



Wio Terminal – Part 1

Installation & Tests

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TinyML4D Academic Network Co-Chair



UNIFEI

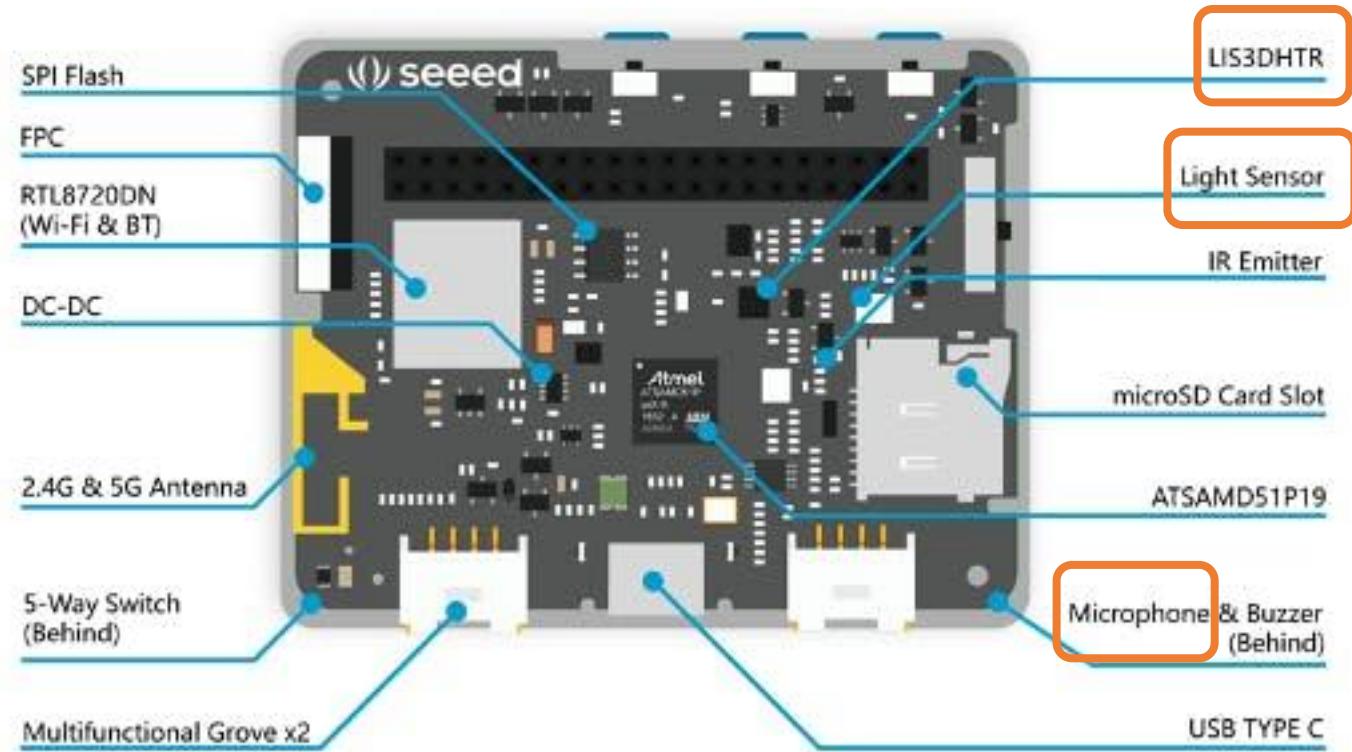
The Wio Terminal

The Wio Terminal

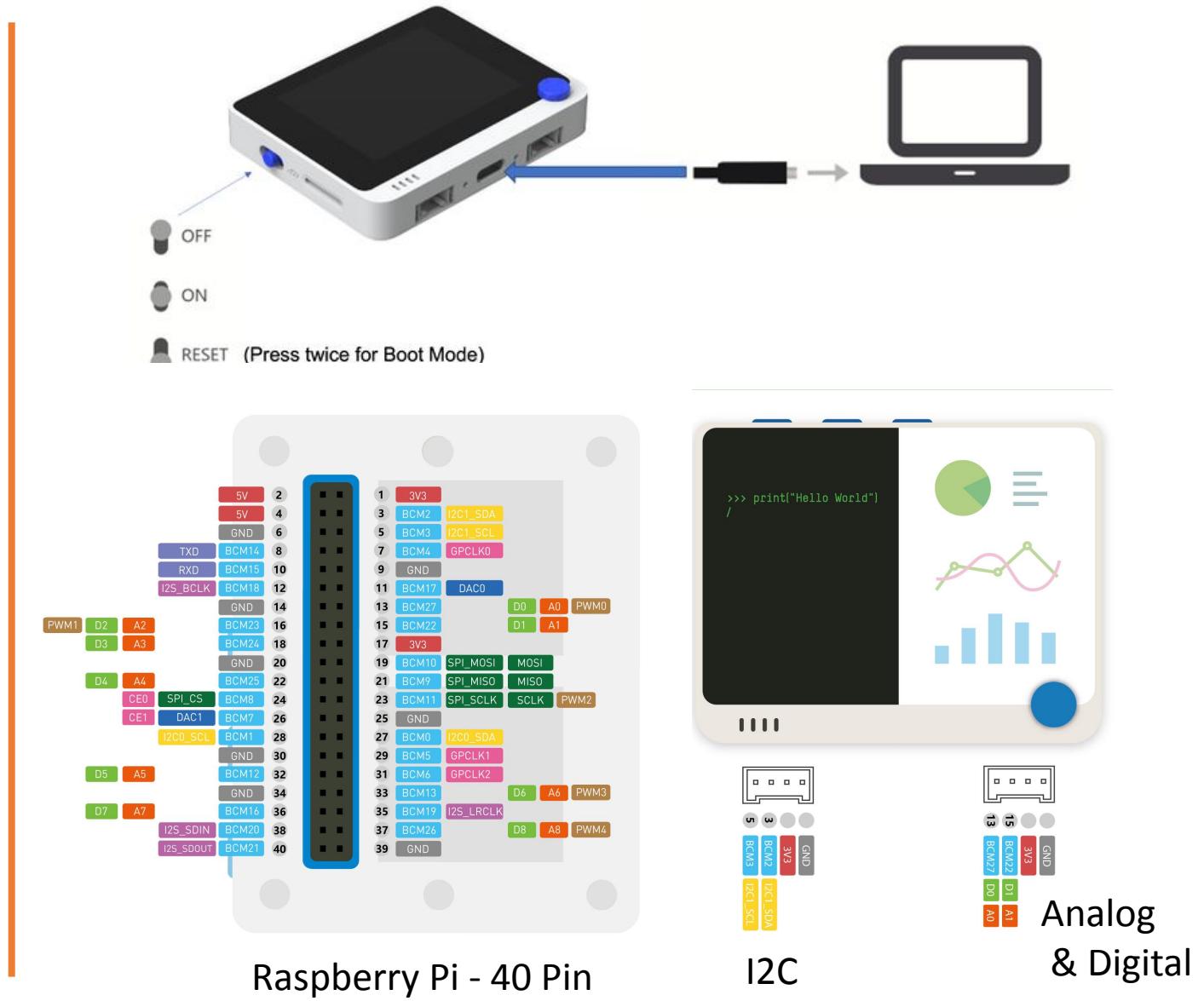
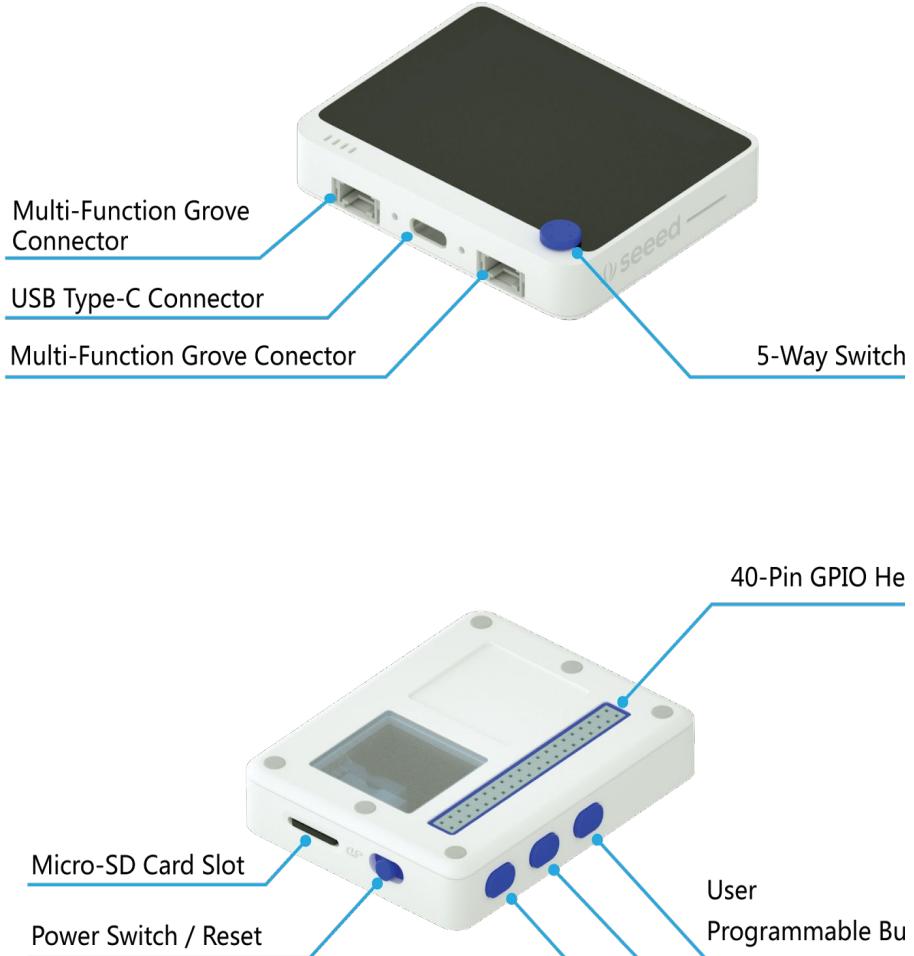
The [Wio Terminal](#) uses an ATSAMD51P19 microcontroller with ARM Cortex-M4F running at 120MHz (boost up to 200MHz), 4MB of external flash memory, and 192KB of RAM.

