CEC Continuing Education Center

DesignNews

Machine Learning Application Design using STM32 MCU's

DAY 2 : Capturing, Cleaning and Labeling Data

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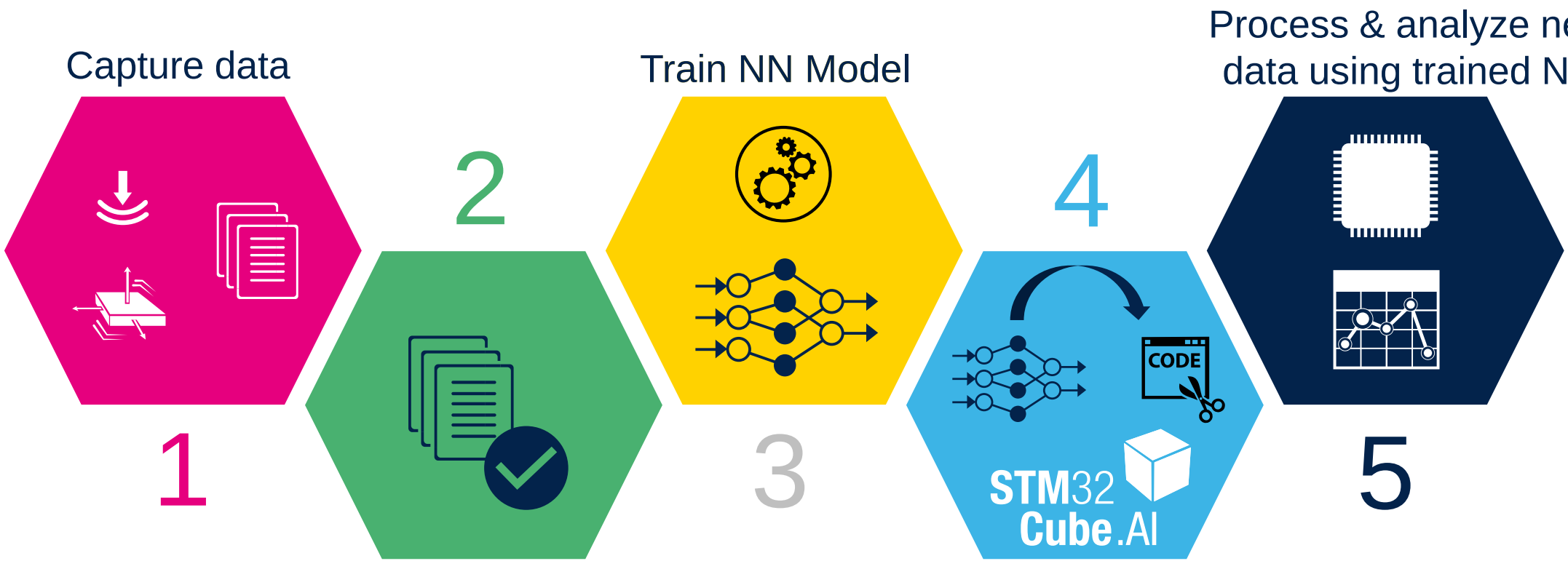
Webinar Logistics

- Turn on your system sound to hear the streaming presentation.
- If you have technical problems, click “Help” or submit a question asking for assistance.
- Participate in ‘Group Chat’ by maximizing the chat widget in your dock.
- Submit questions for the lecturer using the Q&A widget. They will follow-up after the lecture portion concludes.

Course Sessions

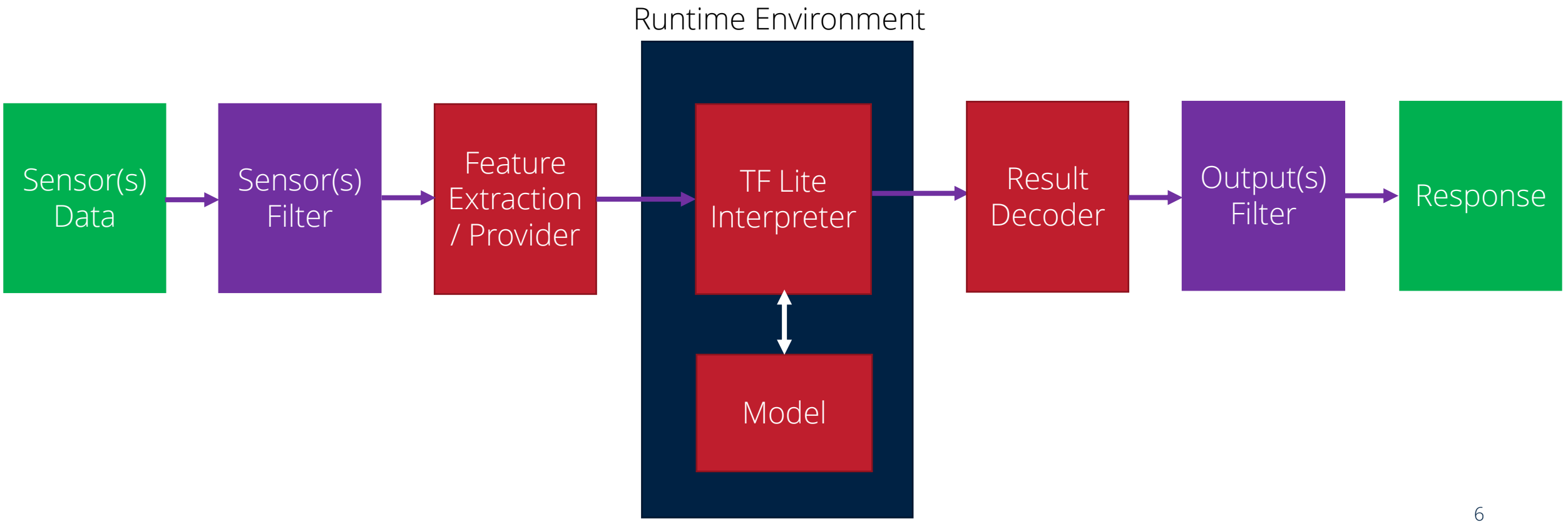
- Introduction to Machine Learning on MCU's
- Capturing, Cleaning and Labeling Data
- Training a Neural Network Part 1
- Training a Neural Network Part 2
- Running an Inference on Target

