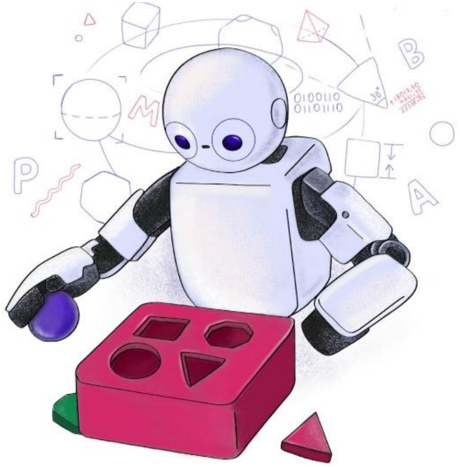
TP557 - Tópicos avançados em IoT e Machine Learning:

Arduino nano ble 33 sense

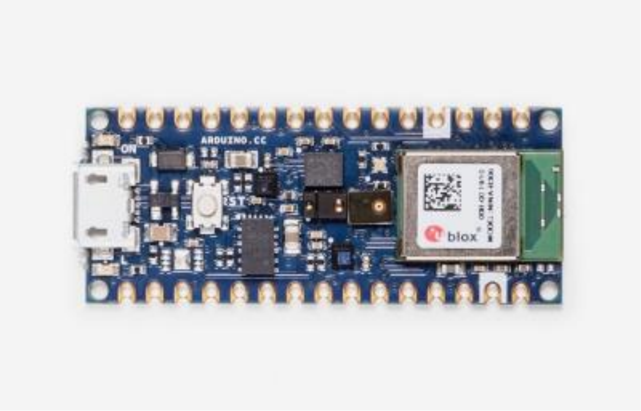


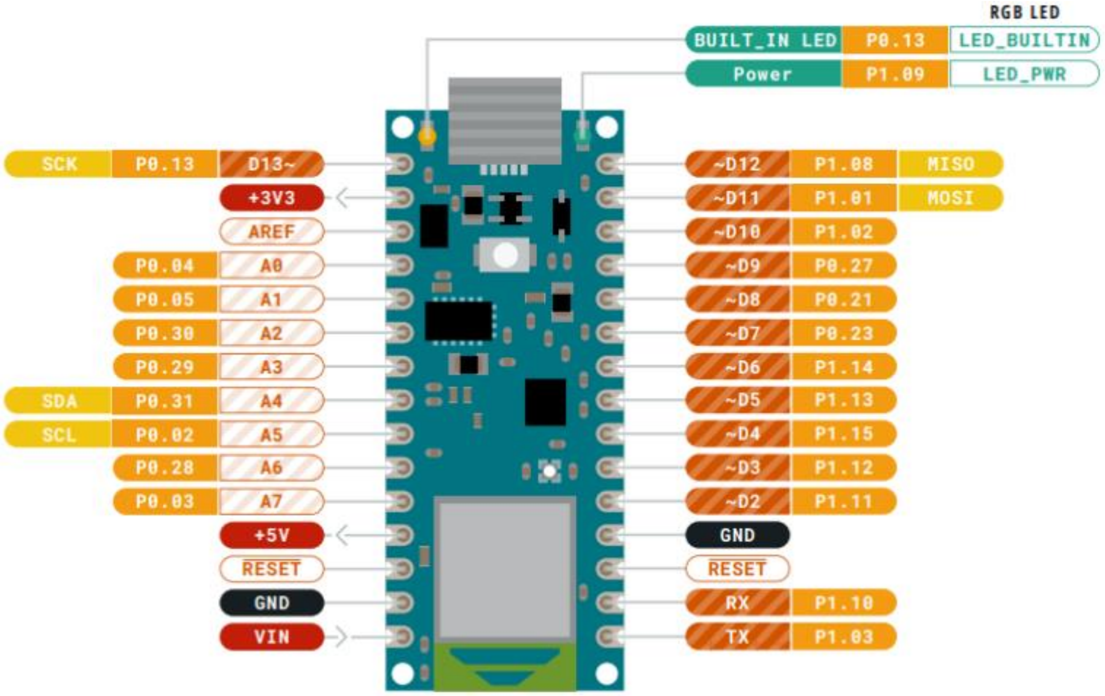
Inatel

Créditos: Prof. Marcelo Rovai UNIFEI

Samuel Baraldi Mafra
samuelbmafra@inatel.br

Arduino nano ble 33 sense





Pinout

Arduino nano ble 33 sense

Bluetooth®

IMU for Motion Detection

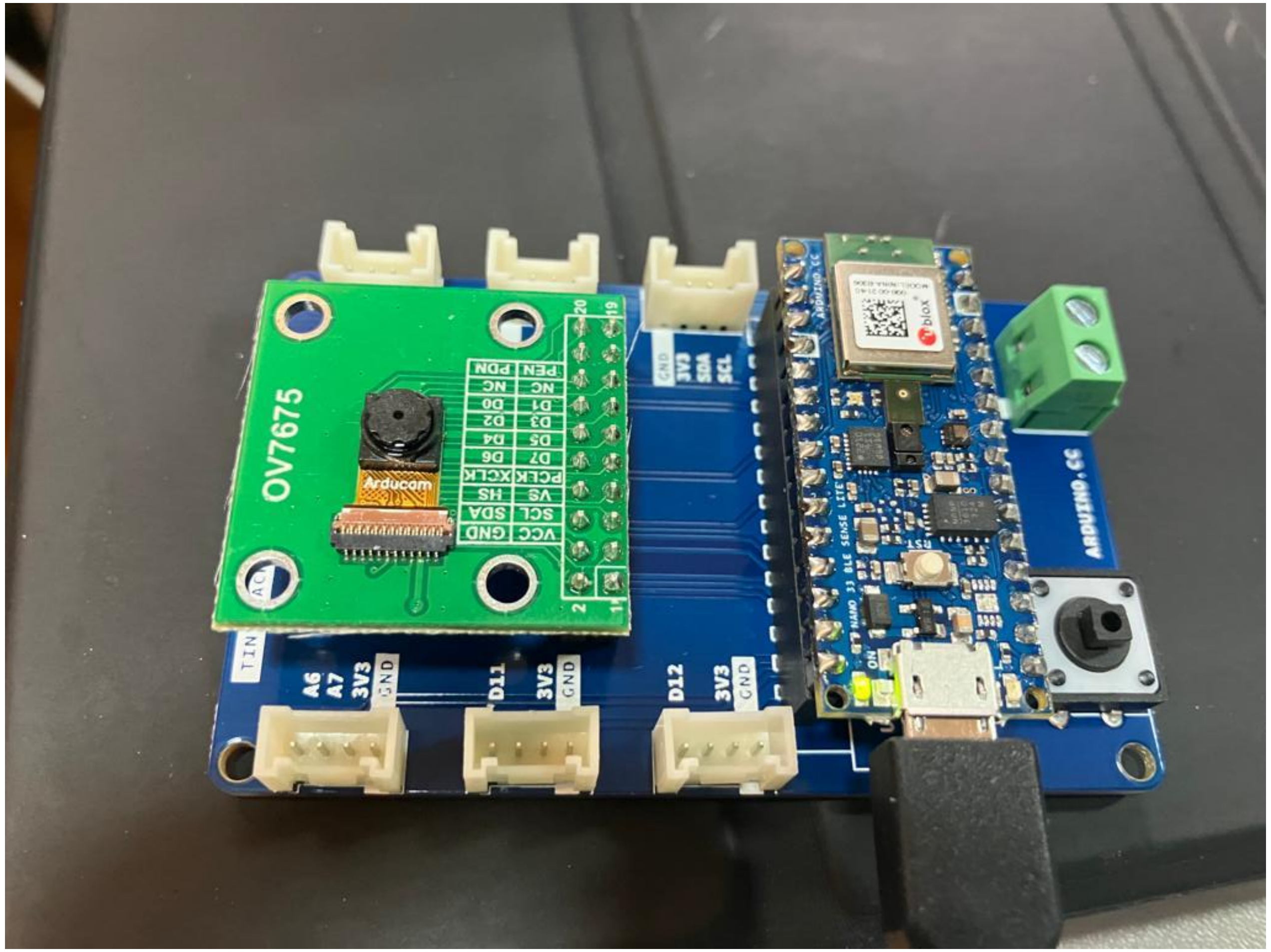
Microphone

Proximity and Gesture Detection

Barometric Pressure Sensor

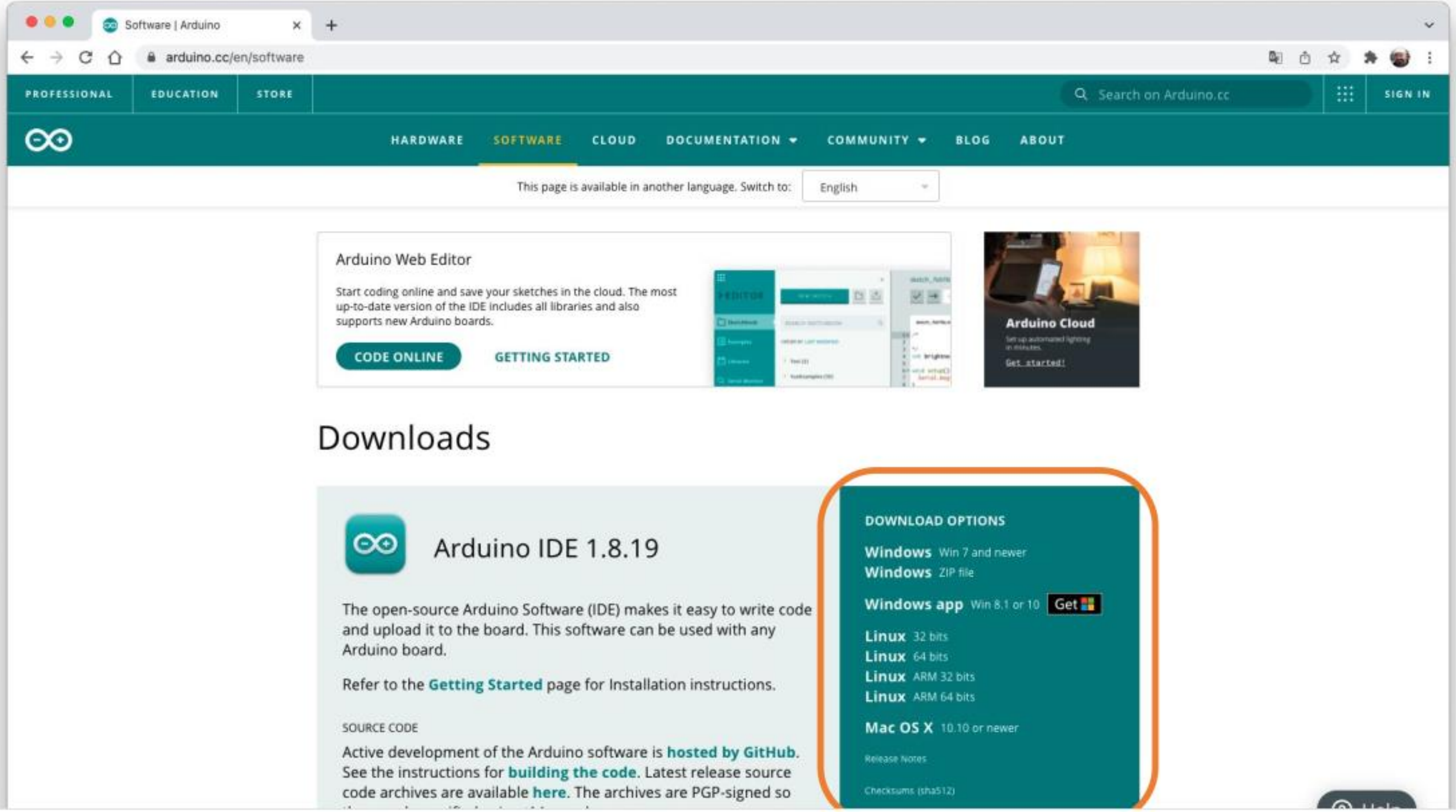
Temperature and Humidity Sensor

Arduino nano ble 33 sense



Arduino nano ble 33 sense

Installing the Arduino IDE



This page is available in another language. Switch to: English

Arduino Web Editor