Wireless connectivity with Realtek RTL8720DN support. It is compatible with Arduino and MicroPython. It supports Bluetooth and Wi-Fi. There is a 2.4-inch LCD screen on Wio Terminal, an onboard Accelerometer (LIS3DHTR), a microphone, a buzzer, a microSD card slot, a light sensor, and an IR emitter (IR 940nm).

It has two multi-functional Grove connectors (I2C and Dig/Analog GPIOs) and Raspberry Pi-compatible 40-pin GPIO pins for additional add-on support.



The Wio Terminal – Hardware installation / Expansion

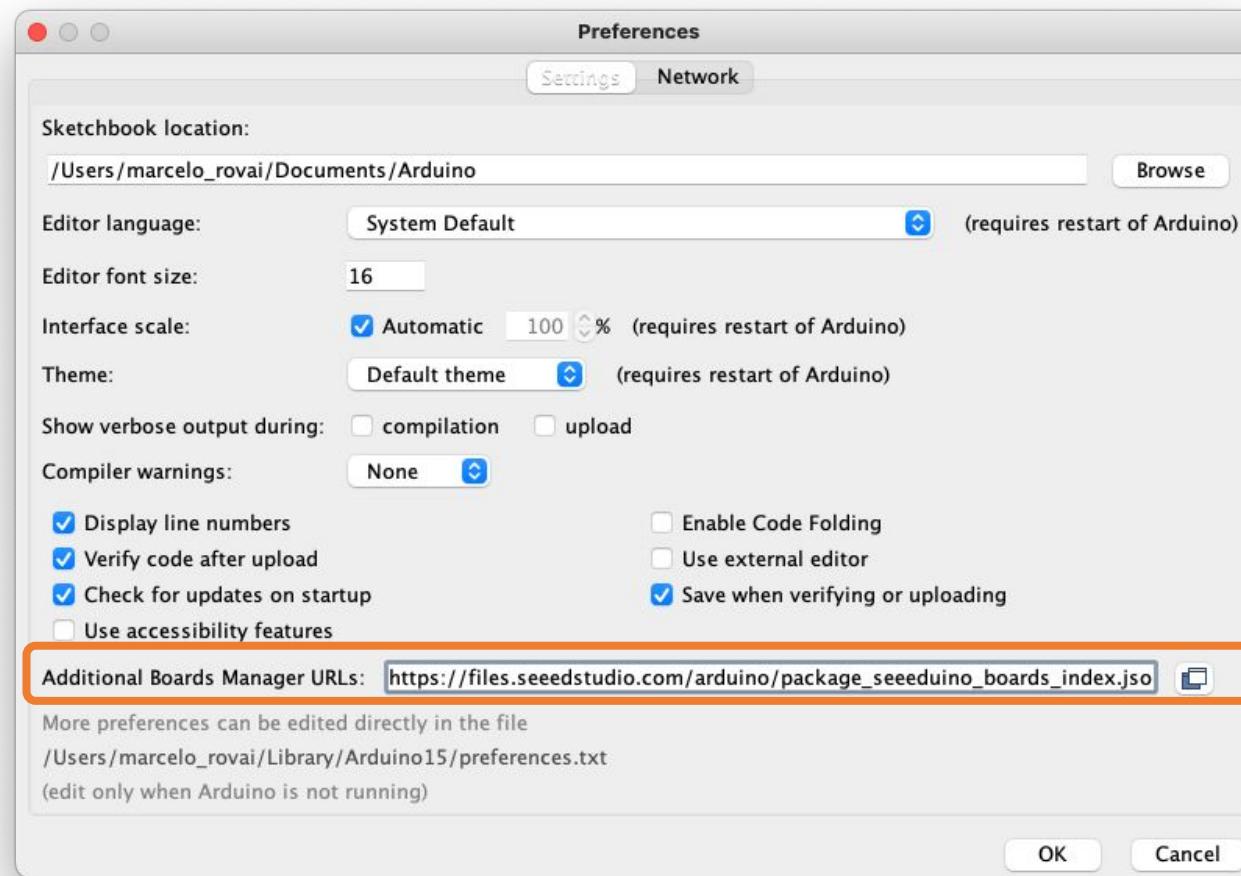


Installing Wio Terminal – Arduino IDE

Open the Arduino IDE, and click on:

