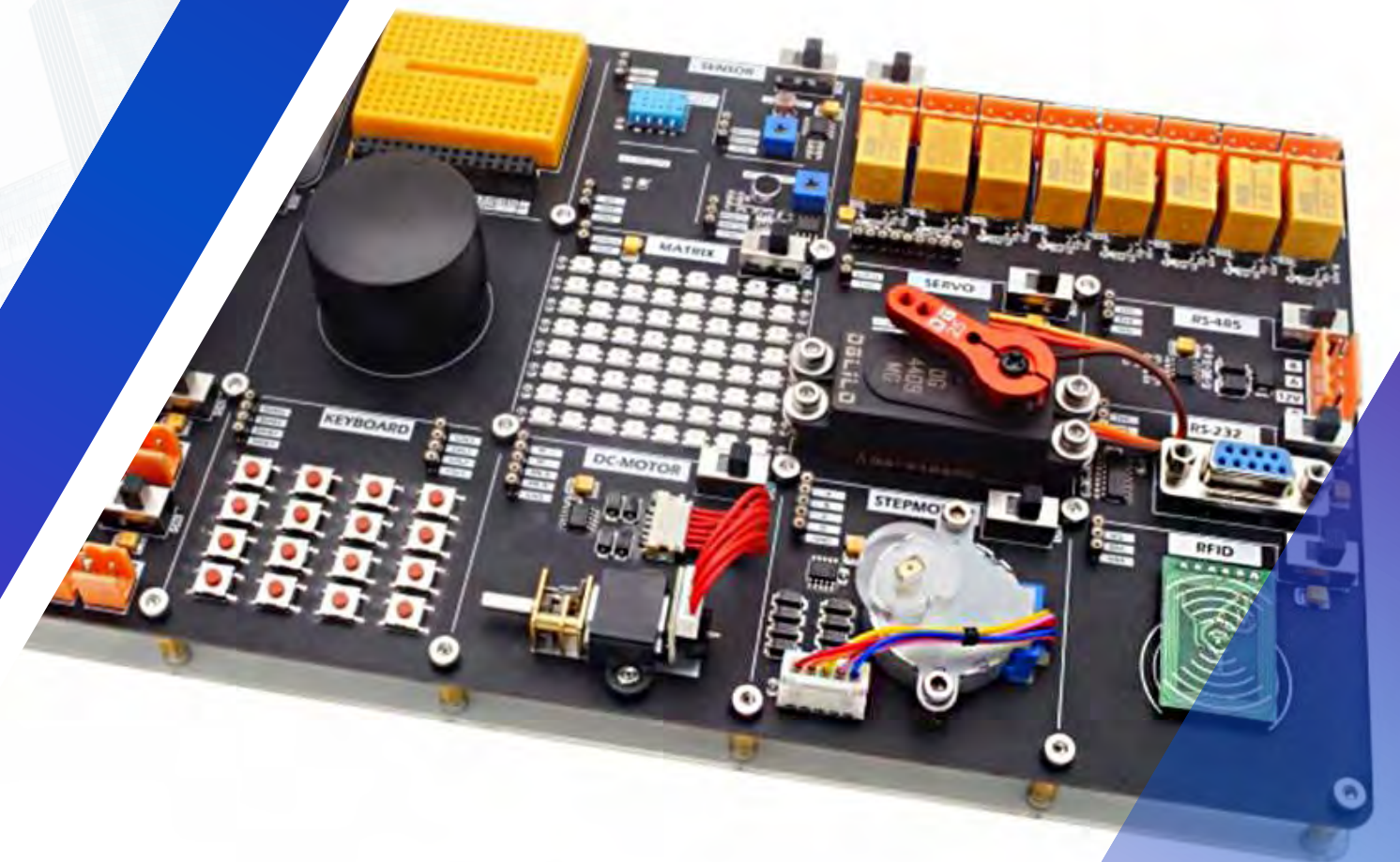
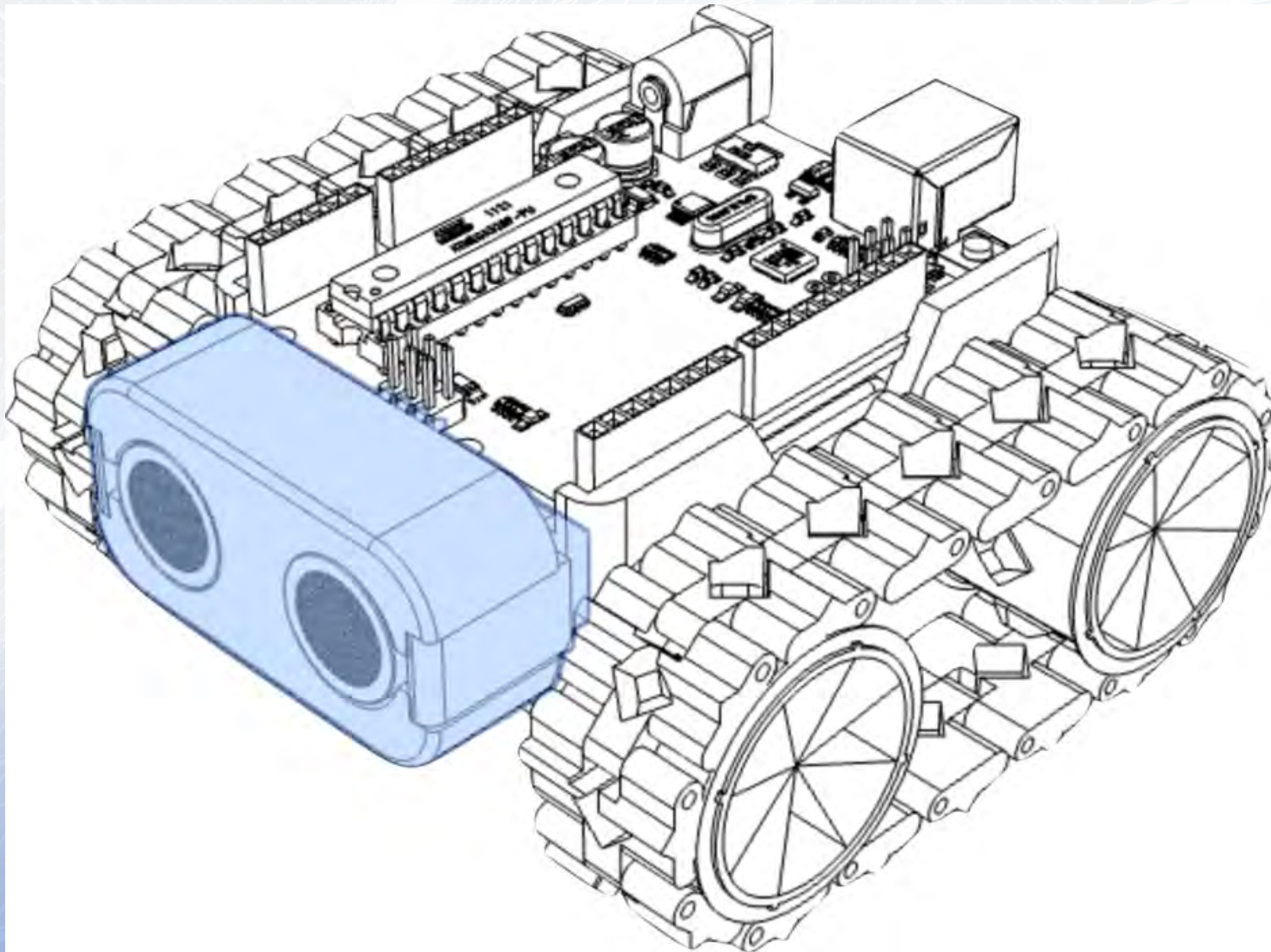