Start coding online and save your sketches in the cloud. The most up-to-date version of the IDE includes all libraries and also supports new Arduino boards.

Downloads

Arduino IDE 1.8.19

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

Refer to the **Getting Started** page for Installation instructions.

SOURCE CODE

Active development of the Arduino software is **hosted by GitHub**. See the instructions for **building the code**. Latest release source code archives are available **here**. The archives are PGP-signed so

DOWNLOAD OPTIONS

Windows Win 7 and newer
Windows ZIP file

Windows app Win 8.1 or 10

Linux 32 bits
Linux 64 bits
Linux ARM 32 bits
Linux ARM 64 bits

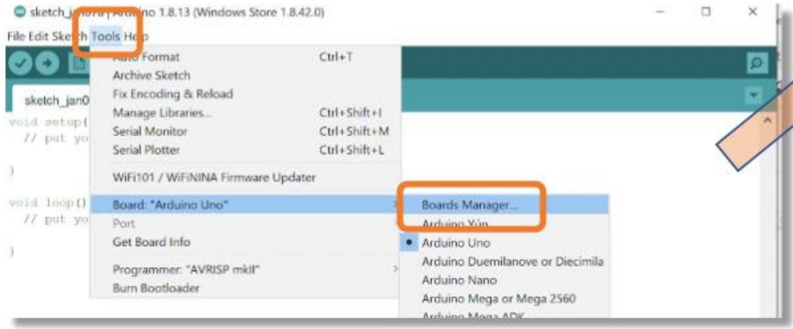
Mac OS X 10.10 or newer

Release Notes

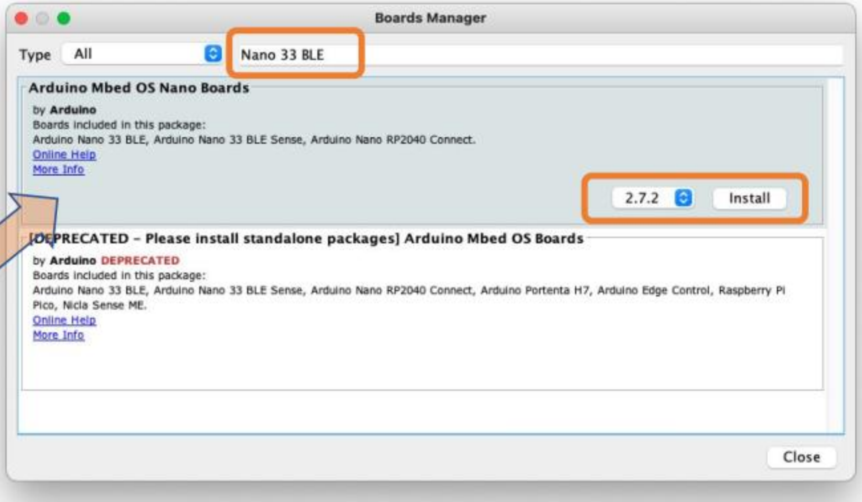
Checksums (sha512)

