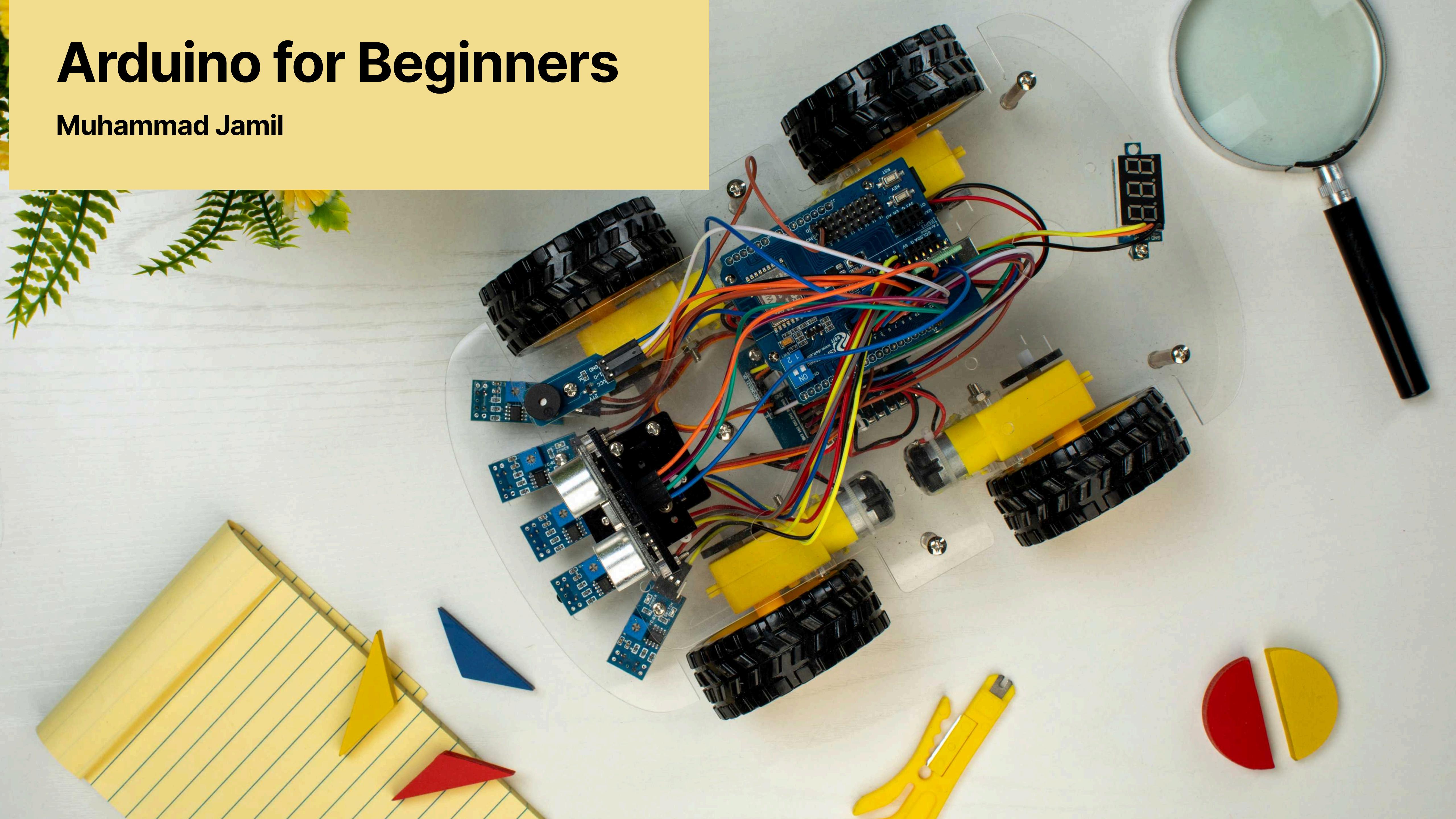


Arduino for Beginners

Muhammad Jamil

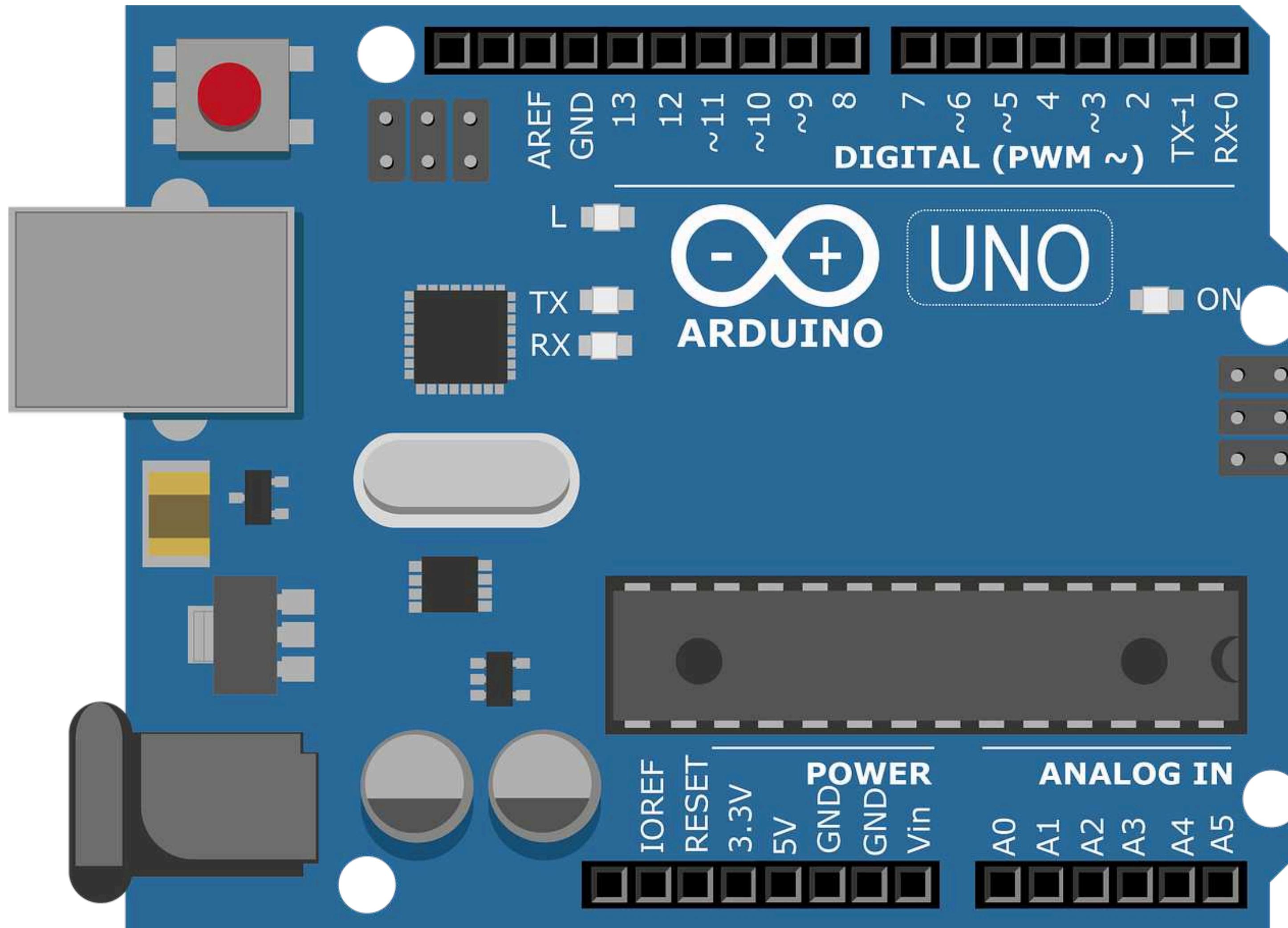


Agenda

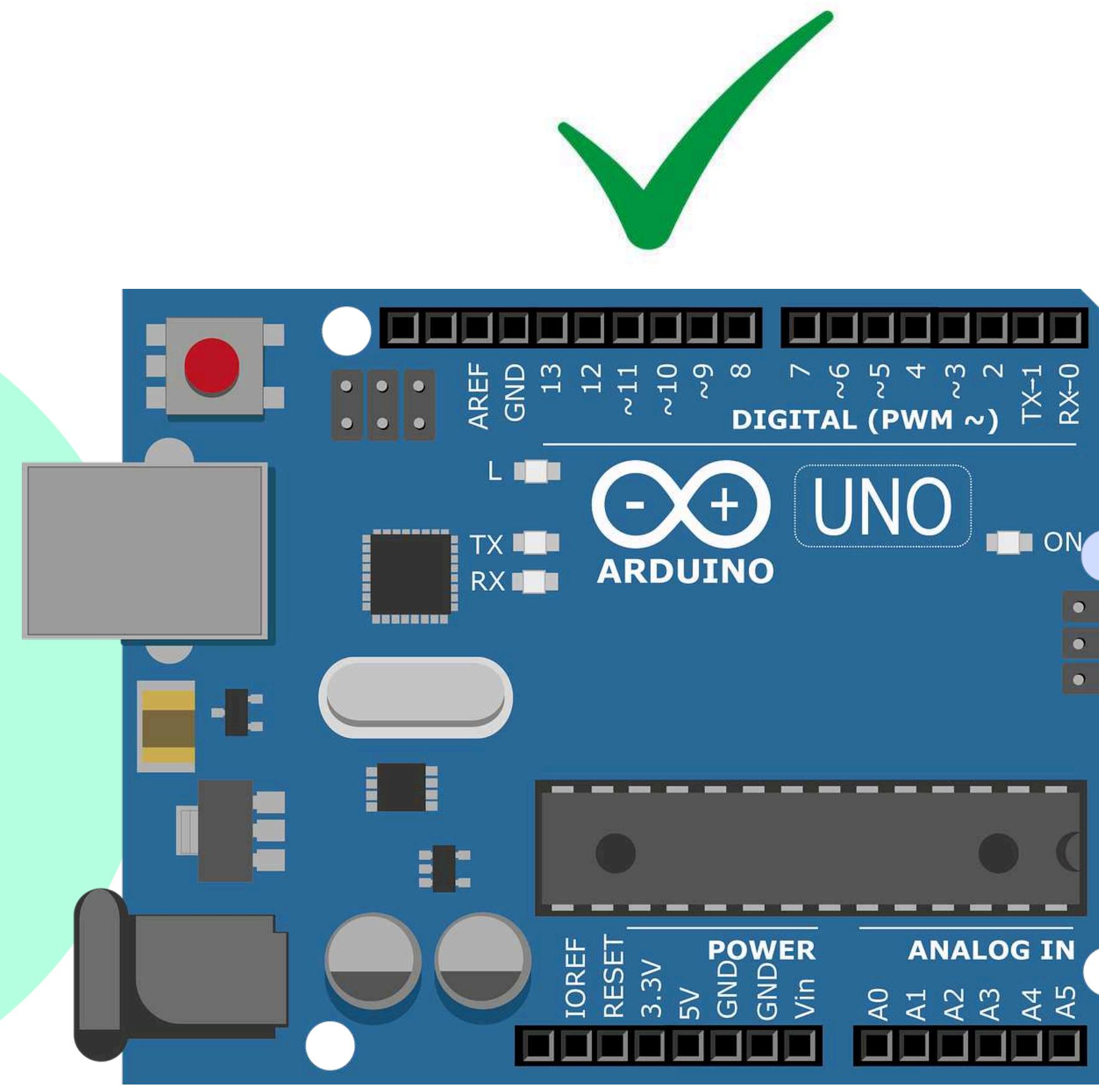
- What is Arduino
- What can you do with Arduino?
- Arduino Boards and Microcontrollers
- Usage of Microcontrollers in everyday life
- Working with Microcontrollers
- Arduino Online Simulations
- Introduction to STEM & Arduino
- STEM Integration Arduino Projects



What is Arduino



What is Arduino



Software

Hardware

What can you do with Arduino? (cont.)