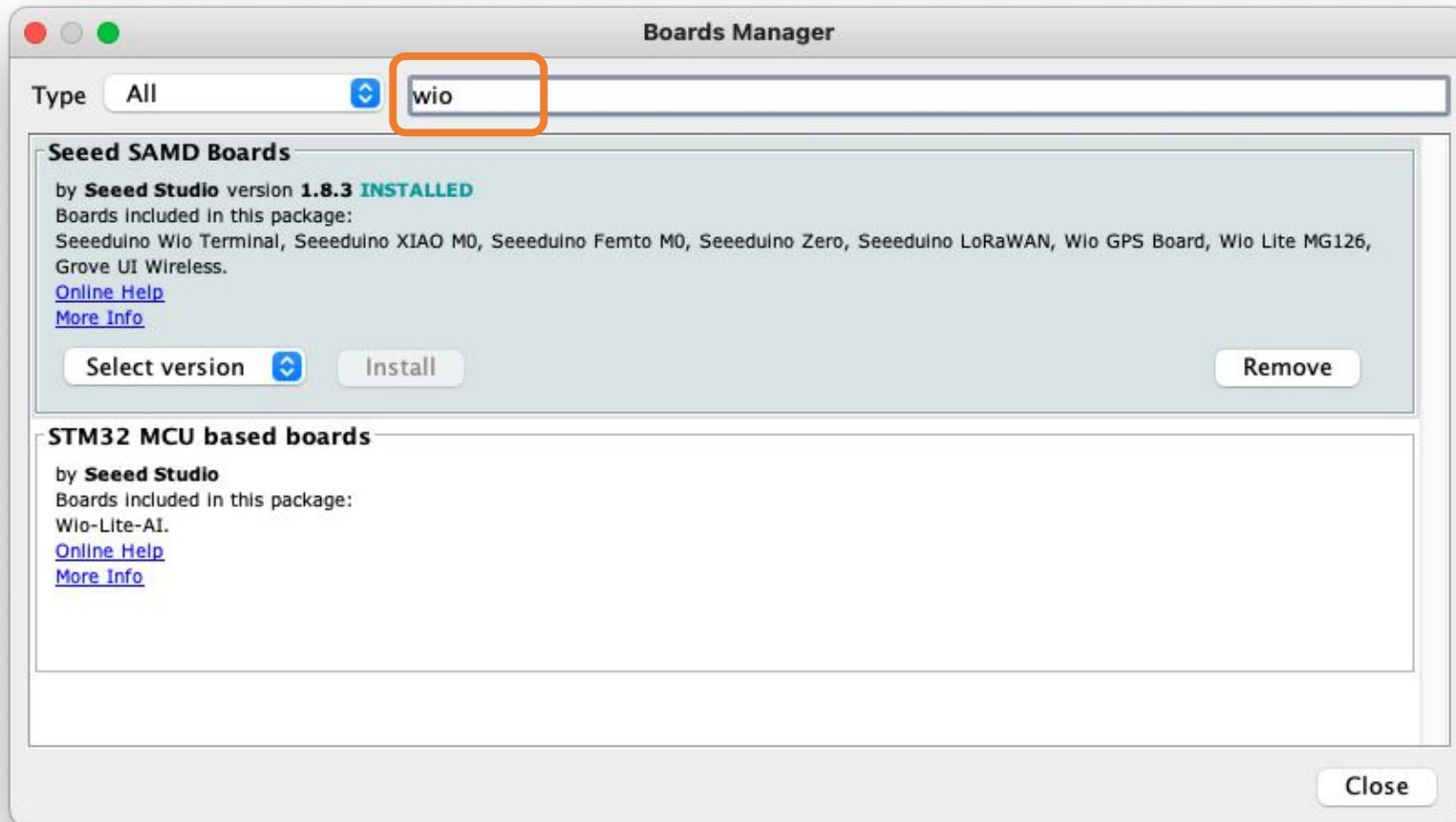
File > Preferences, and copy the below URL to **Additional Boards Manager URLs**:

https://files.seeedstudio.com/arduino/package_seeeduino_boards_index.json

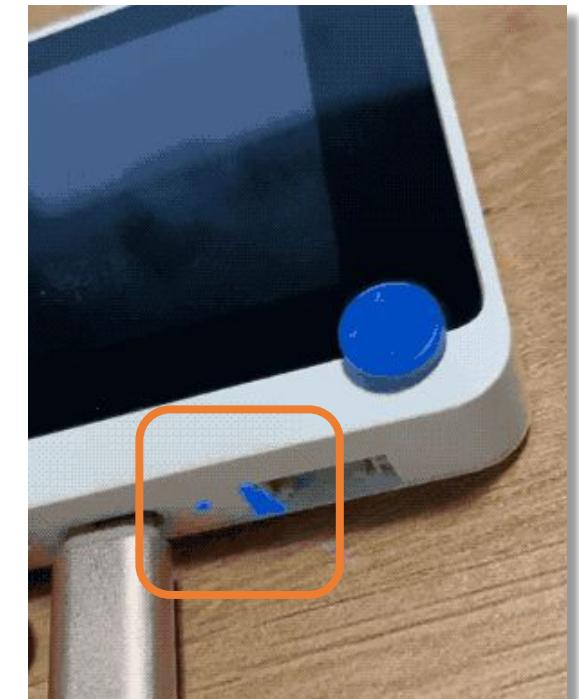
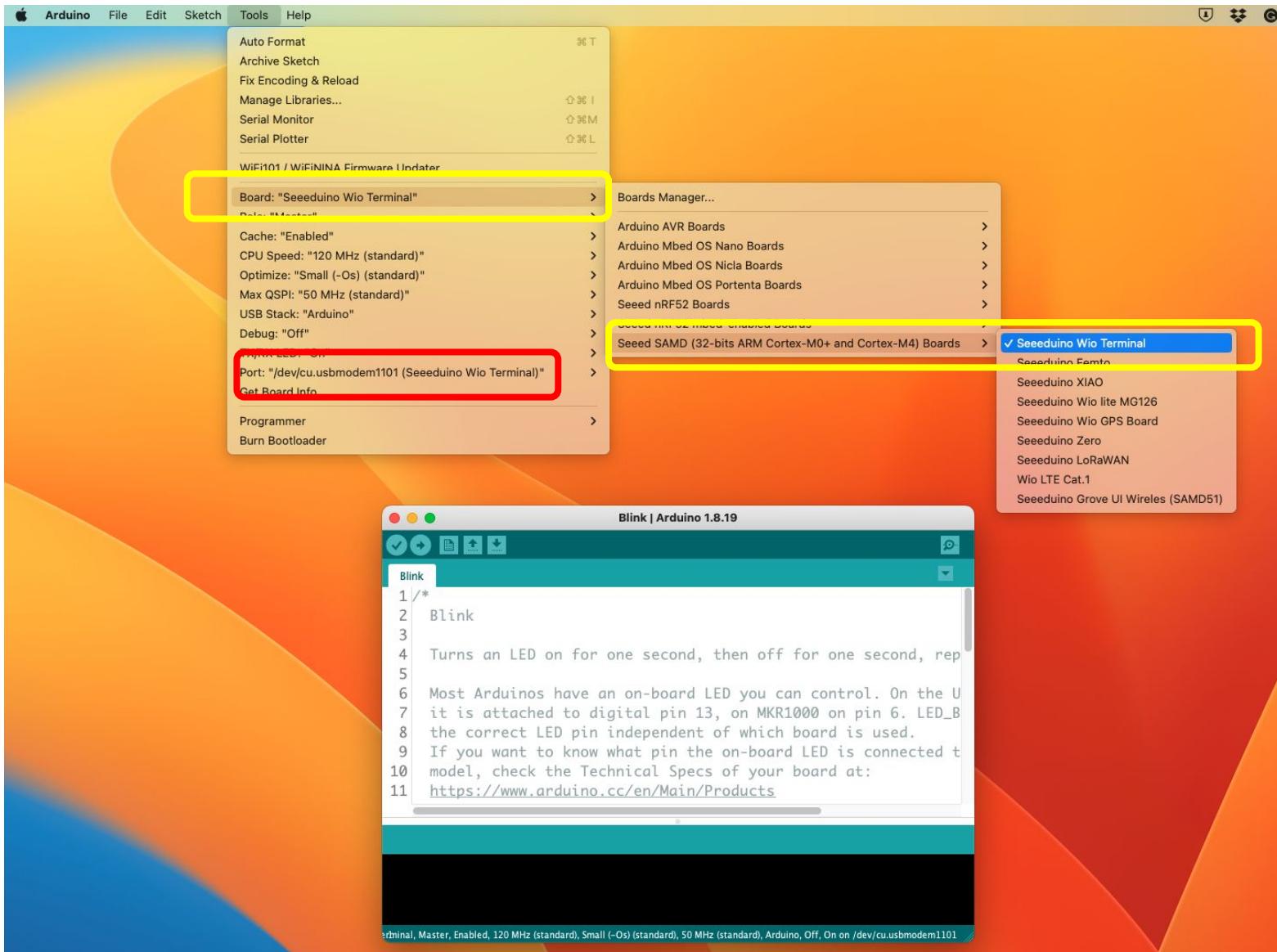


