Wio Terminal – Part 1
Installation & Tests

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UNIFEI

Updated @27Apr23

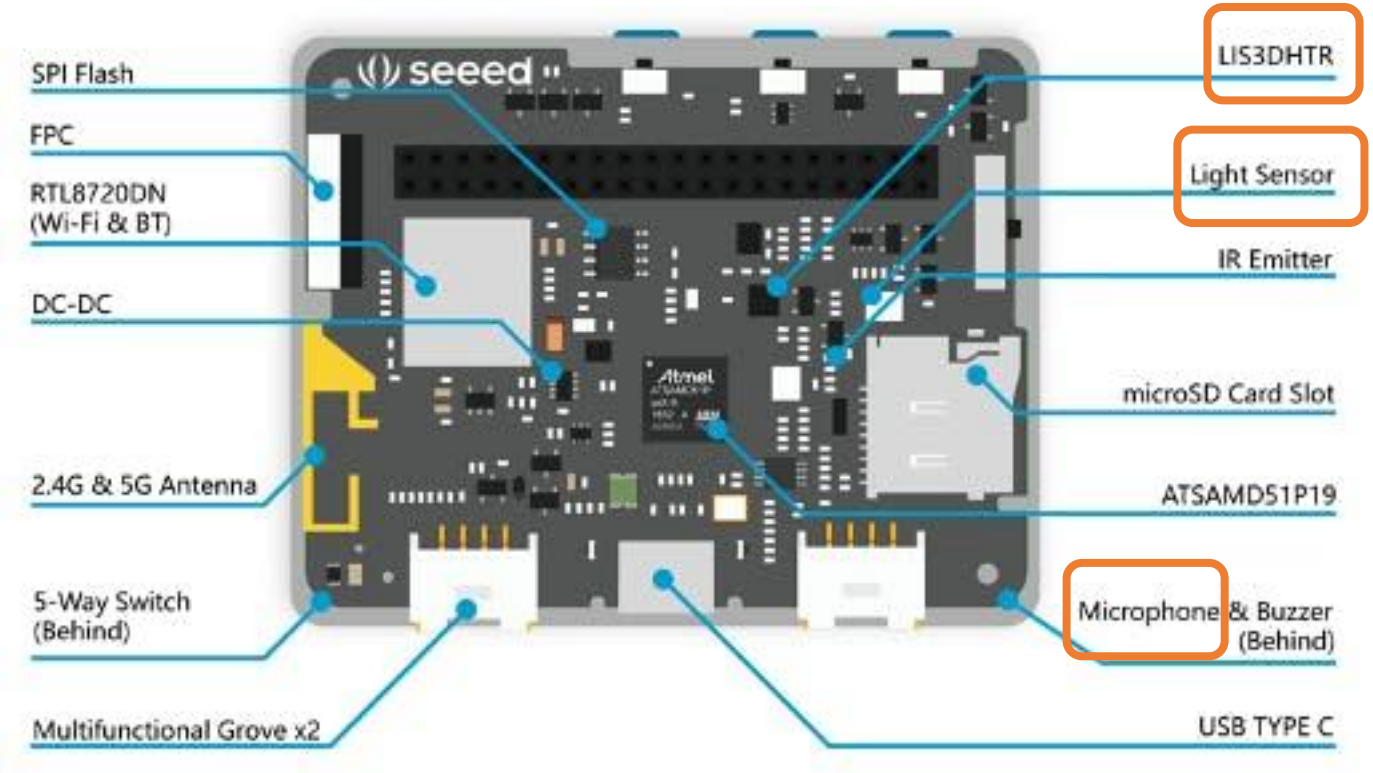
The Wio Terminal

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.

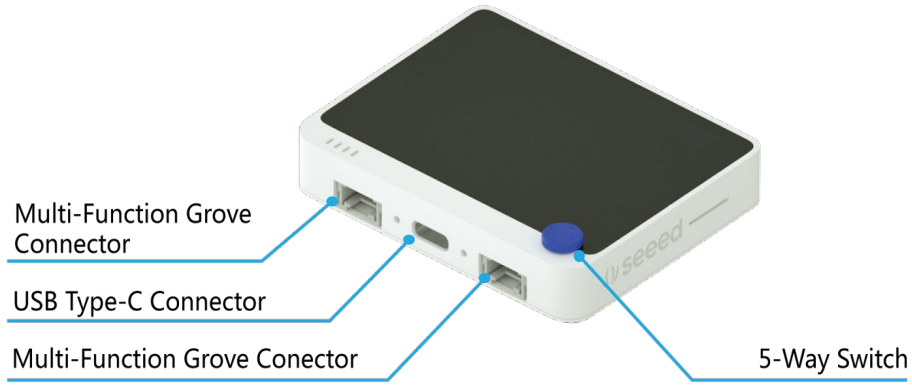
Wireless connectivity with Realtek RTL8720DN support. It is compatible with Arduino and MicroPython. It supports Bluetooth and Wi-Fi. There is a 2.4-inch LCD screen on Wio Terminal, an onboard Accelerometer (LIS3DHTR), a microphone, a buzzer, a microSD card slot, a light sensor, and an IR emitter (IR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

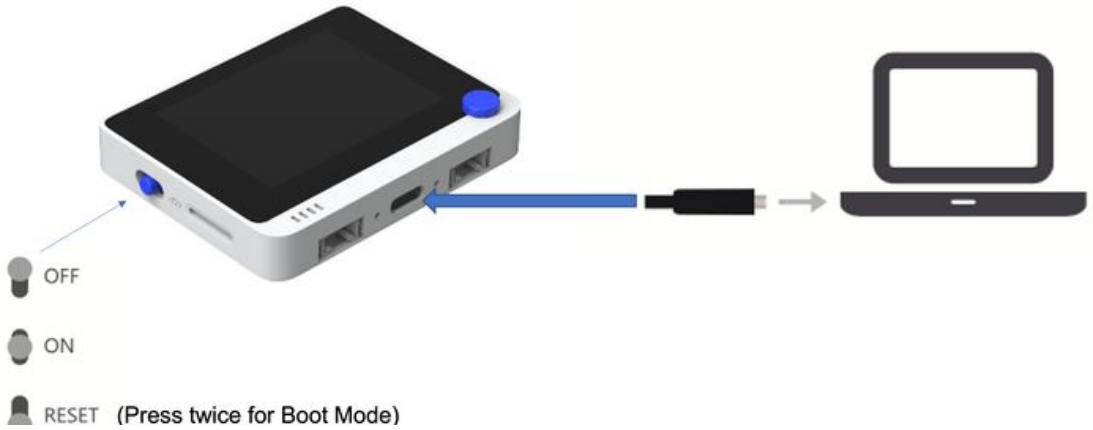
It has two multi-functional Grove connectors (I2C and Dig/Analog GPIOs) and Raspberry Pi-compatible 40-pin GPIO pins for additional add-on support.

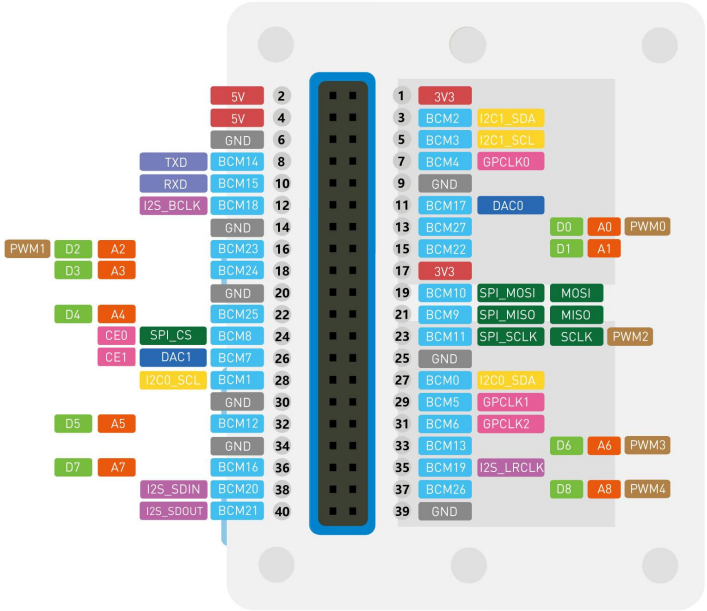


https://wiki.seeedstudio.com/Wio-Terminal-Getting-Started/

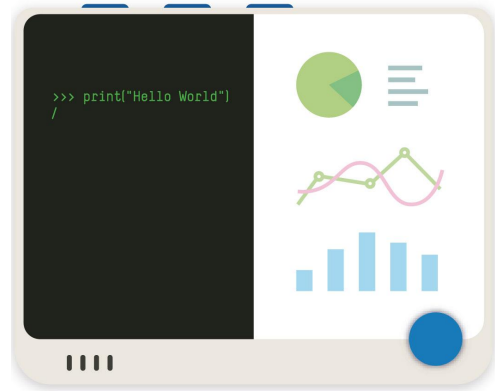
The Wio Terminal – Hardware installation / Expansion



