SciTinyML
Scientific Use of Machine Learning on Low Power Devices

Regional Workshop - Africa

Arduino Nano-33 BLE Sense EI set-up and Getting Started with Edge Impulse

Marcelo Rovai
Professor, UNIFEI - Brazil

Shawn Himel
Senior DevRel Engineer, Edge Impulse
Arduino Nano-33 BLE
Set up board and Arduino IDE
Nano 33 BLE Sense (Development board)

- **Microphone**
- **Processor + Bluetooth**
- **IMU**
- **Temperature + pressure**
- **I/O (USB)**
- **RGB LED**
- **Built-In LED (Yellow)**
- **Power-On LED (Green)**
- **Reset & Boot Button**
- **Gesture, proximity, light color and light intensity**
- **System / Comm**
- **Input Sensors**
- **Output**
Installing the Hardware
Installing the Arduino IDE

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 they can be verified using this gpg key.
Installing the Board Files
Installing the Main Libraries

Includes the OV767X library
Set up connection between Arduino Nano and Edge Impulse
Log in

roval@mjrcbot.org

Forgot your password?

Log in

Don't have an account? Sign up

Start building embedded machine learning models today.

© 2023 EdgImpulse Inc. All rights reserved
Create project

Enter a name for your new project

iESTIV1 - Nano Motion Classification

Cancel  Create new project
Pre-Processing Data
Design a Model
Train a Model
Page not found

Sorry, but the page you were looking for could not be found.

Back to front page
EI/Arduino CLI

Go to 2. Arduino CLI

(Note that the 1. Edge Impulse CLI is not necessary for Arduino Nano-33. We will use WebUSB insted.)

Installing dependencies

To set this device up in Edge Impulse, you will need to install the following software:

1. Edge Impulse CLI
2. Arduino CLI
   - Here's an instruction video for Windows.
   - The Arduino website has instructions for macOS and Linux.
Arduino CLI

See this video for Windows installation: https://www.youtube.com/watch?v=1iMWsFER-Bc
1. Connect the development board to your computer

Use a micro-USB cable to connect the development board to your computer. Then press RESSET twice to launch into the bootloader. The on-board LED should start pulsating to indicate this.

2. Update the firmware

The development board does not come with the right firmware yet. To update the firmware:

1. Download the latest Edge Impulse firmware, and unzip the file.
2. Open the flash script for your operating system (flash_windows.bat, flash_mac.command or flash_linux.sh) to flash the firmware.
3. Wait until flashing is complete, and press the RESET button once to launch the new firmware.

3. Setting keys

From a command prompt or terminal, run:
```
edge_impulse_device
```
1. Press Nano-33 Reset button Twice
2. With Nano-33 LED Flashing:
3. Nano-33 LED Stop Flashing
Windows 10

1. Press Nano-33 Reset button Twice
2. With Nano-33 LED Flashing:

```
Usage:
  arduino-cli [command]

Examples:
  arduino-cli <command> [flags...]

Available Commands:
  board  Arduino board commands.
  burn-bootloader Upload the bootloader.
  cache  Arduino cache commands.
  compile Compiles Arduino sketches.
  completion Generates completion scripts
  config  Arduino configuration commands.
  core  Arduino core operations.
  daemon Run as a daemon on port 50051
  debug  Debug Arduino sketches.
  help  Help about any command
  lib  Arduino commands about libraries.
  outdated Lists cores and libraries that can be upgraded
  sketch  Arduino CLI sketch commands.
  update  Updates the index of cores and libraries
  upgrade  Upgrades installed cores and libraries.
  upload  Upload Arduino sketches.
  version  Shows version number of Arduino CLI.
```
Nano-33 LED Stop Flashing

Windows 10

C:\WINDOWS\system32\cmd.exe

Finding Arduino Mbed core...
arduino:mbed_nano 2.0.0 2.0.0 Arduino Mbed OS Nano Boards
Finding Arduino Mbed core OK
Finding Arduino Nano 33 BLE...
Finding Arduino Nano 33 BLE OK at COM11
arduino:mbed_nano 2.0.0 2.0.0 Arduino Mbed OS Nano Boards

Device : nRF52840-QIAA

Version : Arduino Bootloader (SAM-BA extended) 2.0 [Arduino:IKXYZ]
Address  : 0x08
Pages    : 256
Page Size : 4096 bytes
Total Size : 1024KB
Planes   : 1
Lock Regions : 0
Locked : none
Security : false
Erase flash

Done in 0.002 seconds
Write 525440 bytes to flash (129 pages)
[============================================] 100% (129/129 pages)
Done in 22.290 seconds
Flashed your Arduino Nano 33 BLE development board
To set up your development with Edge Impulse, run 'edge-impulse-daemon'
To run your impulse on your development board, run 'edge-impulse-run-impulse'
Pressione qualquer tecla para continuar...
Thanks
Addendum:
Using Edge Impulse CLI
Installation

This Edge Impulse CLI is used to control local devices, act as a proxy to synchronise data for devices that don’t have an internet connection, and to upload and convert local files. The CLI consists of seven tools:

- `edge-impulse-daemon` - configures devices over serial, and acts as a proxy for devices that do not have an IP connection.
- `edge-impulse-uploader` - allows uploading and signing local files.
- `edge-impulse-data-forwarder` - a very easy way to collect data from any device over a serial connection, and forward the data to Edge Impulse.
- `edge-impulse-run-impulse` - show the impulse running on your device.
- `edge-impulse-blocks` - create organizational transformation blocks.
- `eta-flash-tool` - to flash the Eta Compute ECM3532 AI Sensor.
- `nimbus-flash-tool` - to flash the Himax WE-I Plus.

