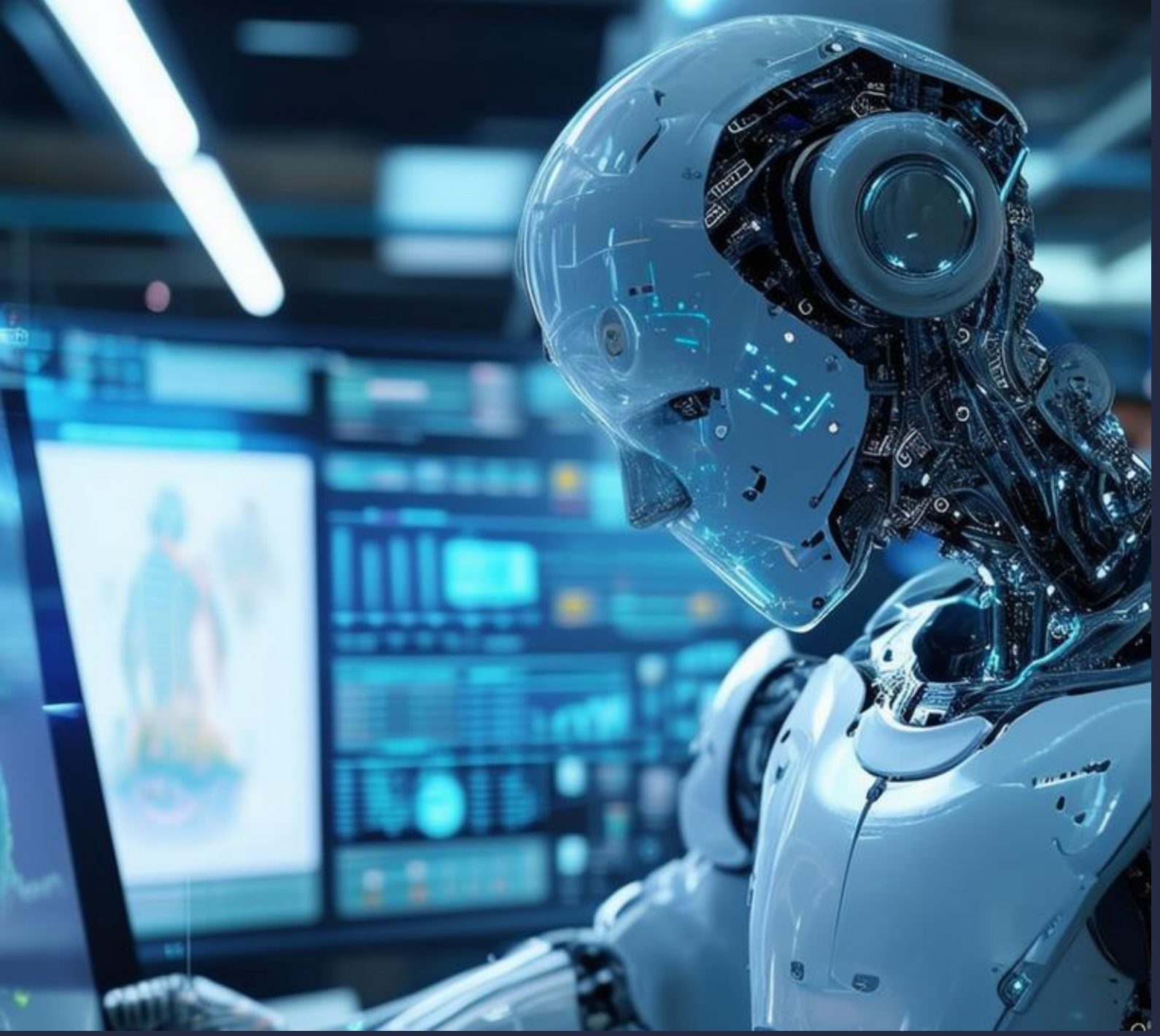


Basic Robotics Workshop

Organised by **KURC**

Course Outline

Electronics basics

Arduino Basics

Bluetooth and Communication

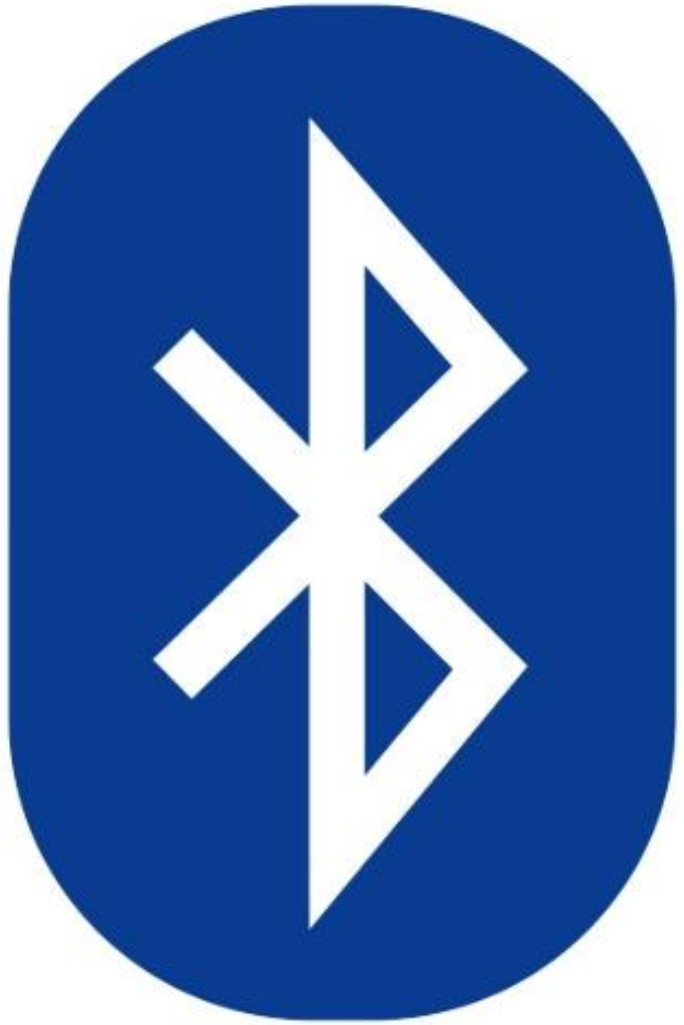
Motors and Actuators

Robotics Project

Bluetooth

- Bluetooth is a short-range wireless communication technology that allows devices to connect and share data over a limited distance (typically up to 10 meters).

- Radio Waves: Bluetooth uses radio waves in the 2.4 GHz ISM (Industrial, Scientific, and Medical) band.