RBE2001 Sensor and Attenuator

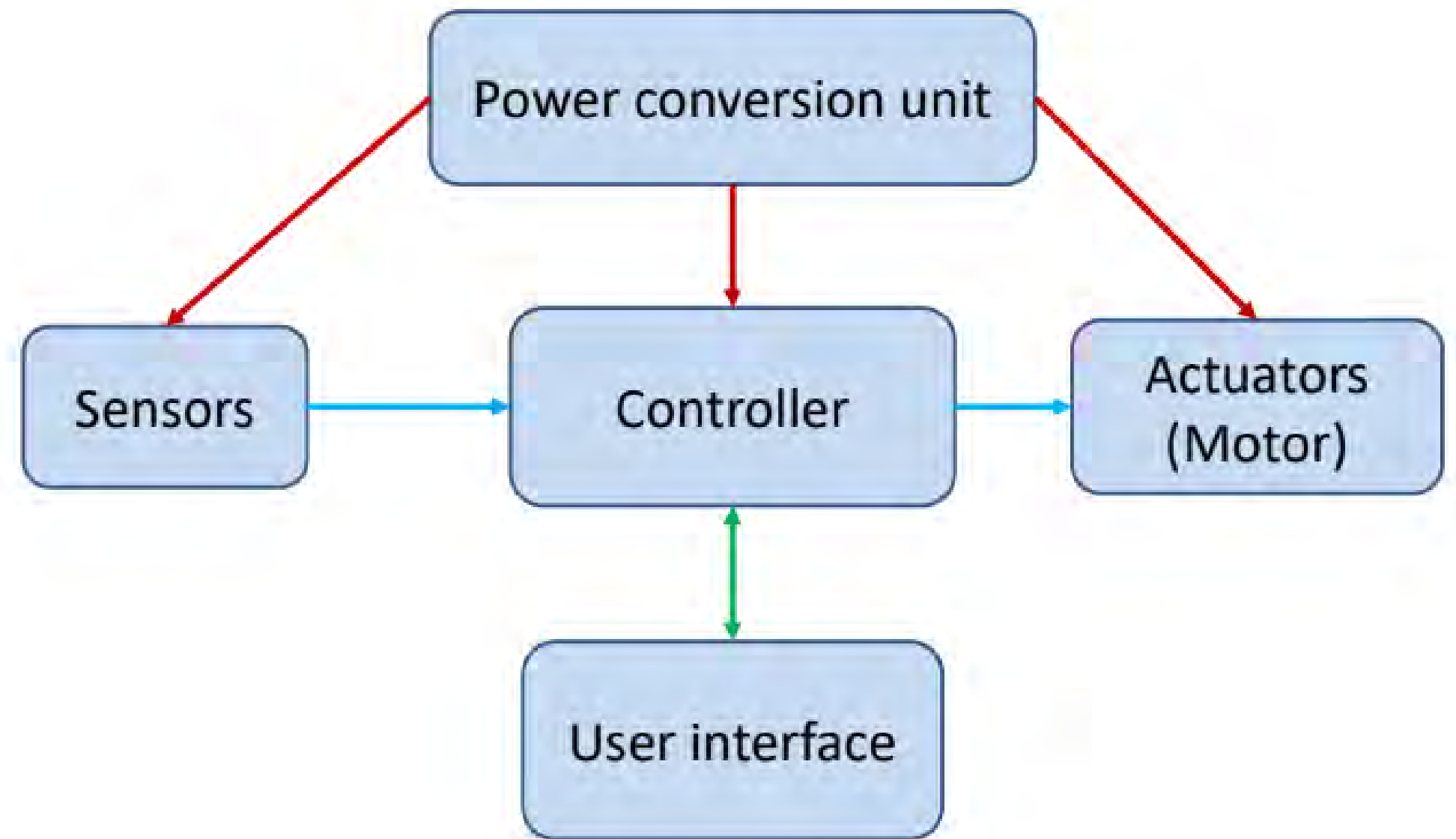
Microcontroller for Sensor Embedded & IOT M5Stack

Presented by Aphirak Thitinaruemit,
D.Eng - 2024





Key Components



Human senses and Machine sensations

Add more text

Five senses	Sight	Hearing	Smell	Taste	Touch
As behavior	-See the thing -Feel the light	-Listen the sound -Feel the shaking -Take the balance	-Smell the thing	-Feel the taste	-By touching, feel the heat, force, or texture
Sensory organ as human	Eye 	Ear 	Nose 	Tongue 	Skin 
Typical sensors as machinery	-Image sensor -Light intensity sensor	-Acoustic sensor -Ultrasonic sensor	-Gas component sensor	-Liquid component sensor	-Tactile sensor -Pressure sensor -Temperature sensor -Humidity sensor -Displacement sensor



Human senses and Machine sensations

Add more text

The Sensors

Provides information about the outside world to the Robot:

Robots need sensors to detect, measure and provide input to the brain so it can make decisions

Common sensors include:

- Switches and buttons
- Range finders
- Temperature, Humidity sensors
- Infrared & Ultrasonic sensors
- Lasers
- Cameras
- Microphones