Connect to devices without the CLI? Recent versions of Google Chrome and Microsoft Edge can connect directly to fully-supported development boards, without the CLI. See this blog post for more information.

Installation - macOS and Windows

1. Install Python 3 on your host computer.
2. Install Node.js v14 or higher on your host computer.
   - For Windows users, Install the Additional Node.js tools when prompted. You may skip this setup if you have Visual Studio 2015 or more.
3. Install the CLI tools via:
   ```bash
   npm install -g edge-impulse-cli --force
   ```

You should now have the tools available in your PATH.

Installation - Linux/Ubuntu and Raspbian OS
Installation

**Edge Impulse CLI optional Installation**

This Edge Impulse CLI is used to control local devices, act as a proxy to synchronise data for devices that don’t have an internet connection, and to upload and convert local files. The CLI consists of seven tools:

- `edge-impulse-daemon` - configures devices over serial, and acts as a proxy for devices that do not have an IP connection.
- `edge-impulse-uploader` - allows uploading and signing local files.
- `edge-impulse-data-forwarder` - a very easy way to collect data from any device over a serial connection, and forward the data to Edge Impulse.
- `edge-impulse-run-impulse` - show the Impulse running on your device.
- `edge-impulse-blocks` - create organizational transformation blocks.
- `eta-flash-tool` - to flash the Eta Compute ECM3532 AI Sensor.
- `himax-flash-tool` - to flash the Himax WE-I Plus.

Connect to devices without the CLI? Recent versions of Google Chrome and Microsoft Edge can connect directly to fully-supported development boards, without the CLI. See [this blog post](#) for more information.

**Installation - macOS and Windows**

1. Install **Python 3** on your host computer.

2. Install **Node.js** v14 or higher on your host computer.

   - For Windows users, install the Additional Node.js tools when prompted. You may skip this setup if you have Visual Studio 2016 or more.

3. Install the CLI tools via:

   ```bash
   npm install -g edge-impulse-cli --force
   ```

   You should now have the tools available in your PATH.

**Installation - Linux/Ubuntu and Raspbian OS**
Alternative Data Capture using EI CLI: $ edge-impulse-data-forwarder

```
#include <Arduino_ISR001.h>

#define CONV_G_TO_MS2 9.80665f
#define FREQUENCY_HZ 100
#define INTERVAL_MS (1000 / (FREQUENCY_HZ + 1))

void setup() {
  Serial.begin(9600);
  while (!Serial)
    delay(100);

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

void loop() {
  static unsigned long last_interval_ms = 0;
  float x, y, z;

  if (millis() > last_interval_ms + INTERVAL_MS) {
    last_interval_ms = millis();
    IMU.readAcceleration(x, y, z);

    Serial.print(x * CONV_G_TO_MS2);
    Serial.print(’,’);
    Serial.println(y * CONV_G_TO_MS2);
    Serial.println(z * CONV_G_TO_MS2);
  }
```

```
Edge Impulse data forwarder v1.13.16

Endpoints:
- Websocket: wss://remote-mgmt.edgeimpulse.com
- API: https://studio.edgeimpulse.com/v1
- Ingestion: https://ingestion.edgeimpulse.com

[SER] Connecting to /dev/tty.usbmodem145101
[WS] Connecting to wss://remote-mgmt.edgeimpulse.com
[WS] Connected to wss://remote-mgmt.edgeimpulse.com

? To which project do you want to connect this device? MJRoBot (Marcelo Royai) / IESTI01 - Nano Motion Classification

[SER] Detecting data frequency...
[SER] Detected data frequency: 100Hz

? 3 sensor axes detected (example values: [-0.13, -0.34, 9.011]). What do you want to call them? Separate the names with ': ' accX, accY, accZ

? What name do you want to give this device? Nano

[WS] Device "Nano" is now connected to project IESTI01 - Nano Motion Classification

[WS] Go to https://studio.edgeimpulse.com/studio/61345/acquisition/training to build your machine learning model!
Your devices

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

<table>
<thead>
<tr>
<th>NAME</th>
<th>ID</th>
<th>TYPE</th>
<th>SENSORS</th>
<th>REMOTE M...</th>
<th>LAST SEEN</th>
</tr>
</thead>
</table>

© 2021 Edgimpulse Inc. All rights reserved