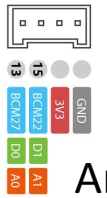




Raspberry Pi - 40 Pin



I2C

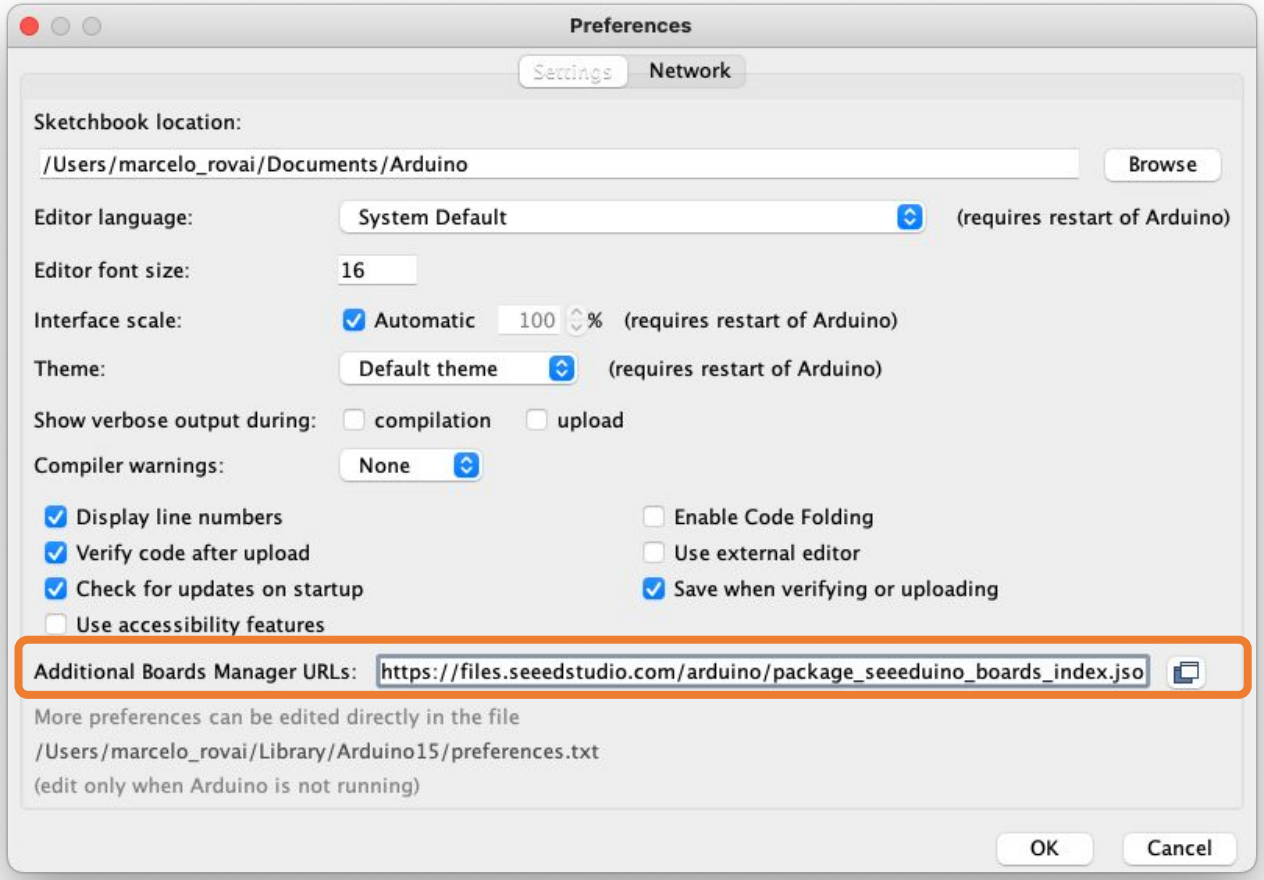


Analog & Digital

Installing Wio Terminal – Arduino IDE

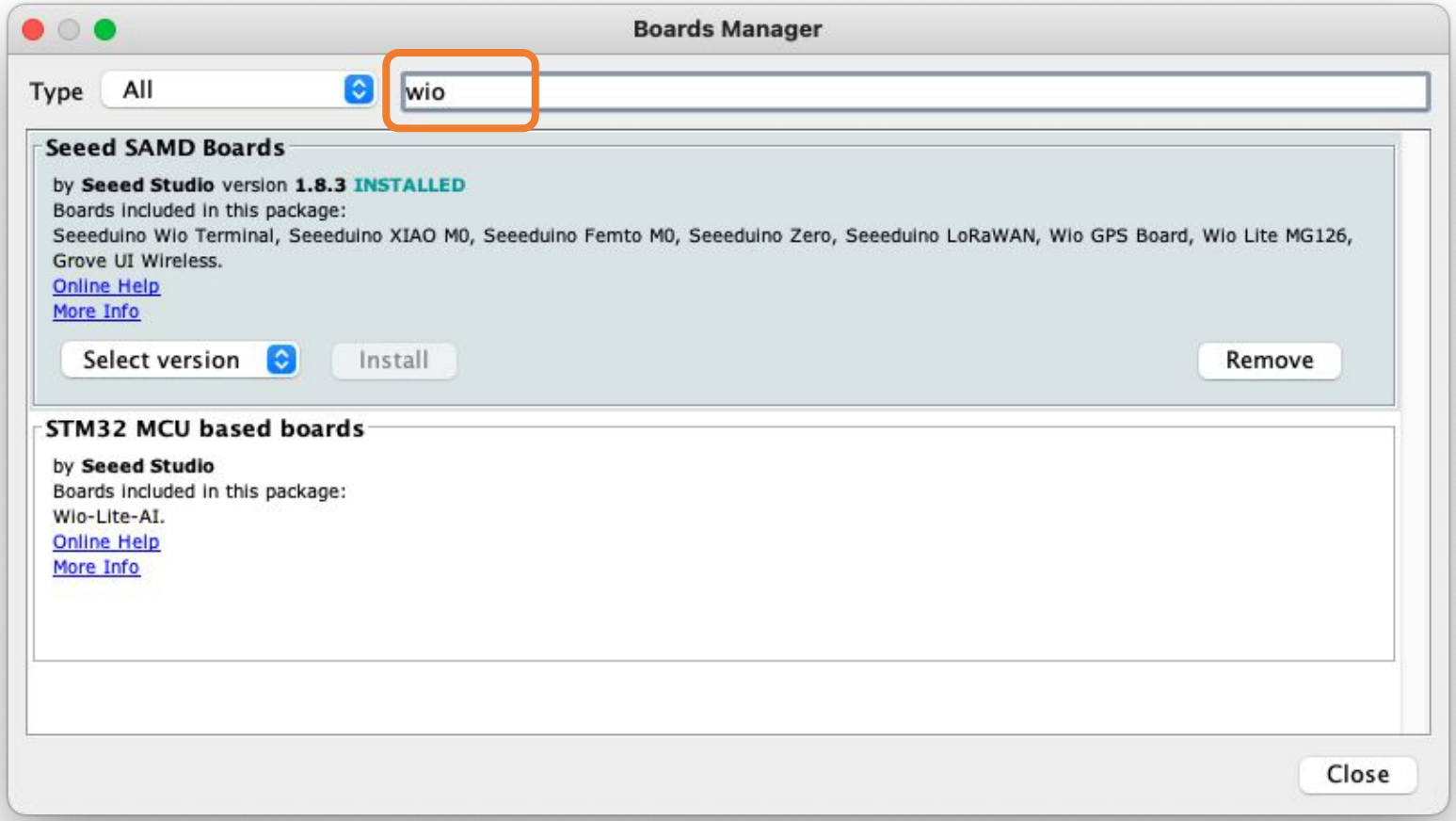
Open the Arduino IDE, and click on:
File > **Preferences**, and copy the below URL to **Additional Boards Manager URLs**:

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

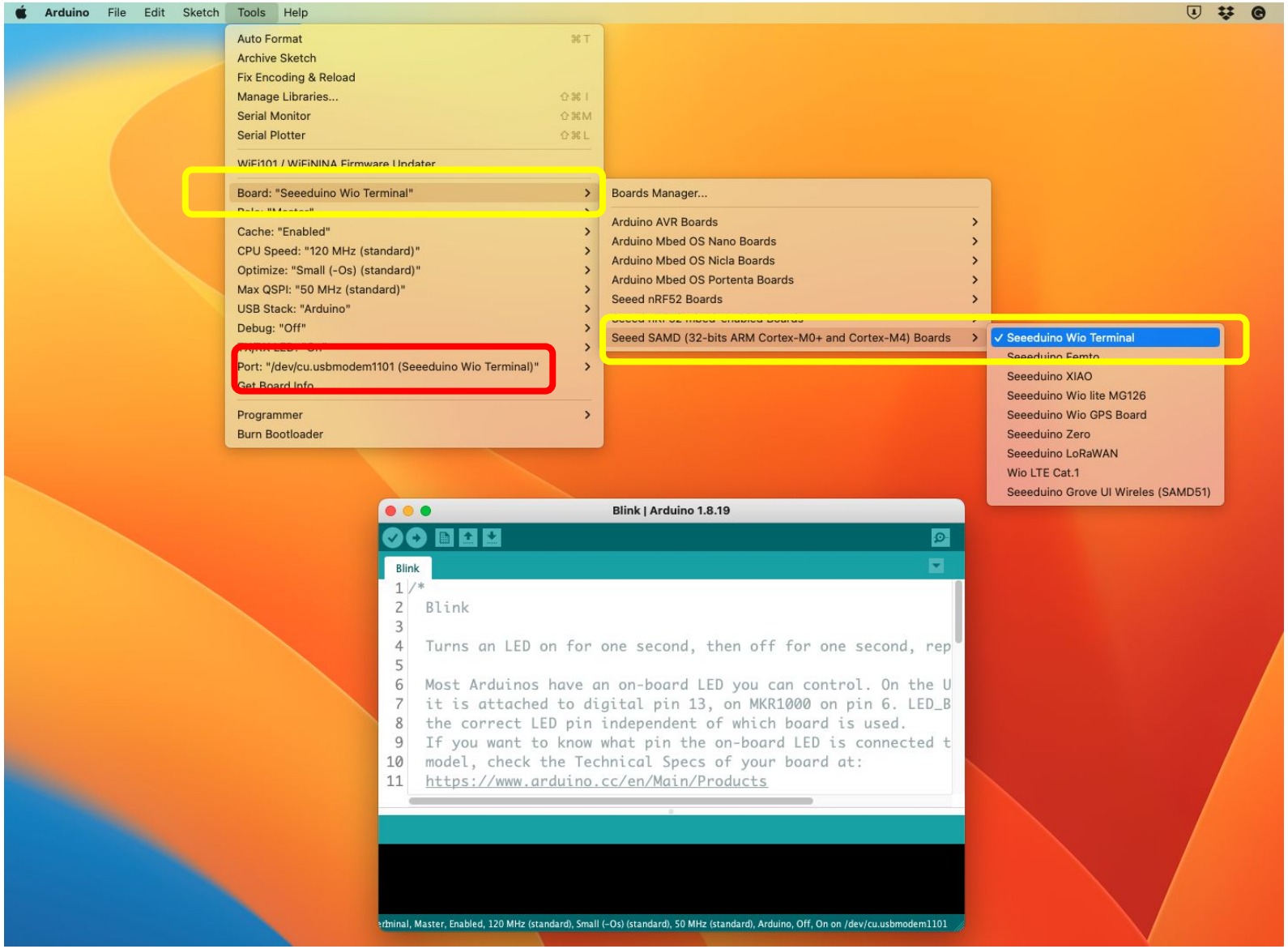


Click **Tools** > **Board** > **Board Manager** and Search **Wio Terminal** in the Boards Manager.