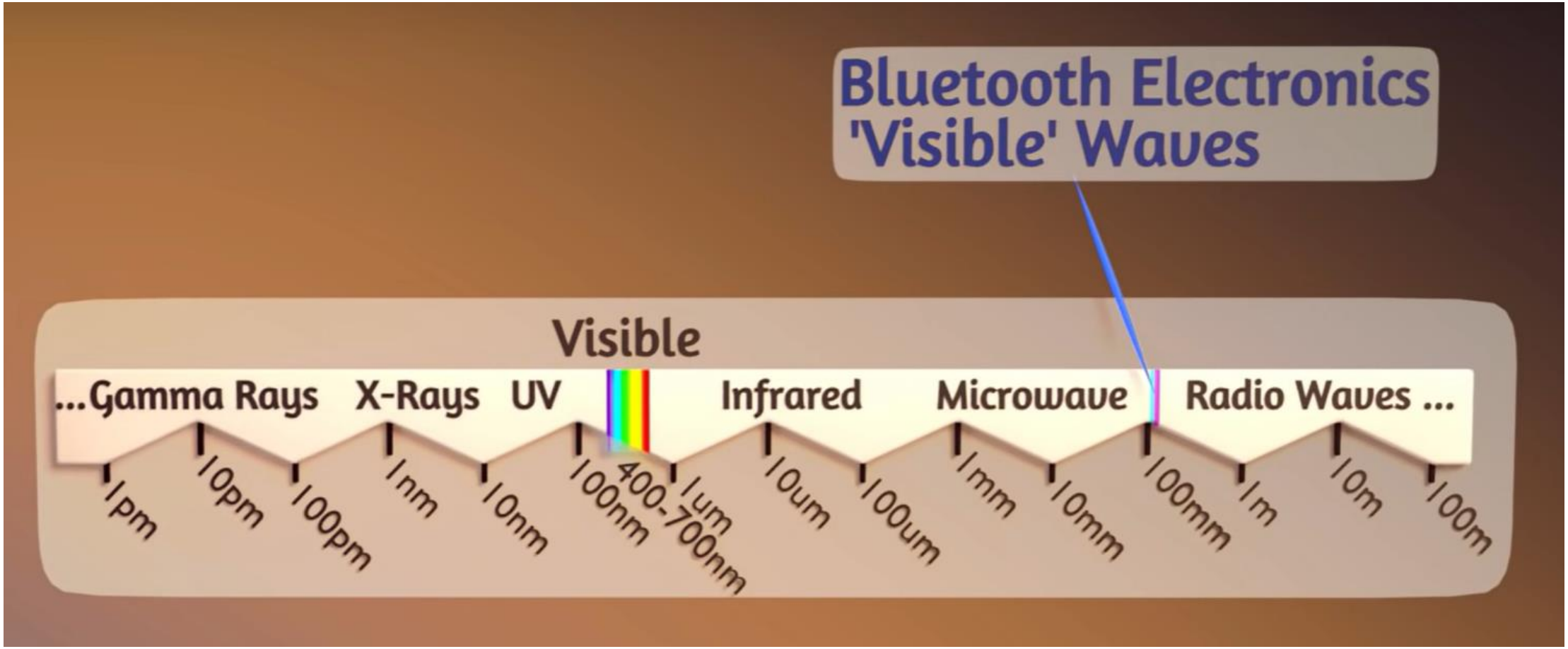
Stop

Slow Down

or at least you should

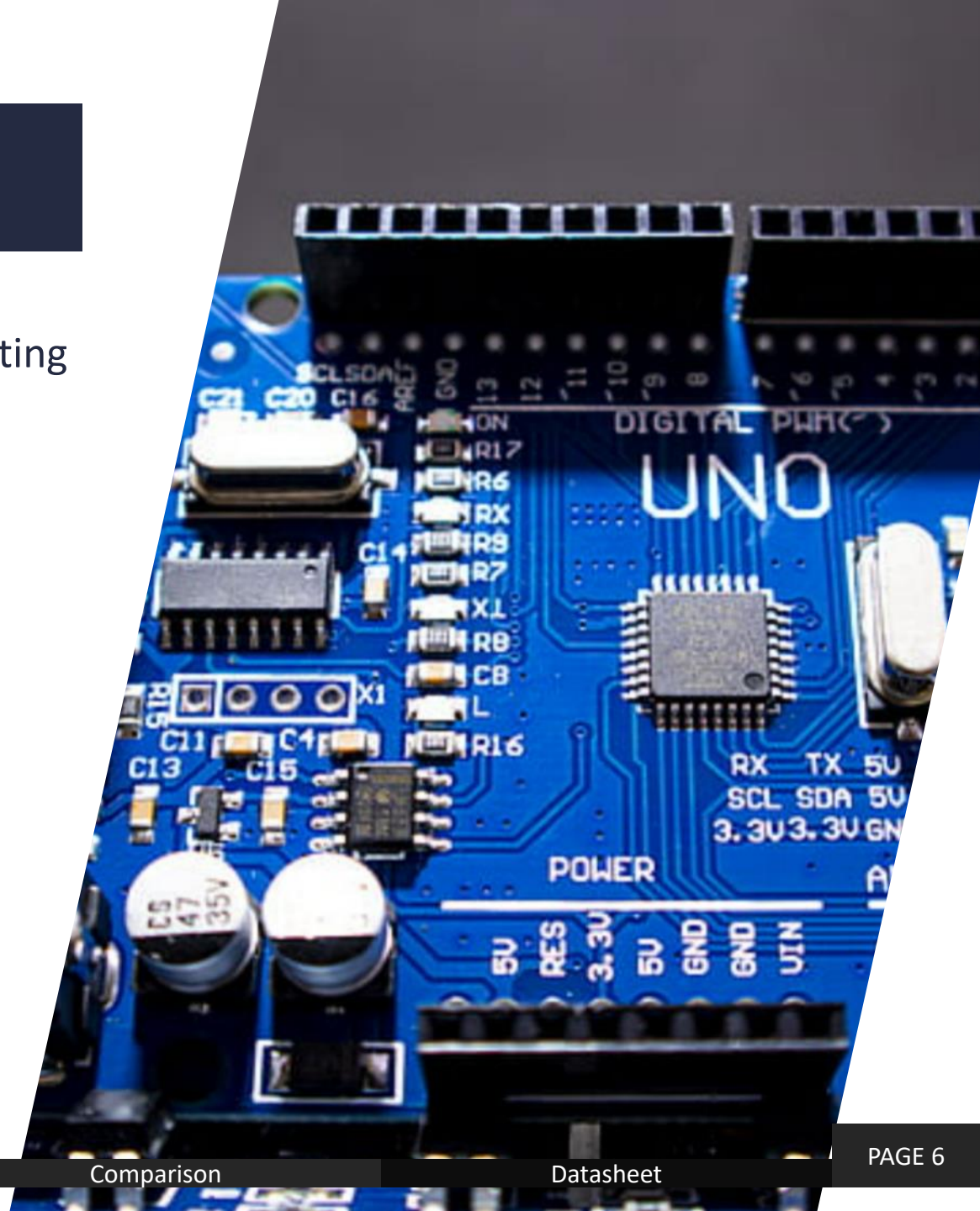
Go

PRETTY MUCH THE SAME



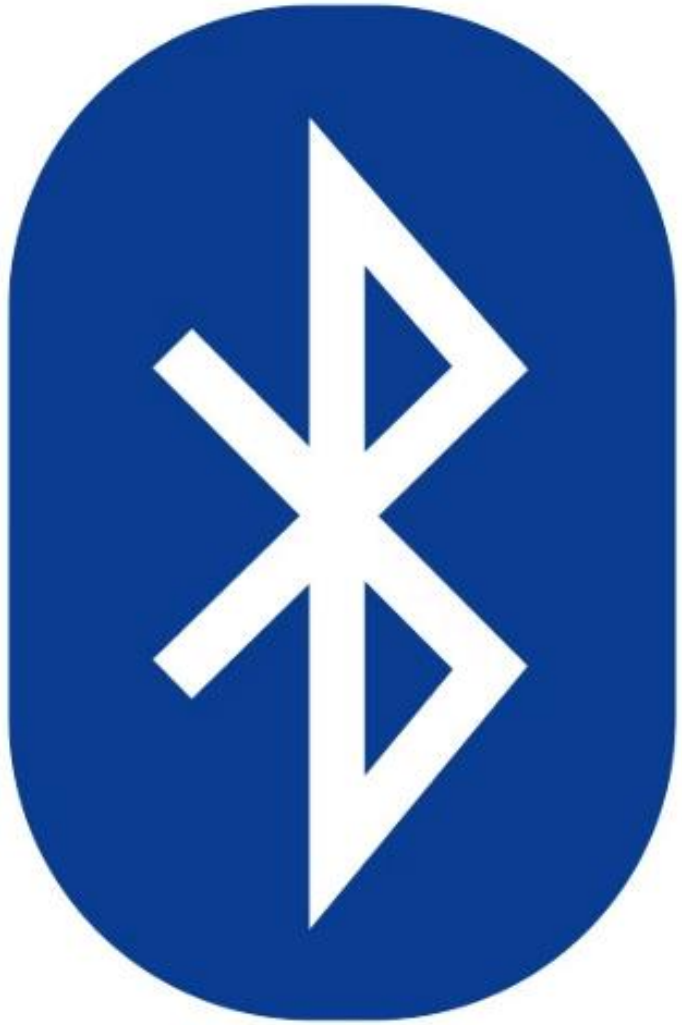
Connection Process:

- Discovery: Devices search for each other by broadcasting signals.