- Home Automation
 - Smart Lights & Fans
 - Automated Curtains
 - Remote-controlled Appliances (via Wi-Fi/Bluetooth)
 - Home Security Alarms & Intruder Detection
- Robotics
 - Line-following Robot
 - Obstacle Avoiding Car
 - Robotic Arm Control
 - Drones & RC Vehicles (basic level)

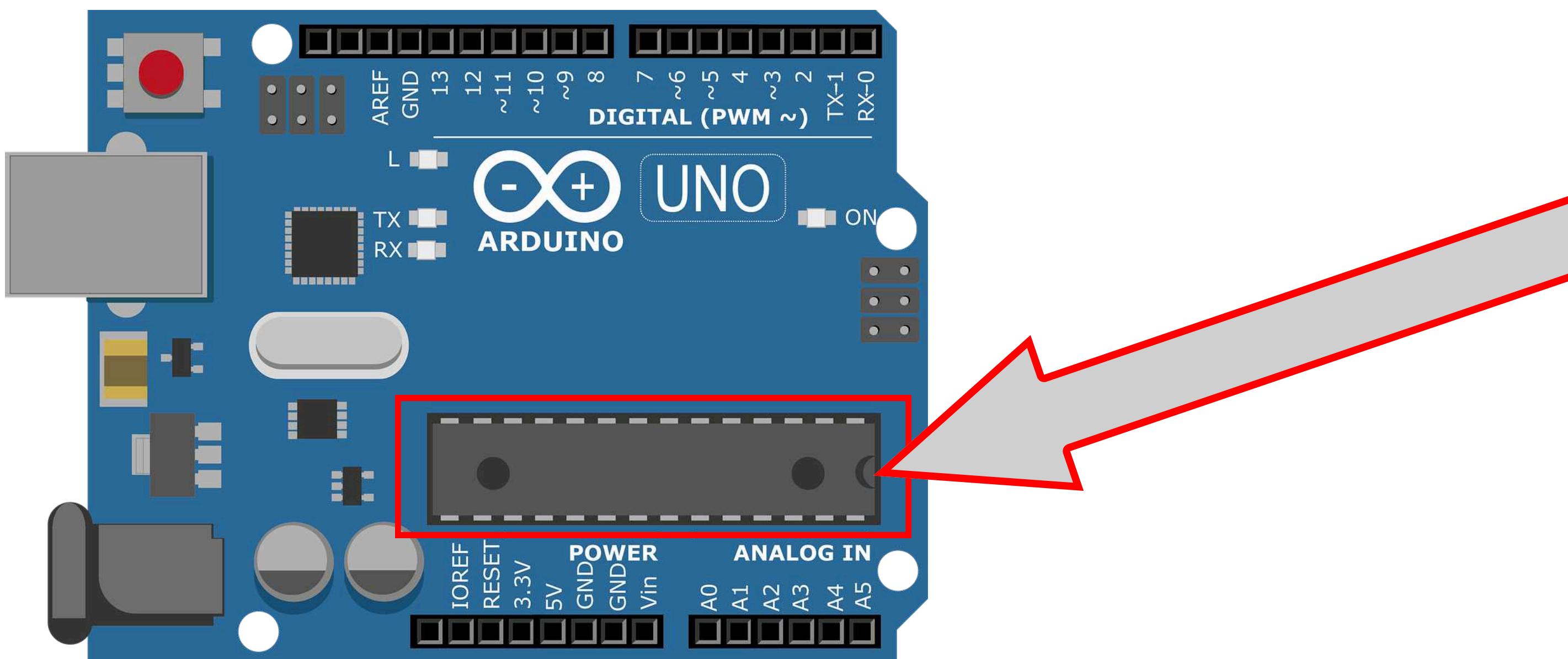
What can you do with Arduino? (cont.)

- IoT (Internet of Things)
 - Smart Plant Watering System
 - Home Automation controlled via Smartphone App
- Industrial & Practical Uses:
 - Access Control (RFID/NFC cards)
 - Automated Attendance Systems
 - Data Loggers (SD Card storage)
 - Motor & Relay Control for Machinery

What can you do with Arduino?

- Fun & Experimental
 - Sound-reactive LED Light Shows
 - Digital Dice, Clocks, and Countdown Timers
 - Gesture Control Projects

Arduino Boards and Microcontrollers



This microcontroller will
run your Arduino programs

Arduino Boards and Microcontrollers

	Microcontroller (Arduino Uno)	Microprocessor (standard PC)
Execution speed	16 MHz (16 000 000 Hz)	2 GHz (multiple cores) (2 000 000 000 Hz)
Memory (RAM)	2 kB (2000 B)	8 GB (8 000 000 000 B)

Arduino Boards and Microcontrollers

	Microcontroller (Arduino Uno)	Microprocessor (standard PC)
Execution speed	16 MHz (16 000 000 Hz)	2 GHz (multiple cores) (2 000 000 000 Hz)
Memory (RAM)	2 kB (2000 B)	8 GB (8 000 000 000 B)

Better for handling
hardware (low level)

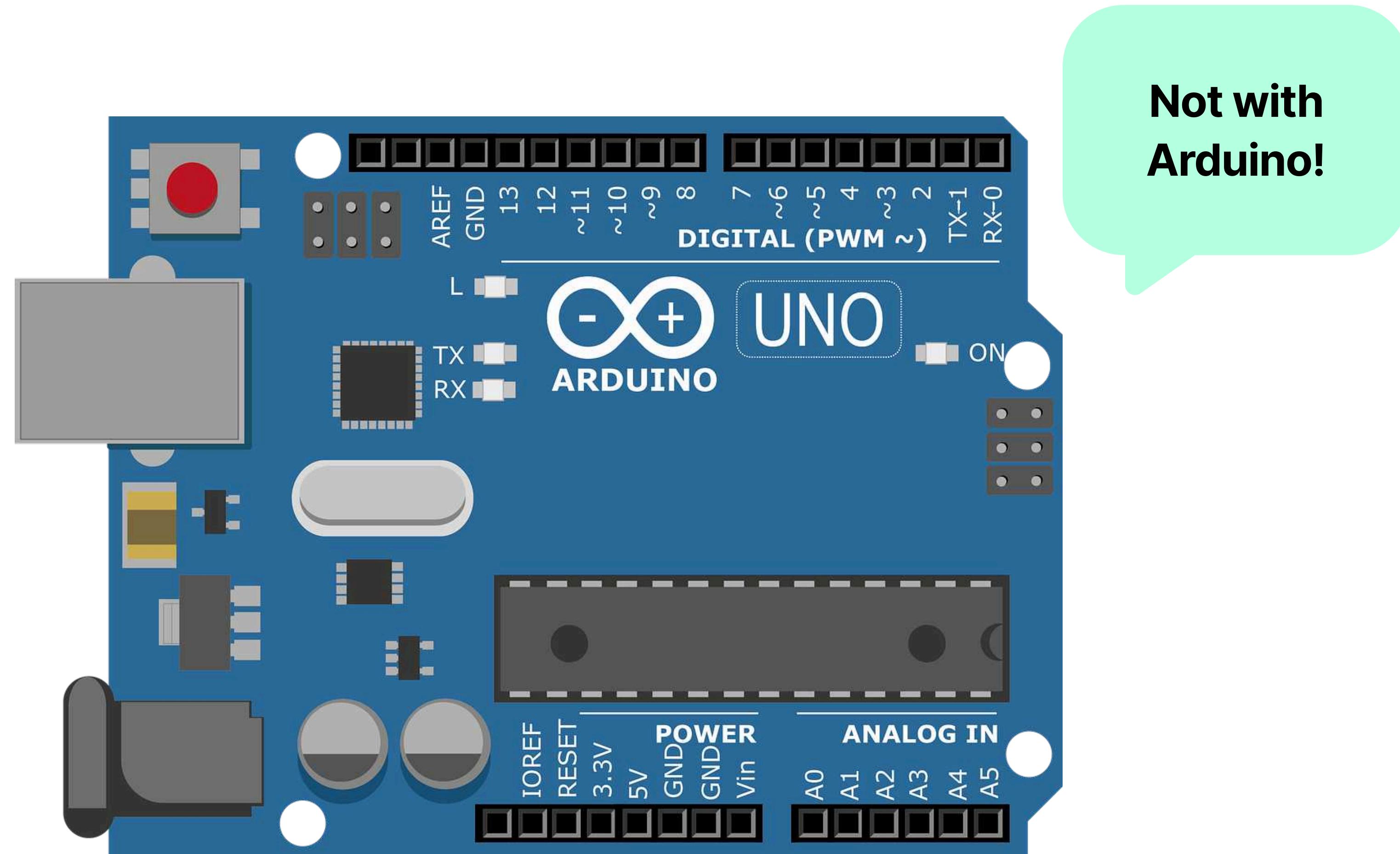


Better for handling
computation power tasks (high level)

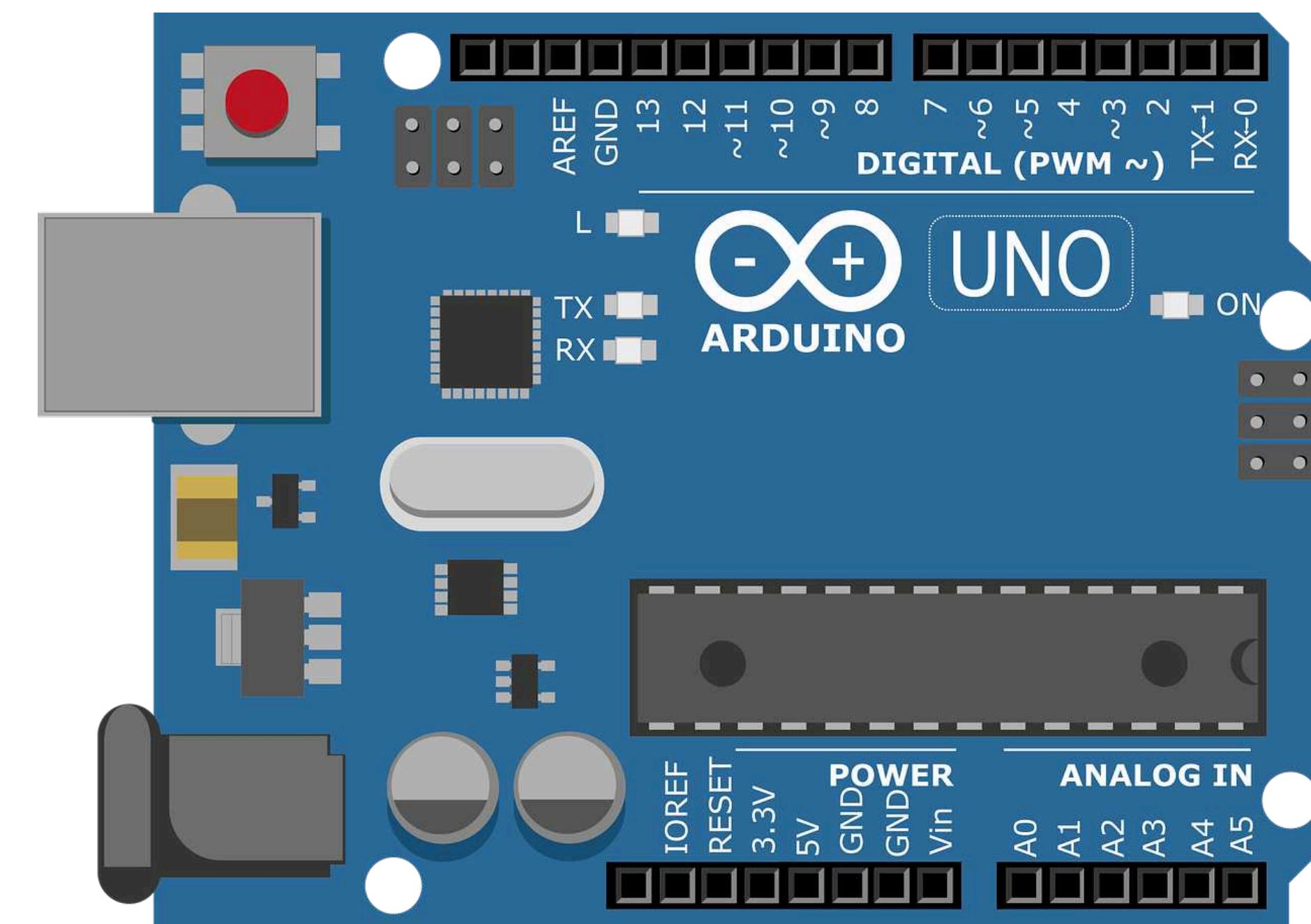
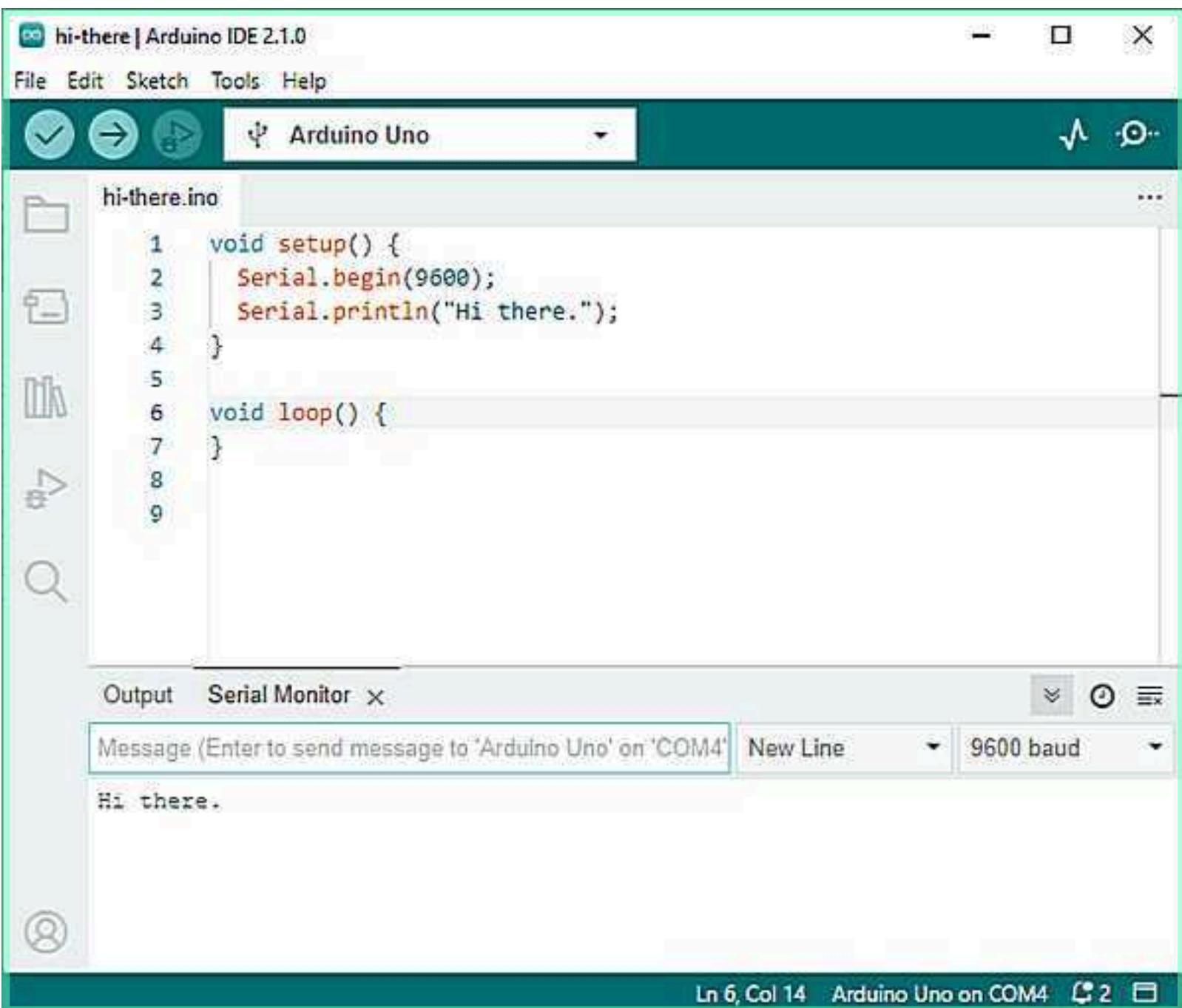
Microcontrollers in every day's life

