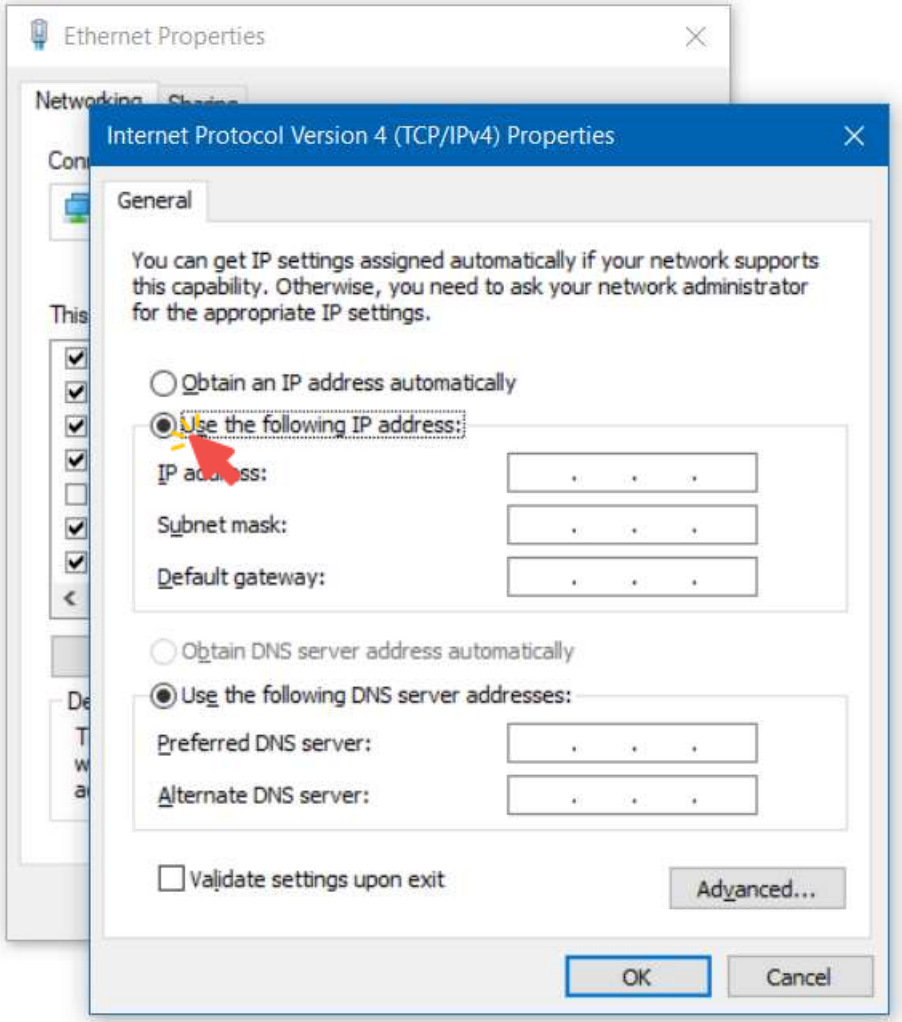
AIoT Home: Configuration

3. Double click on Internet Protocol Version 4 (TCP/IPv4).



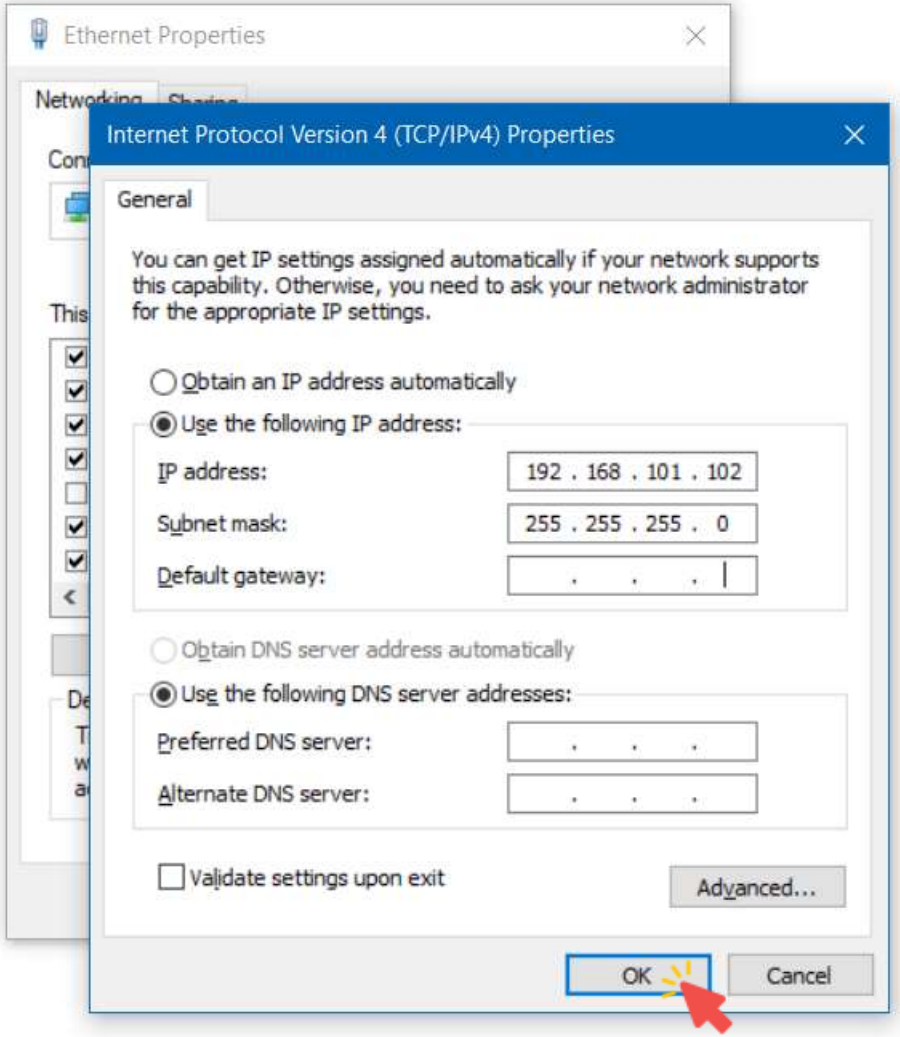