Neural Network (NN) Model Creation | Operating Mode



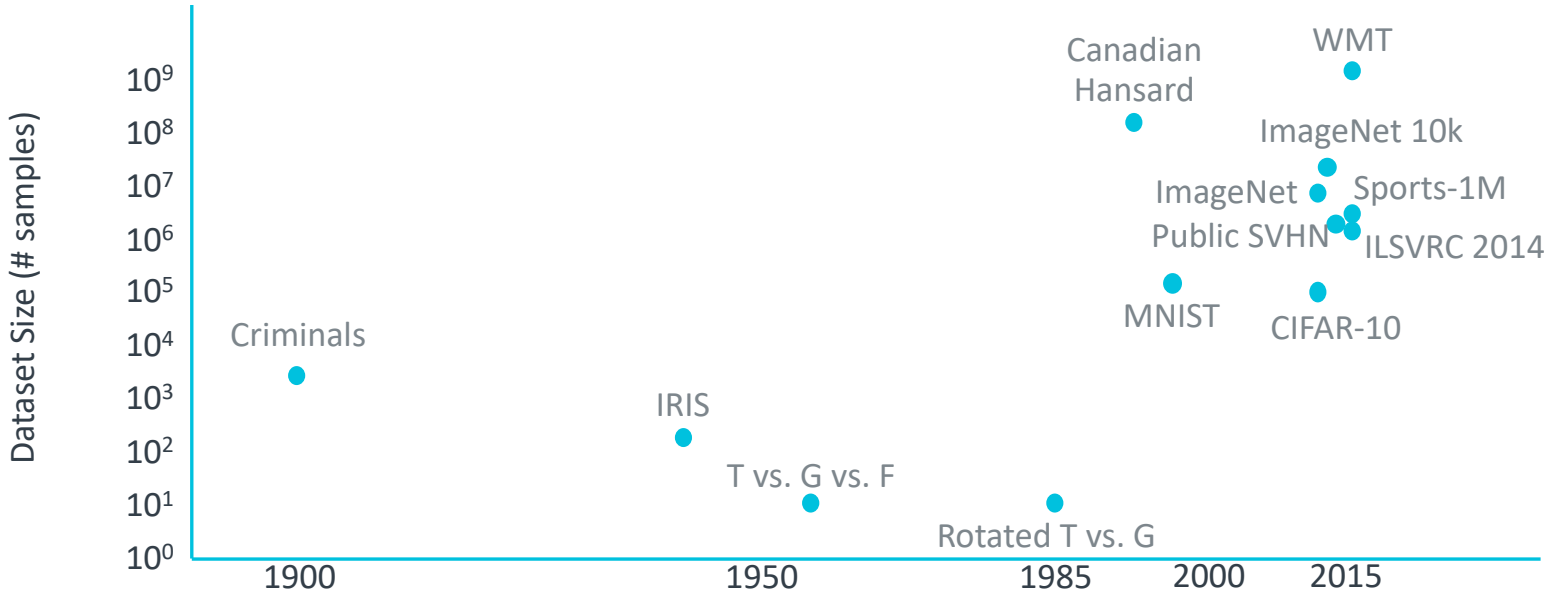
1) What problem are you trying to solve?
2) What are the models' inputs?
3) Do the inputs need to be processed?
4) What are the features?
5) What are the outputs?
6) How is the output processed?
7) Will this run on an MCU?