- They're everywhere !!!
 - Phones
 - Cars
 - Planes
 - Home electronics
 - Microwave Ovens
 - Washing Machines
 - Refrigerators
 - Air Conditioners
 - TV Remotes & Smart TVs

But microcontrollers are hard to setup and program...

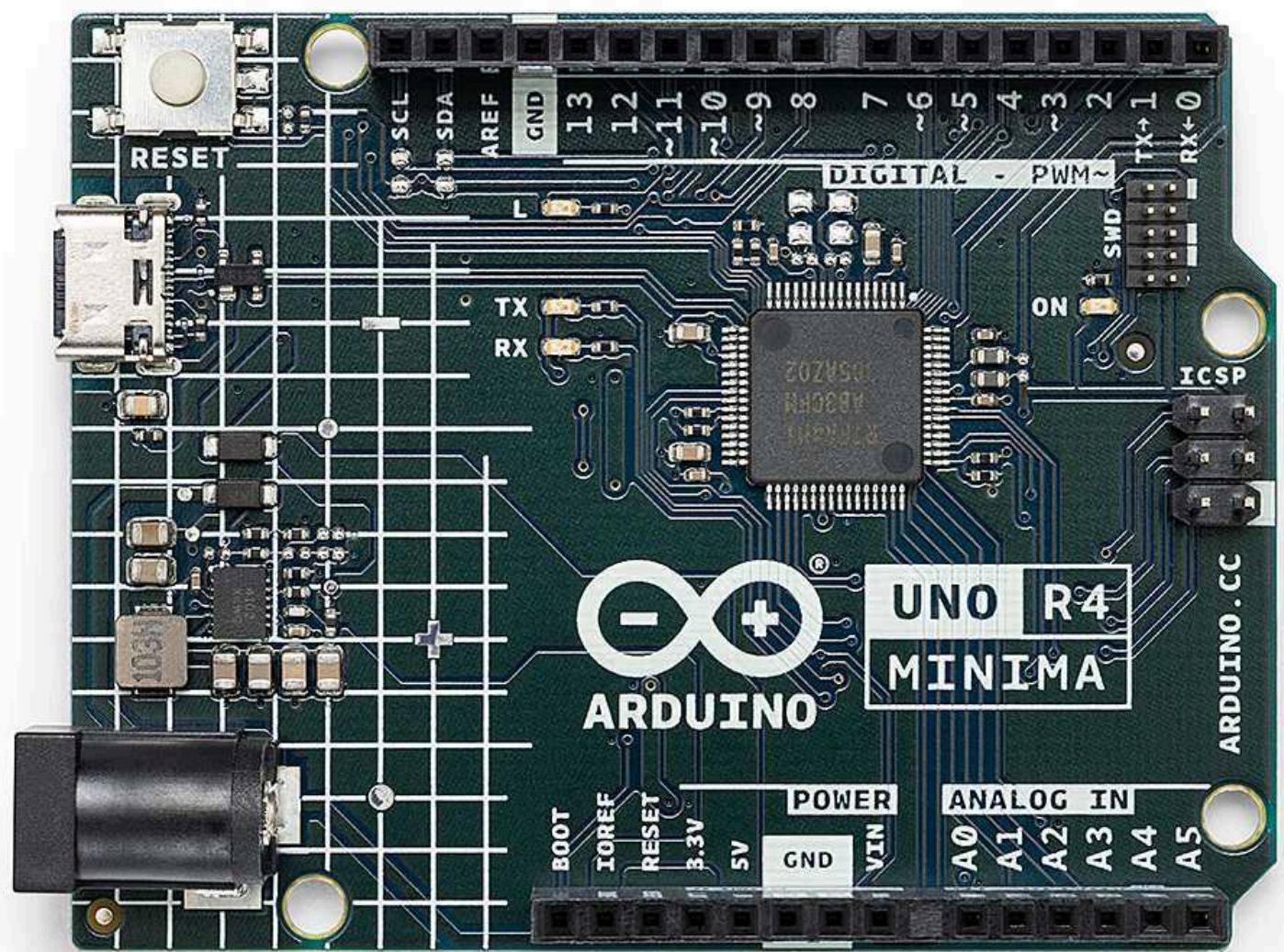


Working with Microcontroller

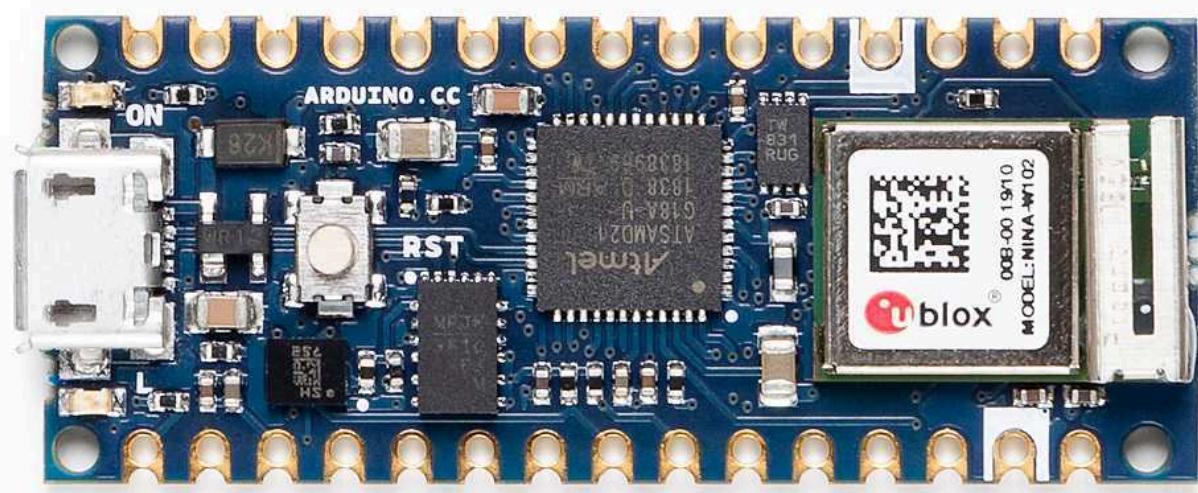


The Arduino Project

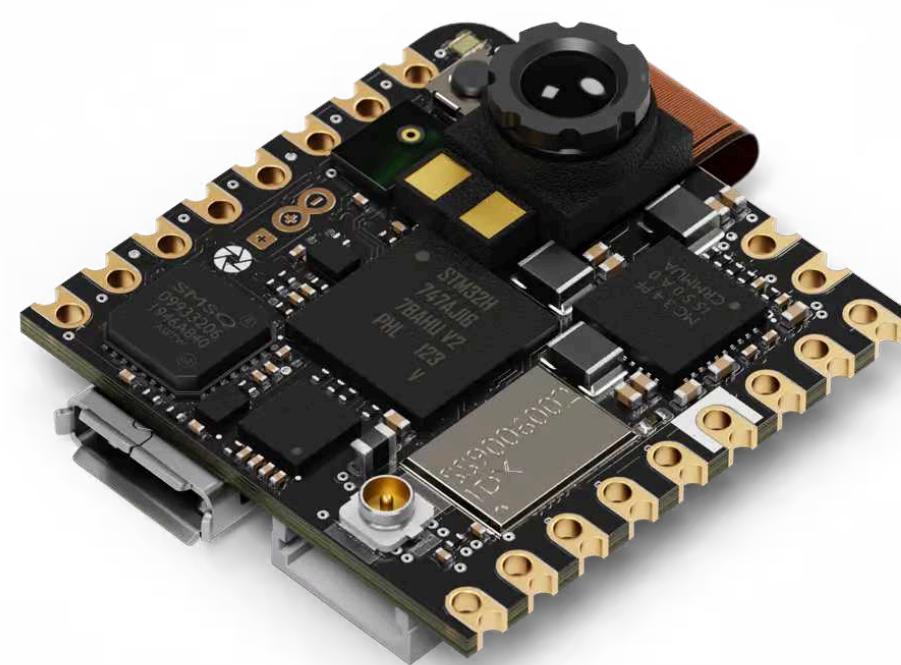
- Started in 2003
- First Board: Arduino UNO