AIoT Home: Configuration

4. Choose Use the following IP address.



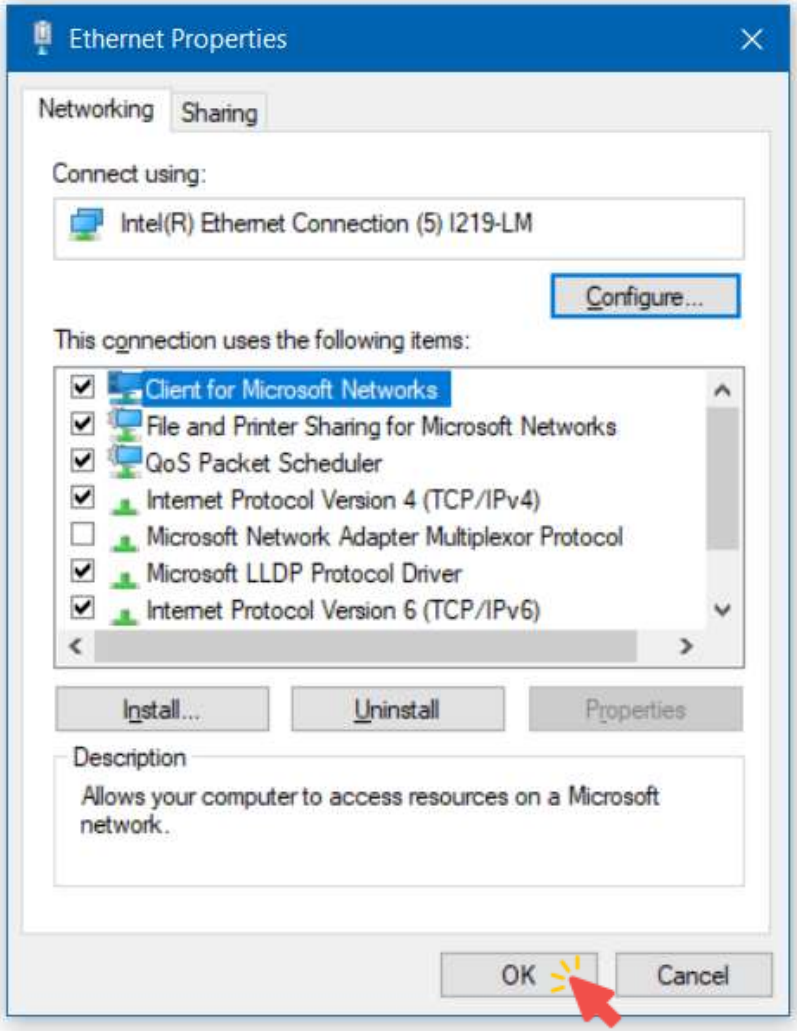
AIoT Home: Configuration

5. Enter the IP address `192.168.101.102`, and click Ok.