Install the last available version.



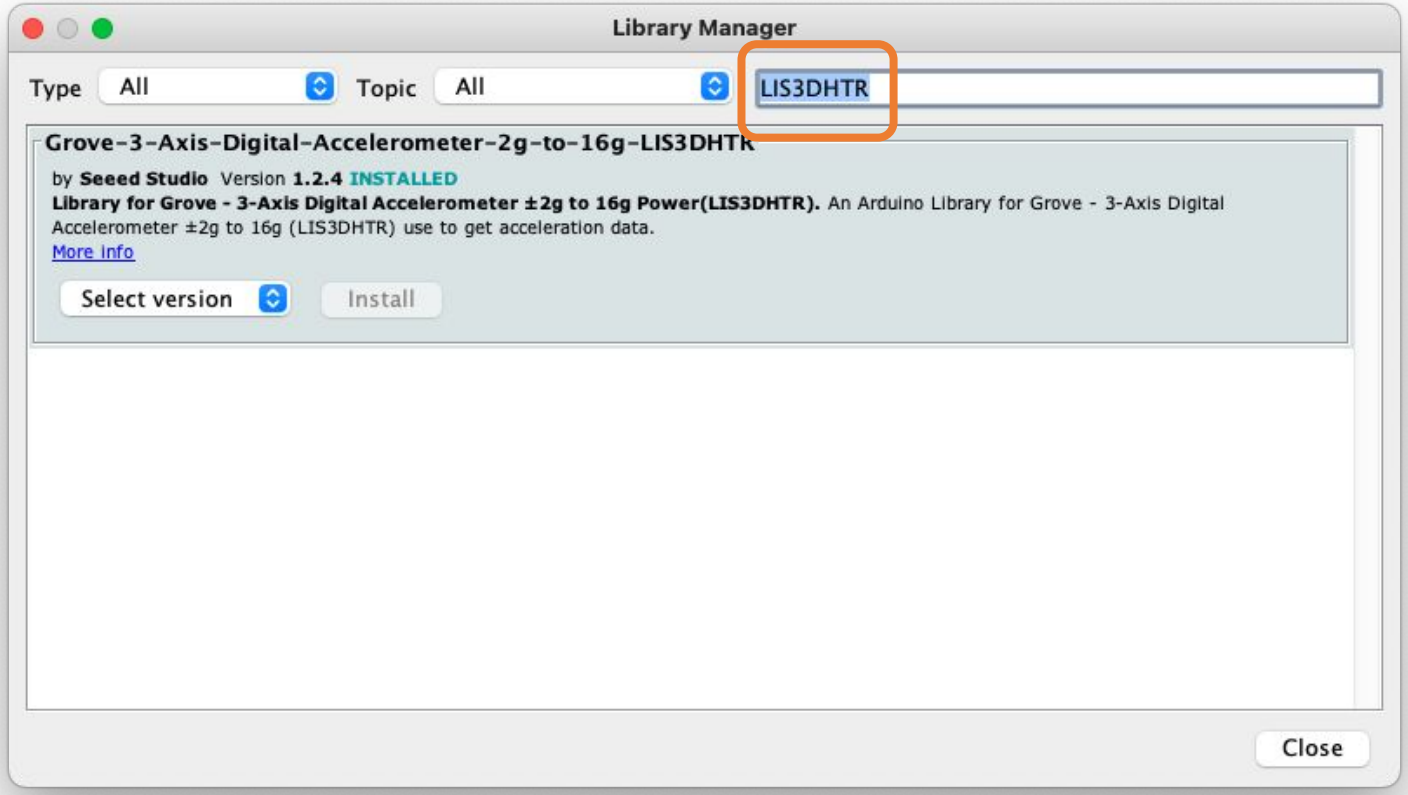
Select your board and port. Load the Blink sketch and run it.

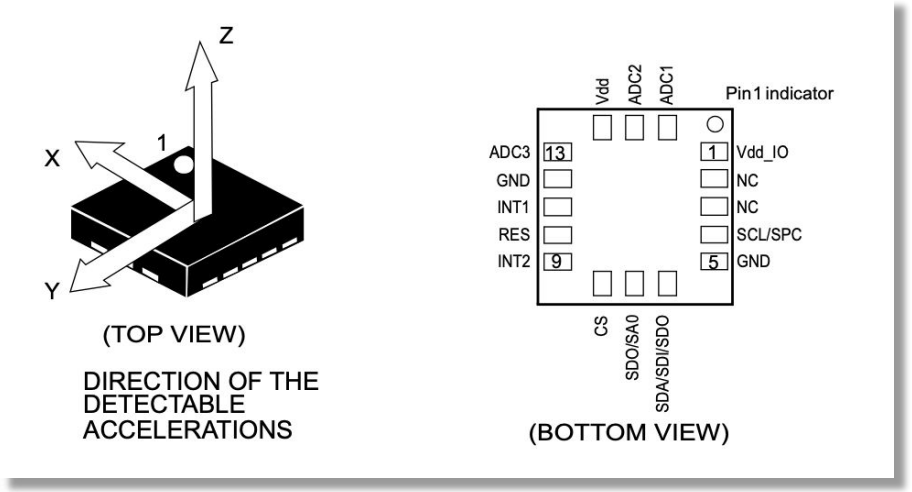


Installing the 3-Axis Accelerometer (LIS3DHTR)

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

Install the last available version.





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

Acc_LIS3DHTR_test | Arduino 1.8.19

Acc_LIS3DHTR_test

```ino
#include"LIS3DHTR.h"
LIS3DHTR<TwoWire> lis;

void setup() {
  Serial.begin(115200);
  lis.begin(Wire1);

  if (!lis) {
    Serial.println("ERROR");
    while(1);
  }
  lis.setOutputDataRate(LIS3DHTR_DATARATE_50HZ); //Data output rate
  lis.setFullScaleRange(LIS3DHTR_RANGE_2G); //Scale range set to 2g
}

void loop() {
  float x_values, y_values, z_values;
  x_values = lis.getAccelerationX();
  y_values = lis.getAccelerationY();
  z_values = lis.getAccelerationZ();

  Serial.print("X: "); Serial.print(x_values);
  Serial.print(" Y: "); Serial.print(y_values);
  Serial.print(" Z: "); Serial.print(z_values);
  Serial.println();
  delay(50);
}

```

Done uploading.

```
Done in 0.493 seconds
Verify 38372 bytes of flash
[==============================] 100% (75/75 pages)
Verify successful
Done in 0.096 seconds
```

28 Seeeduino Wio Terminal, Master, Enabled, 120 MHz (standard), Small (-Os) (standard), 50 MHz (standard), Arduino, Off, On on /dev/cu.usbmodem1101

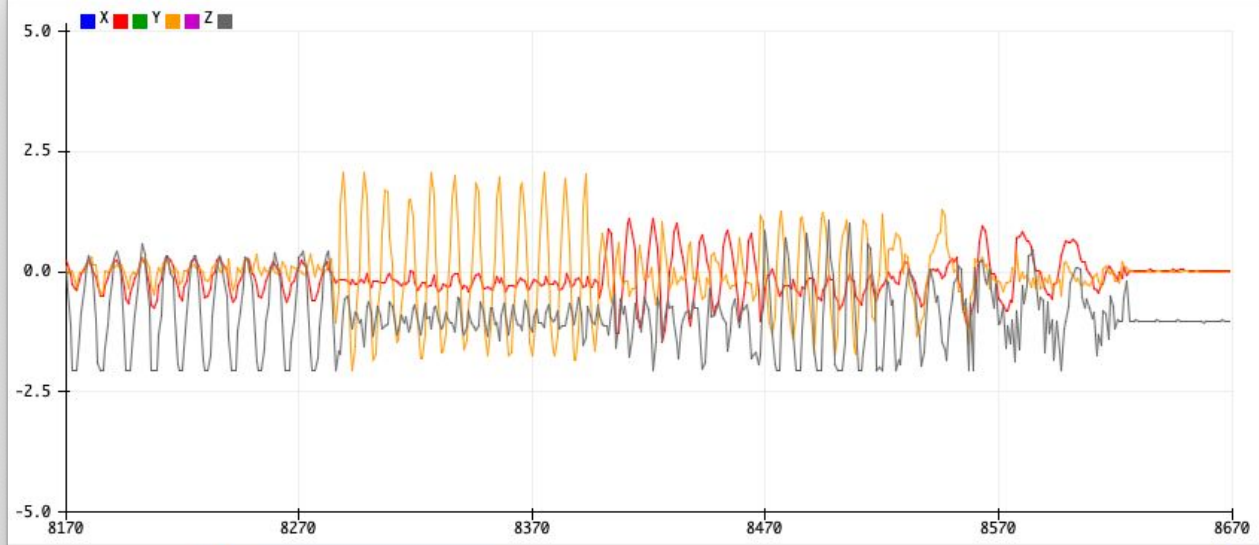
/dev/cu.usbmodem1101

Send

```
X: 0.08 Y: -0.18 Z: -1.67
X: -0.31 Y: -0.52 Z: -0.43
X: 0.12 Y: 0.50 Z: -1.36
X: -0.32 Y: 0.43 Z: -0.65
X: 0.24 Y: 0.96 Z: -1.36
X: -0.19 Y: 0.46 Z: -1.28
X: -0.12 Y: 0.85 Z: -1.47
X: -0.10 Y: 0.33 Z: -2.04
X: -0.02 Y: -0.88 Z: -0.97
X: 0.02 Y: 0.56 Z: -0.48
X: 0.15 Y: 0.63 Z: -1.01
X: 0.14 Y: 0.51 Z: -0.75
X: 0.18 Y: 0.54 Z: -0.84
X: 0.20 Y: -0.05 Z: -1.26
```