Arduino UNO R4 Minima



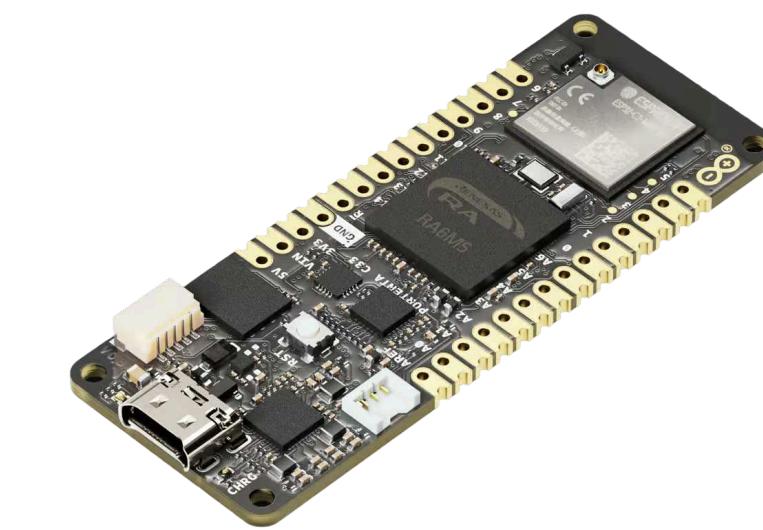
Arduino Nano 33 IoT



Nicla Vision



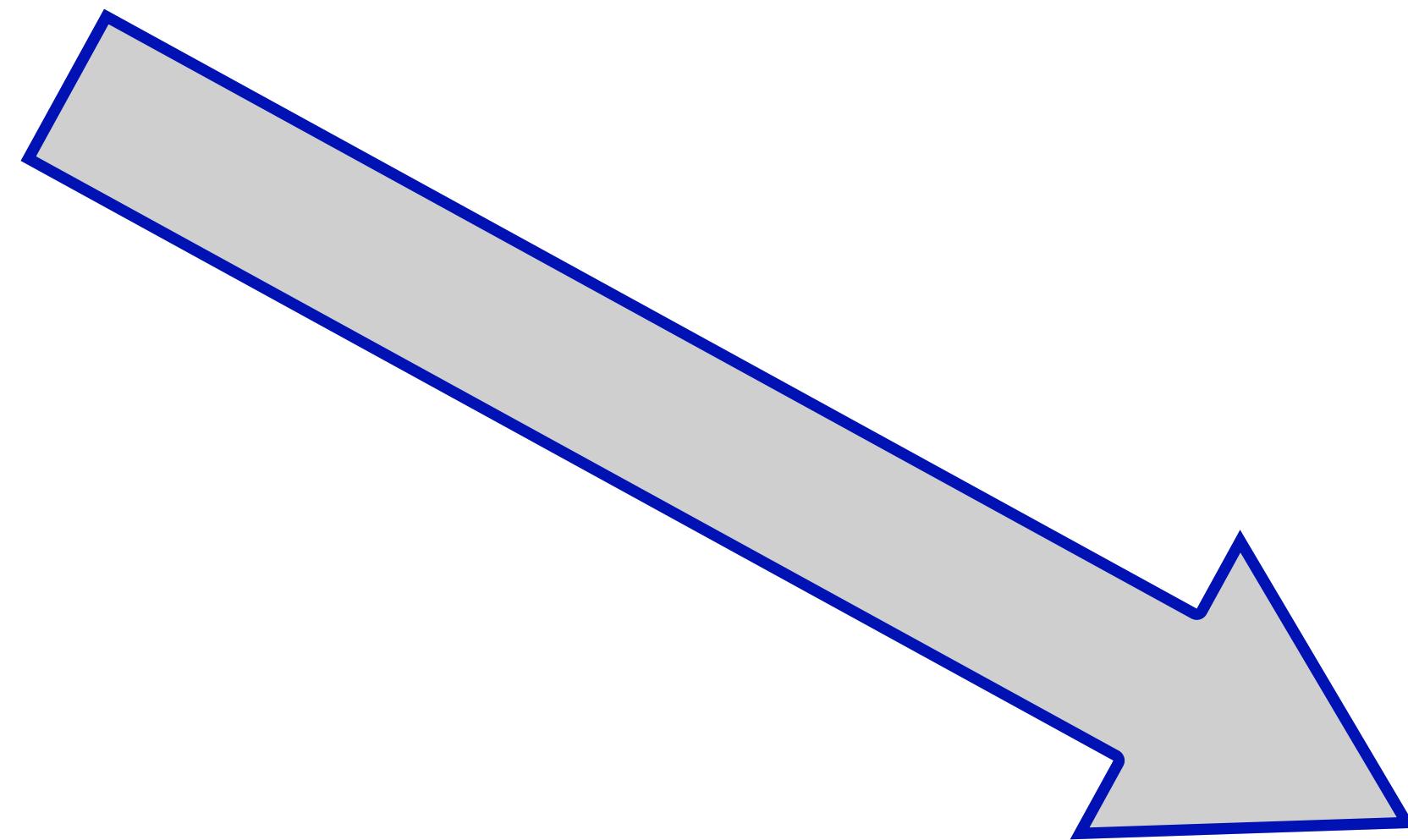
Arduino Due (Giga)



Portenta H7

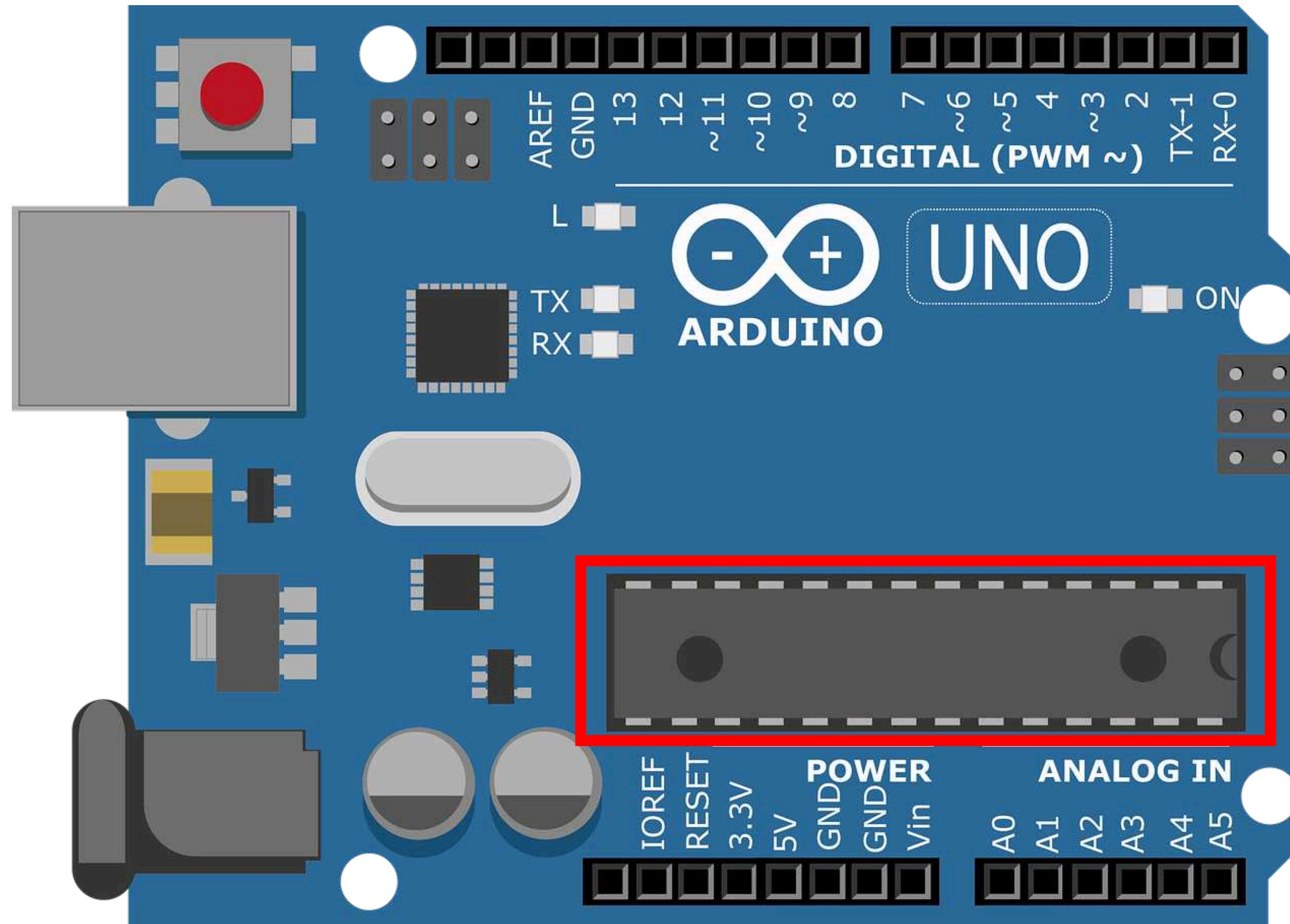
Arduino is open source

- Open source hardware
- Open source software



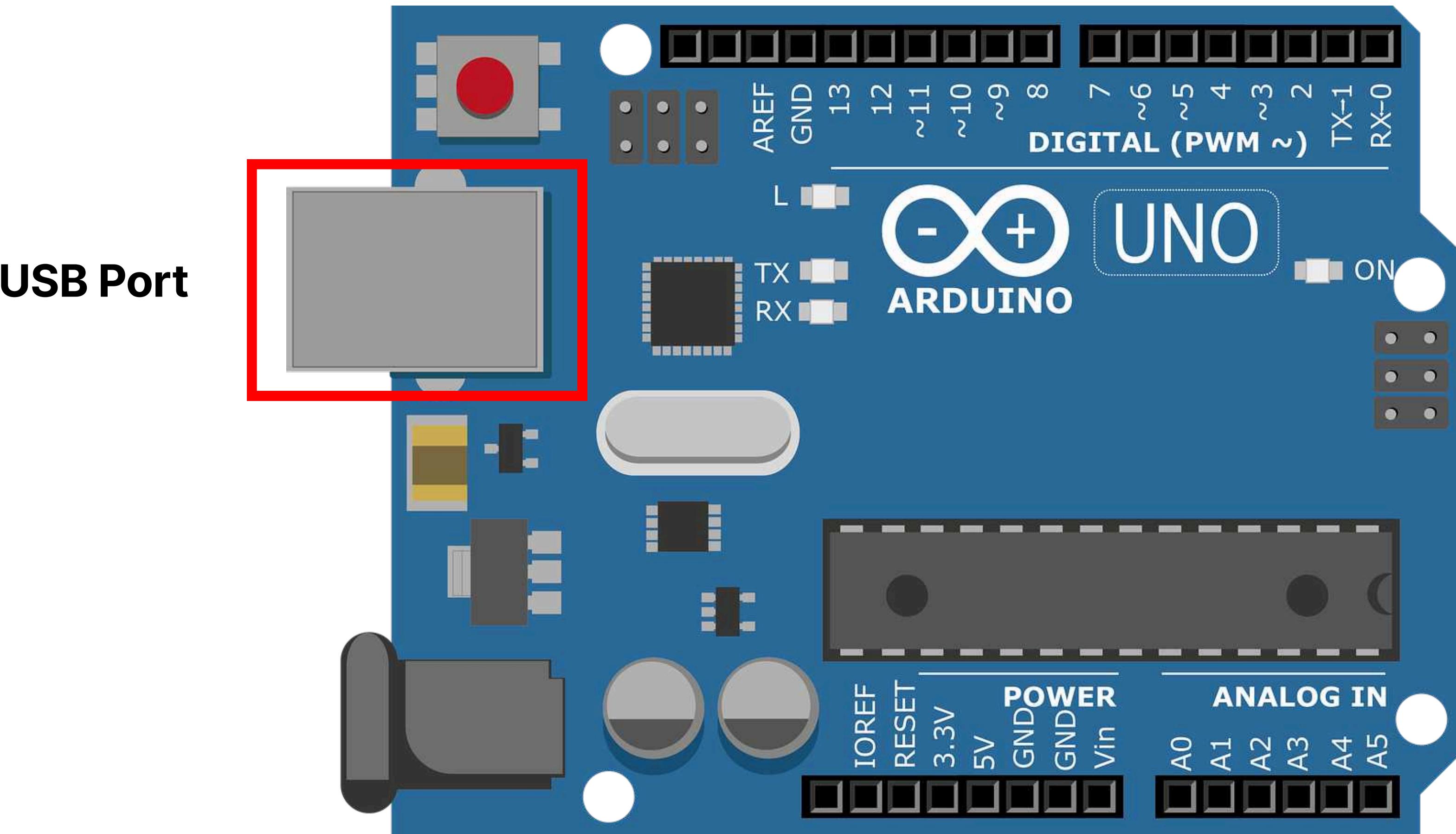
Big open source community

Arduino Uno - What's on the board?

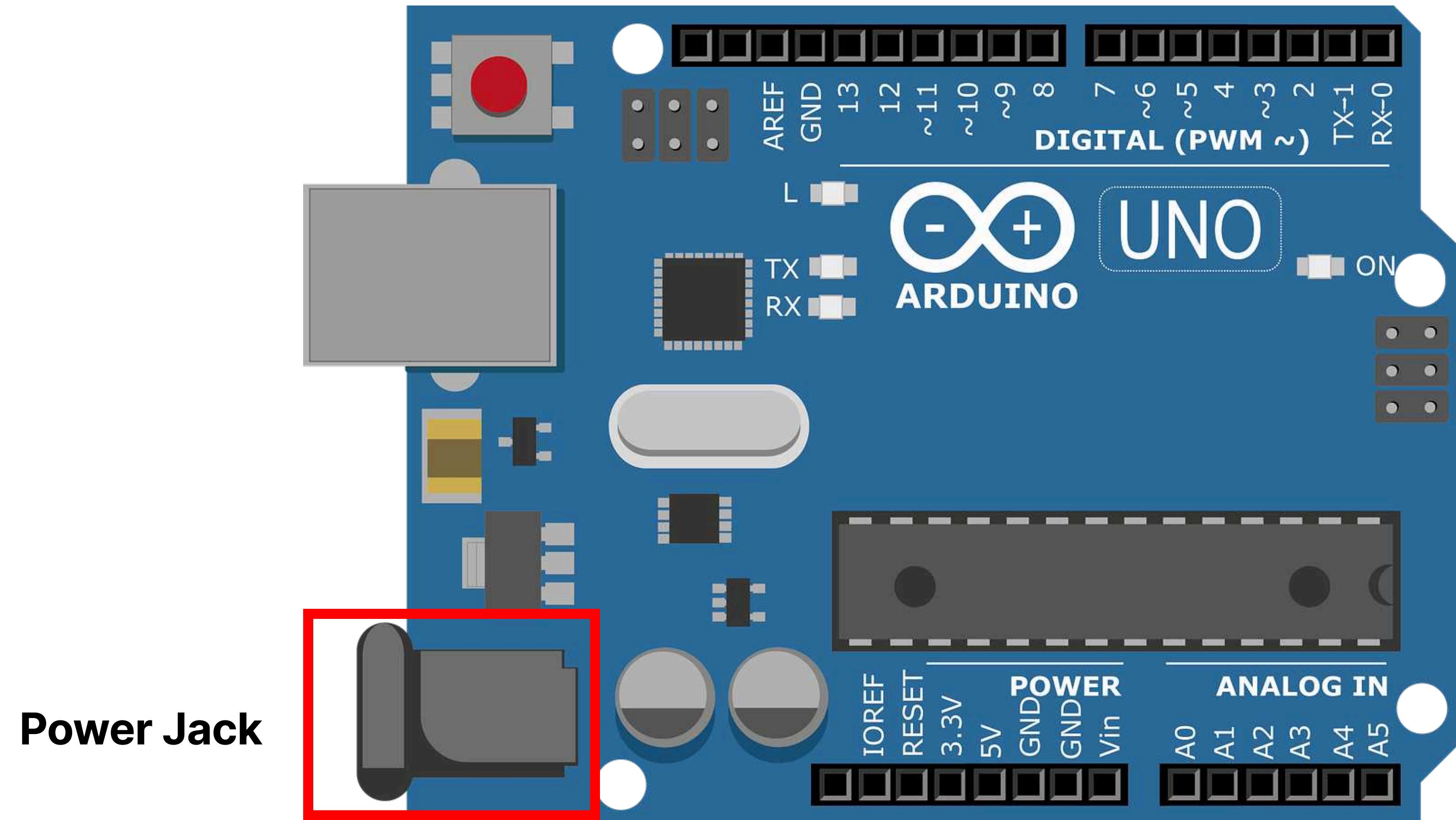


Microcontroller

Arduino Uno - What's on the board?