- Pairing: A secure connection is established using a shared key.
- Data Exchange: Data is transferred between devices using packets.

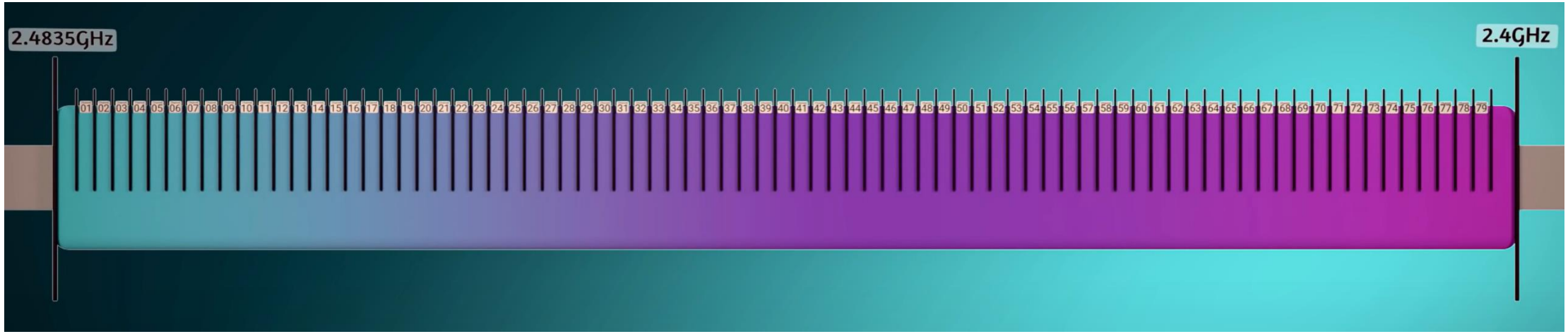


Frequency Hopping

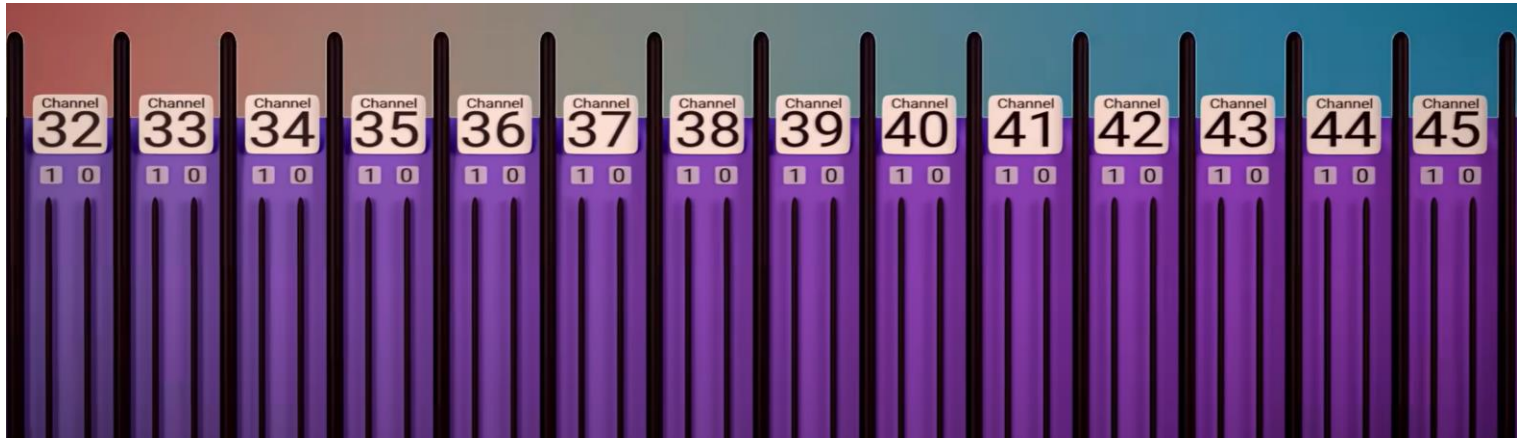
- Frequency hopping is a technique where Bluetooth switches (or "hops") between different frequencies within its range while communicating.
- Since Bluetooth shares the 2.4 GHz band with other wireless technologies (like Wi-Fi or microwaves), hopping avoids prolonged clashes on a single channel.
- The constant frequency changes make it harder for unauthorized devices to intercept the signal.