A General High-Level Software Architecture



Options for getting Training Data

1) Online Data Sets
2) Generate it
3) Collect it
4) Buy it



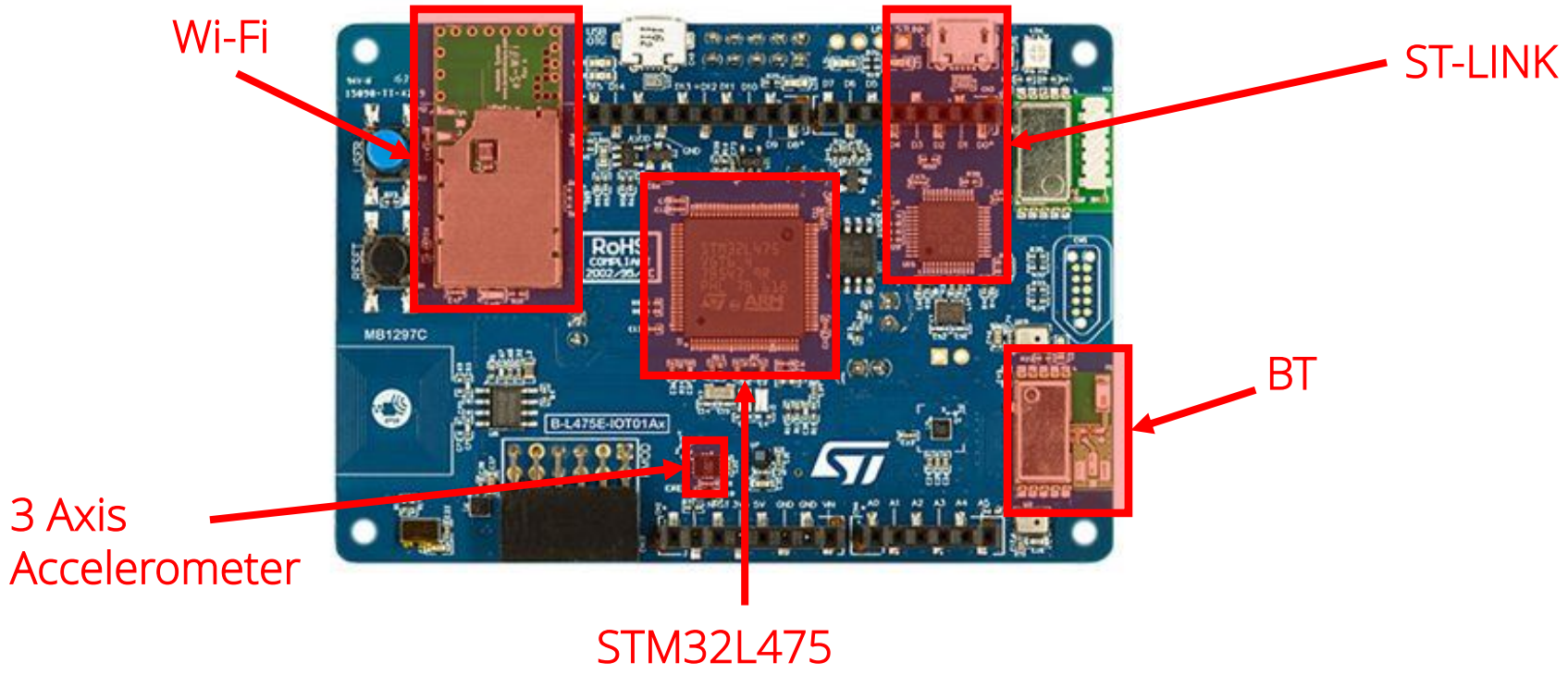
Collecting it is the most interesting … (and the most work)

How do you plan to get the data for your own applications?

1) Online Data Sets
2) Generate it (through simulation)
3) Collect it (experimentation)
4) Buy it

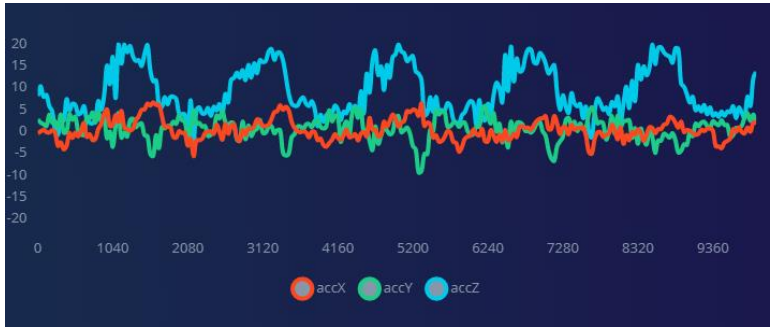
Example Application – Gesture Classification

STM32L475 IoT Discovery Kit (B-L475E-IOT01A)

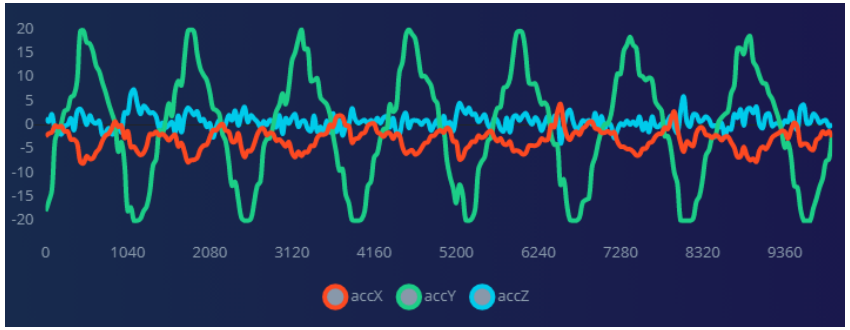


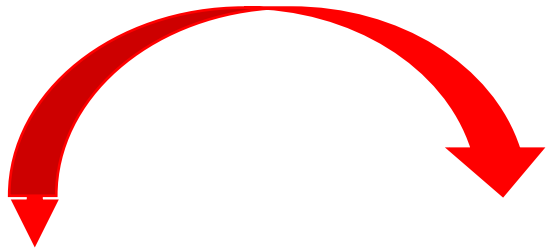
Example Application – Gesture Classification