Autoscroll Show timestamp Both NL & CR 115200 baud Clear output

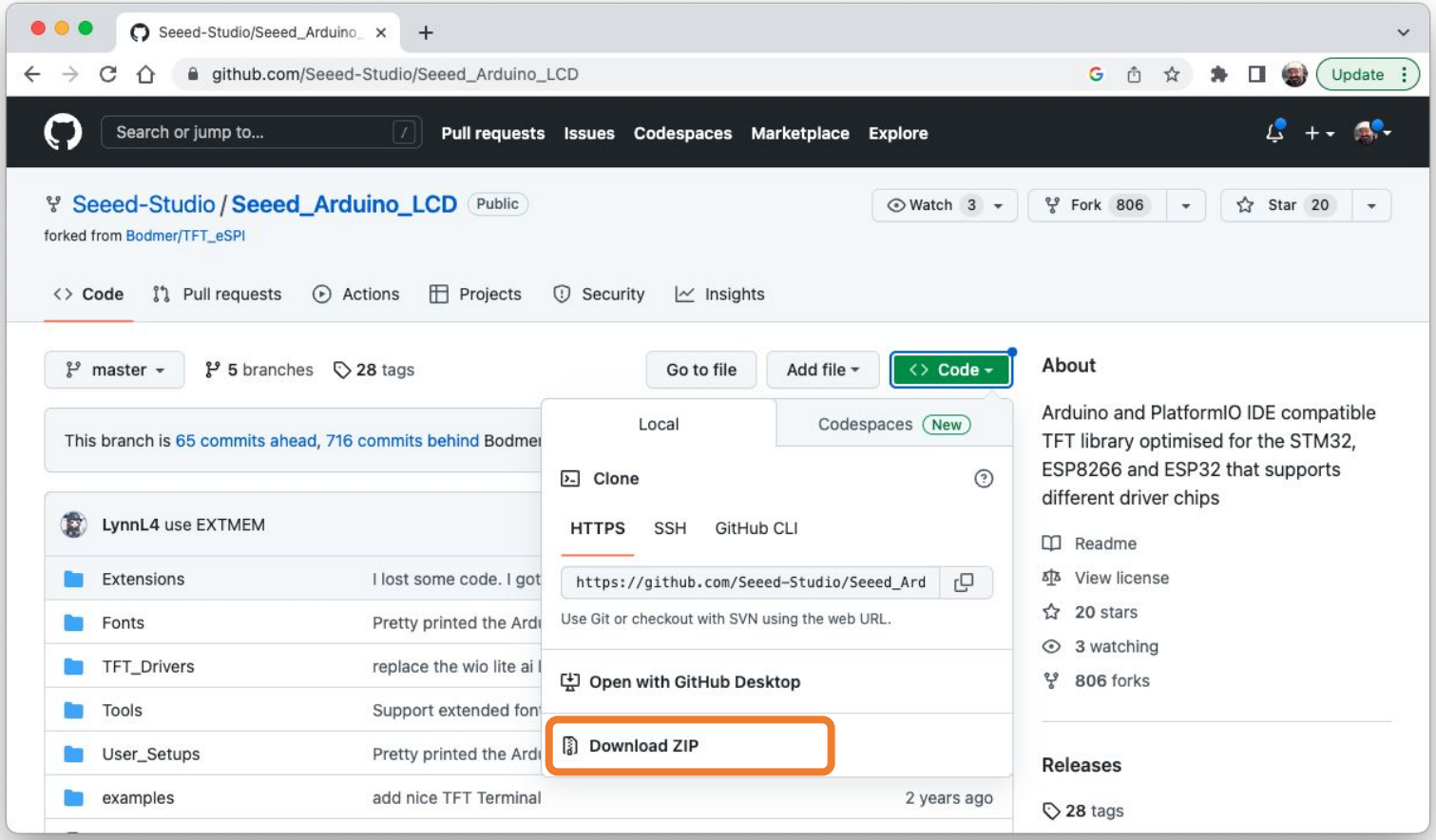
/dev/cu.usbmodem1101



115200 baud Send Both NL & CR

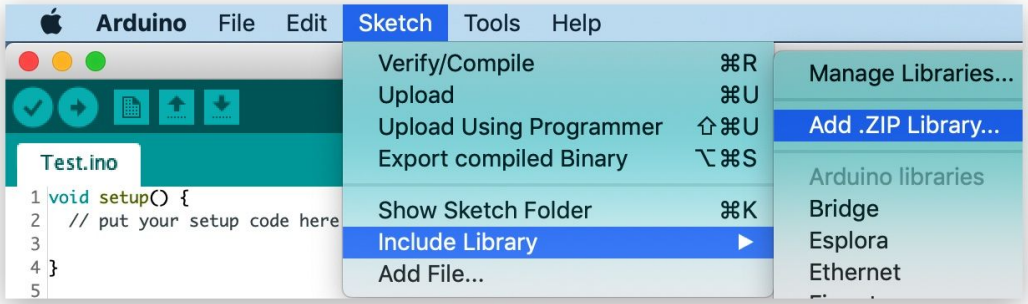
Installing the TFT LCD Library

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



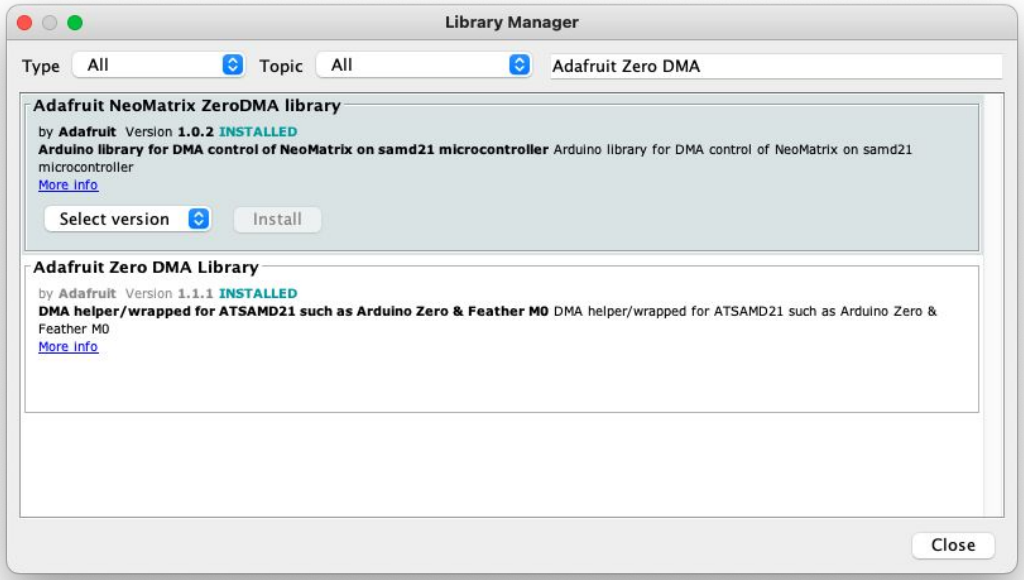
Installing the TFT LCD Library

- 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 for: “Adafruit Zero DMA”

Install the last available version.



Using the TFT Display

Acc_LIS3DHTR_LCD_test | Arduino 1.8.19

Acc_LIS3DHTR_LCD_test §

```
 * Wio Terminal Setup
 * IMU test and Display on TFT
 * @MJRovai 23Feb23
 */

#include"LIS3DHTR.h"
#include"TFT_eSPI.h"
LIS3DHTR<TwoWire> lis;
TFT_eSPI tft;

void setup() {
  Serial.begin(115200);

  // Initiate LCD
  tft.begin();
  tft.setRotation(3);
  tft.fillScreen(TFT_WHITE);
  tft.setFreeFont(&FreeSansBoldOblique12pt7b);

  // Initiate Accelerometer
  lis.begin(Wire1);

  if (!lis.available()) {
    Serial.println("Failed to initialize IMU!");
    tft.drawString("Failed to initialize IMU!", 20, 10);
    while (1);
  }
  else {
    Serial.println("IMU initialized");
    tft.drawString("IMU initialized", 20, 10);
  }

  //Setting output data rage to 100Hz, can be set up tp 5kHz
  lis.setOutputDataRate(LIS3DHTR_DATARATE_100HZ);
  //Scale range set to 16g, select from 2,4,8,16g
  lis.setFullScaleRange(LIS3DHTR_RANGE_16G);
}
```

Done uploading.