M5Stack

The Brain (Processor)

Runs programs, connects to sensors and motors

Most robots have a computer or micro-controller to perform the instructions from the program

The 'brain' could just be a simple circuit, without a central processing unit (CPU)

Common microcontrollers include:

- M5STACK (ESP32)
- BBC micro:bit
- Raspberry Pi Pico
- Arduino Uno
- NodeMCU (ESP8266)

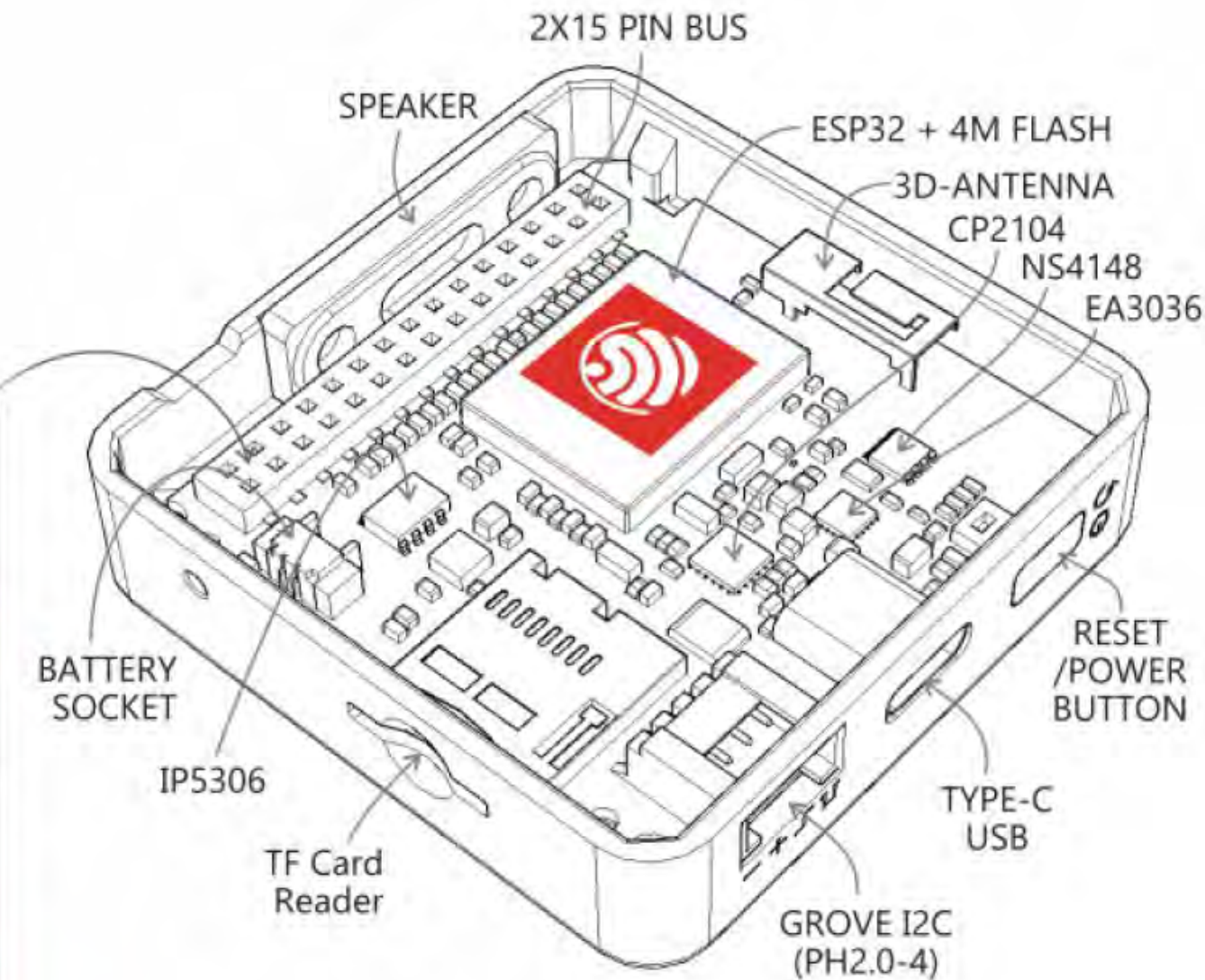
This days we uses an M5STACK (ESP32) for its brain



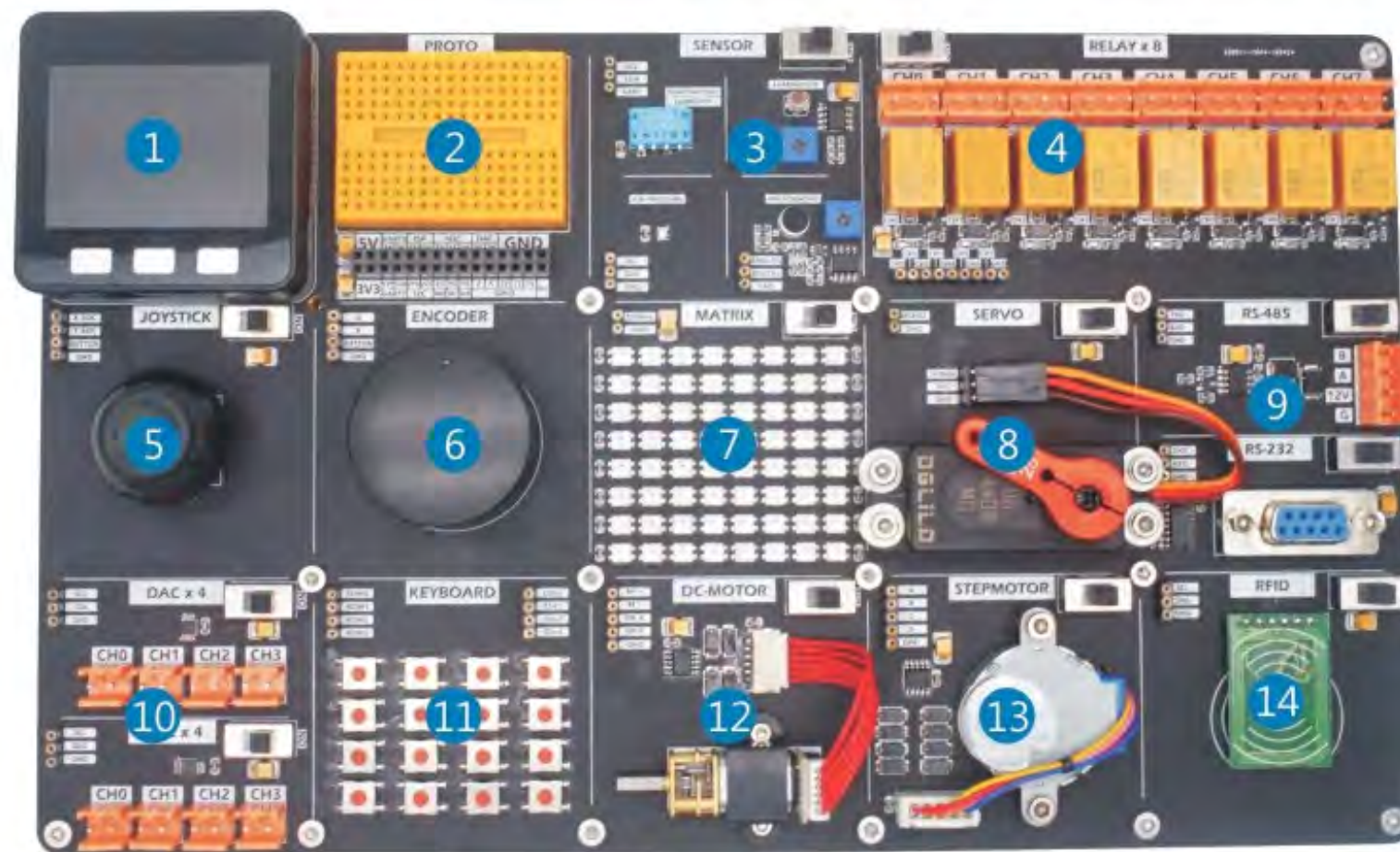
NX-M5Stack Universal IOT Experiment Kit for ESP32