Label 1 – Up and Down

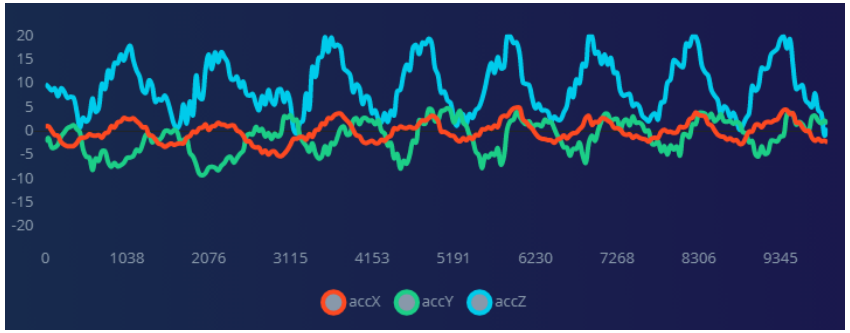


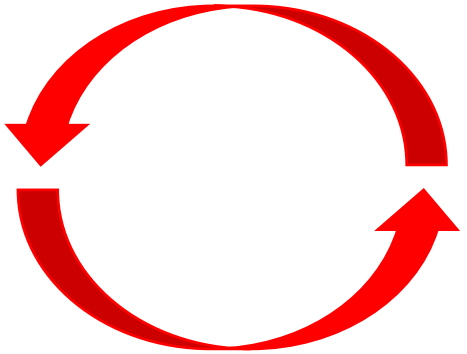
Label 2 – Wave





Label 3 – Circle





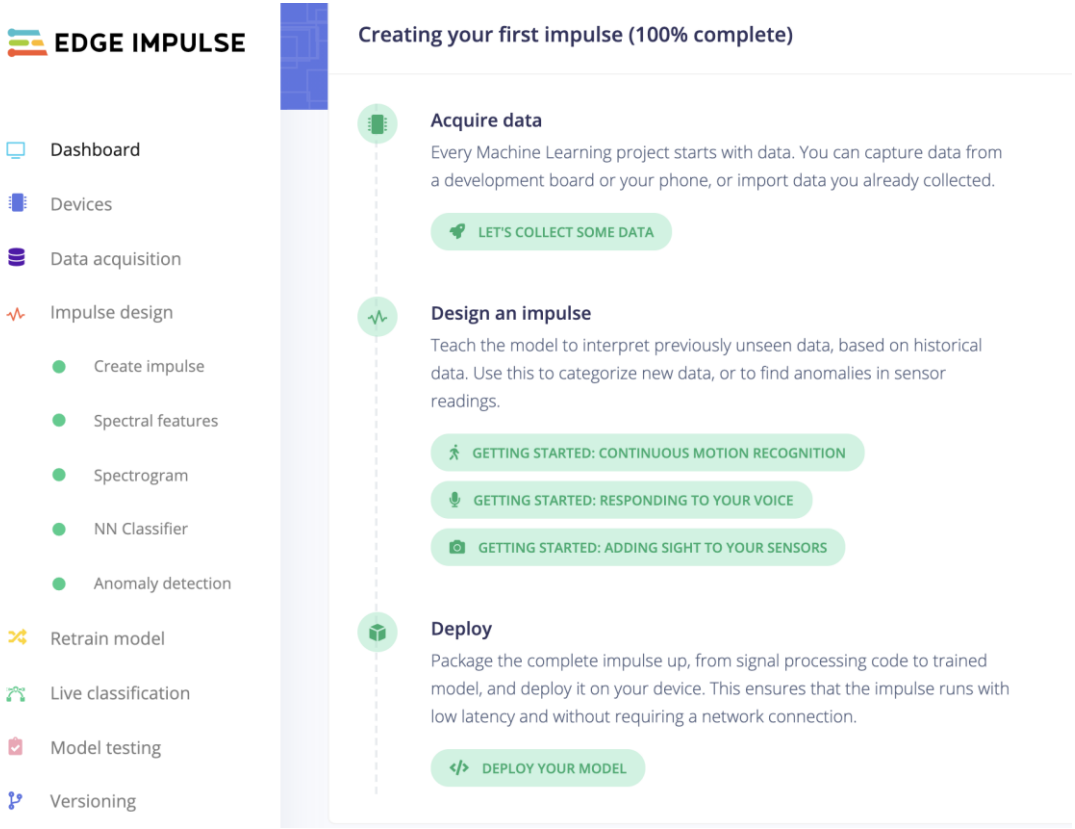
With these three gestures, do you think the machine learning model will have any classification issues?