Arduino nano ble 33 sense

Installing the Board Files


sketch_j... | Arduino 1.8.13 (Windows Store 1.8.42.0)
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
WiFi101 / WiFiNINA Firmware Updater
Board: "Arduino Uno"
Port
Get Board Info
Programmer: "AVRISP mkII"
Burn Bootloader
Boards Manager...
Arduino Yún
● Arduino Uno
Arduino Duemilanove or Diecimila
Arduino Nano
Arduino Mega or Mega 2560
Arduino Mega ADK

```
void setup(
  // put yo

}

void loop()
  // put yo

}
```



Nano 33 BLE

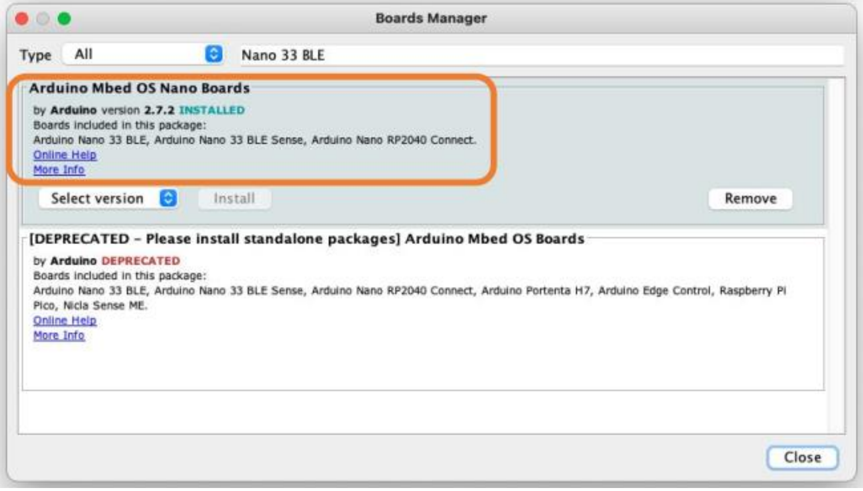
Arduino Mbed OS Nano Boards

by **Arduino**
Boards included in this package:
Arduino Nano 33 BLE, Arduino Nano 33 BLE Sense, Arduino Nano RP2040 Connect.
Online Help
More Info

2.7.2 Install

[DEPRECATED – Please install standalone packages] Arduino Mbed OS Boards

by **Arduino** DEPRECATED
Boards included in this package:
Arduino Nano 33 BLE, Arduino Nano 33 BLE Sense, Arduino Nano RP2040 Connect, Arduino Portenta H7, Arduino Edge Control, Raspberry Pi Pico, Nicla Sense ME.
Online Help
More Info



Nano 33 BLE

Arduino Mbed OS Nano Boards

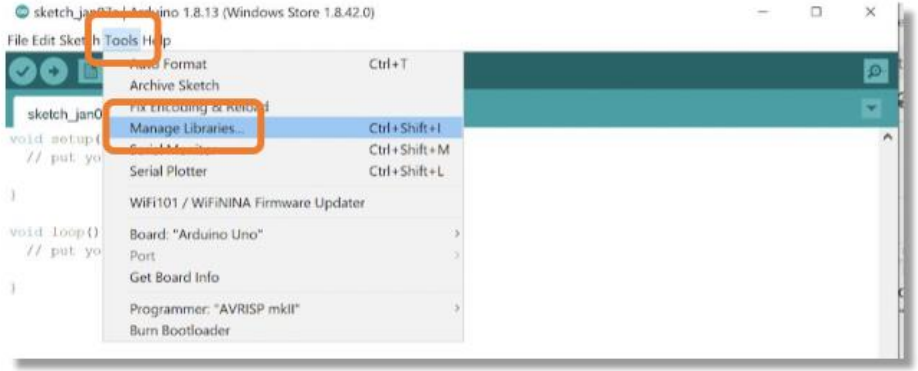
by **Arduino** version **2.7.2** INSTALLED
Boards included in this package:
Arduino Nano 33 BLE, Arduino Nano 33 BLE Sense, Arduino Nano RP2040 Connect.
Online Help
More Info

[DEPRECATED – Please install standalone packages] Arduino Mbed OS Boards

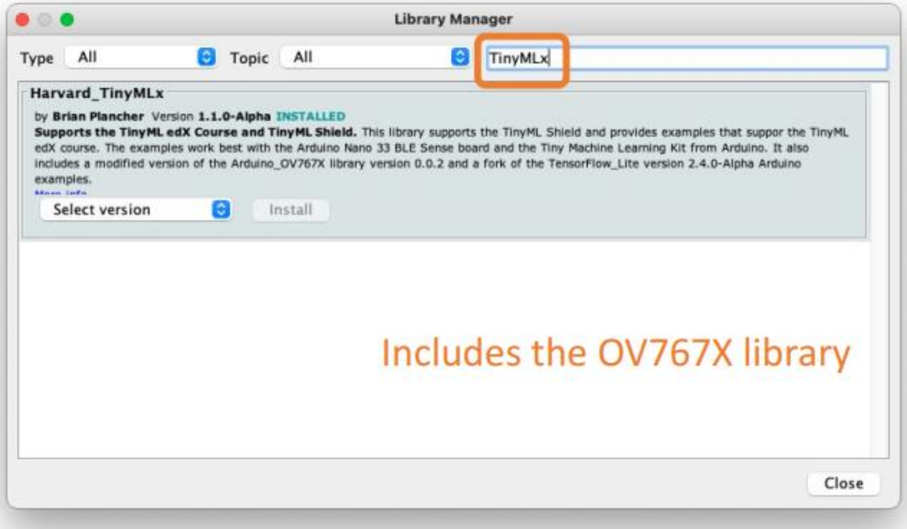
by **Arduino** DEPRECATED
Boards included in this package:
Arduino Nano 33 BLE, Arduino Nano 33 BLE Sense, Arduino Nano RP2040 Connect, Arduino Portenta H7, Arduino Edge Control, Raspberry Pi Pico, Nicla Sense ME.
Online Help
More Info

Arduino nano ble 33 sense

Installing the Main Libraries


sketch_jan07a | Arduino 1.8.13 (Windows Store 1.8.42.0)
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
WiFi101 / WiFiNINA Firmware Updater
Board: "Arduino Uno"
Port
Get Board Info
Programmer: "AVRISP mkII"
Burn Bootloader
sketch_jan07a

```
void setup() {
  // put yo
}

void loop() {
  // put yo
}
```