M BUS					
GND	ADC	G35			
GND	ADC	G36			
GND	RST	EN			
G23	MOSI	DAC/SPK	G25		
G19	MISO	DAC	G26		
G18	SCK	3.3V			
G3	RXD0	TXD0	G1		
G16	RXD2	TXD2	G17		
G21	SDA	SCL	G22		
G2	GPIO	GPIO	G5		
G12	IIS_SK	IIS_WS	G13		
G15	IISOUT	IIS_MK	G0		
HPWR	IIS_IN	G34			
HPWR	5V				
HPWR	BATTERY				



NX-M5Stack Universal IOT Experiment Kit for ESP32



- | | | | |
|------------------|-----------------|--------------|------------|
| 1: CORE | 2: PROTO | 3: SENSOR | 4: RELAYx8 |
| 5: JOYSTICK | 6: ENCODER | 7: MATRIX | 8: SERVO |
| 9: RS-485/RS-232 | 10: DACx4/ADCx4 | 11: KEYBOARD | |
| 12: DC-MOTOR | 13: STEPMOTOR | 14: RFID | |

Schematic

[M5IoT-kit](#)

Arduino

[Click to download example code](#)

[Tutorial&PDF](#)

https://m5stack.oss-cn-shenzhen.aliyuncs.com/resource/docs/Demo-Board_en.pdf

- ซอฟต์แวร์ Arduino เวอร์ชันล่าสุดสำหรับ
- M5Stack Basic IOT

[ดาวน์โหลด Arduino1.8.16_Setup211210.exe สำหรับ Windows](#)

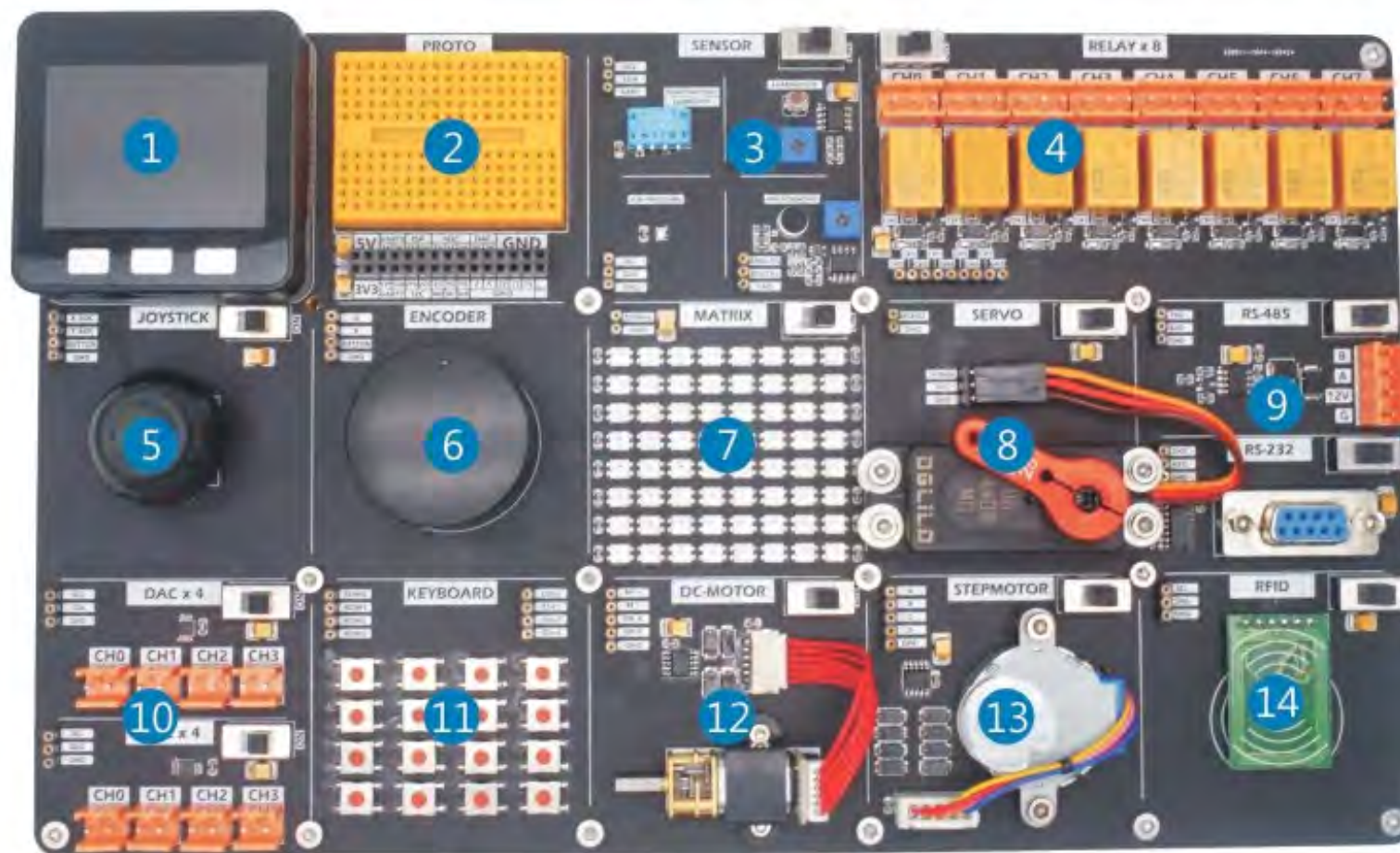
[ดาวน์โหลด Arduino1.8.12_Baseline_Setup200410.dmg สำหรับ MAC OS X](#)