79 channels

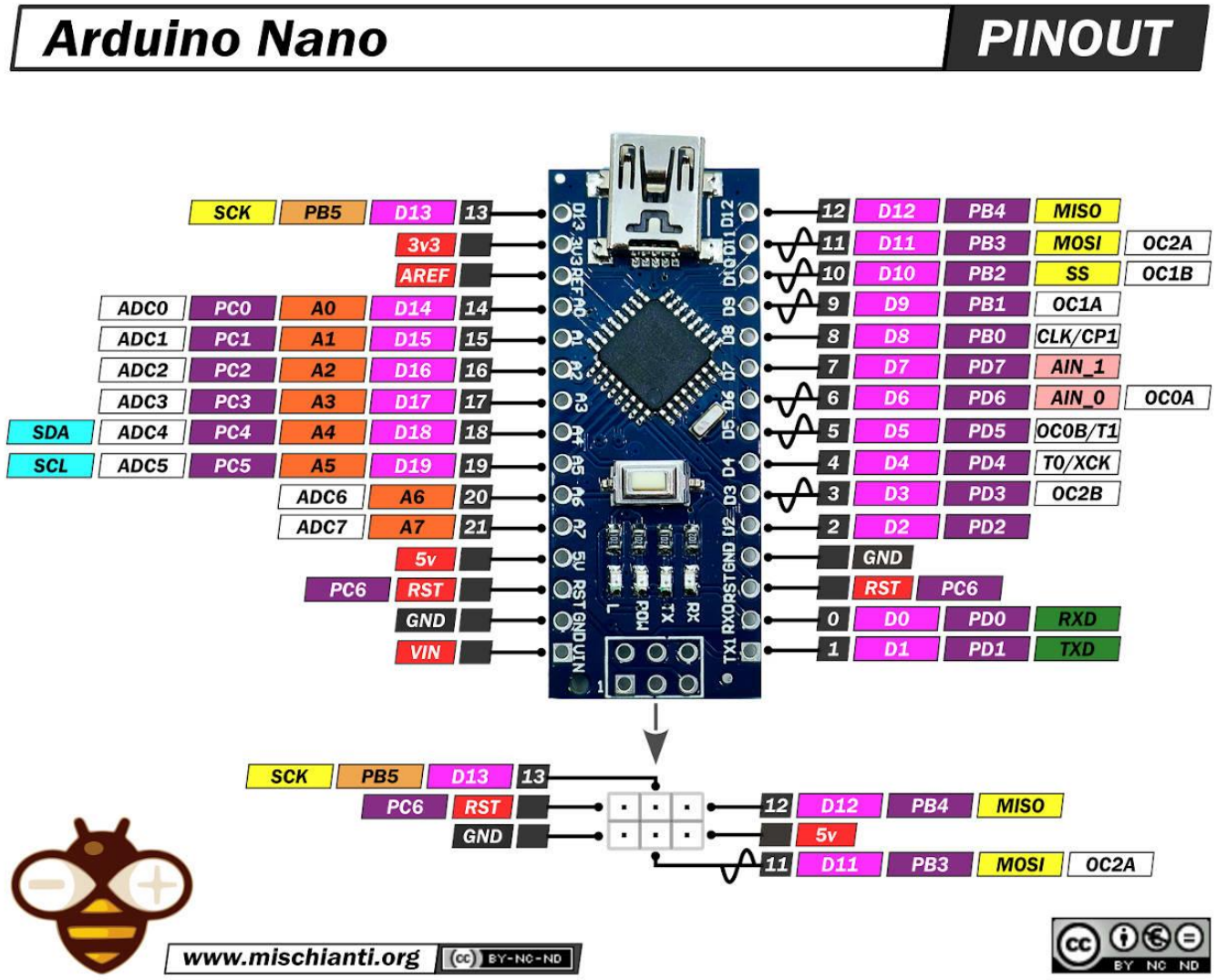


Within each channel



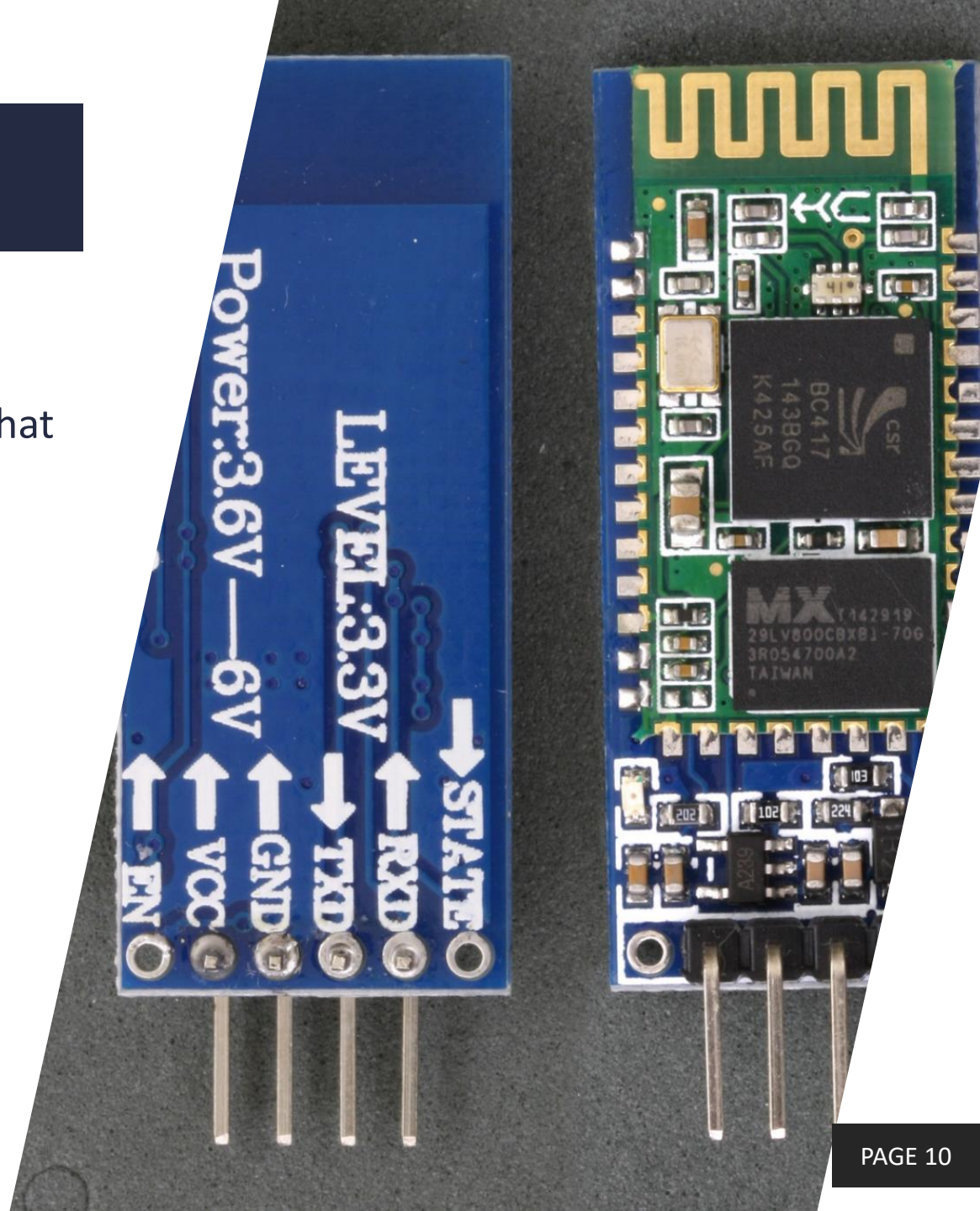
- # Datasheet Nano

-GPIO pins
-3.3v
-GND
-Analog Pin
-Reset and Flash



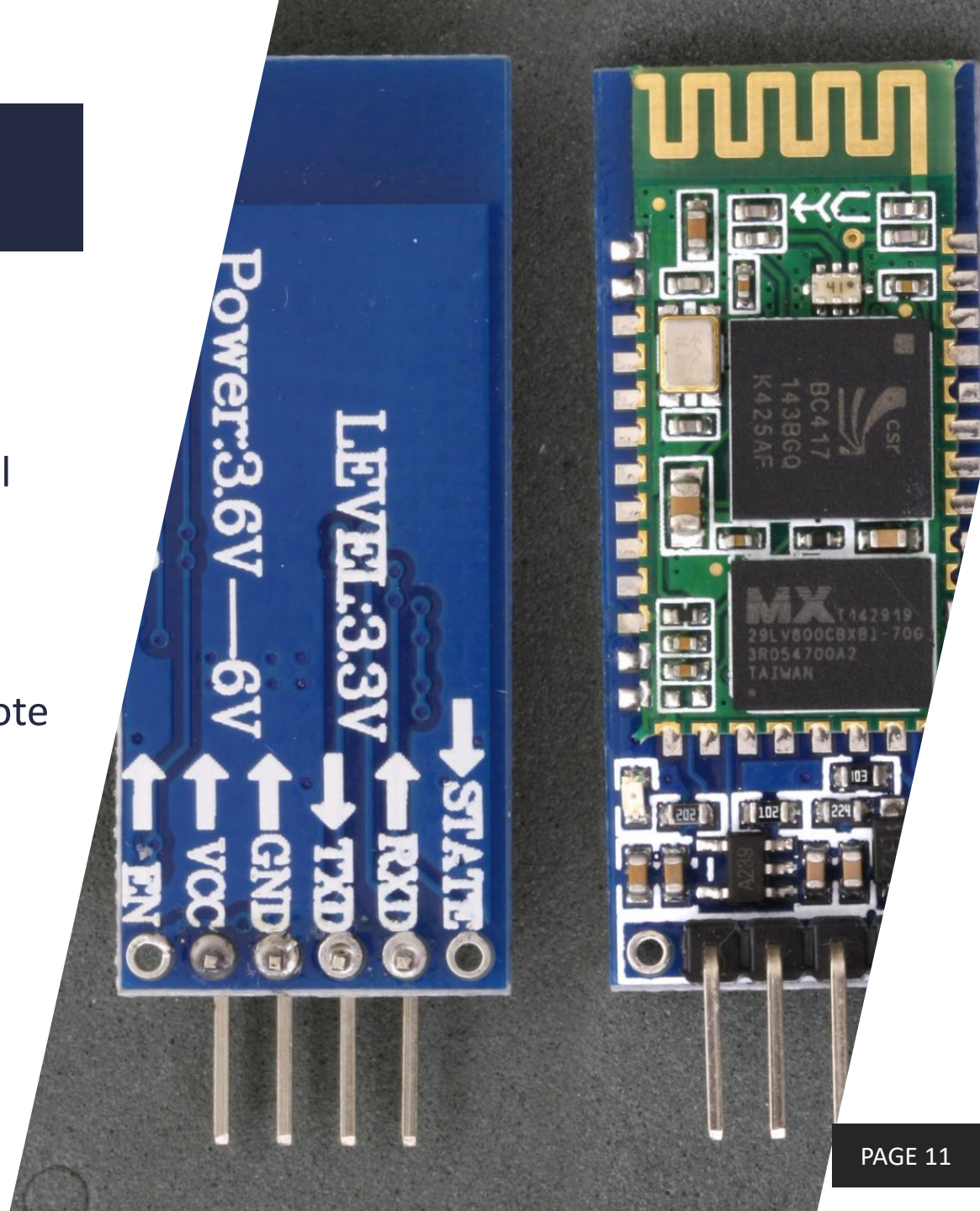
Bluetooth chat app

- Your first task today will be to build basic Bluetooth chat system with provided Bluetooth module
- Data received via Bluetooth is displayed on the Serial Monitor.
- Data entered into the Serial Monitor is sent to the Bluetooth module for transmission.
- Find the code at https://github.com/kurc2014/Basic_robotics_2025



The Bluetooth module

- HC-05 is a versatile Bluetooth module designed for wireless communication.
- Communicates with devices via Bluetooth using Serial Communication (UART).