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

23 Seeeduino Wio Terminal, Master, Enabled, 120 MHz (standard), Small (-Os) (standard), 50 MHz (standard), Arduino, Off, On on /dev/cu.usbmodem1101

Acc_LIS3DHTR_LCD_test | Arduino 1.8.19

Acc_LIS3DHTR_LCD_test §

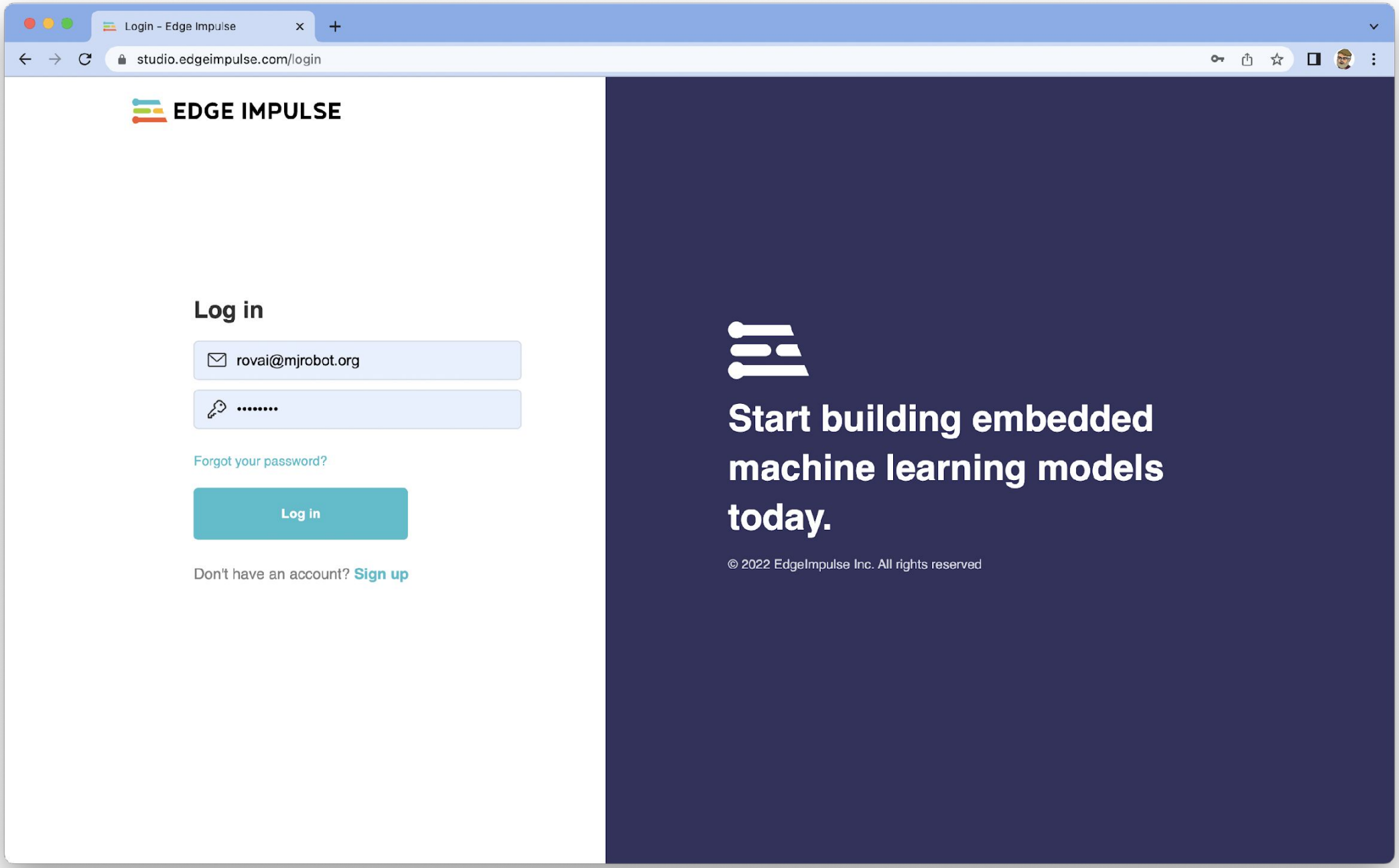
```
void loop() {
  float x_values, y_values, z_values;
  x_values = lis.getAccelerationX();
  y_values = lis.getAccelerationY();
  z_values = lis.getAccelerationZ();

  Serial.print("X: "); Serial.print(x_values);
  Serial.print(" Y: "); Serial.print(y_values);
  Serial.print(" Z: "); Serial.print(z_values);
  Serial.println();

  tft.drawString("X:            ", 20, 60);
  tft.drawString(String(x_values), 60, 60);
  tft.drawString("Y:            ", 20, 100);
  tft.drawString(String(y_values), 60, 100);
  tft.drawString("z:            ", 20, 140);
  tft.drawString(String(x_values), 60, 140);
  delay(100);
  //tft.fillScreen(TFT_WHITE);
}
```

Done uploading.

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

45 Seeeduino Wio Terminal, Master, Enabled, 120 MHz (standard), Small (-Os) (standard), 50 MHz (standard), Arduino, Off, On on /dev/cu.usbmodem1101

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
Start building embedded machine learning models today.
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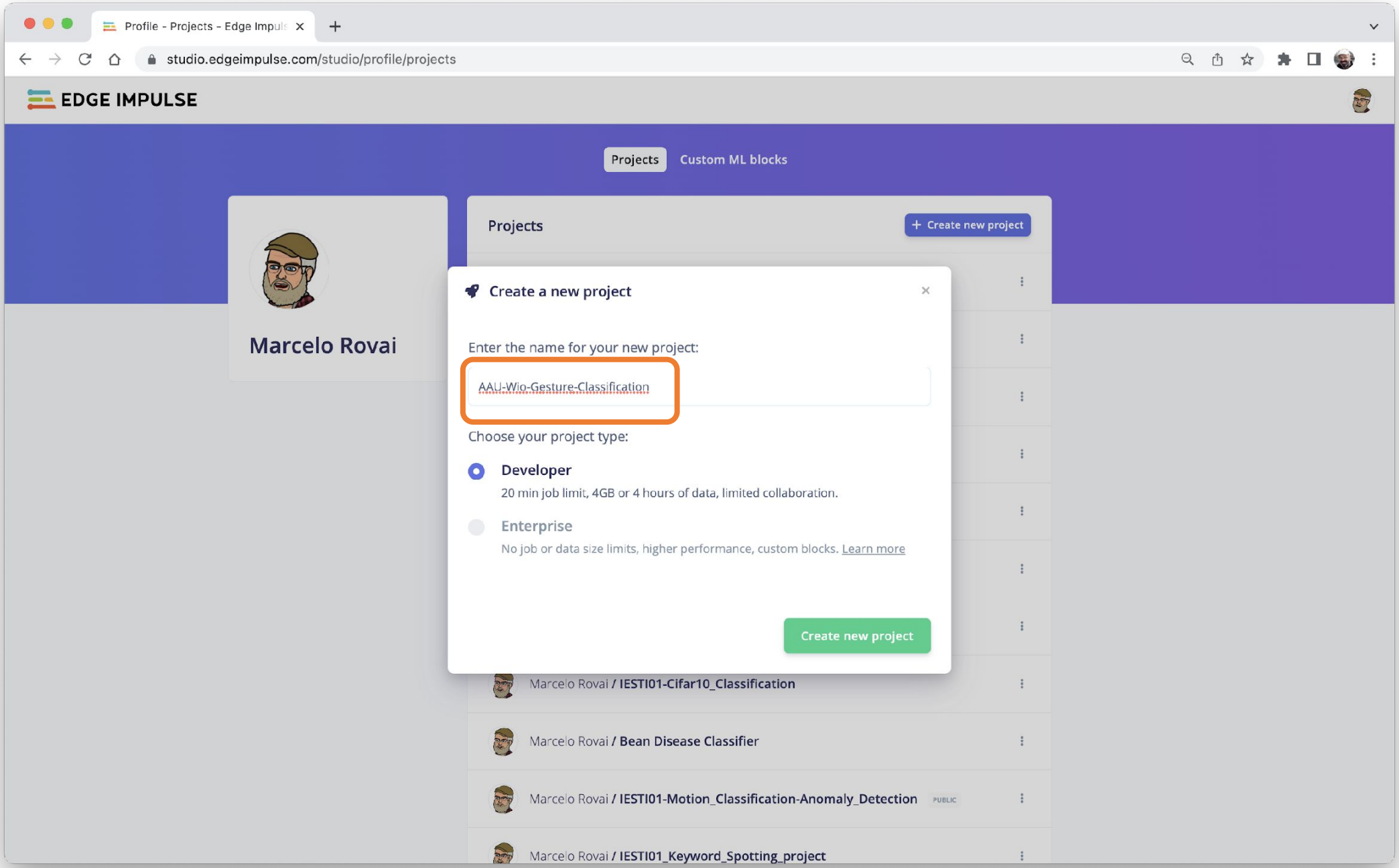
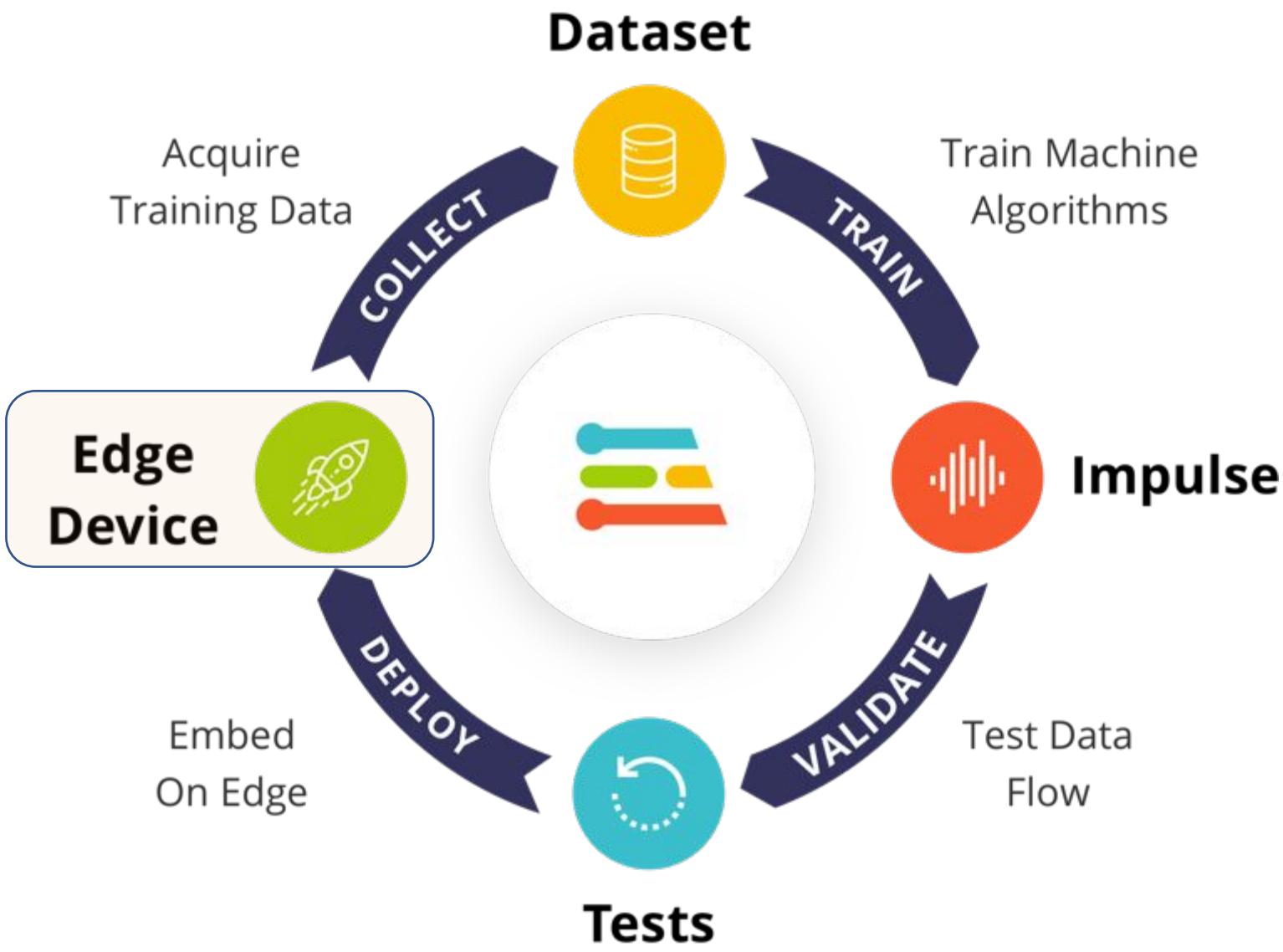
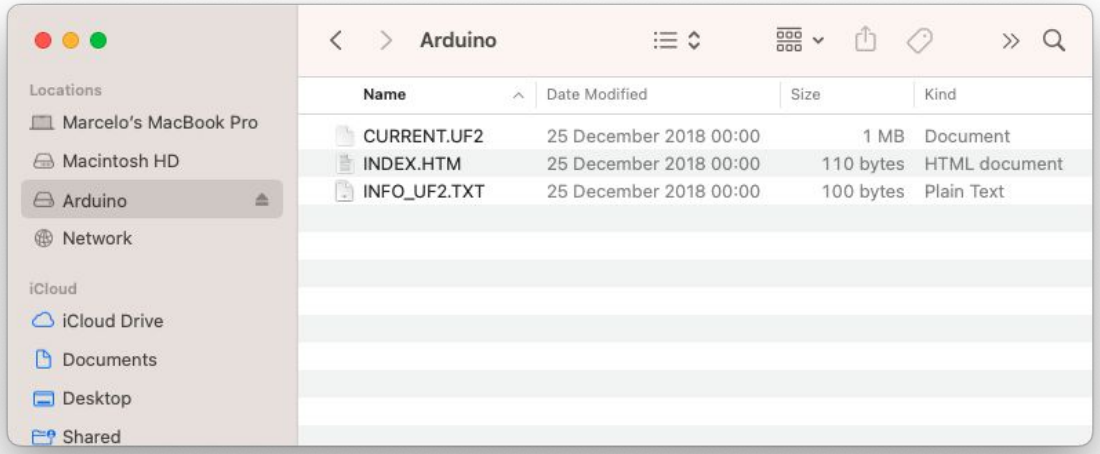