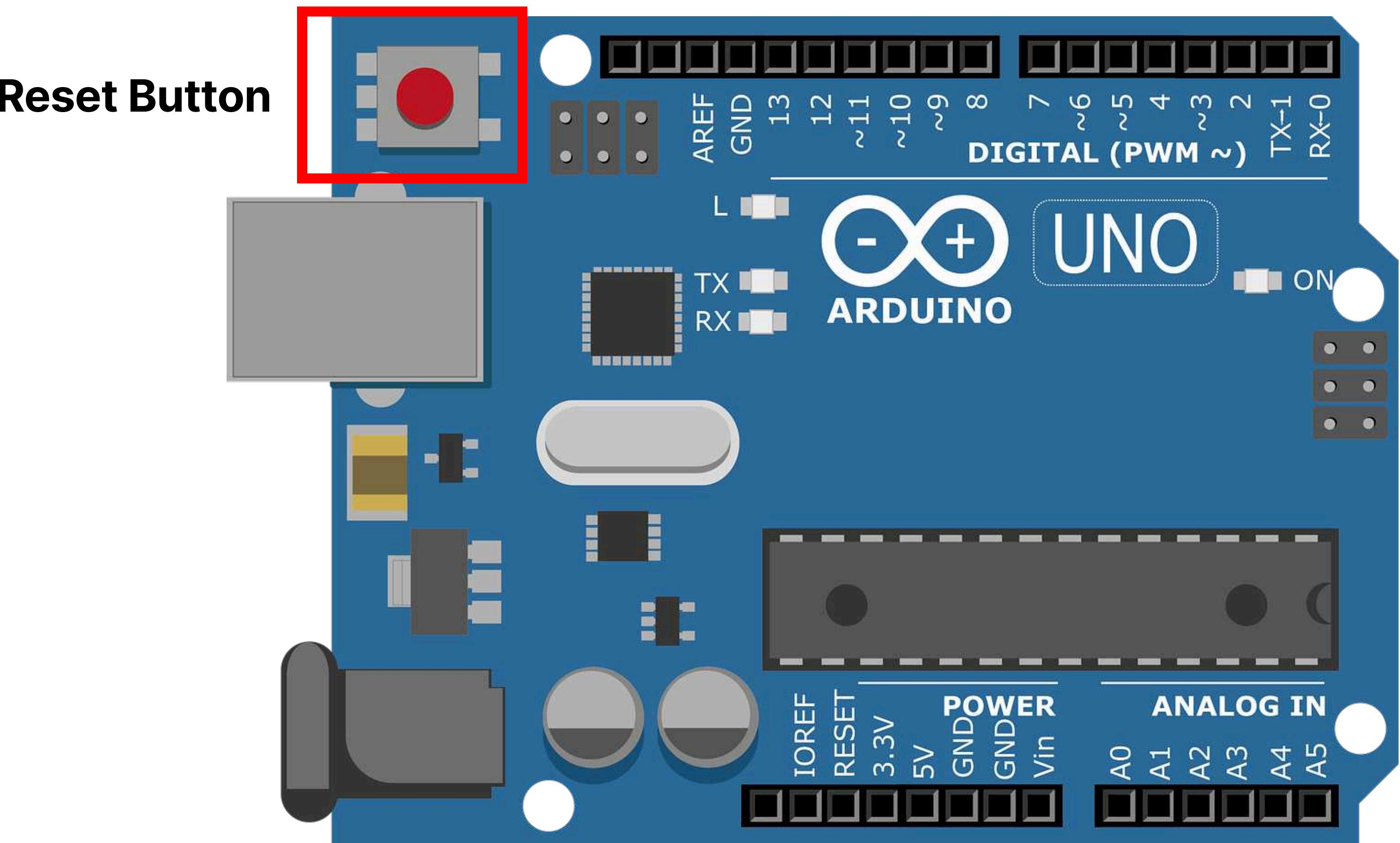


Arduino Uno - What's on the board?

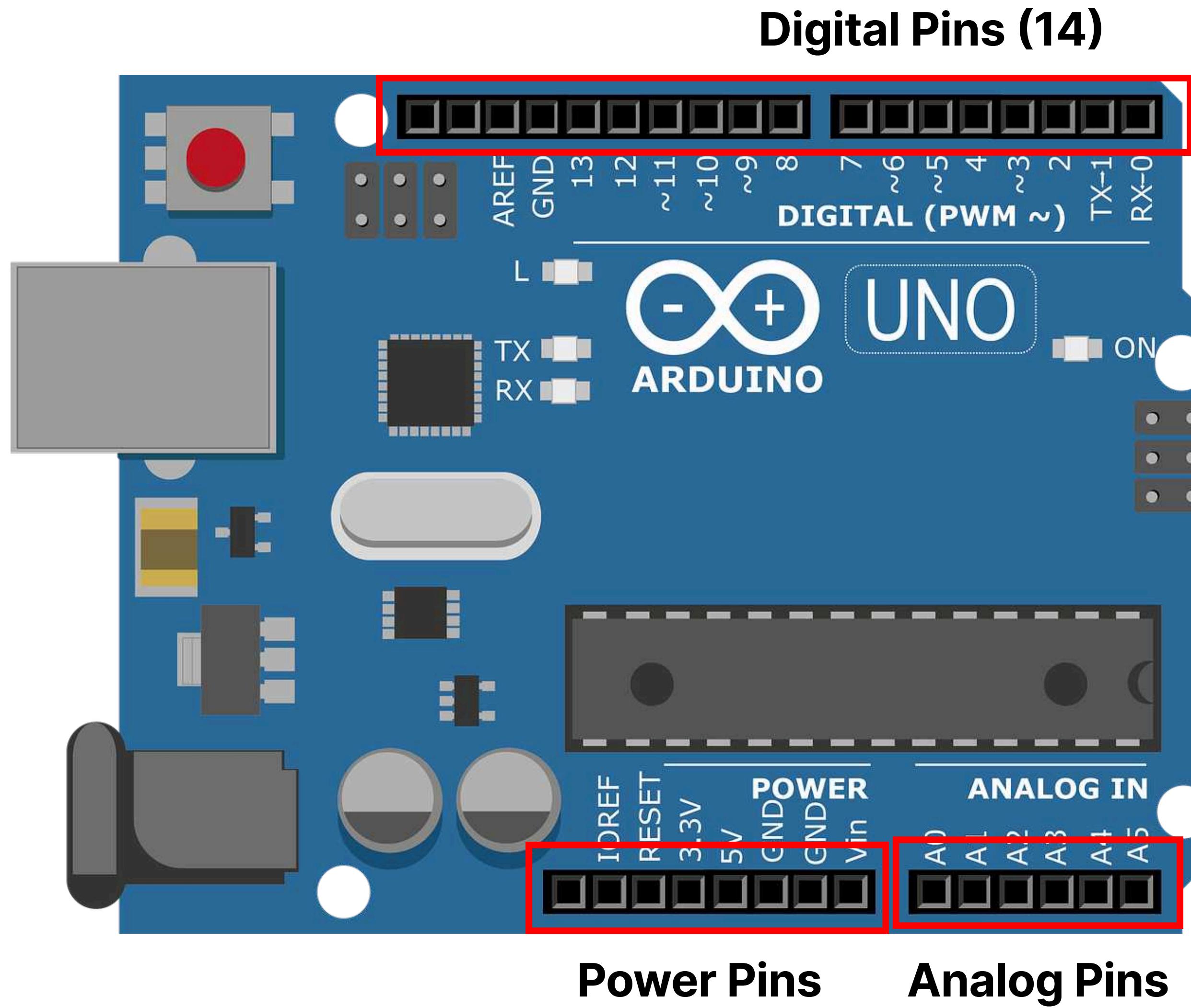


Power Jack

Arduino Uno - What's on the board?



Arduino Uno - What's on the board?

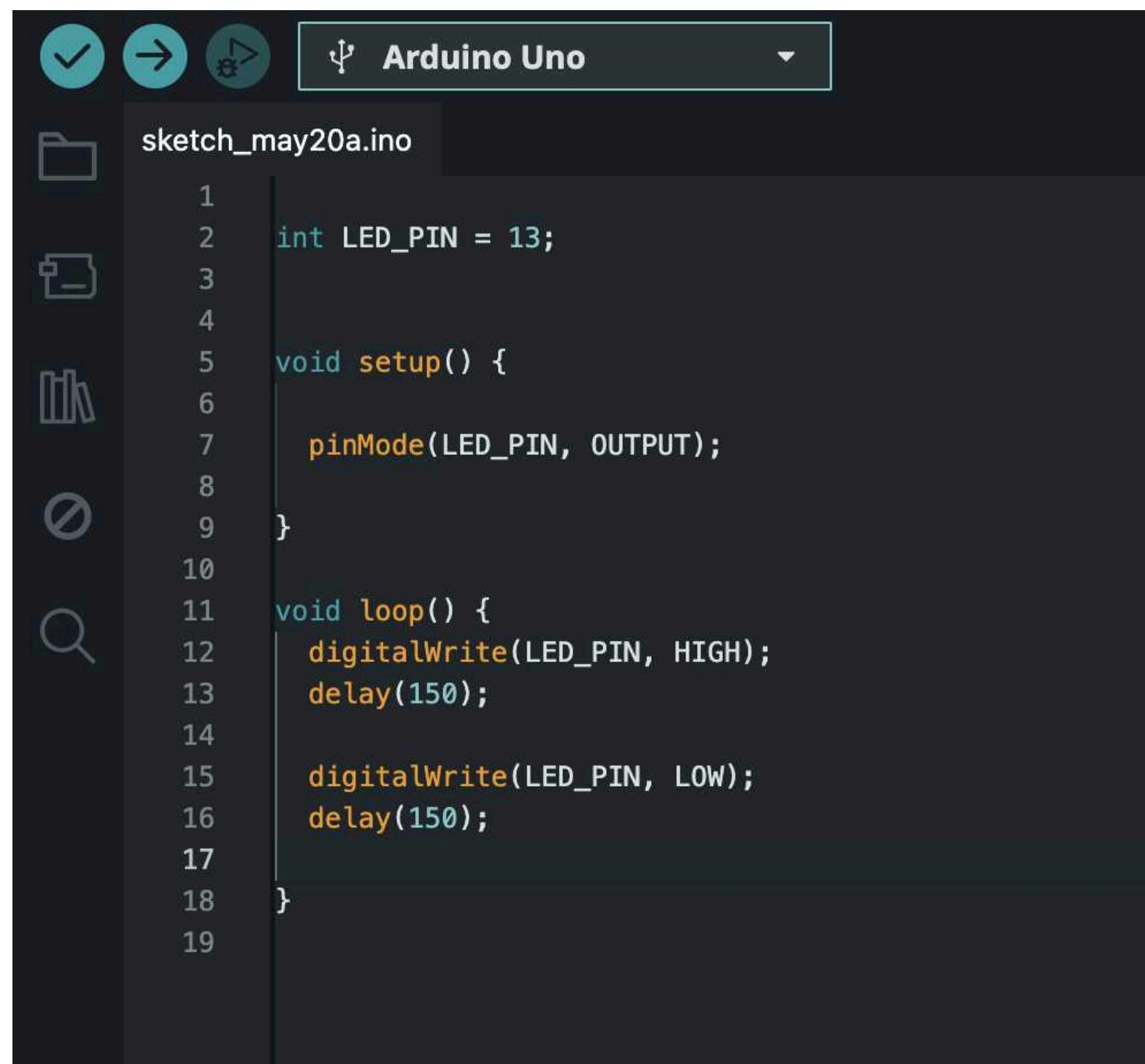


Arduino Uno - Official and Unofficial Boards

- Arduino is an open-source project, which means both its hardware and software designs are freely available for anyone to use and modify.
- As a result, many different manufacturers produce Arduino-compatible boards with variations in color, size, and layout.
- Despite these differences, the pin layout and core microcontroller functions remain the same, ensuring compatibility with Arduino code and shields.