TinyMLx

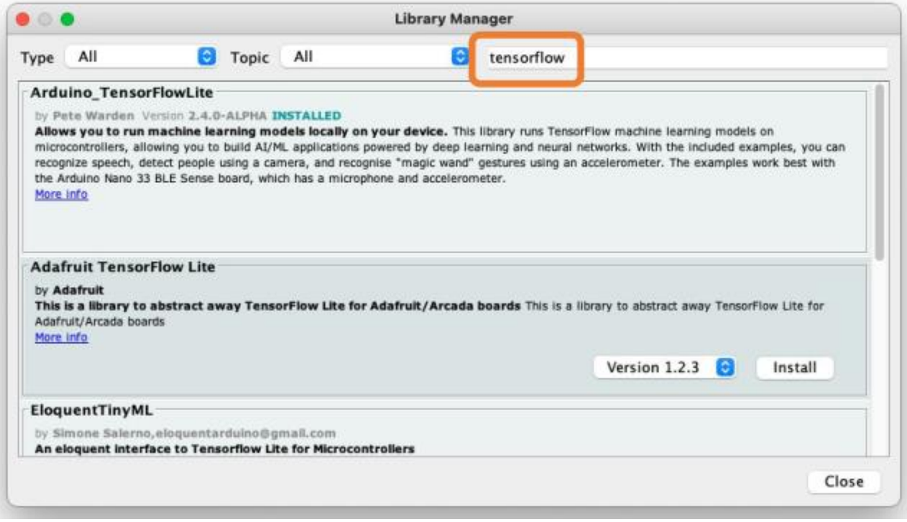
Harvard_TinyMLx

by **Brian Plancher** Version **1.1.0-Alpha** INSTALLED

Supports the TinyML edX Course and TinyML Shield. This library supports the TinyML Shield and provides examples that suppor the TinyML edX course. The examples work best with the Arduino Nano 33 BLE Sense board and the Tiny Machine Learning Kit from Arduino. It also includes a modified version of the Arduino_OV767X library version 0.0.2 and a fork of the TensorFlow_Lite version 2.4.0-Alpha Arduino examples.

More info

Includes the OV767X library



tensorflow

Arduino_TensorFlowLite

by **Pete Warden** Version **2.4.0-ALPHA** INSTALLED

Allows you to run machine learning models locally on your device. This library runs TensorFlow machine learning models on microcontrollers, allowing you to build AI/ML applications powered by deep learning and neural networks. With the included examples, you can recognize speech, detect people using a camera, and recognise "magic wand" gestures using an accelerometer. The examples work best with the Arduino Nano 33 BLE Sense board, which has a microphone and accelerometer.

More info

Adafruit TensorFlow Lite

by **Adafruit**

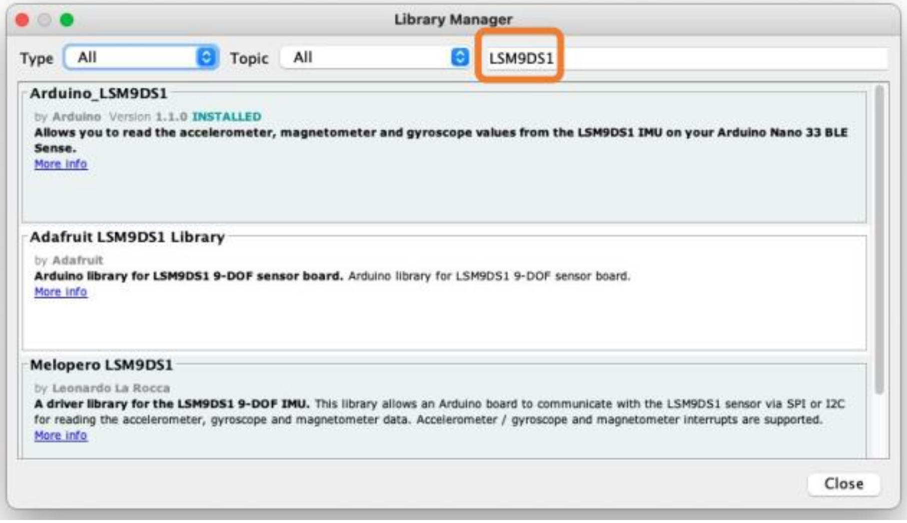
This is a library to abstract away TensorFlow Lite for Adafruit/Arcada boards This is a library to abstract away TensorFlow Lite for Adafruit/Arcada boards

More info

EloquentTinyML

by **Simone Salerno,eloquentarduino@gmail.com**

An eloquent interface to Tensorflow Lite for Microcontrollers



LSM9DS1

Arduino_LSM9DS1

by **Arduino** Version **1.1.0** INSTALLED

Allows you to read the accelerometer, magnetometer and gyroscope values from the LSM9DS1 IMU on your Arduino Nano 33 BLE Sense.

More info

Adafruit LSM9DS1 Library

by **Adafruit**

Arduino library for LSM9DS1 9-DOF sensor board. Arduino library for LSM9DS1 9-DOF sensor board.