Click **Tools > Board > Board Manager** and Search **Wio Terminal** in the Boards Manager.

Install the last available version.



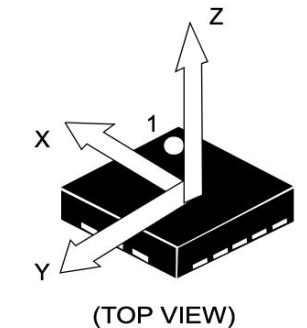
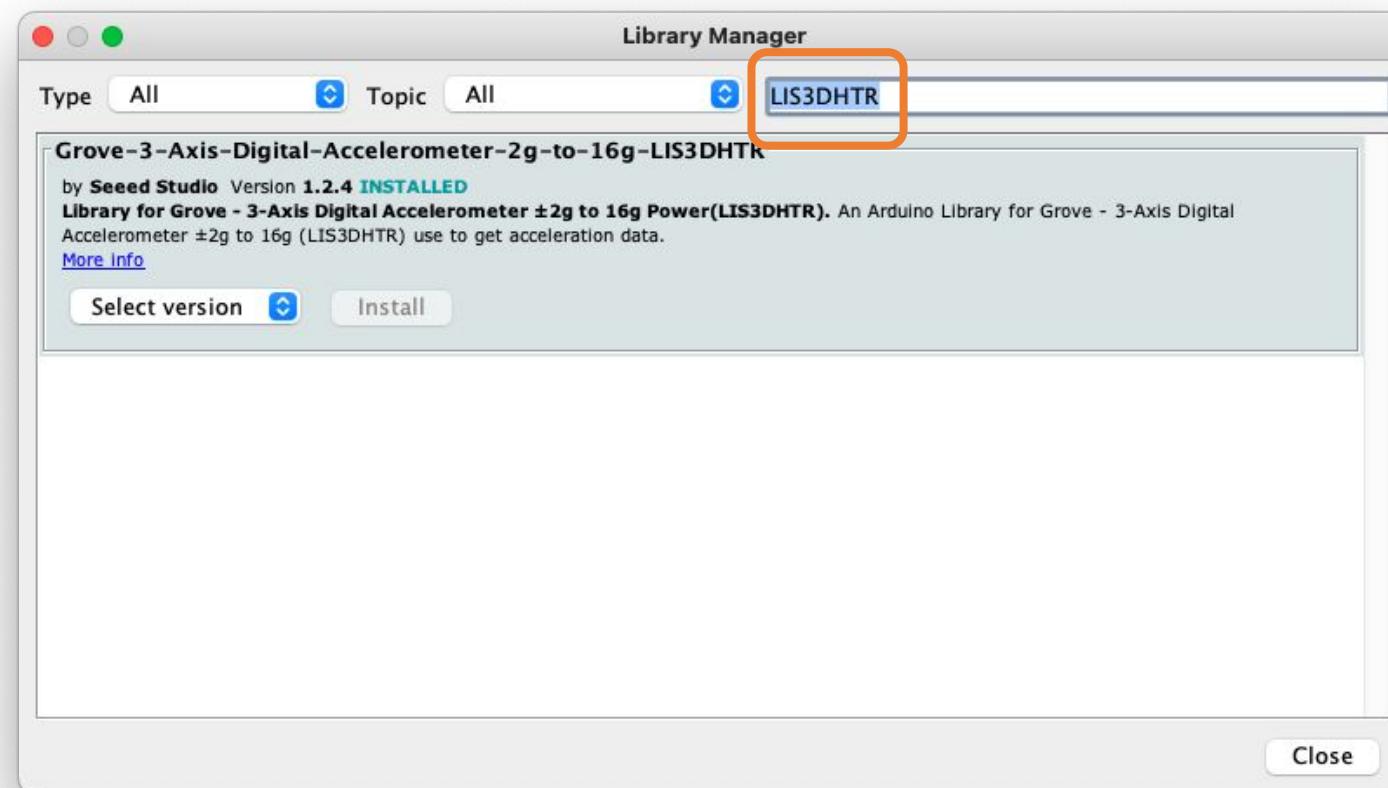
Select your **board** and **port**. Load the **Blink** sketch and run it.



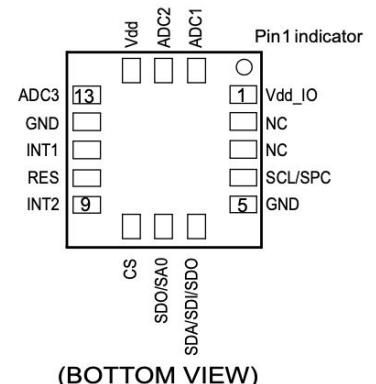
Installing the 3-Axis Accelerometer (LIS3DHTR)

Click **Tools > Manage Libraries ..** and Search in the Libraries Manager.

Install the last available version.