[ดาวน์โหลด Arduino1.8.19_Baseline_Setup.exe สำหรับ Windows เฉพาะส่วนบอร์ดกลุ่ม AVR](#)

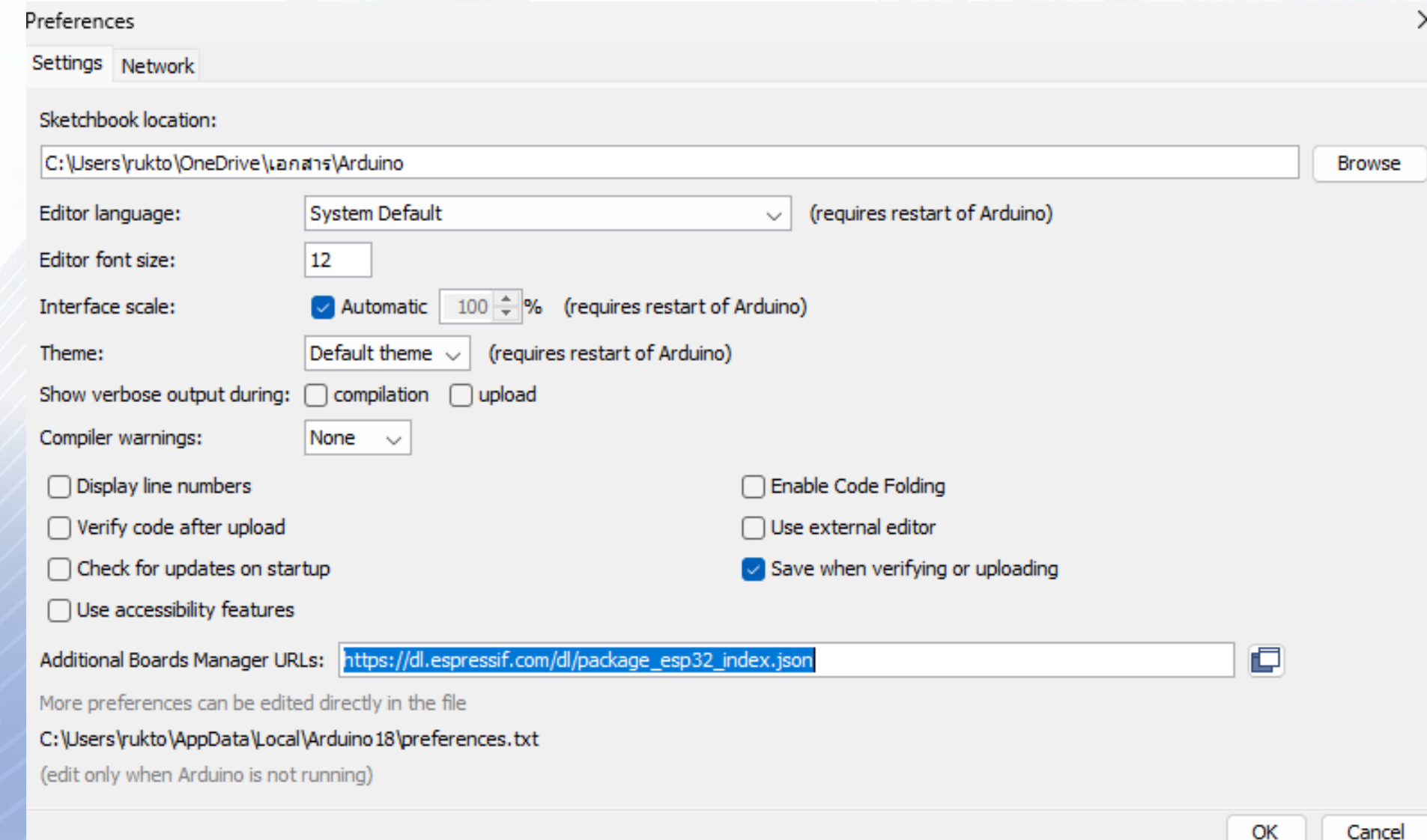
NX-M5Stack Universal IOT Experiment Kit for ESP32