More info

Melopero LSM9DS1

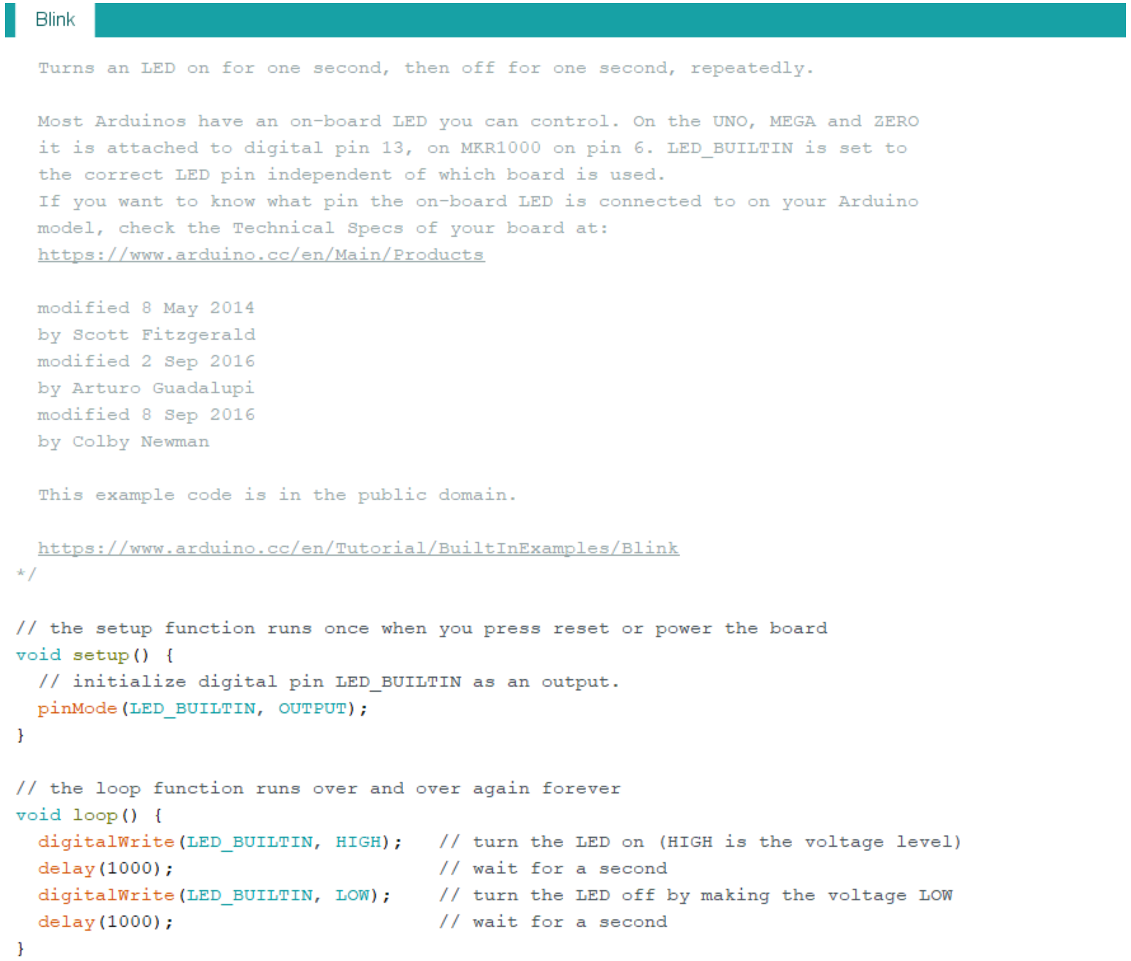
by **Leonardo La Rocca**

A driver library for the LSM9DS1 9-DOF IMU. This library allows an Arduino board to communicate with the LSM9DS1 sensor via SPI or I2C for reading the accelerometer, gyroscope and magnetometer data. Accelerometer / gyroscope and magnetometer interrupts are supported.

More info

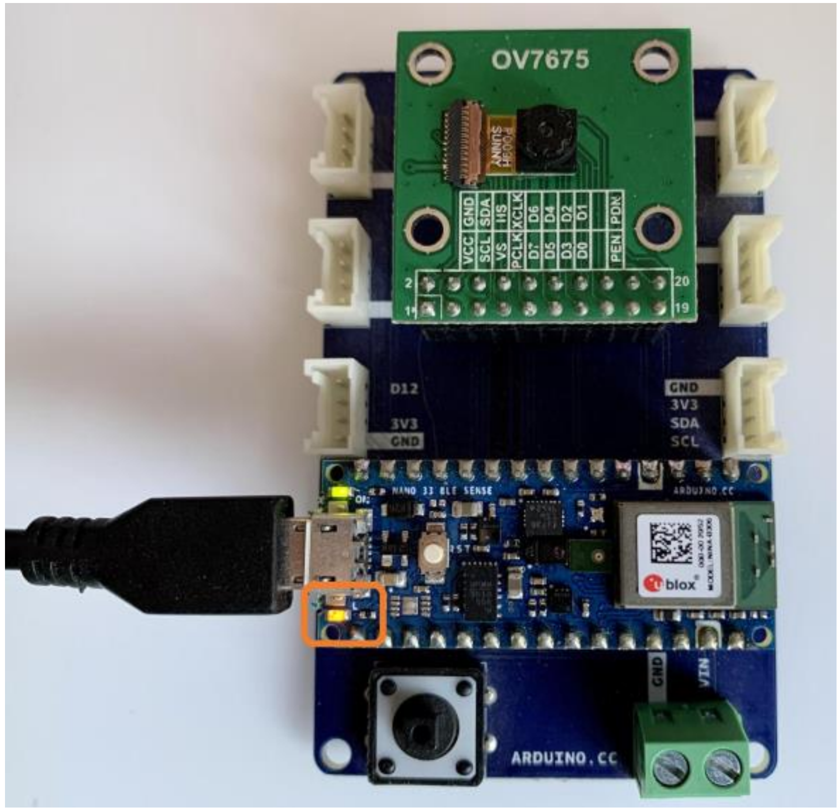
Arduino nano ble 33 sense

Blink

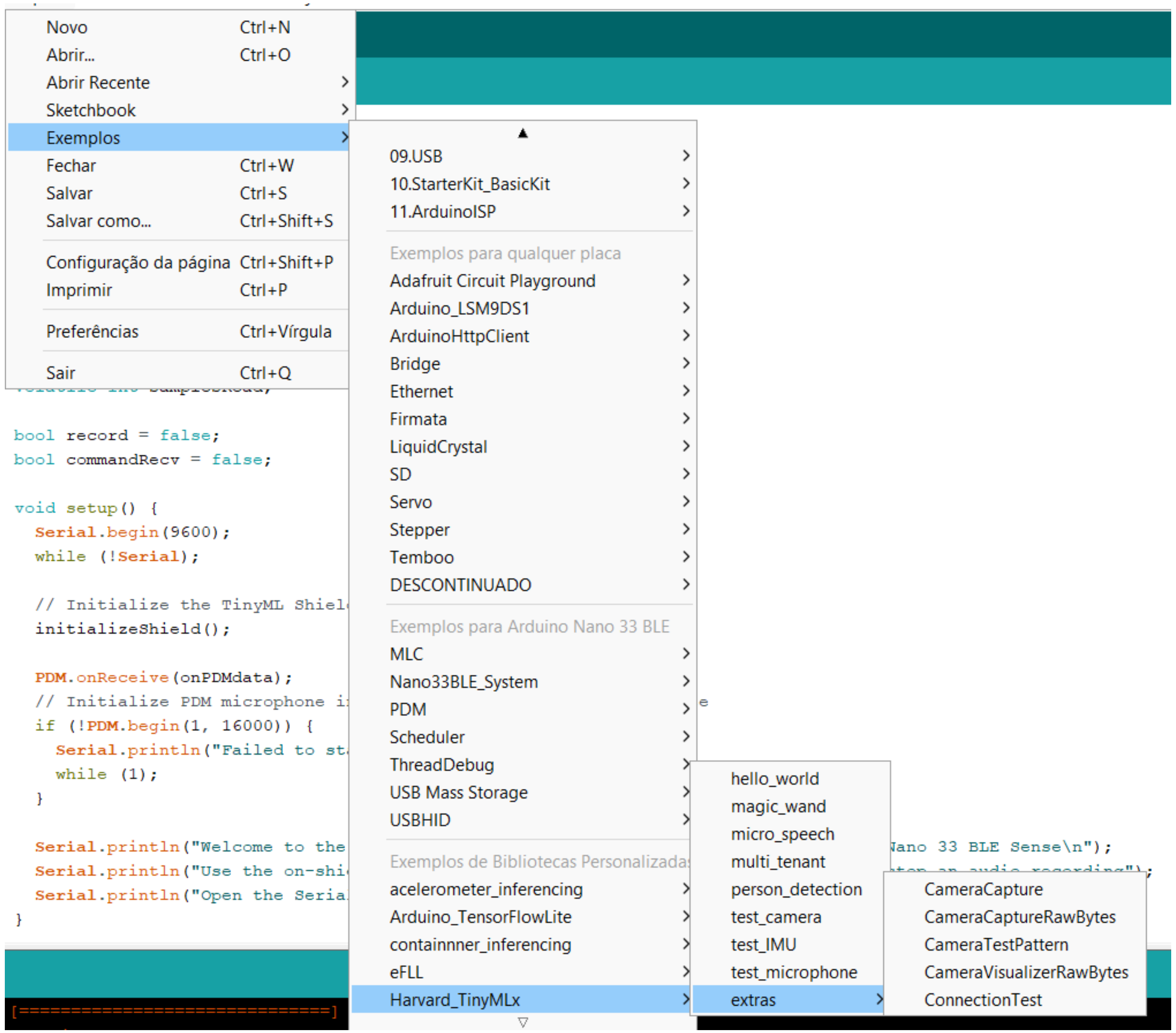


Blink

```
  Turns an LED on for one second, then off for one second, repeatedly.

  Most Arduinos have an on-board LED you can control. On the UNO, MEGA and ZERO
  it is attached to digital pin 13, on MKR1000 on pin 6. LED_BUILTIN is set to
  the correct LED pin independent of which board is used.
  If you want to know what pin the on-board LED is connected to on your Arduino
  model, check the Technical Specs of your board at:
  https://www.arduino.cc/en/Main/Products

  modified 8 May 2014
  by Scott Fitzgerald
  modified 2 Sep 2016
  by Arturo Guadalupi
  modified 8 Sep 2016
  by Colby Newman

  This example code is in the public domain.

  https://www.arduino.cc/en/Tutorial/BuiltInExamples/Blink
*/

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);                       // wait for a second
  digitalWrite(LED_BUILTIN, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
}
```