Profile - Projects - Edge Impuls
studio.edgeimpulse.com/studio/profile/projects
EDGE IMPULSE
Projects
Custom ML blocks
Marcelo Rovai
Projects
+ Create new project
Create a new project
Enter the name for your new project:
AAU-Wio-Gesture-Classification
Choose your project type:
Developer
20 min job limit, 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 / IESTI01-Cifar10_Classification
Marcelo Rovai / Bean Disease Classifier
Marcelo Rovai / IESTI01-Motion_Classification-Anomaly_Detection
PUBLIC
Marcelo Rovai / IESTI01_Keyword_Spotting_project

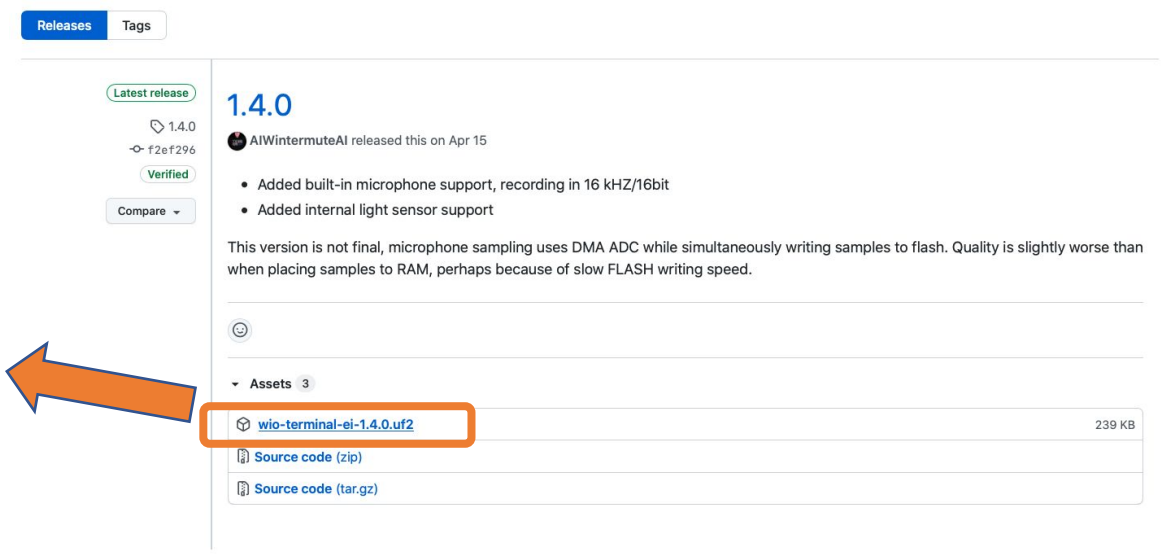


- Pre-Processing Data
- Design a Model
- Train a Model

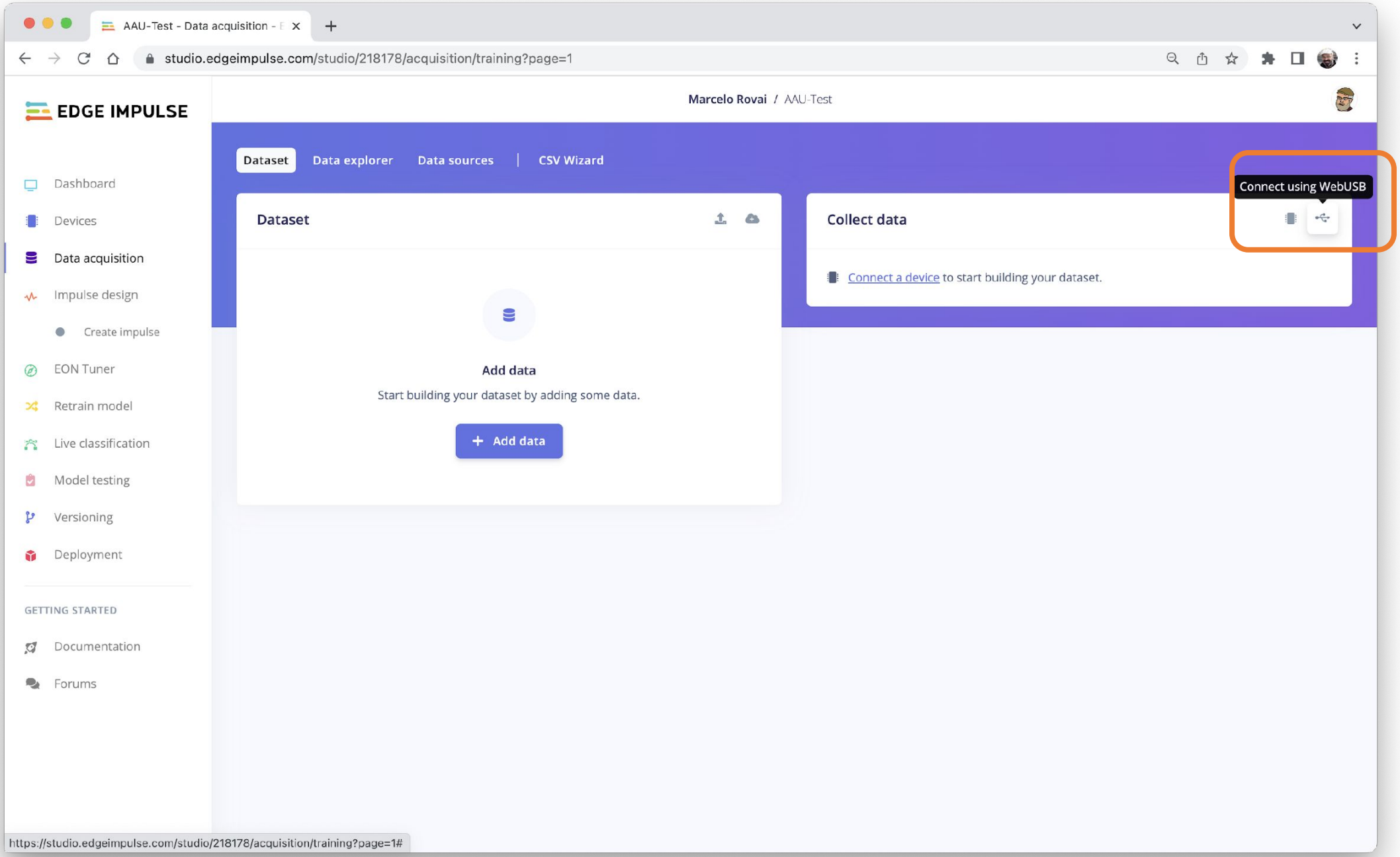
Firmware installation

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!