Additional Board Manager : NX-M5Stack (ESP32) in Arduino IDE

https://dl.espressif.com/dl/package_esp32_index.json



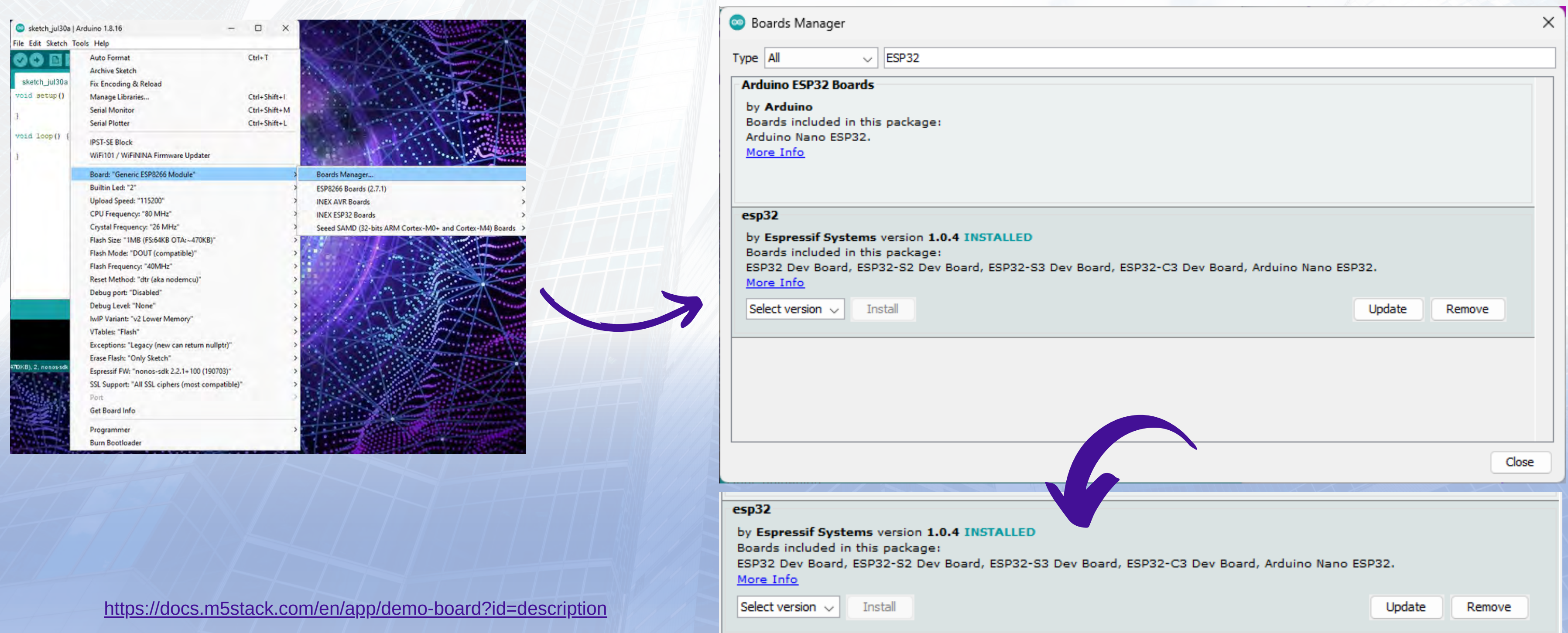
- 1: CORE 2: PROTO 3: SENSOR 4: RELAYx8
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NX-M5Stack Universal IOT Experiment Kit for ESP32

Additional Board Manager : NX-M5Stack (ESP32) in Arduino IDE

https://dl.espressif.com/dl/package_esp32_index.json



The image shows the Arduino IDE interface. On the left, the 'Tools' menu is open, and 'Board: "Generic ESP8266 Module"' is selected. The 'Boards Manager...' option is highlighted in the dropdown menu. A blue arrow points from this menu to the 'Boards Manager' window on the right. The 'Boards Manager' window shows the 'Type' set to 'All' and 'ESP32' selected. Under 'Arduino ESP32 Boards', it lists boards by Arduino. Under 'esp32', it lists boards by Espressif Systems version 1.0.4, which is marked as 'INSTALLED'. The boards included are: ESP32 Dev Board, ESP32-S2 Dev Board, ESP32-S3 Dev Board, ESP32-C3 Dev Board, and Arduino Nano ESP32. There are 'Select version', 'Install', 'Update', and 'Remove' buttons for this package. A blue arrow points from the 'Install' button to a larger view of the 'esp32' package details at the bottom.

sketch_jul30a | Arduino 1.8.16

File Edit Sketch Tools Help

Auto Format Ctrl+T

Archive Sketch

Fix Encoding & Reload

Manage Libraries... Ctrl+Shift+I

Serial Monitor Ctrl+Shift+M

Serial Plotter Ctrl+Shift+L

IPST-SE Block

WiFi101 / Wi-FiNINA Firmware Updater

Board: "Generic ESP8266 Module"

Built-in LED: "2"

Upload Speed: "115200"

CPU Frequency: "80 MHz"

Crystal Frequency: "26 MHz"

Flash Size: "1MB (FS:64KB OTA:~470KB)"

Flash Mode: "DOUT (compatible)"

Flash Frequency: "40MHz"

Reset Method: "dtr (aka nodemcu)"

Debug port: "Disabled"

Debug Level: "None"

Wi-Fi Variant: "v2 Lower Memory"

VTables: "Flash"

Exceptions: "Legacy (new can return nullptr)"

Erase Flash: "Only Sketch"

Espressif FW: "nonos-sdk 2.2.1+100 (190703)"

SSL Support: "All SSL ciphers (most compatible)"

Port

Get Board Info

Programmer

Burn Bootloader

Boards Manager...

ESP8266 Boards (2.7.1)

INEX AVR Boards

INEX ESP32 Boards

Seeed SAMD (32-bits ARM Cortex-M0+ and Cortex-M4) Boards

Boards Manager

Type All ESP32

Arduino ESP32 Boards

by **Arduino**

Boards included in this package:

Arduino Nano ESP32.

[More Info](#)

esp32

by **Espressif Systems** version **1.0.4 INSTALLED**

Boards included in this package:

ESP32 Dev Board, ESP32-S2 Dev Board, ESP32-S3 Dev Board, ESP32-C3 Dev Board, Arduino Nano ESP32.

[More Info](#)

Select version Install Update Remove

Close

esp32

by **Espressif Systems** version **1.0.4 INSTALLED**

Boards included in this package:

ESP32 Dev Board, ESP32-S2 Dev Board, ESP32-S3 Dev Board, ESP32-C3 Dev Board, Arduino Nano ESP32.