Arduino nano ble 33 sense

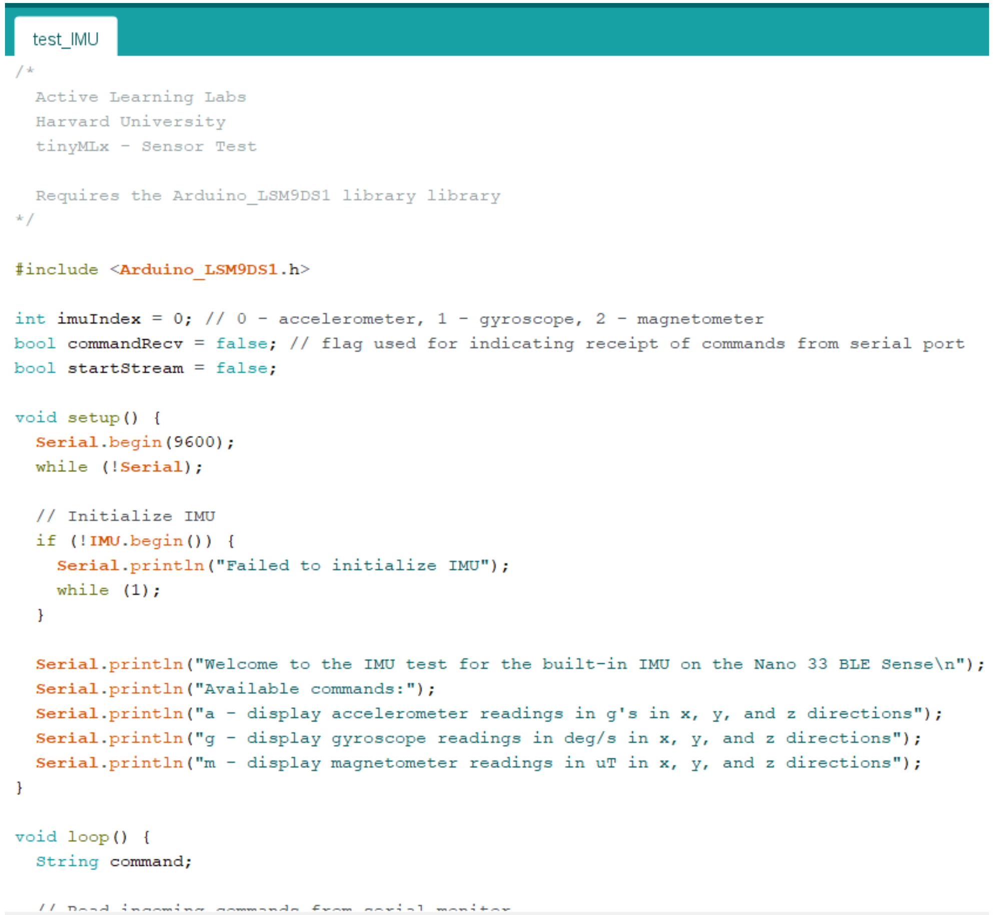


```
bool record = false;
bool commandRecv = false;

void setup() {
  Serial.begin(9600);
  while (!Serial);

  // Initialize the TinyML Shiel
  initializeShield();

  PDM.onReceive(onPDMdata);
  // Initialize PDM microphone i
  if (!PDM.begin(1, 16000)) {
    Serial.println("Failed to st
    while (1);
  }

  Serial.println("Welcome to the
  Serial.println("Use the on-shi
  Serial.println("Open the Seria
}
```

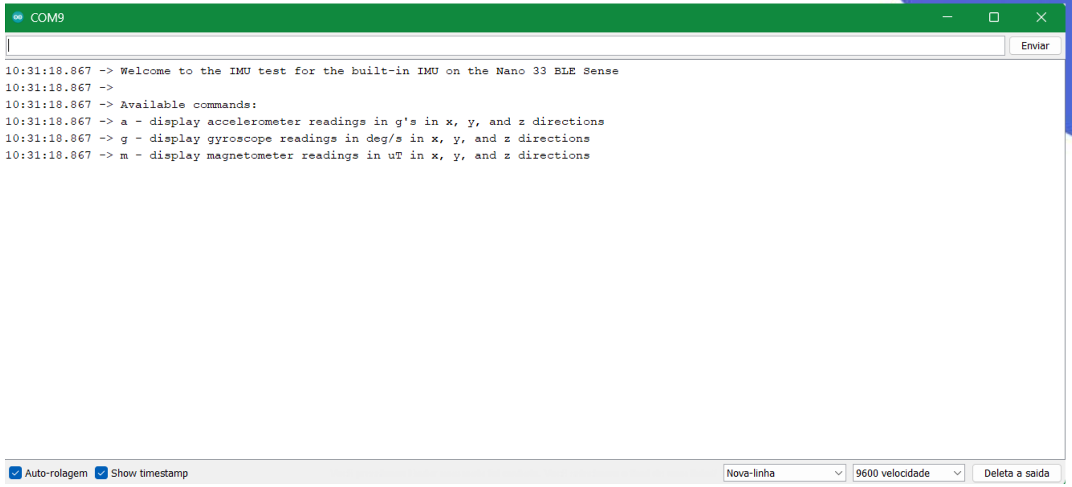
```
Nano 33 BLE Sense\n");
```

Arduino nano ble 33 sense

IMU acelerômetro



```
/*
  Active Learning Labs
  Harvard University
  tinyMLx - Sensor Test

  Requires the Arduino_LSM9DS1 library library
*/

#include <Arduino_LSM9DS1.h>

int imuIndex = 0; // 0 - accelerometer, 1 - gyroscope, 2 - magnetometer
bool commandRecv = false; // flag used for indicating receipt of commands from serial port
bool startStream = false;

void setup() {
  Serial.begin(9600);
  while (!Serial);

  // Initialize IMU
  if (!IMU.begin()) {
    Serial.println("Failed to initialize IMU");
    while (1);
  }

  Serial.println("Welcome to the IMU test for the built-in IMU on the Nano 33 BLE Sense\n");
  Serial.println("Available commands:");
  Serial.println("a - display accelerometer readings in g's in x, y, and z directions");
  Serial.println("g - display gyroscope readings in deg/s in x, y, and z directions");
  Serial.println("m - display magnetometer readings in uT in x, y, and z directions");
}

void loop() {
  String command;

  // Read incoming commands from serial monitor
```