Built-in Sensor’s Test


AAU-Test - Data acquisition
studio.edgeimpulse.com/studio/218178/acquisition/training?page=1
EDGE IMPULSE
Marcelo Rovai / AAU-Test
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CSV Wizard
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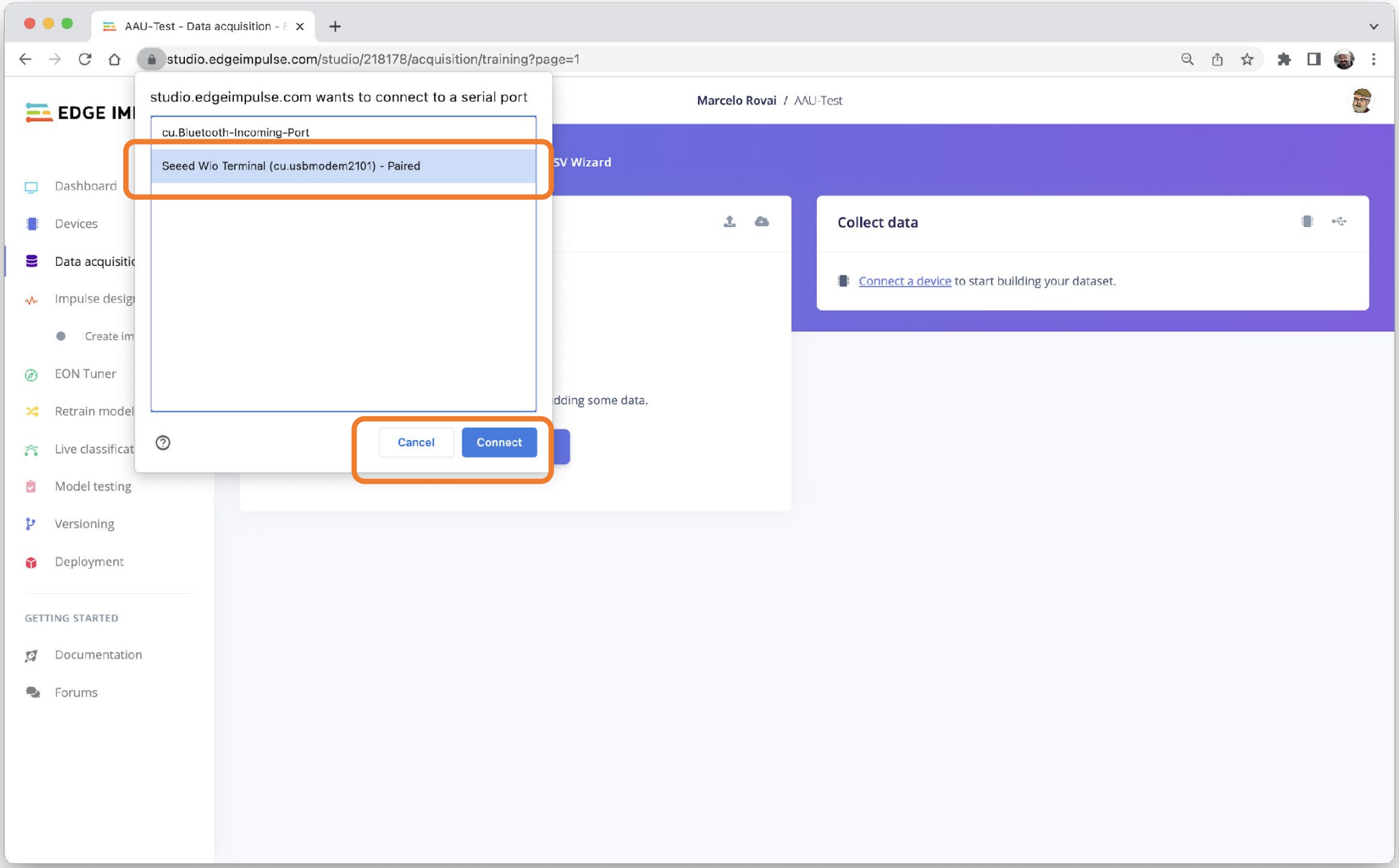
Collect data
Connect a device to start building your dataset.
Add data
Start building your dataset by adding some data.
+ Add data
https://studio.edgeimpulse.com/studio/218178/acquisition/training?page=1#


AAU-Test - Data acquisition
studio.edgeimpulse.com/studio/218178/acquisition/training?page=1
studio.edgeimpulse.com wants to connect to a serial port
cu.Bluetooth-Incoming-Port
Seeed Wio Terminal (cu.usbmodem2101) - Paired
Cancel
Connect
Marcelo Rovai / AAU-Test
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Impulse desig
Create im
EON Tuner
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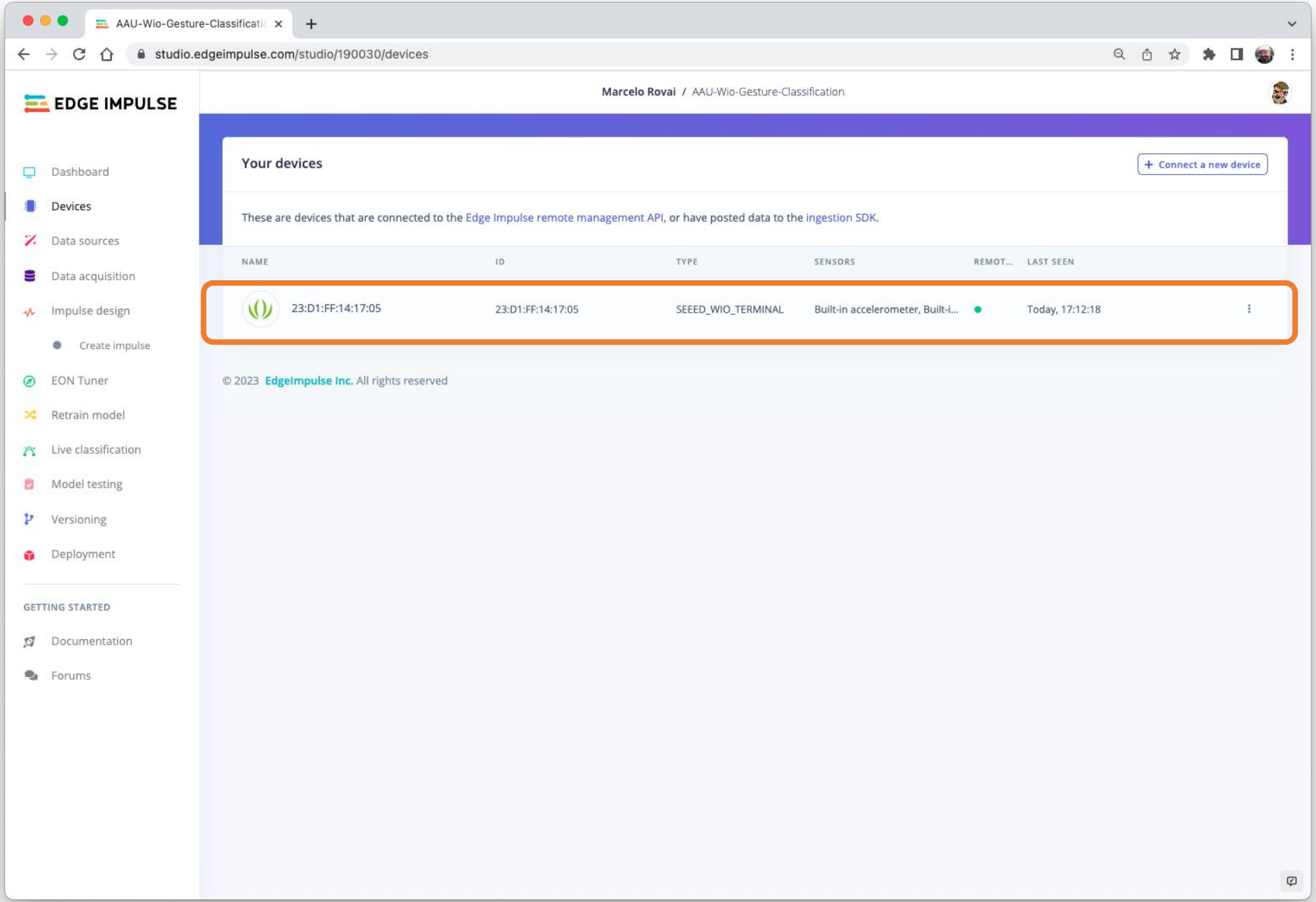
SV Wizard
Collect data
Connect a device to start building your dataset.
dding some data.