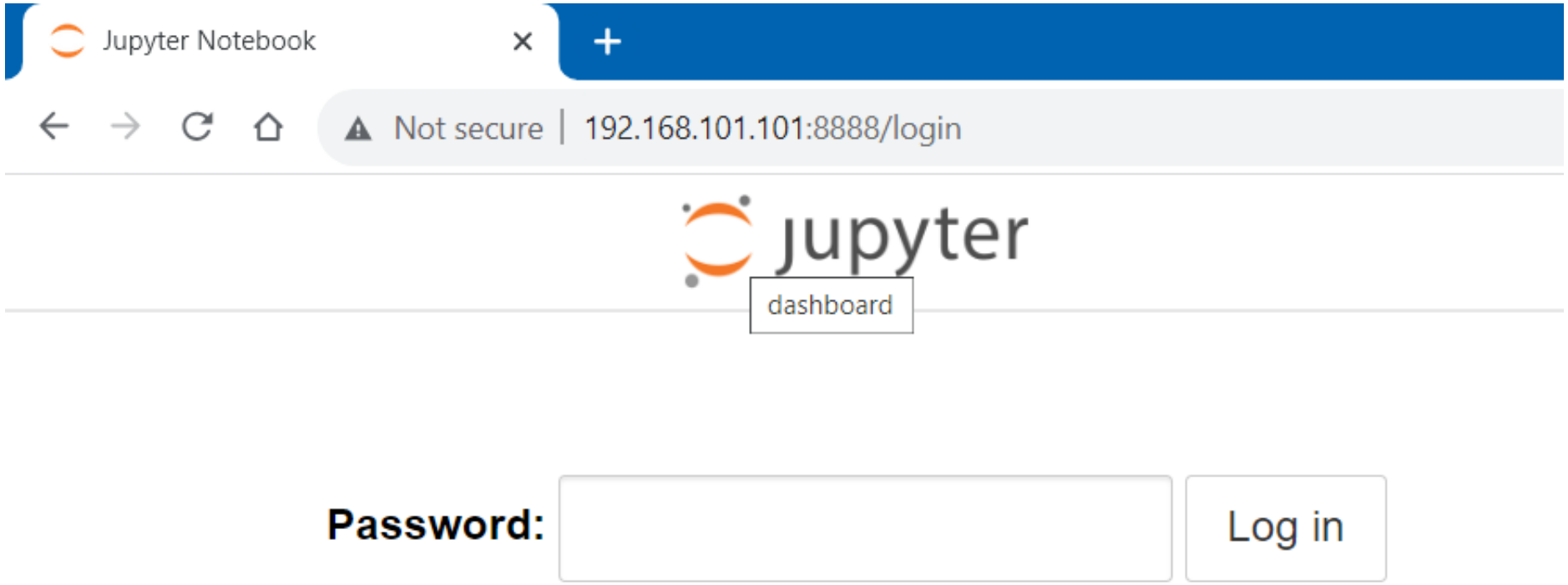
AIoT Home: Configuration

6. Click Ok.



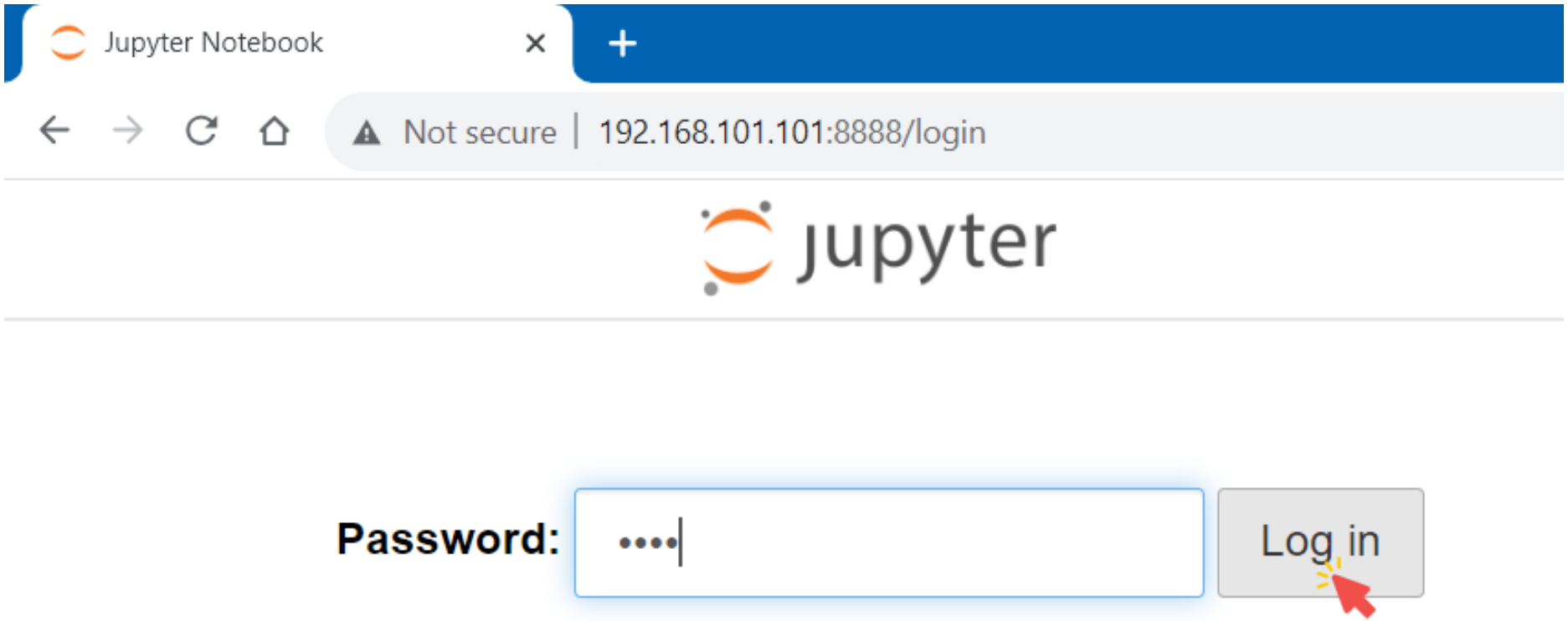
AIoT Home: Configuration

7. Open Google Chrome, and enter the address `192.168.101.101:8888`.



AIoT Home: Configuration

8. Enter the password `soda`, and click Login.



AIoT Home: Configuration

9. Start coding with Python!