- Yes
- No
- Not sure

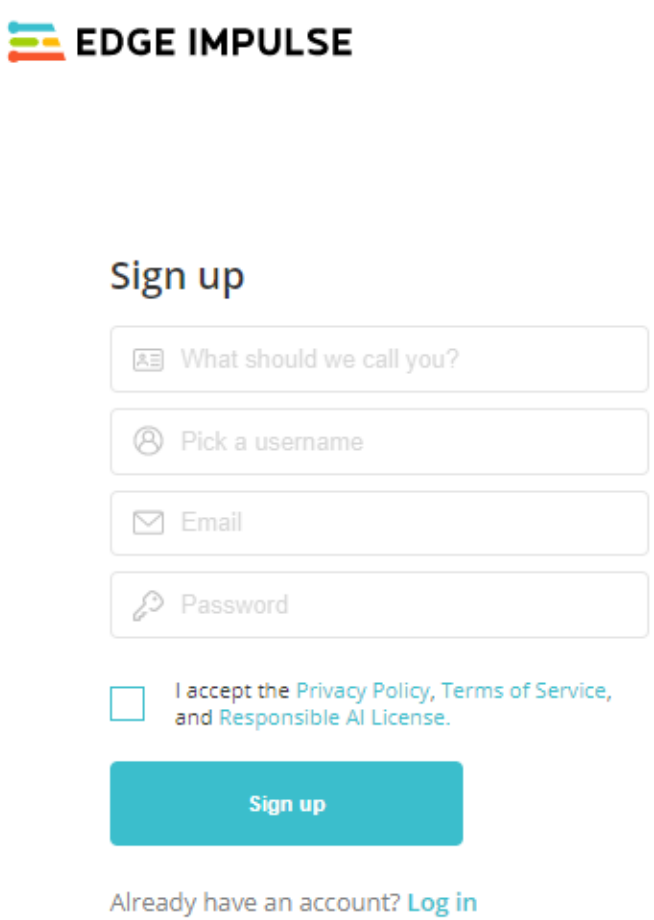
Edge Impulse

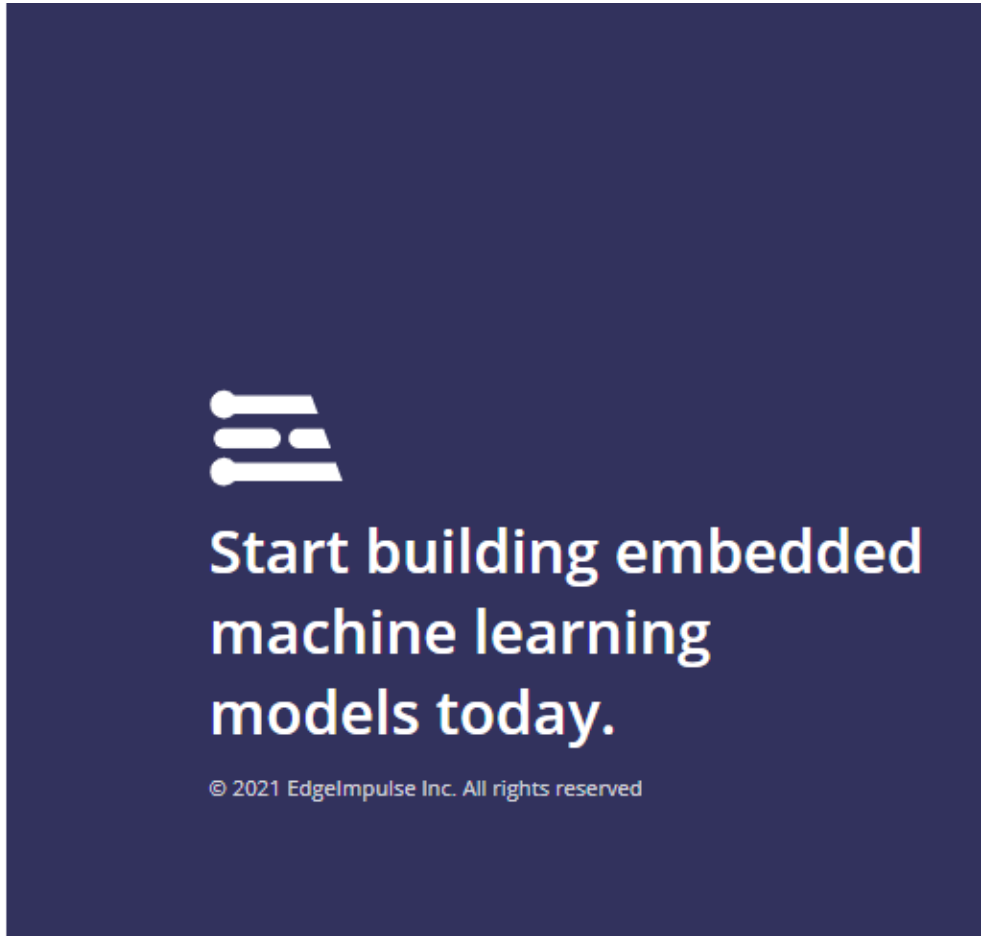
Edge Impulse was designed for software developers, engineers and domain experts to solve real problems using machine learning on edge devices without a PhD in machine learning.