DIRECTION OF THE
DETECTABLE
ACCELERATIONS



<https://www.mouser.cl/datasheet/2/389/cd00274221-1797088.pdf>

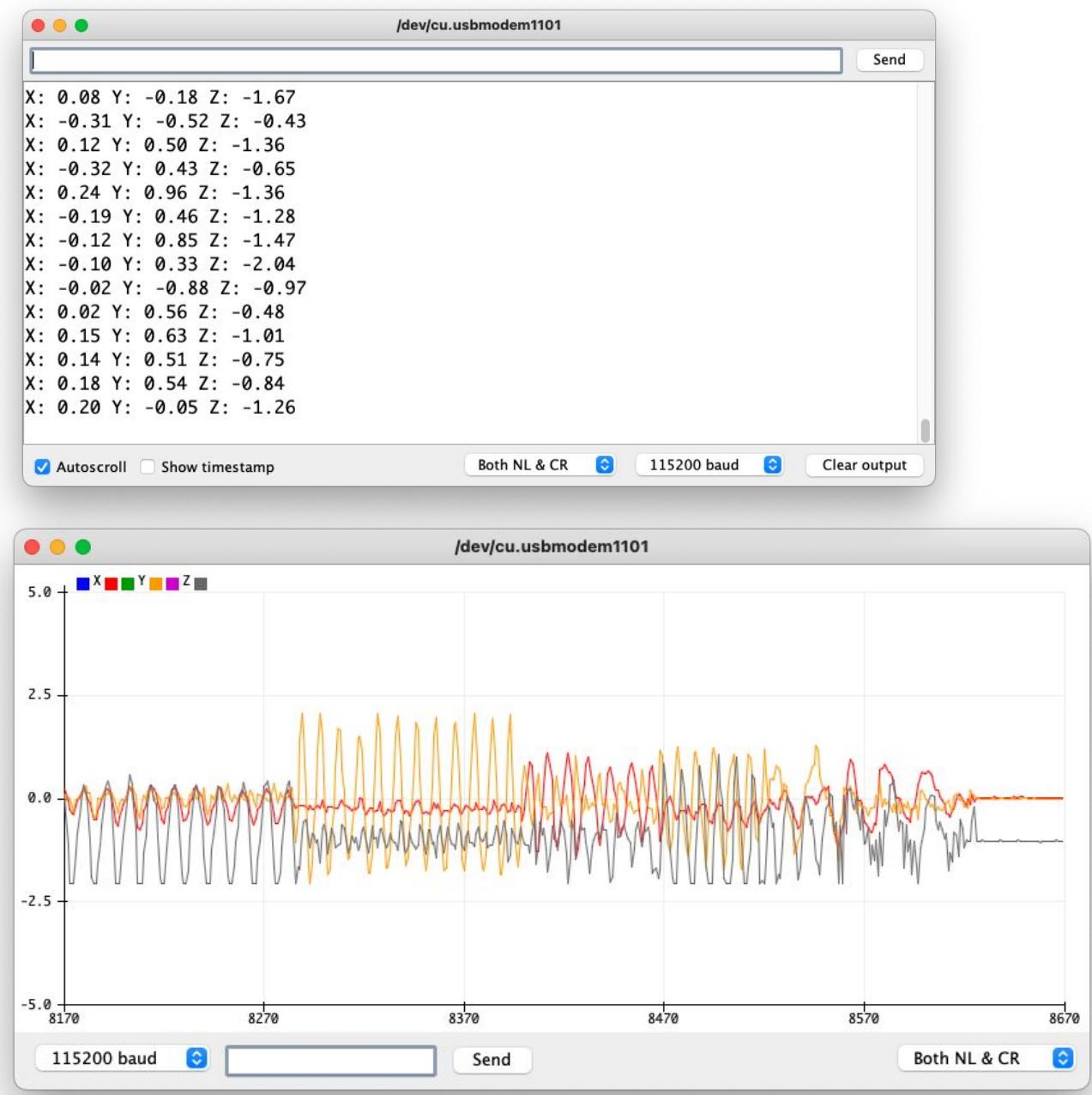
Acc_LIS3DHTR_test | Arduino 1.8.19

```

Acc_LIS3DHTR_test
1 #include "LIS3DHTR.h"
2 LIS3DHTR<TwoWire> lis;
3
4 void setup() {
5   Serial.begin(115200);
6   lis.begin(Wire1);
7
8   if (!lis) {
9     Serial.println("ERROR");
10    while(1);
11  }
12 lis.setOutputDataRate(LIS3DHTR_DATARATE_50HZ); //Data output rate
13 lis.setFullScaleRange(LIS3DHTR_RANGE_2G); //Scale range set to 2g
14 }
15
16 void loop() {
17   float x_values, y_values, z_values;
18   x_values = lis.getAccelerationX();
19   y_values = lis.getAccelerationY();
20   z_values = lis.getAccelerationZ();
21
22   Serial.print("X: "); Serial.print(x_values);
23   Serial.print(" Y: "); Serial.print(y_values);
24   Serial.print(" Z: "); Serial.print(z_values);
25   Serial.println();
26   delay(50);
27 }
28

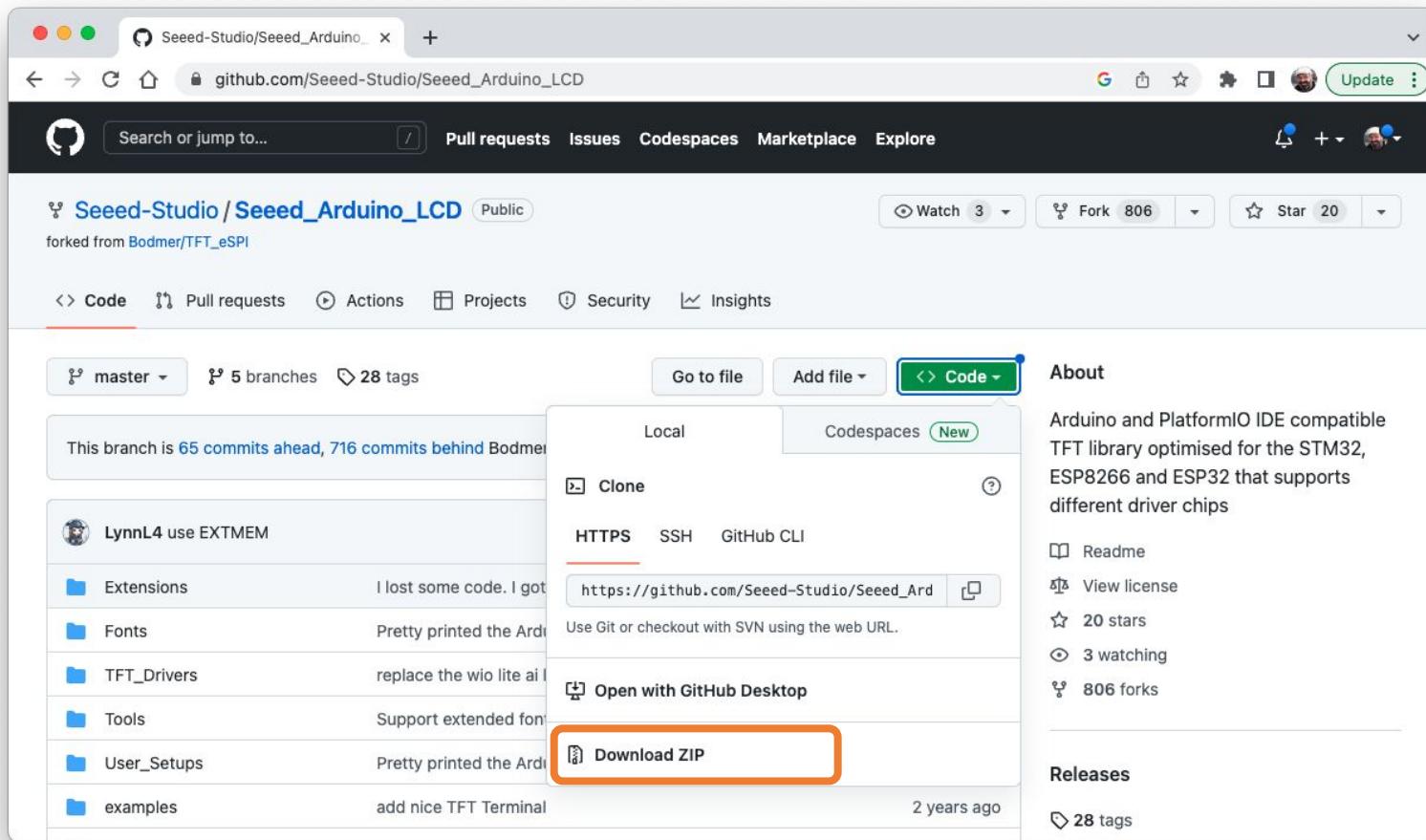
```