- Default baud rate is 9600, and it connects to microcontrollers (e.g., Arduino) via TX and RX pins.
- Applications:Wireless robotics, IoT systems, and remote control devices.



```ino
#include <SoftwareSerial.h>

#define BT_RX_PIN 2 // Connect to TX of HC-05
#define BT_TX_PIN 3  // Connect to RX of HC-05

SoftwareSerial bluetooth(BT_RX_PIN,BT_TX_PIN);

void setup() {
  Serial.begin(9600); // For serial monitor
  bluetooth.begin(9600); // HC-05 default baud rate

  Serial.println("Waiting for Bluetooth connection...");
}

void loop() {
  // If data is available from Bluetooth, read it and send it to Serial Monitor
  if (bluetooth.available()) {
    char btData = bluetooth.read();
    Serial.print(btData);
  }

  // If data is available from Serial Monitor, read it and send it to Bluetooth
  if (Serial.available()) {
    char serialData = Serial.read();
    Serial.print(serialData);
    bluetooth.write(serialData);

  }
}
```

Simple Chat app

- The code establishes two-way communication between a computer's Serial Monitor and an HC-05/ HC-06 Bluetooth module using the Arduino.

```
// Function to handle received commands
void handleCommand(String command) {
  if (command.equalsIgnoreCase("ON")) {
    digitalWrite(LED_BUILTIN, HIGH); // Turn LED on
    Serial.println("LED turned ON");
    bluetooth.println("LED turned ON");
  } else if (command.equalsIgnoreCase("OFF")) {
    digitalWrite(LED_BUILTIN, LOW); // Turn LED off
    Serial.println("LED turned OFF");
    bluetooth.println("LED turned OFF");
  } else {
    Serial.println("Invalid command: " + command);
    bluetooth.println("Invalid command: " + command);
  }
}
```