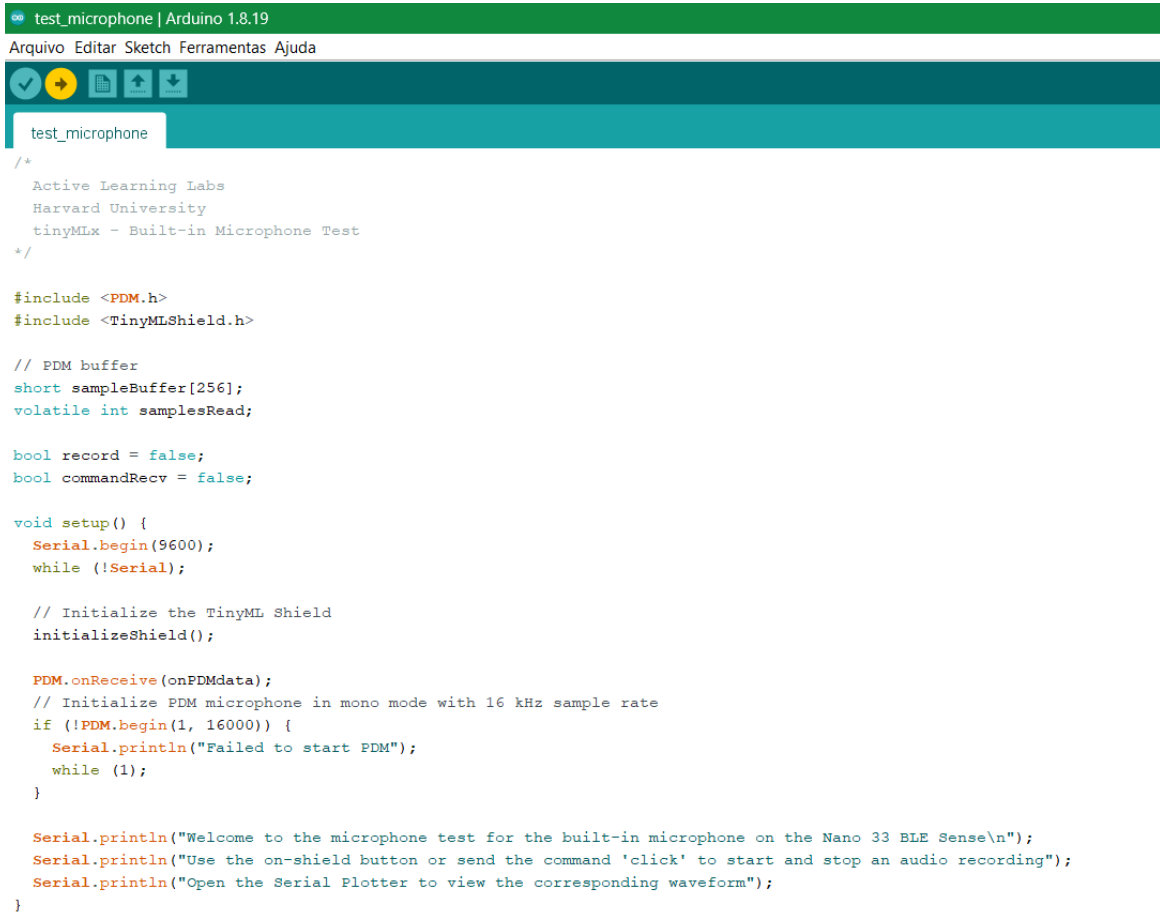


```
10:31:18.867 -> Welcome to the IMU test for the built-in IMU on the Nano 33 BLE Sense
10:31:18.867 -> 
10:31:18.867 -> Available commands:
10:31:18.867 -> a - display accelerometer readings in g's in x, y, and z directions
10:31:18.867 -> g - display gyroscope readings in deg/s in x, y, and z directions
10:31:18.867 -> m - display magnetometer readings in uT in x, y, and z directions
```

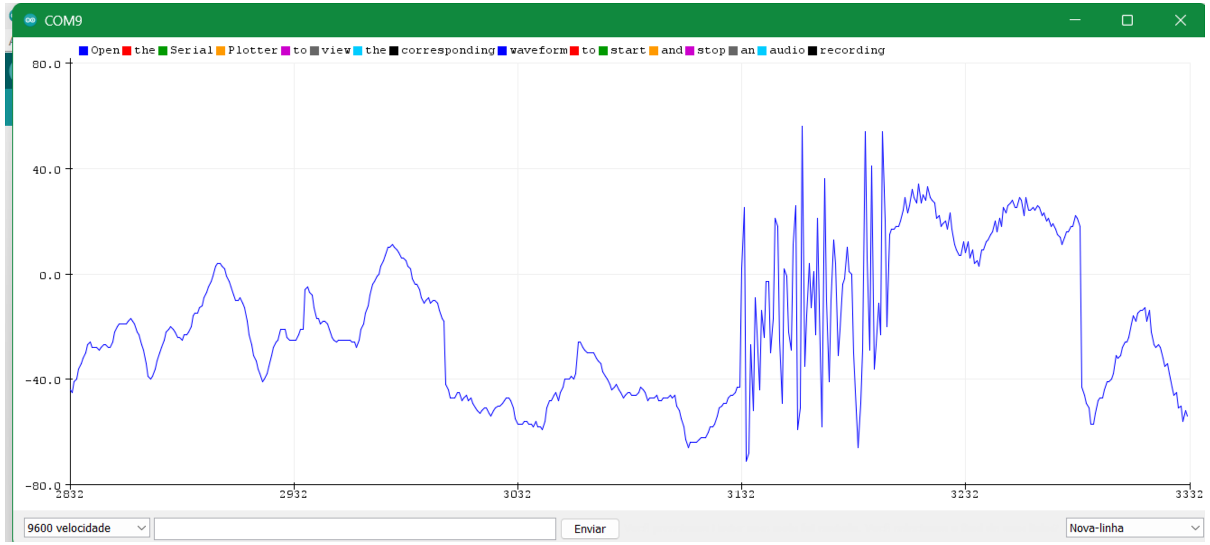
☑ Auto-rolagem ☑ Show timestamp Nova-linha 9600 velocidade