Done uploading.
done in 0.495 seconds
Verify 38372 bytes of flash
[=====] 100% (75/75 pages)
Verify successful
Done in 0.096 seconds



Installing the TFT LCD Library

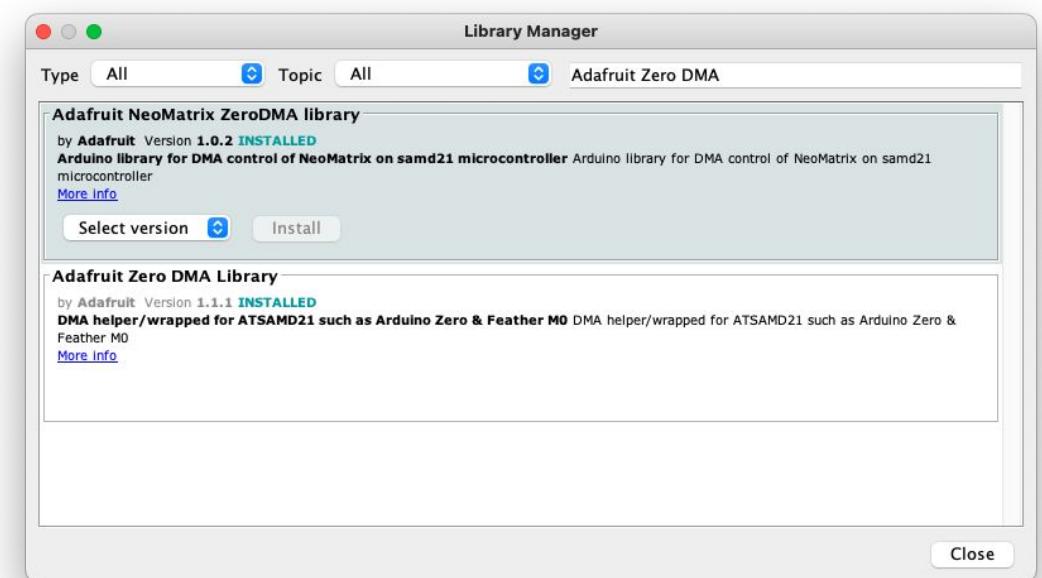
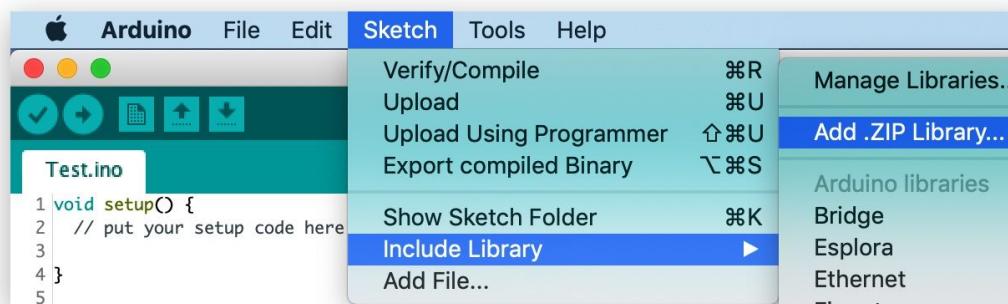
- Go to the URL: https://github.com/Seeed-Studio/Seeed_Arduino_LCD
- Download the entire repo in your drive as .ZIP



Installing the TFT LCD Library

- Open the Arduino IDE, and click sketch
-> Include Library -> Add .ZIP Library,
and choose the Seeed_Arduino_LCD file
that you've have just downloaded.
- Click Tools > Manage Libraries .. >
and Search in the Libraries Manager.

Install the last available version.



Using the TFT Display

```
Acc_LIS3DHTR_LCD_test | Arduino 1.8.19
```

```
Acc_LIS3DHTR_LCD_test §
2 * Wio Terminal Setup
3 * IMU test and Display on TFT
4 * @MJRovai 23Feb23
5 */
6
7 #include "LIS3DHTR.h"
8 #include "TFT_eSPI.h"
9 LIS3DHTR<TwoWire> lis;
10 TFT_eSPI tft;
11
12 void setup() {
13   Serial.begin(115200);
14
15   // Initiate LCD
16   tft.begin();
17   tft.setRotation(3);
18   tft.fillScreen(TFT_WHITE);
19   tft.setFreeFont(&FreeSansBoldOblique12pt7b);
20
21   // Initiate Accelerometer
22   lis.begin(Wire1);
23
24   if (!lis.available()) {
25     Serial.println("Failed to initialize IMU!");
26     tft.drawString("Failed to initialize IMU!", 20, 10);
27     while (1);
28   }
29   else {
30     Serial.println("IMU initialized");
31     tft.drawString("IMU initialized", 20, 10);
32   }
33
34   //Setting output data rage to 100Hz, can be set up tp 5kHz
35   lis.setOutputDataRate(LIS3DHTR_DATARATE_100HZ);
36   //Scale range set to 16g, select from 2,4,8,16g
37   lis.setFullScaleRange(LIS3DHTR_RANGE_16G);
38 }
```

Done uploading.

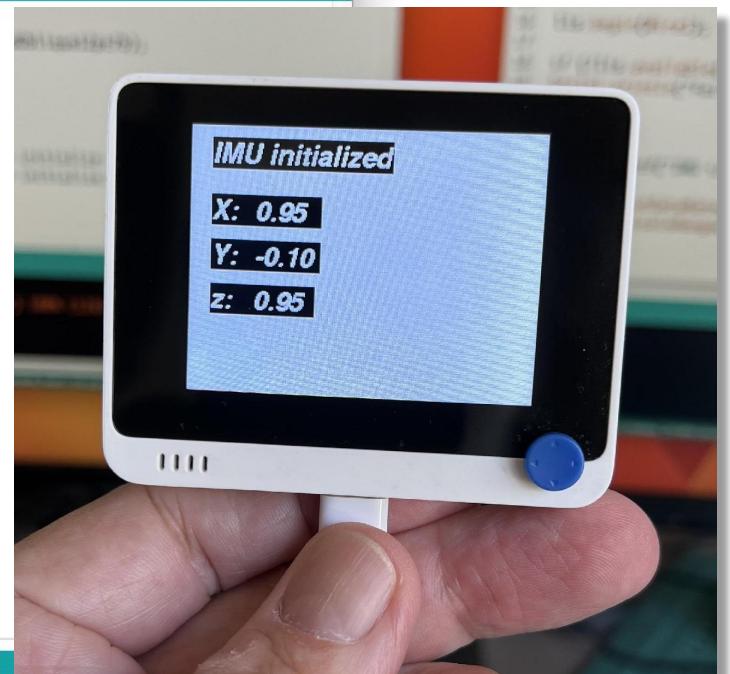
Verify 65376 bytes of flash
[=====] 100% (128/128 pages)
Verify successful

```
Acc_LIS3DHTR_LCD_test | Arduino 1.8.19
```

```
Acc_LIS3DHTR_LCD_test §
40 void loop() {
41   float x_values, y_values, z_values;
42   x_values = lis.getAccelerationX();
43   y_values = lis.getAccelerationY();
44   z_values = lis.getAccelerationZ();
45
46   Serial.print("X: "); Serial.print(x_values);
47   Serial.print(" Y: "); Serial.print(y_values);
48   Serial.print(" Z: "); Serial.print(z_values);
49   Serial.println();
50
51   tft.drawString("X: ", 20, 60);
52   tft.drawString(String(x_values), 60, 60);
53   tft.drawString("Y: ", 20, 100);
54   tft.drawString(String(y_values), 60, 100);
55   tft.drawString("z: ", 20, 140);
56   tft.drawString(String(z_values), 60, 140);
57   delay(100);
58   //tft.fillScreen(TFT_WHITE);
59 }
60
```

Done uploading.