AAU-Wio-Gesture-Classificati
studio.edgeimpulse.com/studio/190030/devices
EDGE IMPULSE
Marcelo Rovai / AAU-Wio-Gesture-Classification
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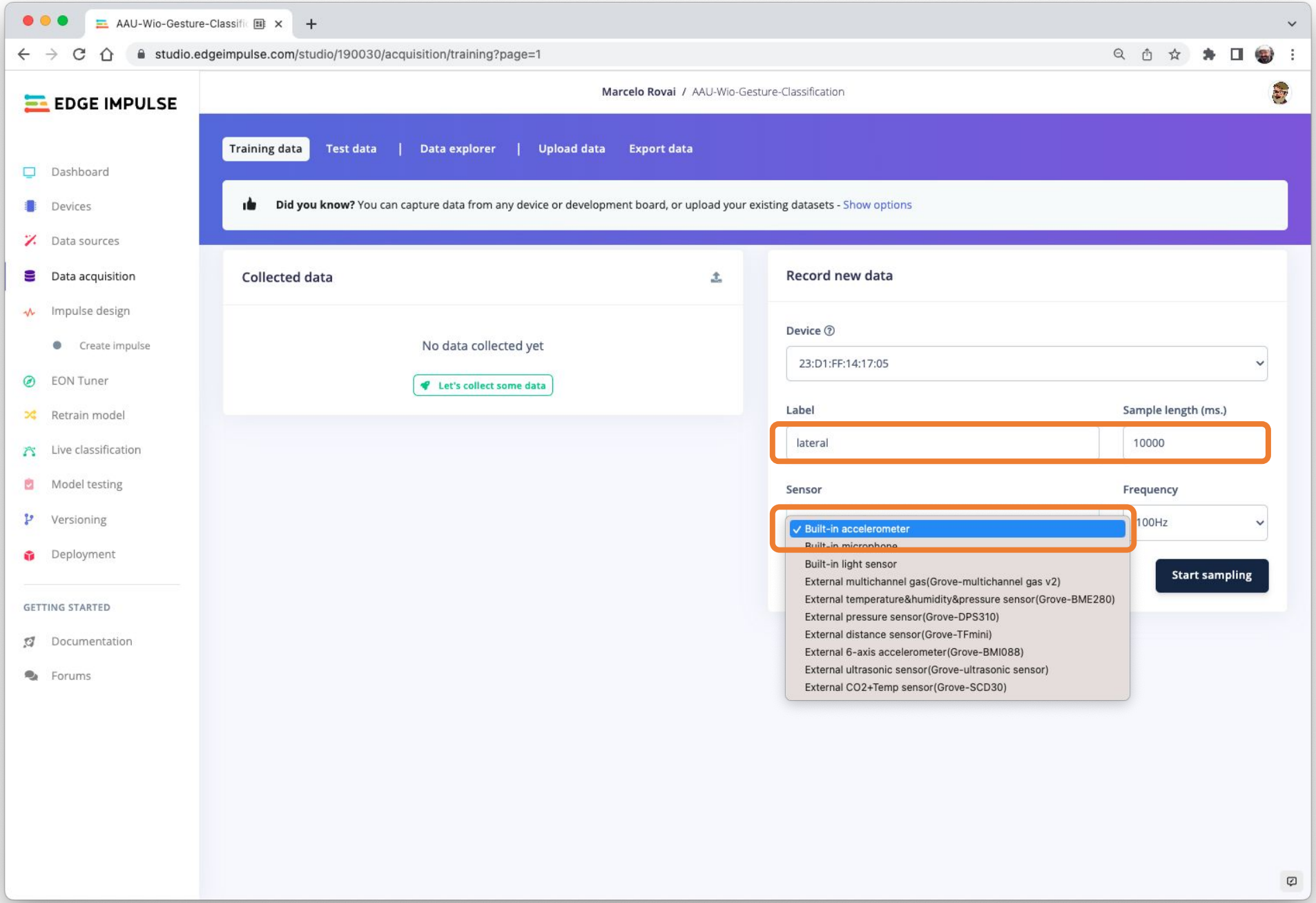
Your devices
+ Connect a new device
These are devices that are connected to the Edge Impulse remote management API, or have posted data to the ingestion SDK.
NAME
ID
TYPE
SENSORS
REMOT...
LAST SEEN
23:D1:FF:14:17:05
23:D1:FF:14:17:05
SEEED_WIO_TERMINAL
Built-in accelerometer, Built-i...
Today, 17:12:18
© 2023 EdgeImpulse Inc. All rights reserved


AAU-Wio-Gesture-Classifi
studio.edgeimpulse.com/studio/190030/acquisition/training?page=1
EDGE IMPULSE
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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
23:D1:FF:14:17:05
Label
lateral
Sample length (ms.)
10000
Sensor
Built-in accelerometer
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)
Frequency
100Hz
Start sampling

AAU-Wio-Gesture-Classifi

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

EDGE IMPULSE

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  - Create impulse
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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

1

Record new data

Device
23:D1:FF:14:17:05

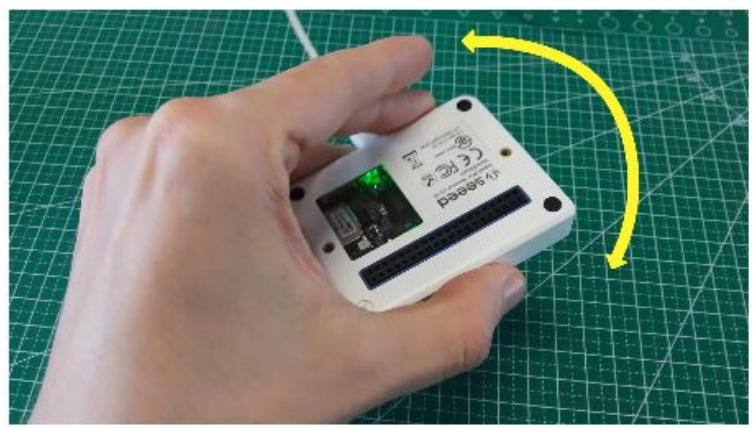
Label
lateral

Sample length (ms.)
10000

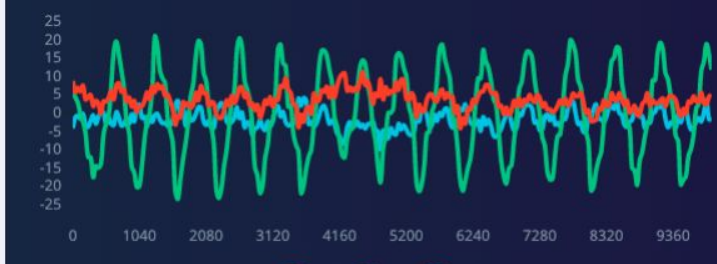
Sensor
Built-in accelerometer

Frequency
100Hz

Start sampling



RAW DATA
lateral.3pq0n74t



AAU-Wio-Gesture-Classifi

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

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DATA COLLECTED
5s

TRAIN / TEST SPLIT
100% / 0%

Collected data

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

1

Record new data

Device
23:D1:FF:14:17:05

Label
yes

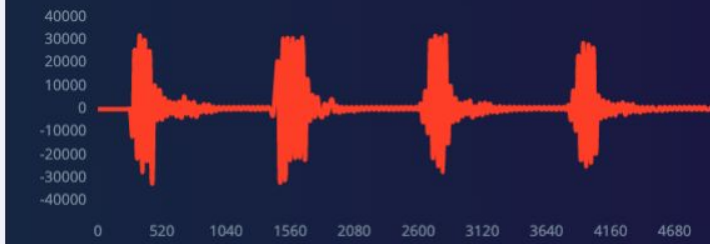
Sample length (ms.)
5000

Sensor
Built-in microphone

Frequency
16000Hz

Start sampling

RAW DATA
yes.3pq19fp5



0:05 / 0:05

AAU-Wio-Gesture-Classifi

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

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

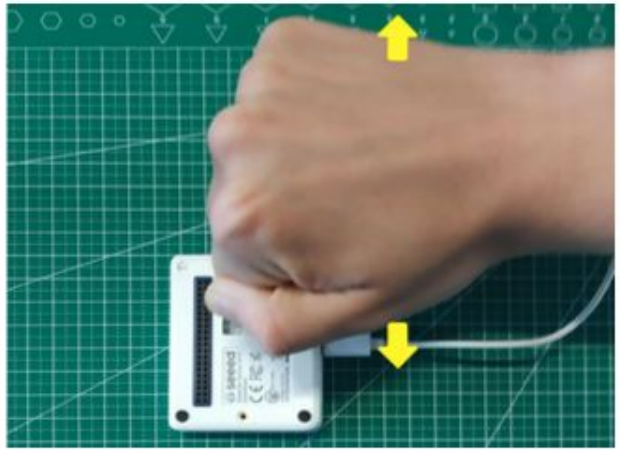
DATA COLLECTED
10s

TRAIN / TEST SPLIT
100% / 0%

Collected data

SAMPLE NAME	LABEL	ADDED	LENGTH
rock.3pq1fjvf	rock	Today, 17:25:36	5s
yes.3pq19fp5	yes	Today, 17:22:15	5s

1



Record new data

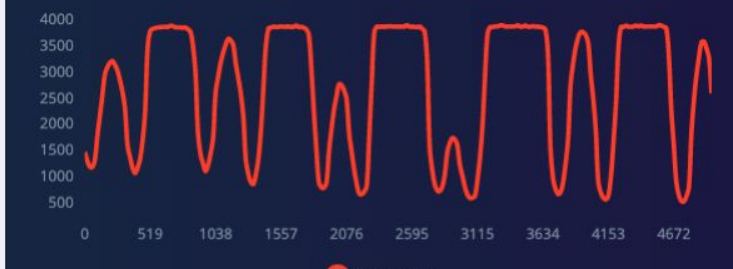
Device
23:D1:FF:14:17:05

Label: rock
Sample length (ms.): 5000

Sensor: Built-in light sensor
Frequency: 62.5Hz

Start sampling

RAW DATA
rock.3pq1fjvf



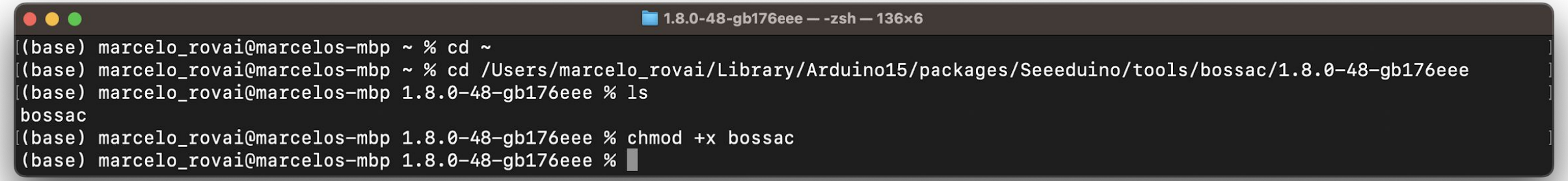
Metadata

Thanks

UNIFEI

Trobleshooting

- On a Mac, if you can not upload a code, try to give access to the file described on Arduino Terminal (in my case (…./bossac)
  - Go to the proper folder (cd ….)
  - Permit to execute: chmod +x bossac



- If the Wio does not connect to the Studio, check if Arduino (or Serial monitor) is open. If yes, close it.
- Try resetting the Wio and/or disconnecting and reconnecting to the USB