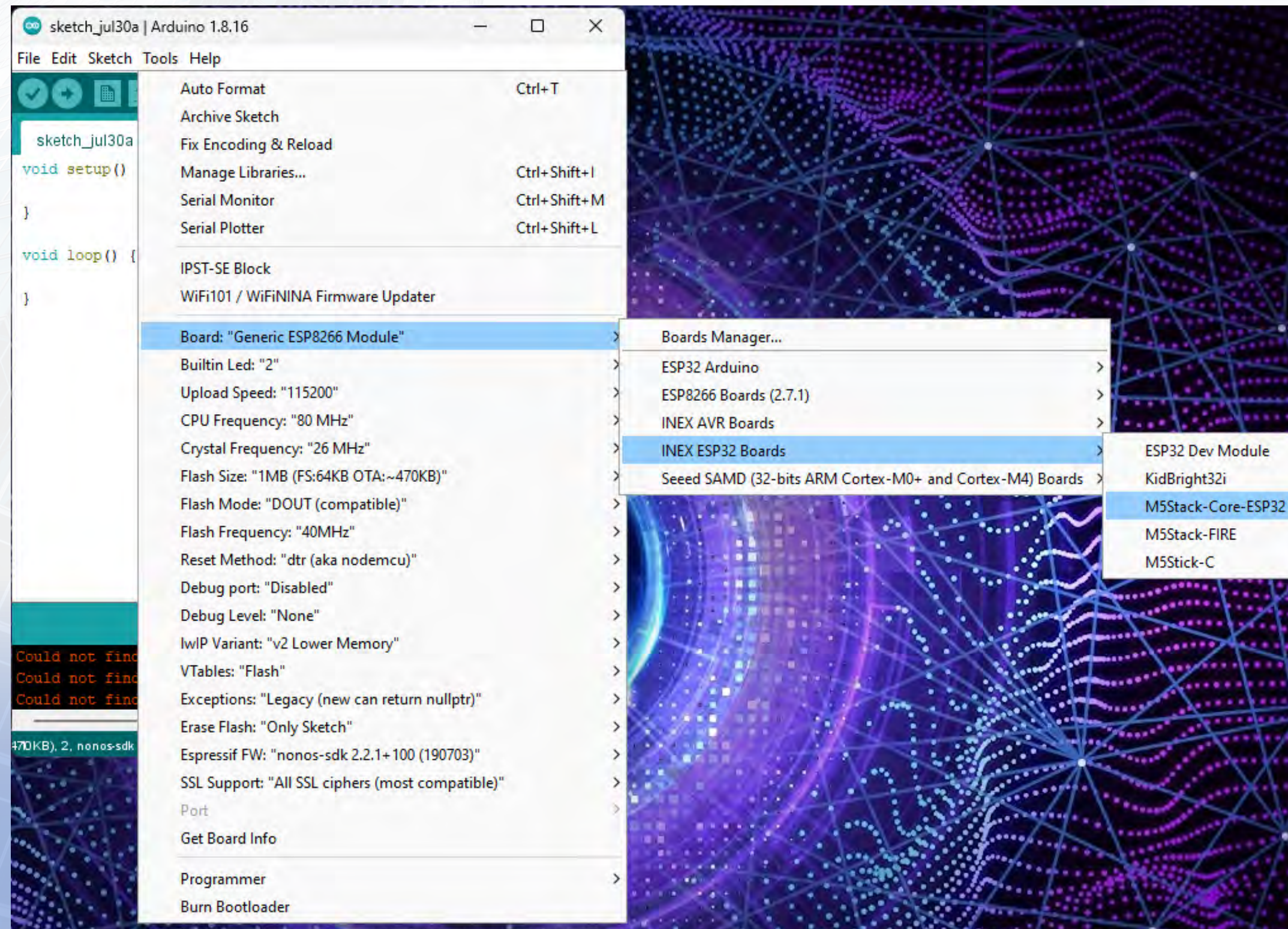
[More Info](#)