Verify 65376 bytes of flash
[=====] 100% (128/128 pages)
Verify successful



Set up connection between Wio Terminal
and Edge Impulse

Login - Edge Impulse

studio.edgeimpulse.com/login

EDGE IMPULSE

Log in

rovai@mjrobot.org

.....

[Forgot your password?](#)

[Log in](#)

Don't have an account? [Sign up](#)



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Select project - Edge Impulse

studio.edgeimpulse.com/studio/select-project

EDGE IMPULSE

Select project

Create a new project

Enter the name for your new project:

AAU-Wio-Gesture-Classification

Choose your project type:

Developer
20 min job limit, 4GB or 4 hours of data, limited collaboration.

Enterprise
No job or data size limits, higher performance, custom blocks. [Learn more](#)

Create new project

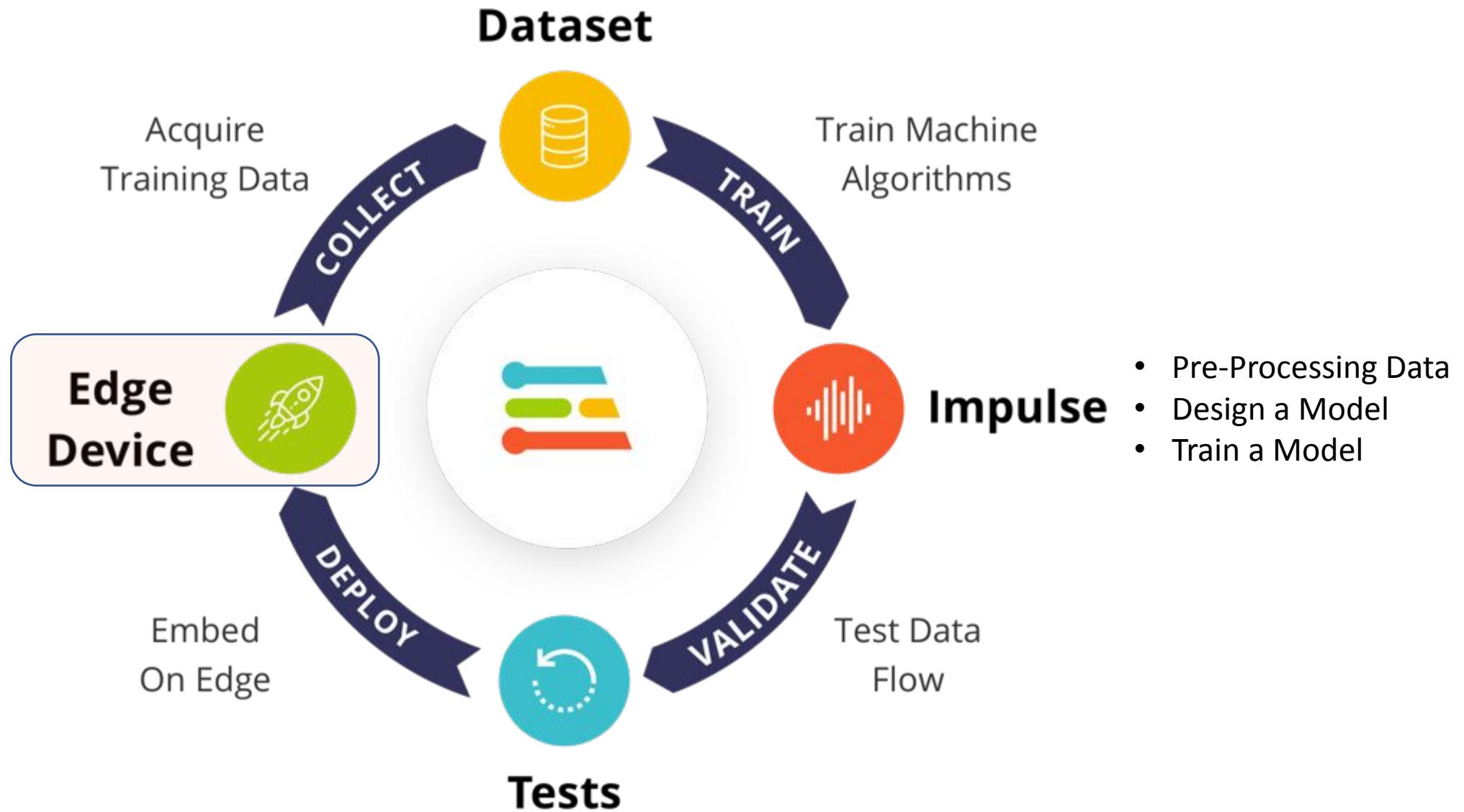
Marcelo Rovai / Cifar10_Image_Classification

Marcelo Rovai / IESTI01-Cifar10_Classification

Marcelo Rovai / Bean Disease Classifier

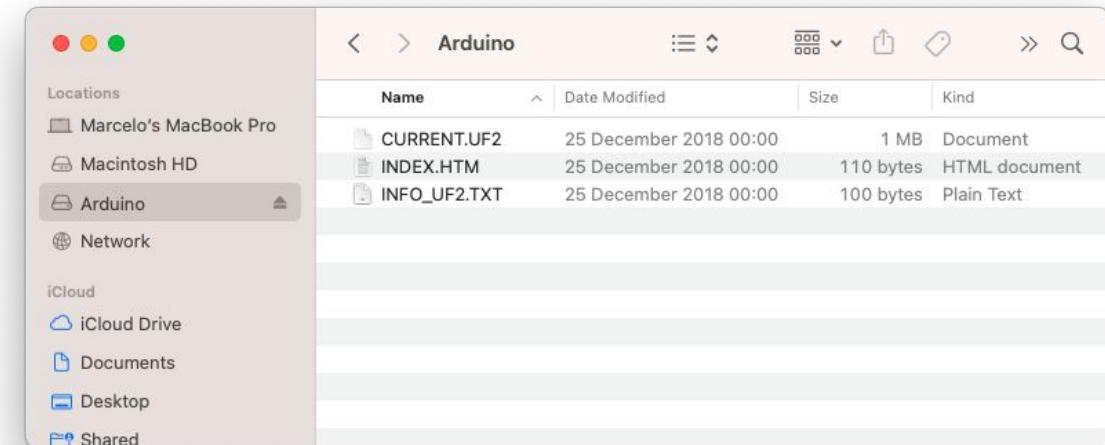
Marcelo Rovai / IESTI01-Motion_Classification-Anomaly_Detection

The screenshot shows a web browser window for the Edge Impulse studio. The main background is orange with a grid pattern. A central modal window titled 'Create a new project' is open. Inside the modal, there's a text input field containing 'AAU-Wio-Gesture-Classification' which is highlighted with a red rounded rectangle. Below the input field, there are two radio button options: 'Developer' (selected) and 'Enterprise'. A descriptive text follows each option. At the bottom right of the modal is a green 'Create new project' button. In the background, several other project thumbnails are visible, each with a small user profile picture and a project name. The top navigation bar includes the Edge Impulse logo, a user profile icon, and various menu icons.