www.edgeimpulse.com



Edge Impulse



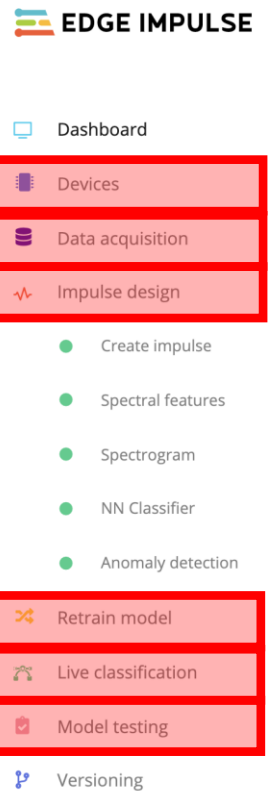


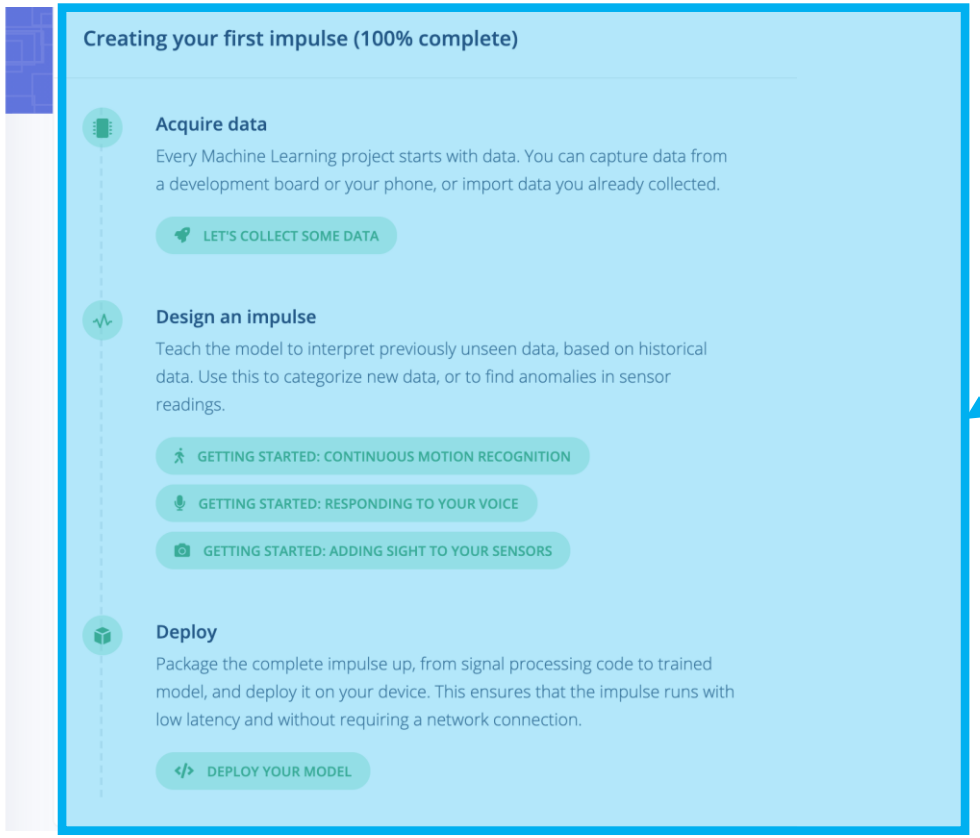
Edge Impulse

DevBoards Running EdgeImpulse Software

Data Collection
Model Design

Training
Live Testing
Model Validation

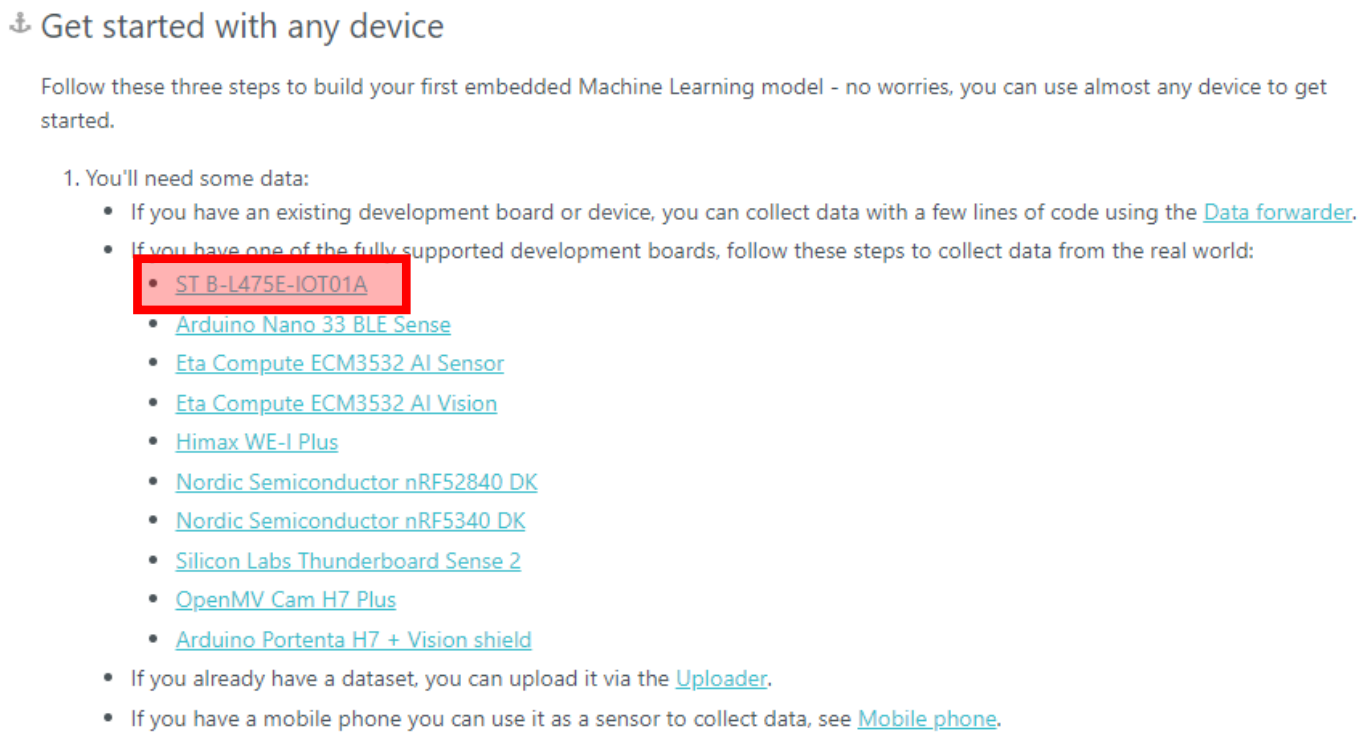




Design Space

Edge Impulse – Board Setup

Visit https://docs.edgeimpulse.com/docs



Get started with any device

Follow these three steps to build your first embedded Machine Learning model - no worries, you can use almost any device to get started.

1. You'll need some data:
   - If you have an existing development board or device, you can collect data with a few lines of code using the Data forwarder.
   - If you have one of the fully supported development boards, follow these steps to collect data from the real world:
     - ST B-L475E-IOT01A
     - Arduino Nano 33 BLE Sense
     - Eta Compute ECM3532 AI Sensor
     - Eta Compute ECM3532 AI Vision
     - Himax WE-I Plus
     - Nordic Semiconductor nRF52840 DK
     - Nordic Semiconductor nRF5340 DK
     - Silicon Labs Thunderboard Sense 2
     - OpenMV Cam H7 Plus