Arduino nano ble 33 sense

Microfone

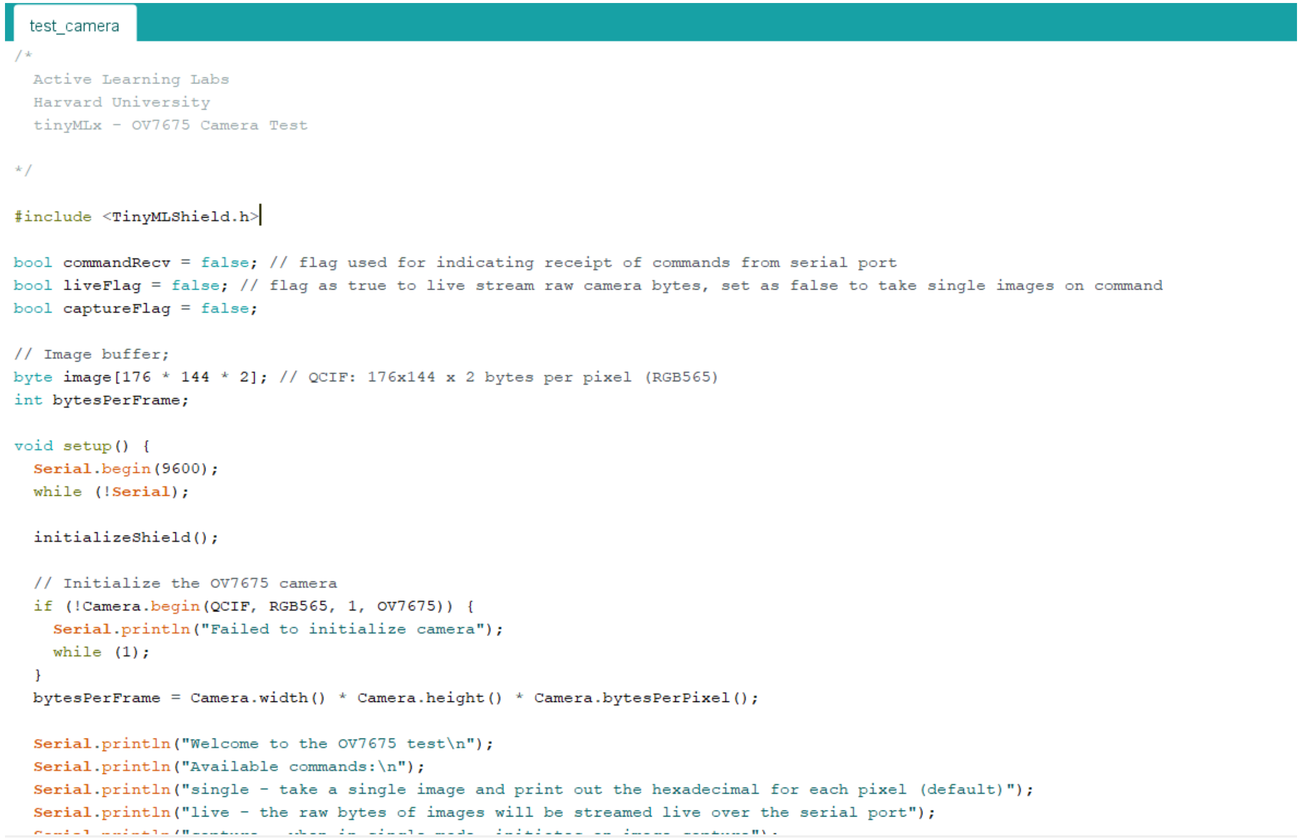

test_microphone | Arduino 1.8.19
Arquivo Editar Sketch Ferramentas Ajuda
test_microphone

```
/*
  Active Learning Labs
  Harvard University
  tinyMLx - Built-in Microphone Test
*/

#include <PDM.h>
#include <TinyMLShield.h>

// PDM buffer
short sampleBuffer[256];
volatile int samplesRead;

bool record = false;
bool commandRecv = false;

void setup() {
  Serial.begin(9600);
  while (!Serial);

  // Initialize the TinyML Shield
  initializeShield();

  PDM.onReceive(onPDMdata);
  // Initialize PDM microphone in mono mode with 16 kHz sample rate
  if (!PDM.begin(1, 16000)) {
    Serial.println("Failed to start PDM");
    while (1);
  }

  Serial.println("Welcome to the microphone test for the built-in microphone on the Nano 33 BLE Sense\n");
  Serial.println("Use the on-shield button or send the command 'click' to start and stop an audio recording");
  Serial.println("Open the Serial Plotter to view the corresponding waveform");
}
```

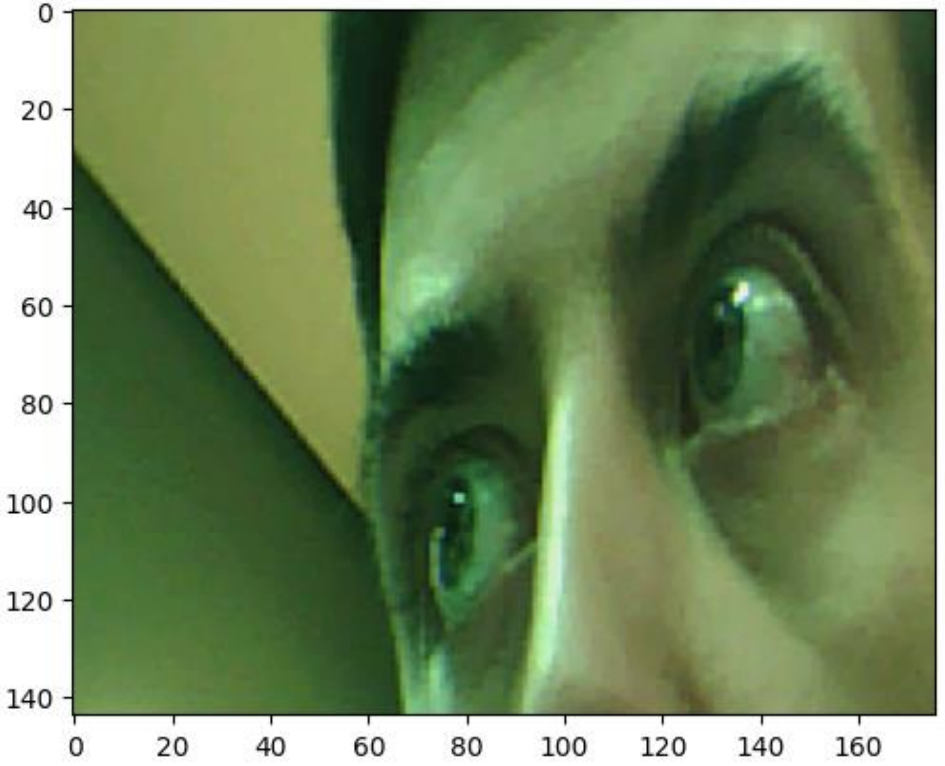

COM9
🟦 Open 🟥 the 🟩 Serial 🟧 Plotter 🟪 to ⬛ view 🟦 the ⬛ corresponding 🟦 waveform 🟥 to 🟩 start 🟧 and 🟪 stop ⬛ an 🟦 audio ⬛ recording
80.0
40.0
0.0
-40.0
-80.0
2832
2932
3032
3132
3232
3332
9600 velocidade
Enviar
Nova-linha

Arduino nano ble 33 sense

Câmera



```
/*
  Active Learning Labs
  Harvard University
  tinyMLx - OV7675 Camera Test

*/

#include <TinyMLShield.h>

bool commandRecv = false; // flag used for indicating receipt of commands from serial port
bool liveFlag = false; // flag as true to live stream raw camera bytes, set as false to take single images on command
bool captureFlag = false;

// Image buffer;
byte image[176 * 144 * 2]; // QCIF: 176x144 x 2 bytes per pixel (RGB565)
int bytesPerFrame;

void setup() {
  Serial.begin(9600);
  while (!Serial);

  initializeShield();

  // Initialize the OV7675 camera
  if (!Camera.begin(QCIF, RGB565, 1, OV7675)) {
    Serial.println("Failed to initialize camera");
    while (1);
  }
  bytesPerFrame = Camera.width() * Camera.height() * Camera.bytesPerPixel();

  Serial.println("Welcome to the OV7675 test\n");
  Serial.println("Available commands:\n");
  Serial.println("single - take a single image and print out the hexadecimal for each pixel (default)");
  Serial.println("live - the raw bytes of images will be streamed live over the serial port");
  Serial.println("capture - when in single mode, initiates an image capture");
```



https://colab.research.google.com/github/tinyMLx/colabs/blob/master/4-2-12-OV7675ImageViewer.ipynb