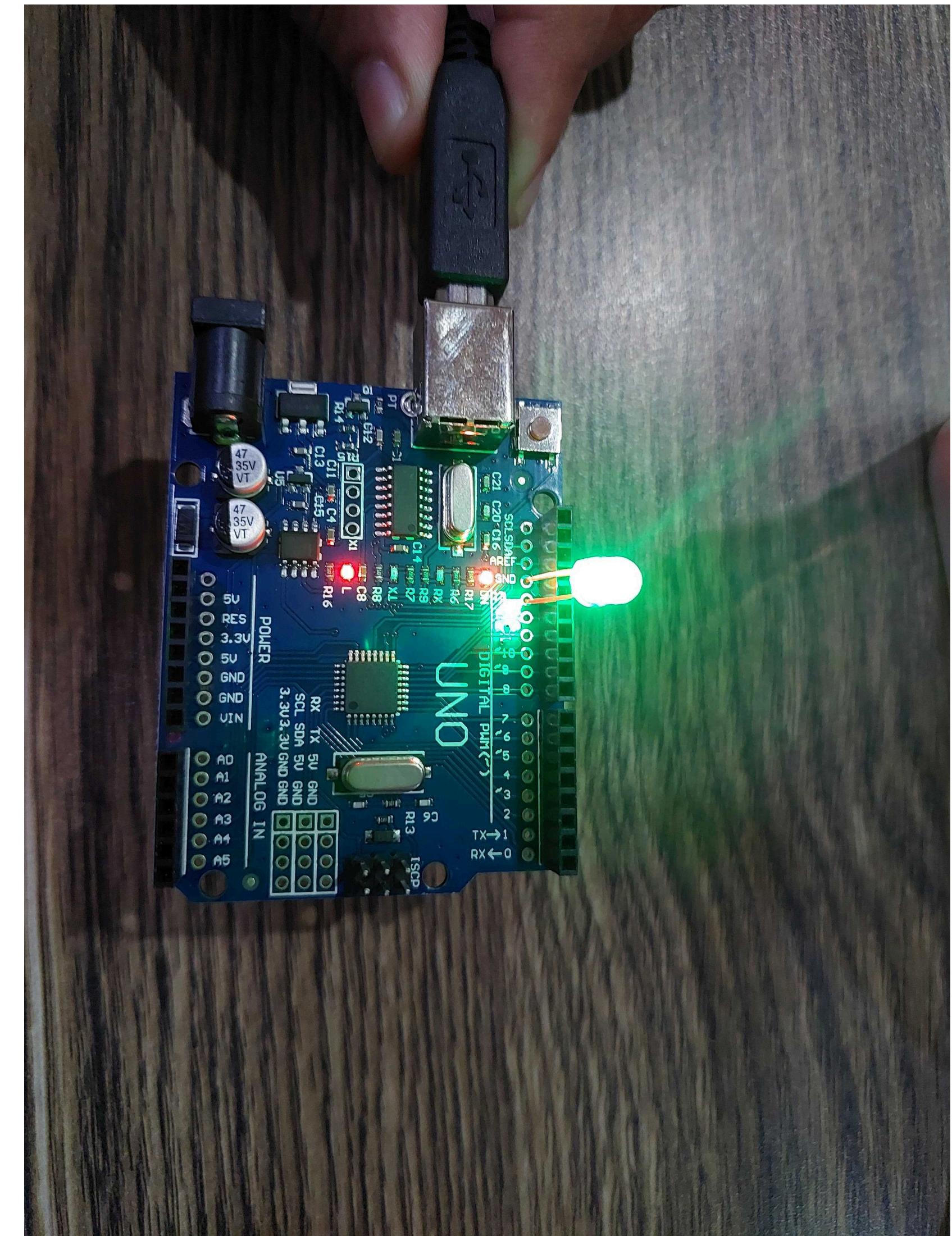
Arduino Second Project

- LED Blink Project
 - LED 1.7 Volt
 - Arduino UNO R3



The screenshot shows the Arduino IDE interface with the board selected as "Arduino Uno". The sketch name is "sketch_may20a.ino". The code is as follows:

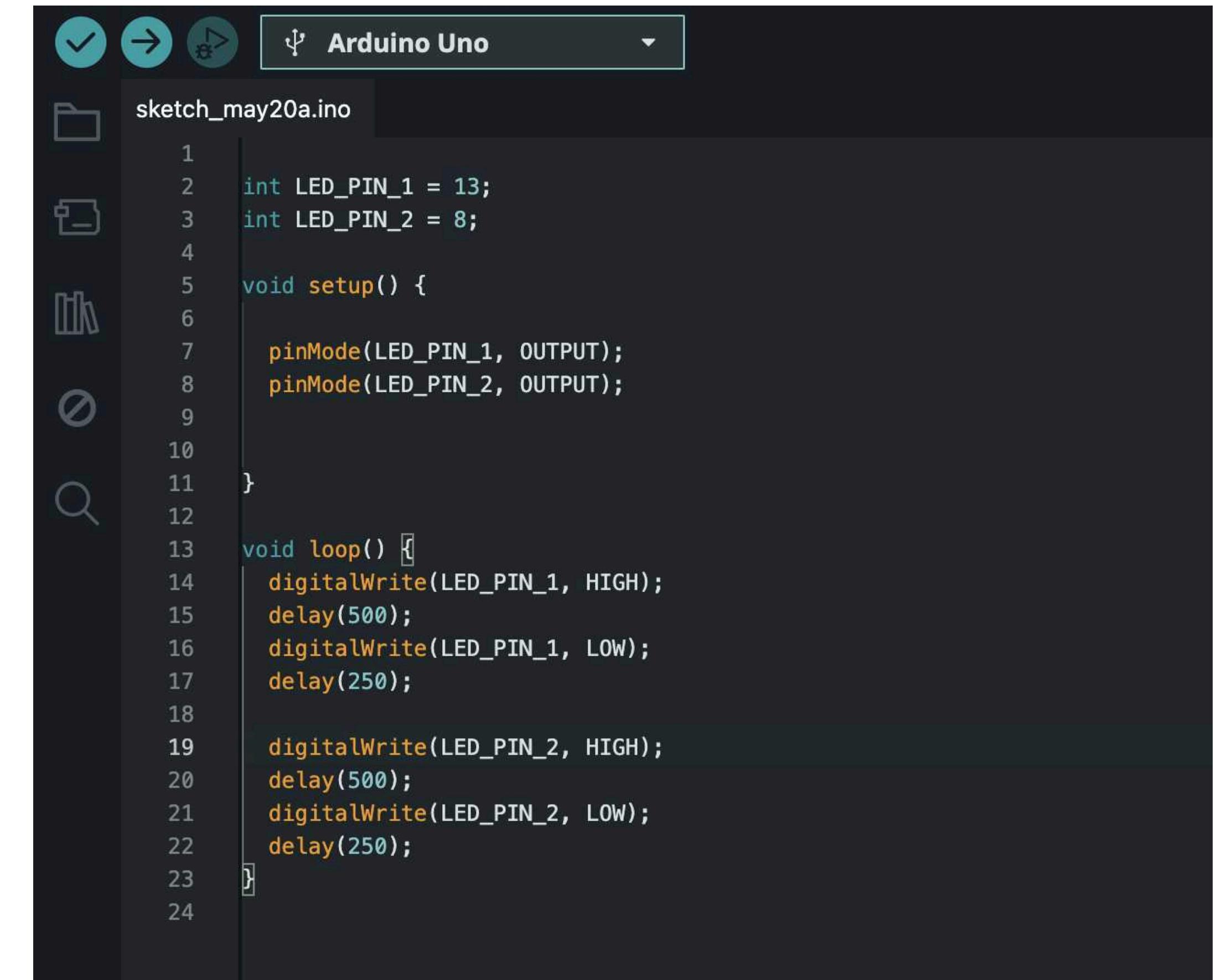
```
1 int LED_PIN = 13;
2
3 void setup() {
4     pinMode(LED_PIN, OUTPUT);
5 }
6
7 void loop() {
8     digitalWrite(LED_PIN, HIGH);
9     delay(150);
10
11    digitalWrite(LED_PIN, LOW);
12    delay(150);
13 }
```



Project Link: <https://wokwi.com/projects/431446192435208193>

Arduino Second Project

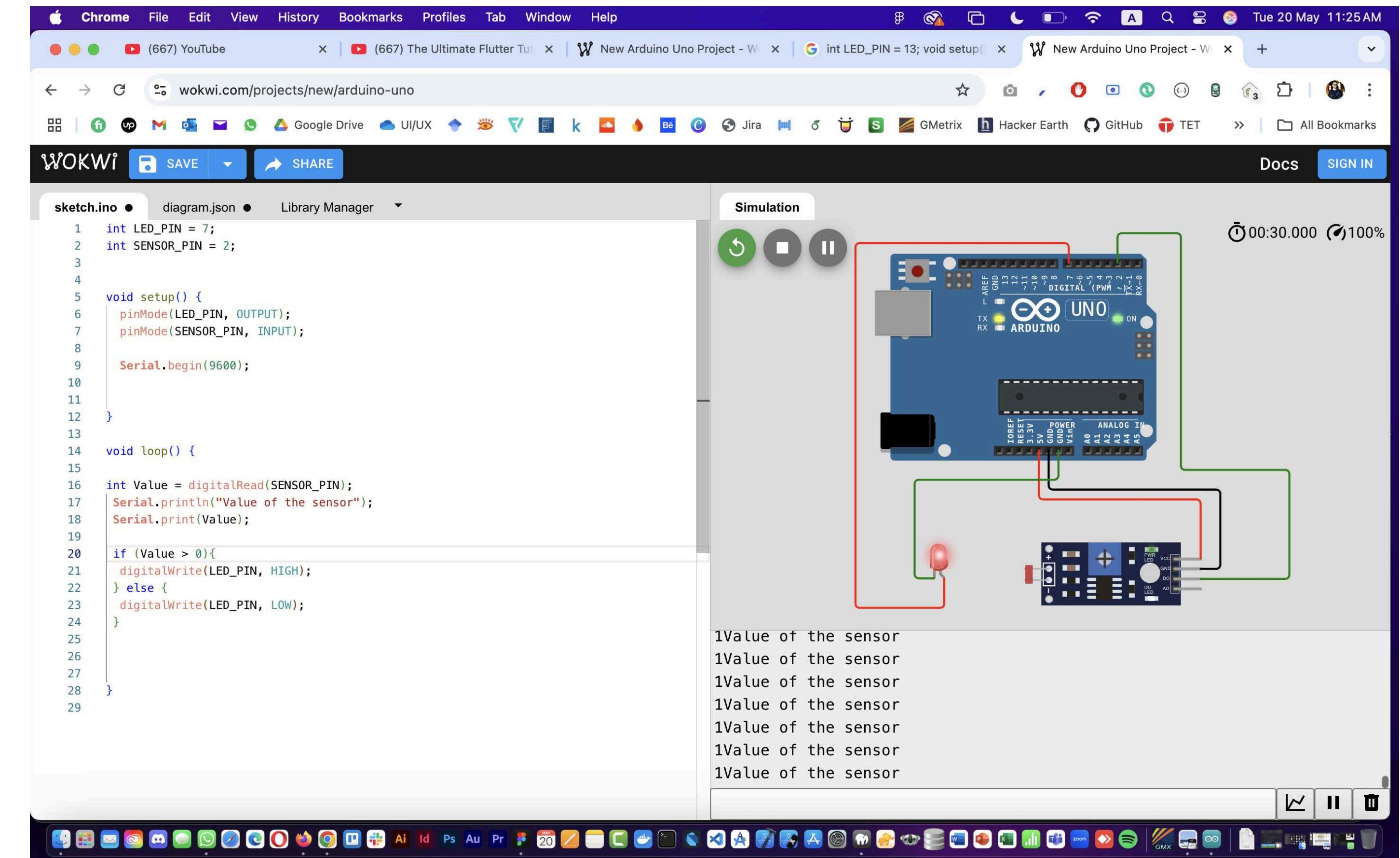
- Multiple LED Blink + Buzzer Alarm Project
 - LED 1.7 Volt x 2
 - Arduino UNO R3
 - Jumper Wire x 4
 - Breadboard Medium
 - Buzzer



```
1  int LED_PIN_1 = 13;
2  int LED_PIN_2 = 8;
3
4  void setup() {
5    pinMode(LED_PIN_1, OUTPUT);
6    pinMode(LED_PIN_2, OUTPUT);
7
8  }
9
10
11 }
12
13 void loop() {
14   digitalWrite(LED_PIN_1, HIGH);
15   delay(500);
16   digitalWrite(LED_PIN_1, LOW);
17   delay(250);
18
19   digitalWrite(LED_PIN_2, HIGH);
20   delay(500);
21   digitalWrite(LED_PIN_2, LOW);
22   delay(250);
23
24 }
```