Firmware installation

1. Connect Wio Terminal to your computer.
2. Entering the bootloader mode by sliding the power switch twice quickly.
3. An external drive named Arduino should appear in your PC.
4. Drag the the downloaded [Edge Impulse uf2 firmware files](#) to the Arduino drive. Now, Edge Impulse is loaded on Seeeduino Wio Terminal!



A screenshot of a GitHub release page for 'wio-terminal-ei'. The page shows the 'Latest release' for version 1.4.0, which was released on April 15 by AIWintermuteAI. The release notes mention added built-in microphone support and internal light sensor support. The 'Assets' section contains three files:

- wio-terminal-ei-1.4.0.uf2 (highlighted with a red box)
- Source code (zip)
- Source code (tar.gz)

Built-in Sensor's Test

AAU-Wio-Gesture-Classificatio

studio.edgeimpulse.com/studio/190030/acquisition/training?page=1

EDGE IM

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Data acquisition

Impulse designs

Create im

EON Tuner

Retrain model

Live classification

Model testing

Versioning

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studio.edgeimpulse.com wants to connect to a serial port

cu.Bluetooth-Incoming-Port

Arduino Nano 33 BLE (cu.usbmodem1101)

Seeed Wio Terminal (cu.usbmodem1101) - Paired

Marcelo Rovai / AAU-Wio-Gesture-Classification

Upload data Export data

Select your device or development board, or upload your existing datasets - Show options

Record new data

Connect using WebUSB

The screenshot shows the Edge Impulse Studio interface. A modal dialog box titled 'studio.edgeimpulse.com wants to connect to a serial port' is open in the foreground. It lists three options: 'cu.Bluetooth-Incoming-Port', 'Arduino Nano 33 BLE (cu.usbmodem1101)', and 'Seeed Wio Terminal (cu.usbmodem1101) - Paired'. The third option is highlighted with a blue background. At the bottom of the dialog are two buttons: 'Cancel' and 'Connect', with 'Connect' being highlighted by an orange rectangle. In the background, the main studio workspace is visible, showing a purple header bar with the user's name 'Marcelo Rovai / AAU-Wio-Gesture-Classification' and navigation tabs for 'Upload data' and 'Export data'. Below the header is a search bar and a message: 'Select your device or development board, or upload your existing datasets - Show options'. On the right side of the workspace, there is a section titled 'Record new data' with a note: 'No devices connected to the remote management API.' An orange rectangle highlights the 'Connect using WebUSB' button in this section.

AAU-Wio-Gesture-Classification

studio.edgeimpulse.com/studio/190030/devices

EDGE IMPULSE

Marcelo Rovai / AAU-Wio-Gesture-Classification

Your devices

+ Connect a new device

These are devices that are connected to the Edge Impulse remote management API, or have posted data to the ingestion SDK.

NAME	ID	TYPE	SENSORS	REMOT...	LAST SEEN
23:D1:FF:14:17:05	23:D1:FF:14:17:05	SEEED_WIO_TERMINAL	Built-in accelerometer, Built-i...	●	Today, 17:12:18

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studio.edgeimpulse.com/studio/190030/acquisition/training?page=1

EDGE IMPULSE

Marcelo Rovai / AAU-Wio-Gesture-Classification

Training data Test data | Data explorer | Upload data Export data

Did you know? You can capture data from any device or development board, or upload your existing datasets - Show options

Collected data

No data collected yet

Let's collect some data

Record new data

Device ②
23:D1:FF:14:17:05

Label Sample length (ms.)
lateral 10000

Sensor Frequency
✓ Built-in accelerometer 100Hz

Built-in microphone

Built-in light sensor
External multichannel gas(Grove-multichannel gas v2)
External temperature&humidity&pressure sensor(Grove-BME280)
External pressure sensor(Grove-DPS310)
External distance sensor(Grove-TFmini)
External 6-axis accelerometer(Grove-BMI088)
External ultrasonic sensor(Grove-ultrasonic sensor)
External CO2+Temp sensor(Grove-SCD30)

Start sampling

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AAU-Wio-Gesture-Classifi: X +

studio.edgeimpulse.com/studio/190030/acquisition/training?page=1

EDGE IMPULSE

Training data Test data | Data explorer | Upload data Export data

Did you know? You can capture data from any device or development board, or upload your existing datasets - Show options

DATA COLLECTED
10s

TRAIN / TEST SPLIT
100% / 0% ▲

Collected data

SAMPLE NAME	LABEL	ADDED	LENGTH
lateral.3pq0n74t	lateral	Today, 17:12:17	10s

Record new data

Device ⓘ
23:D1:FF:14:17:05

Label
lateral

Sample length (ms.)
10000

Sensor
Built-in accelerometer

Frequency
100Hz

Start sampling

RAW DATA
lateral.3pq0n74t



accX accY accZ

AAU-Wio-Gesture-Classifi: X +

studio.edgeimpulse.com/studio/190030/acquisition/training?page=1

EDGE IMPULSE

Did you know? You can capture data from any device or development board, or upload your existing datasets - Show options

DATA COLLECTED
5s

TRAIN / TEST SPLIT
100% / 0% ▲

Collected data

SAMPLE NAME	LABEL	ADDED	LENGTH
yes.3pq19fp5	yes	Today, 17:22:15	5s

Record new data

Device ⓘ
23:D1:FF:14:17:05

Label Sample length (ms.)
yes 5000

Sensor Frequency
Built-in microphone 16000Hz

Start sampling

RAW DATA
yes.3pq19fp5



audio

▶ 0:05 / 0:05 ⏸

Dashboard Devices Data sources Data acquisition Impulse design Create impulse EON Tuner Retrain model Live classification Model testing Versioning Deployment

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AAU-Wio-Gesture-Classifi: X +

studio.edgeimpulse.com/studio/190030/acquisition/training?page=1

EDGE IMPULSE

Did you know? You can capture data from any device or development board, or upload your existing datasets - Show options

DATA COLLECTED
10s

TRAIN / TEST SPLIT
100% / 0% ▲

Collected data

SAMPLE NAME	LABEL	ADDED	LENGTH
rock.3pq1fjf	rock	Today, 17:25:36	5s
yes.3pq19fp5	yes	Today, 17:22:15	5s

Record new data

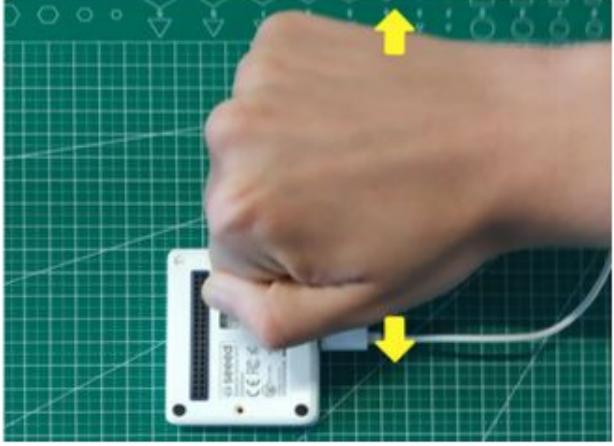
Device ⓘ
23:D1:FF:14:17:05

Label Sample length (ms.)
rock 5000

Sensor Frequency
Built-in light sensor 62.5Hz

Start sampling

RAW DATA
rock.3pq1fjf



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rock.3pq1fjf

4000
3500
3000
2500
2000
1500
1000
500

0 519 1038 1557 2076 2595 3115 3634 4153 4672

illumination

Thanks



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