Blink LED using commands

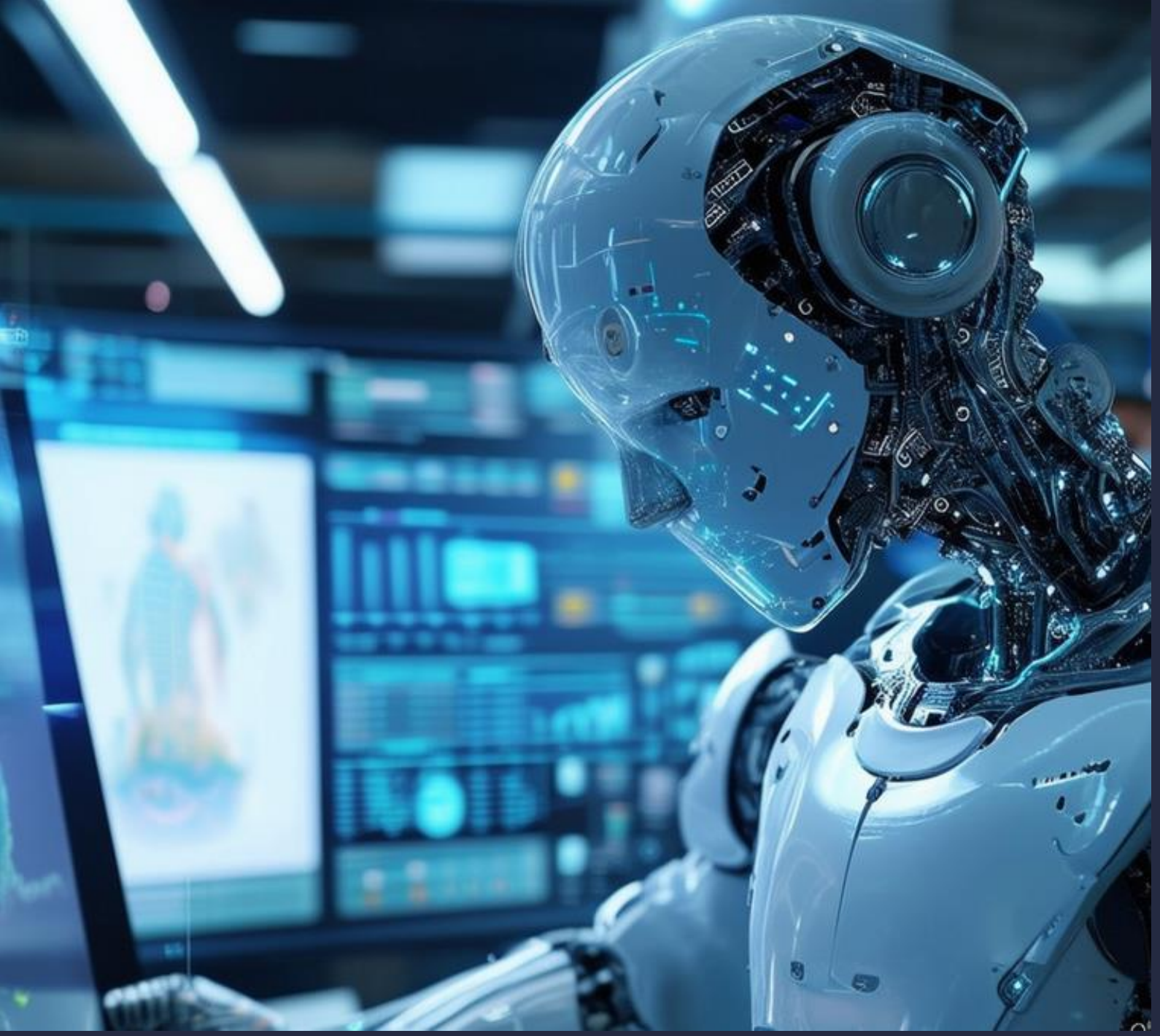
- This simple code toggles the built-in LED on and off based on the command, demonstrating how to control digital outputs on the Arduino.
- By using pinMode and digitalWrite, you can manipulate the state of pins to create various interactive projects.
- You will now toggle relay with this same setup

Relay

- A relay is an electrically operated switch that uses an electromagnet to mechanically operate a set of contacts.
- It allows a low-power signal to control a high-power circuit, enabling safe and efficient control of electrical devices.
- Relays are commonly used in automation, industrial control systems, and electronic circuits where it's necessary to isolate the control signal from the high-power load.

Relay PINS

- **Normally Open (NO):** Circuit is off by default; closes when relay is activated to allow current flow.
- **Normally Closed (NC):** Circuit is on by default; opens when relay is activated to stop current flow.
- **Key Use:**
- **NO:** Turn devices on when activated.
- **NC:** Turn devices off when activated.



End of Day 2

Organised by **KURC**