Select version Install Update Remove

<https://docs.m5stack.com/en/app/demo-board?id=description>

NX-M5Stack Universal IOT Experiment Kit for ESP32

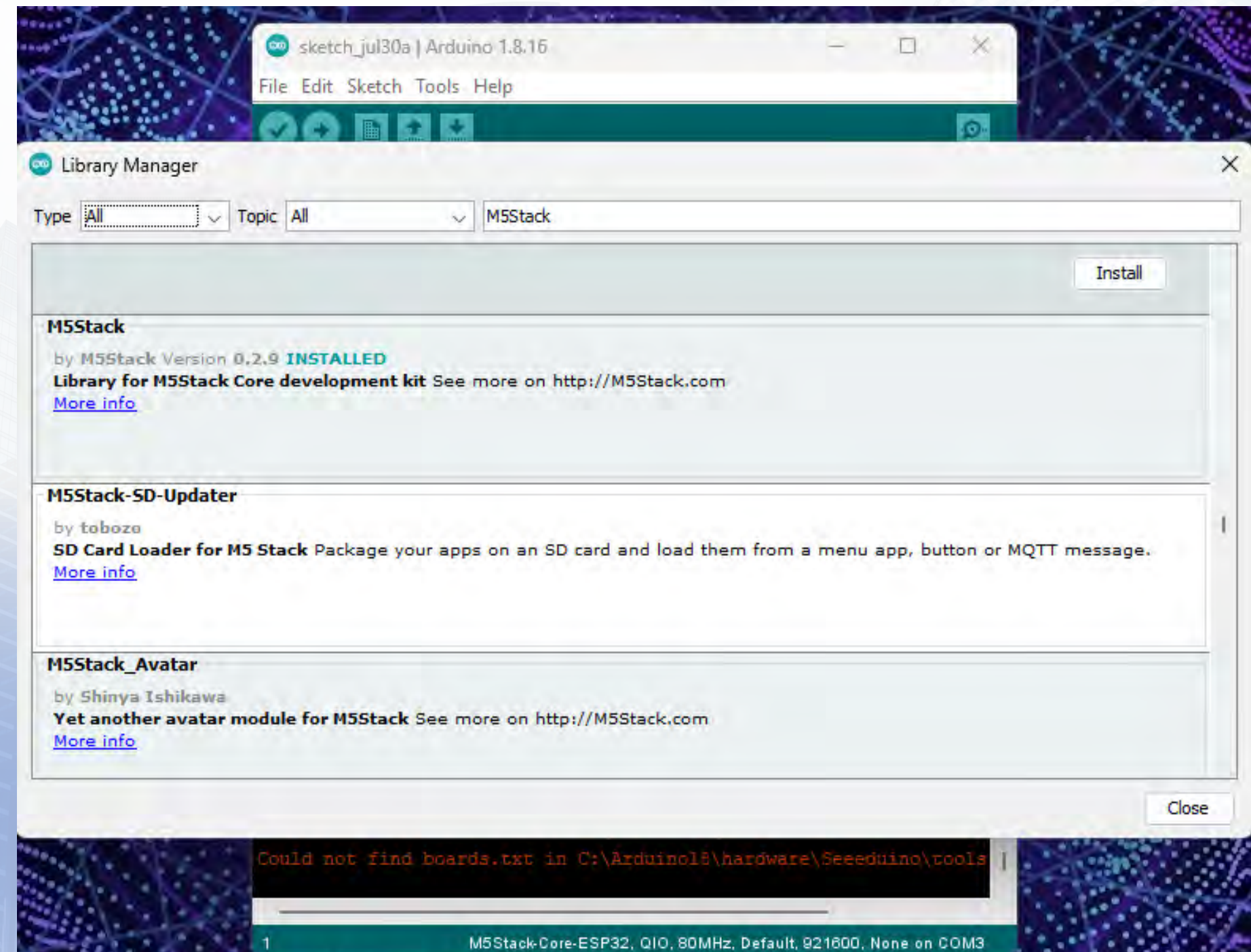
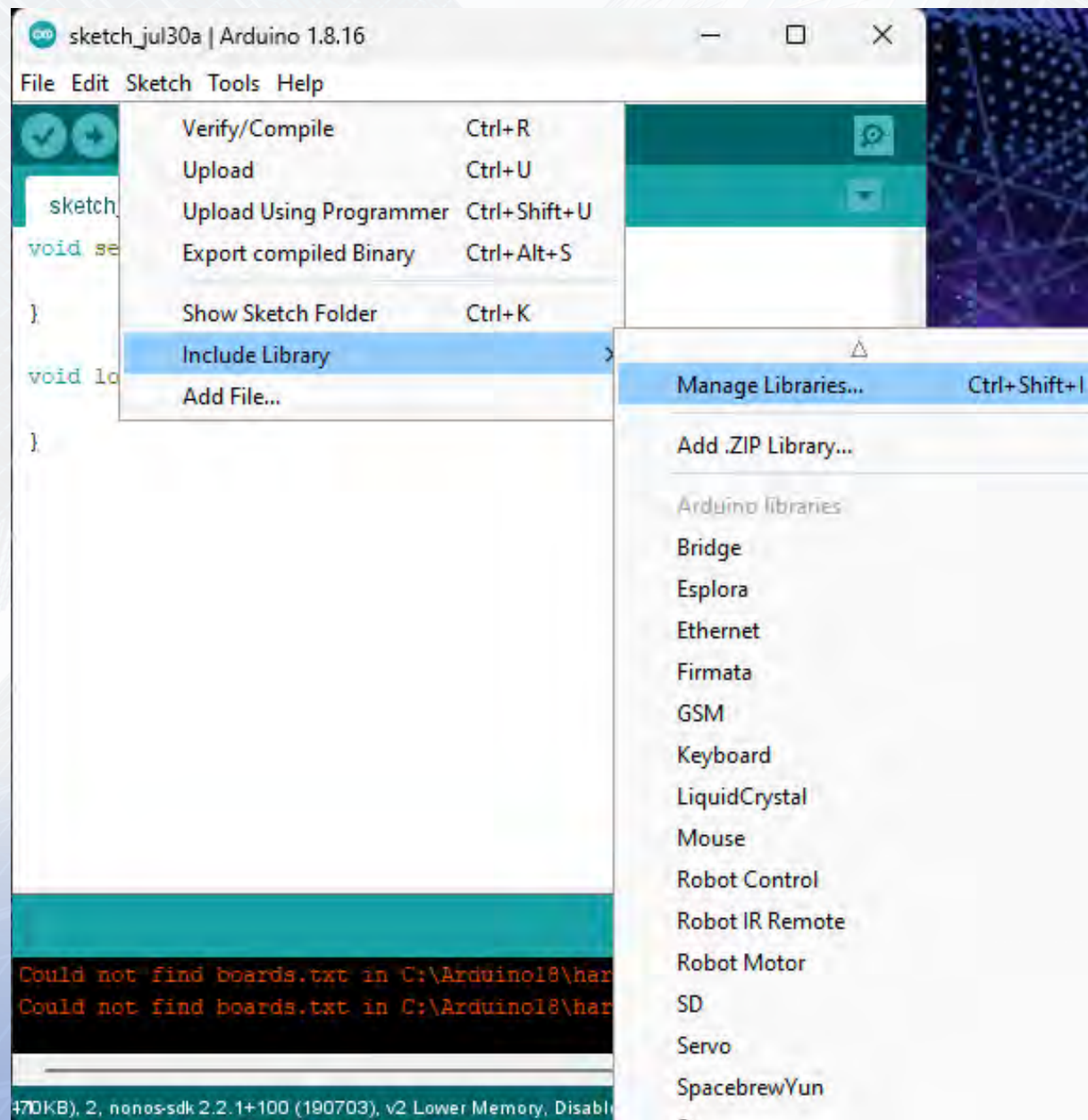
Additional Board Manager : NX-M5Stack (ESP32) in Arduino IDE



NX-M5Stack Universal IOT Experiment Kit for ESP32

Install Library M5Stack

Find Keyword “M5Stack” by M5Stack and Select version 0.2.9



NX-M5Stack Universal IOT Experiment Kit for ESP32

Manual M5Stack (Demo code)

⌋

NX-M5Stack Universal IOT Experiment Kit for ESP32

Test the LCD via M5Stack (Demo code)

```
#include <M5Stack.h>

void setup(){

  M5.begin();
  M5.Lcd.setTextSize(3);
}

void loop() {
  M5.Lcd.setCursor(20, 60);
  M5.Lcd.setTextColor(WHITE,BLACK);
  M5.Lcd.print("Hello World");
  delay(1000);
  M5.Lcd.clear(BLACK);
  M5.Lcd.setTextColor(RED,BLACK);
  M5.Lcd.setCursor(0, 100);
  M5.Lcd.print("M5Stack Screen");
  delay(1000);
  M5.Lcd.clear(BLACK);
  M5.Lcd.setCursor(0, 150);
  M5.Lcd.setTextColor(ORANGE,BLACK);
  M5.Lcd.print("Robotics Eng.");
  delay(1000);
  M5.Lcd.clear(BLACK);
}
```



MINI Project for Collabarative learning

Use Microcontroller board :
M5Stack (ESP-32)
Design 2 or more of Sensor to
Operate.

Show output of Concept.



Scenario: Automatic Greenhouse Monitoring and Control System

In this scenario, we'll use the M5Stack board to create a system that monitors and controls the temperature, humidity, and lighting in a greenhouse. This system will use multiple sensors and devices to automate the environment.

Components Used:

- M5Stack Core: The main board for controlling and displaying data.
- DHT11 or DHT22: A sensor for measuring temperature and humidity.
- Relay Module: Controls the on/off state of electrical devices like fans and lights.
- Light Sensor (BH1750): Measures the intensity of light in the greenhouse.
- Fan: Used to control air circulation based on the temperature.
- LED or Light Bulb: Used to control lighting conditions in the greenhouse