Arduino Third Project

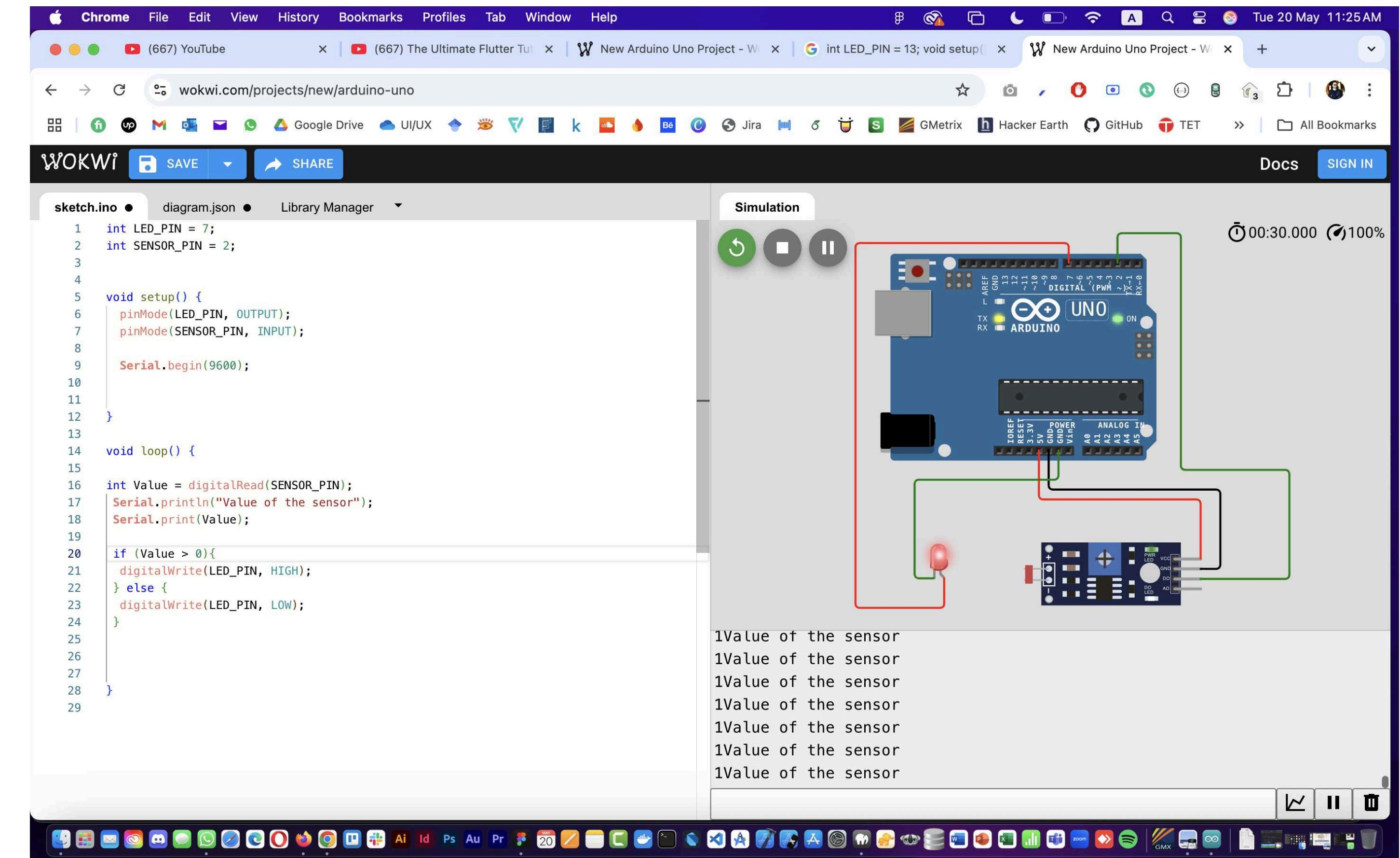
- Street Light Management Project
 - LED 1.7 Volt x 10
 - Arduino UNO R3
 - Jumper Wire x 5
 - Breadboard Medium
 - LDR Sensor Module



<https://wokwi.com/projects/431450786308747265>

Arduino Third Project

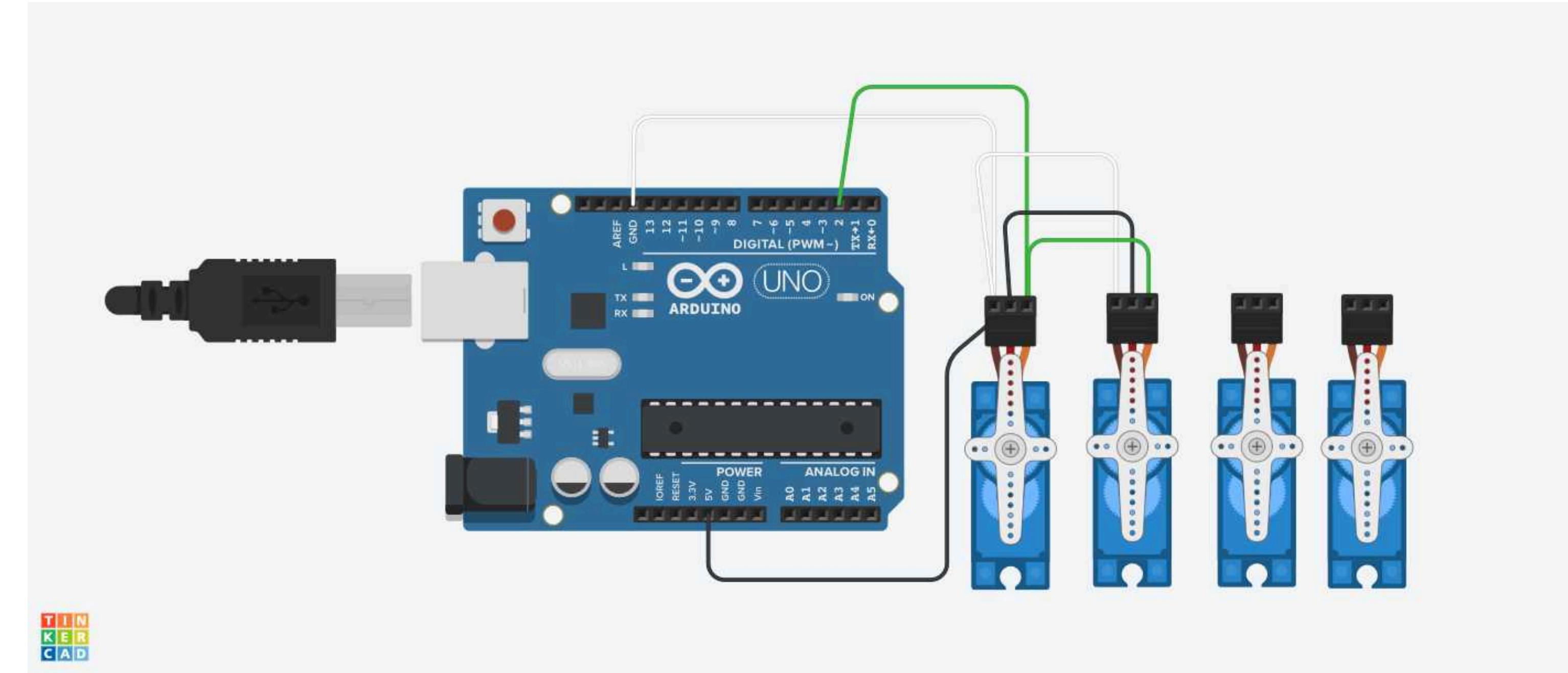
- Street Light Management Project
 - LED 1.7 Volt x 10
 - Arduino UNO R3
 - Jumper Wire x 5
 - Breadboard Medium
 - LDR Sensor Module



<https://wokwi.com/projects/431450786308747265>

Arduino Fourth Project

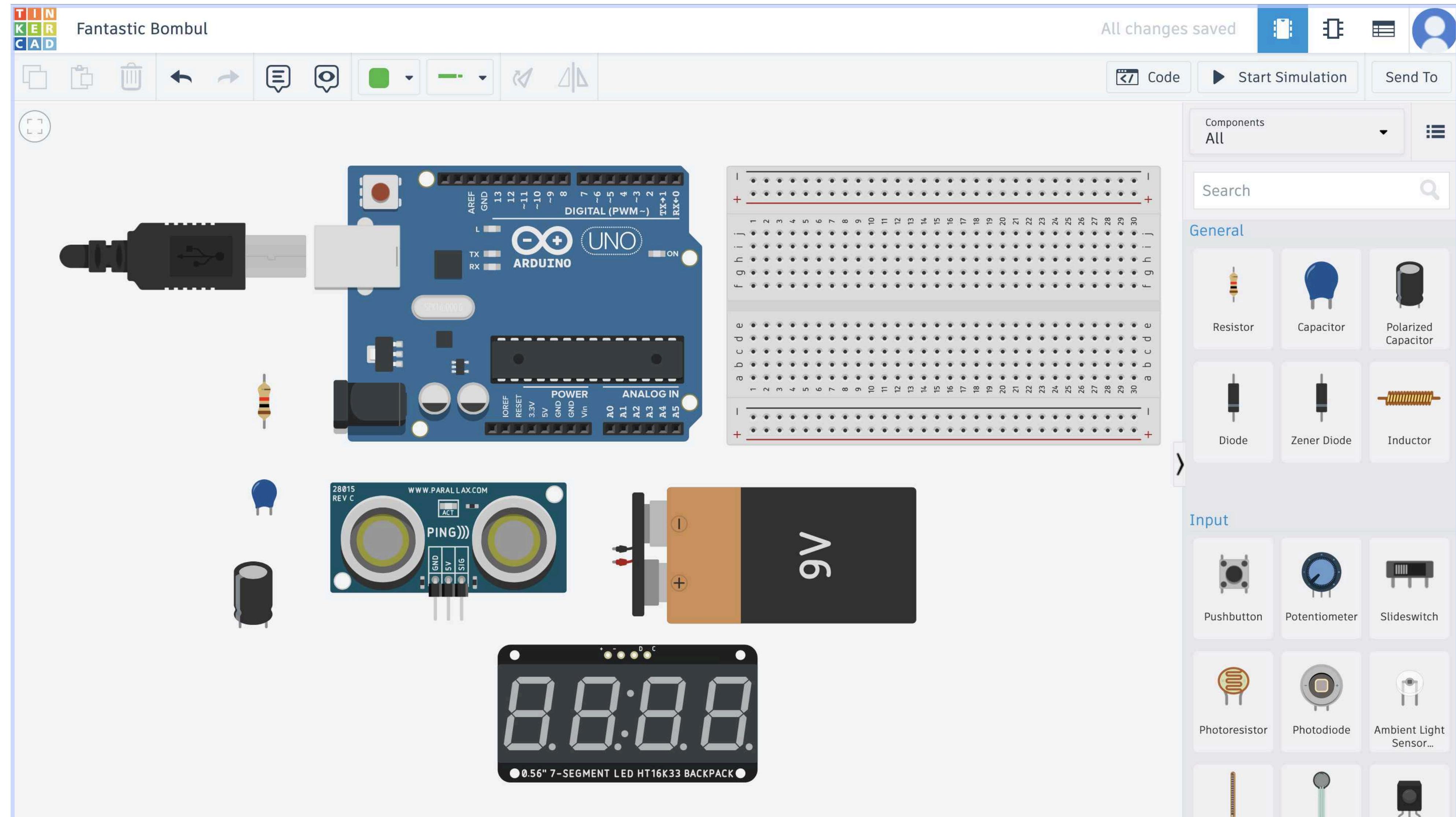
- Dancing Robot
 - Jumper Wires x 3 (each)
 - Arduino UNO R3
 - Servo Moto



https://www.tinkercad.com/things/019evOWdGwa/edit#?returnTo=%2Fdashboard%2Fdesigns%2Fcircuits&sharecode=hh-Og-nK0WkIIIB06NLIOThNZgi-I43_jyhoedwHilo