     - Arduino Portenta H7 + Vision shield
   - If you already have a dataset, you can upload it via the Uploader.
   - If you have a mobile phone you can use it as a sensor to collect data, see Mobile phone.

Edge Impulse – Board Setup

Installation - macOS and Windows

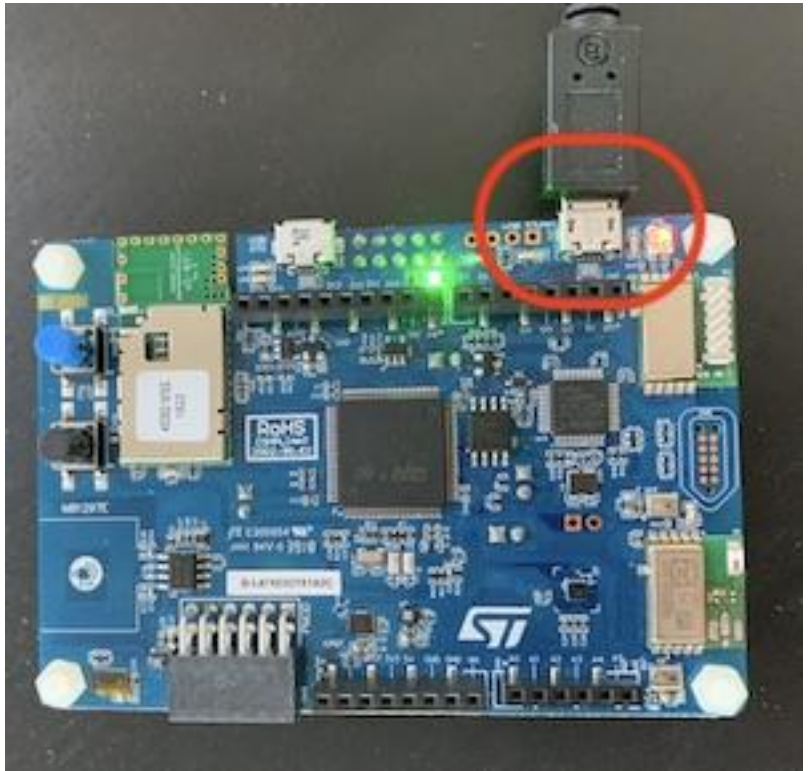
1. Install Python 3 on your host computer.
2. Install Node.js v14 or higher on your host computer.
    - For Windows users, install the **Additional Node.js tools** when prompted. You may skip this setup if you have Visual Studio 2015 or more.
3. Install the CLI tools via:

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

You should now have the tools available in your PATH.

Edge Impulse – Board Setup

1 Connect the development board to your computer



Edge Impulse – Board Setup

2 Update Firmware

1) The development board is mounted as a USB mass-storage device (like a USB flash drive), with the name DIS_L4IOT. Make sure you can see this drive.
2) Download the latest Edge Impulse firmware.
3) Drag the DISCO-L475VG-IOT01A.bin file to the DIS_L4IOT drive.
4) Wait until the LED stops flashing red and green.