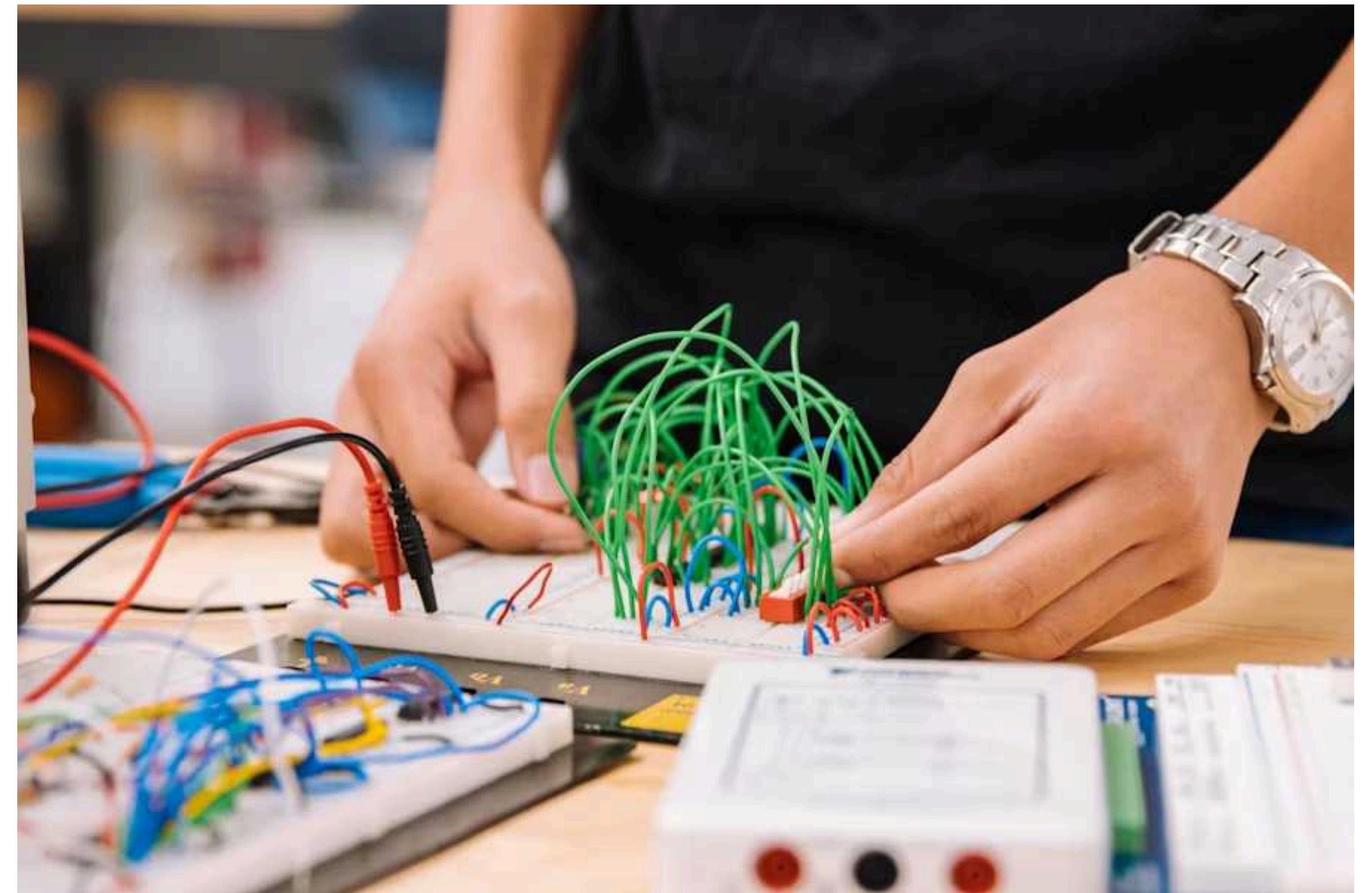
Online Simulation

<https://www.tinkercad.com>



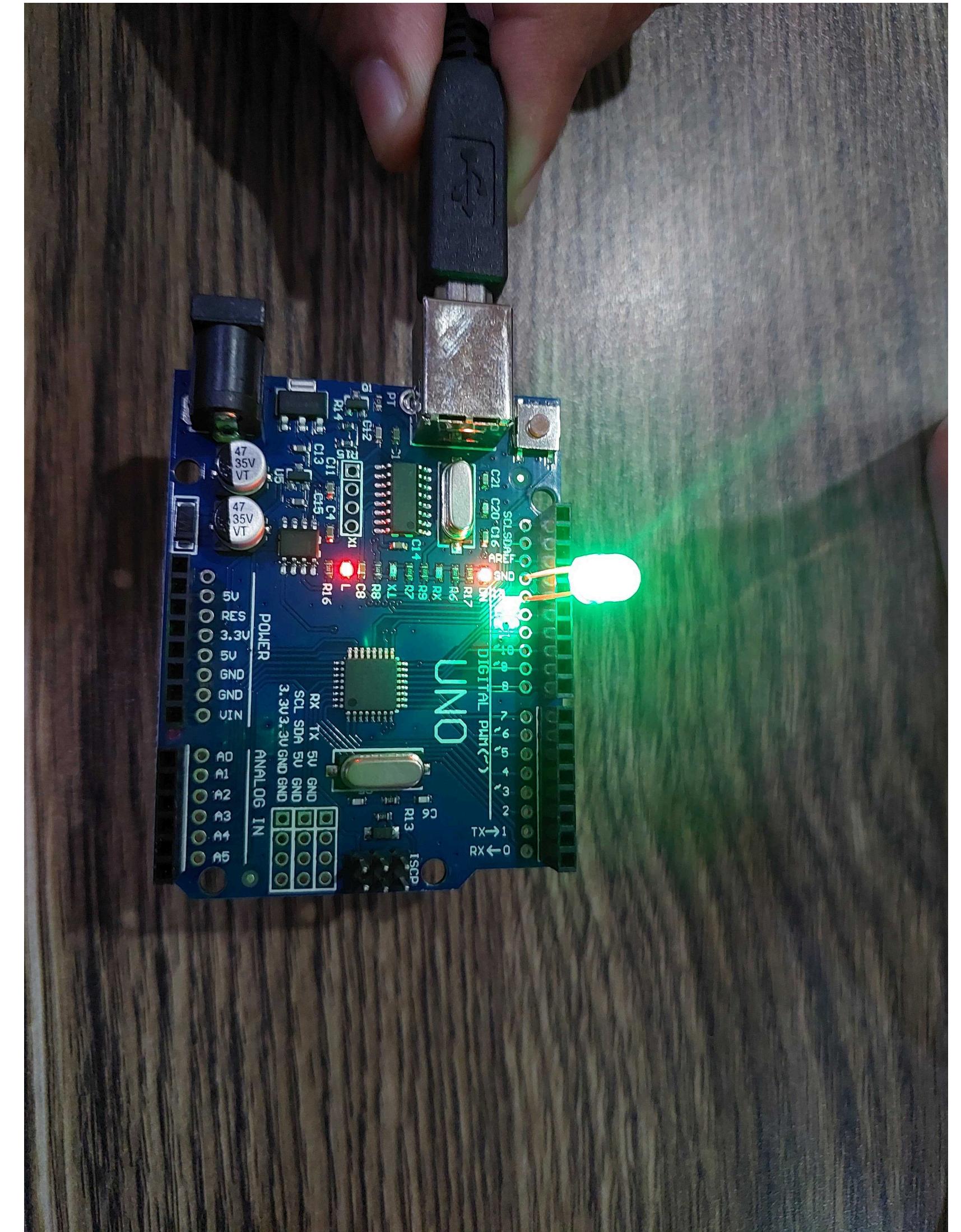
Introduction to STEM & Arduino

- **Science:** Explores how the world works
- **Technology:** Tools & programming to solve problems
- **Engineering:** Designing and building solutions
- **Mathematics:** Calculations & logic to make things work
- **Arduino:** A small programmable board to bring ideas to life



LED Blinking Patterns

- **STEM Integration**
 - **Science:** Circuit, current, resistance
 - **Technology:** Programming delays in Arduino
 - **Engineering:** Circuit design using LEDs & resistors
 - **Math:** Controlling time intervals (e.g., `delay(1000)`)
- **Skills Gained**
 - Logic building, circuit handling, timing control
- **Visual**
 - LED circuit diagram + blinking pattern illustration



Plant Watering System

- **STEM Integration**
 - **Science:** Soil moisture and plant health
 - **Technology:** Sensor + pump control using Arduino
 - **Engineering:** Building automated watering system
 - **Math:** Sensor values & decision thresholds (e.g., $< 300 \rightarrow$ ON pump)
- **Skills Gained**
 - Automation, real-world problem solving
- **Visual**
 - Photo/diagram of setup with labeled components

Vehicle Distance Alert System

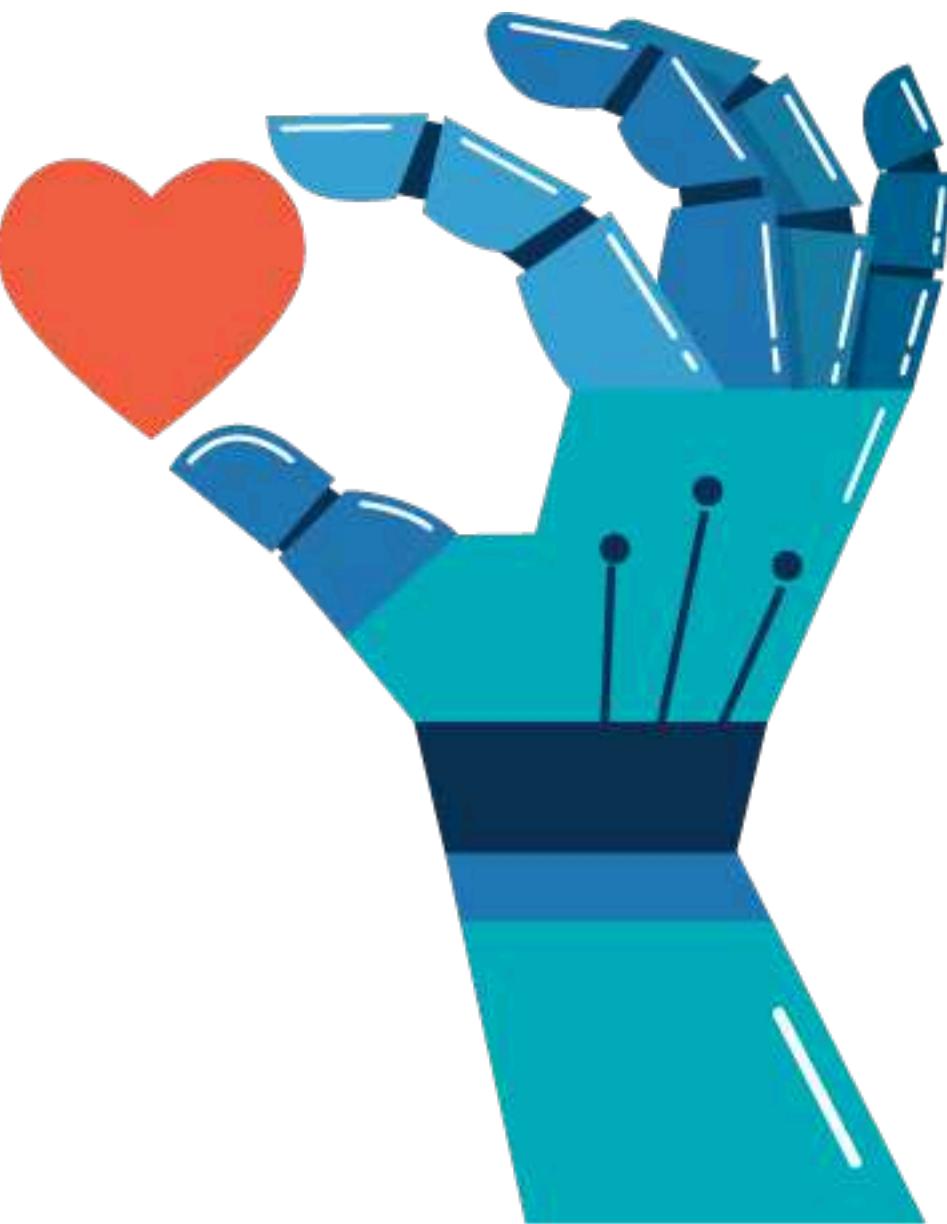
- **STEM Integration**
 - **Science:** Sound wave reflection & travel time
 - **Technology:** Ultrasonic sensor and buzzer
 - **Engineering:** Proximity-based alert system
 - **Math:** $\text{Distance} = (\text{Time} \times \text{Speed of Sound}) / 2$
- **Skills Gained**
 - Real-time sensing, alert logic
- **Visual**
 - Car proximity diagram with sensor + buzzer

“Start small, build big — Your ideas can change the world!”



Questions?

**Thank
You**



jamil.57@hotmail.com