Edge Impulse – Board Setup

3 Setting keys and WiFi credentials

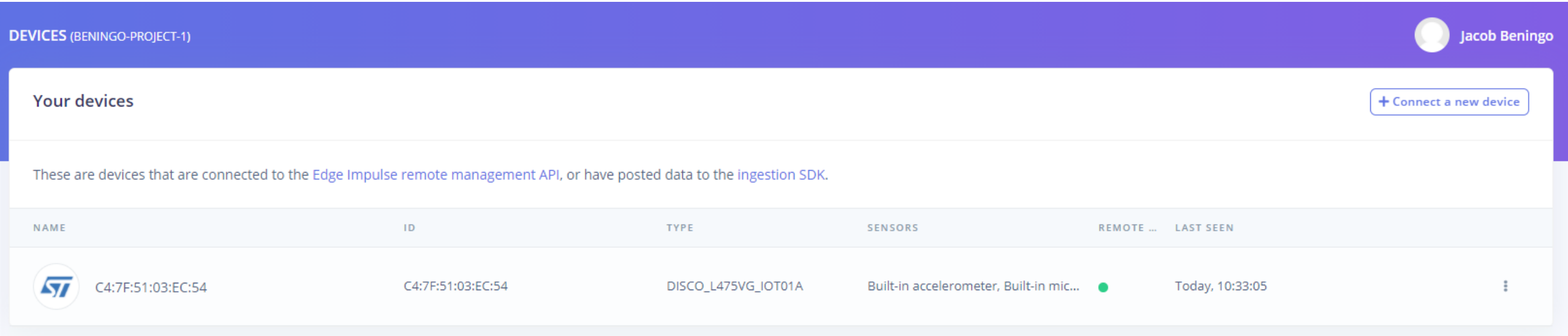
From a command prompt or terminal, run:

$ edge-impulse-daemon

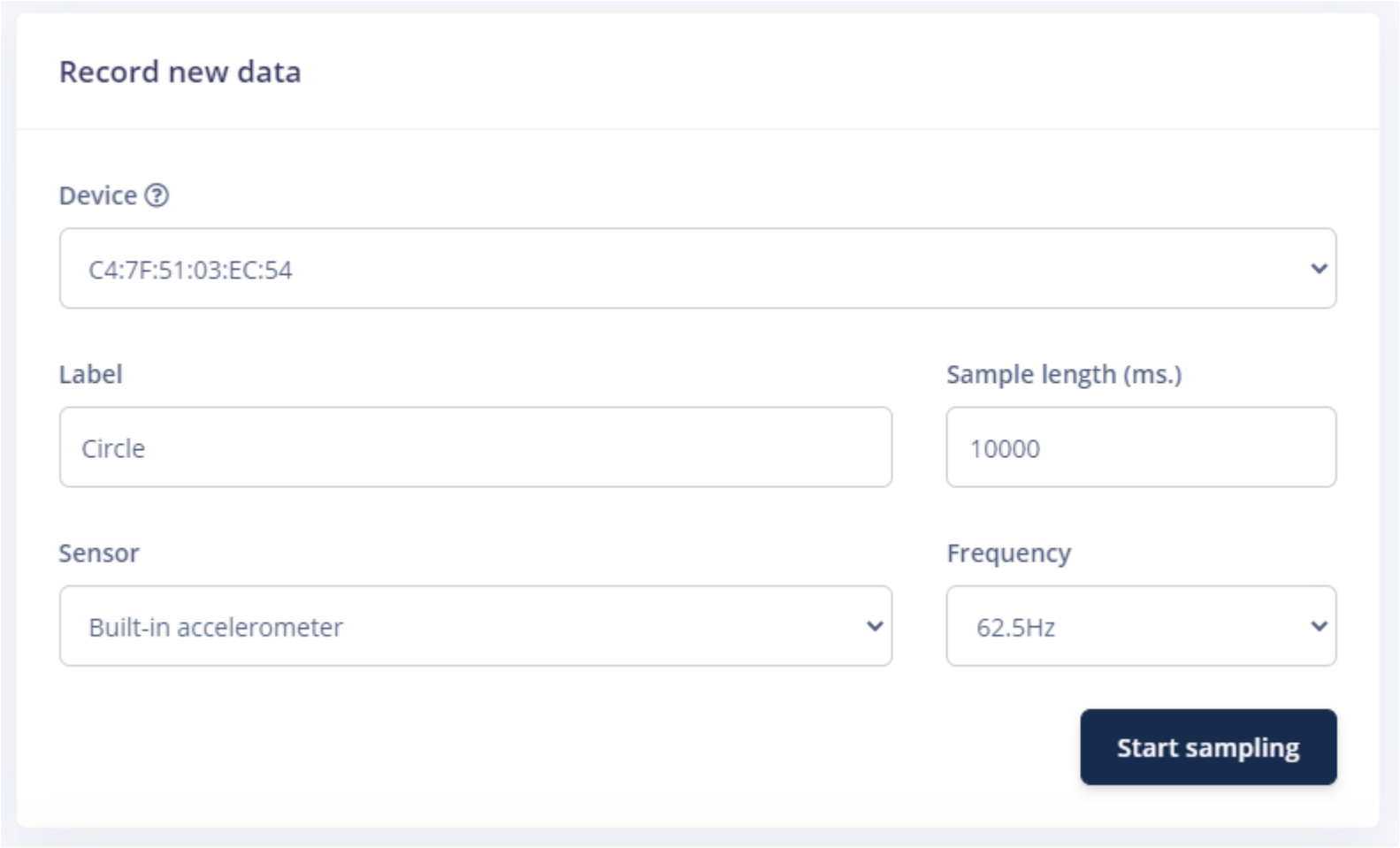
This will start a wizard which will ask you to log in, choose an Edge Impulse project, and set up your WiFi network. If you want to switch projects run the command with --clean.

Edge Impulse – Board Setup

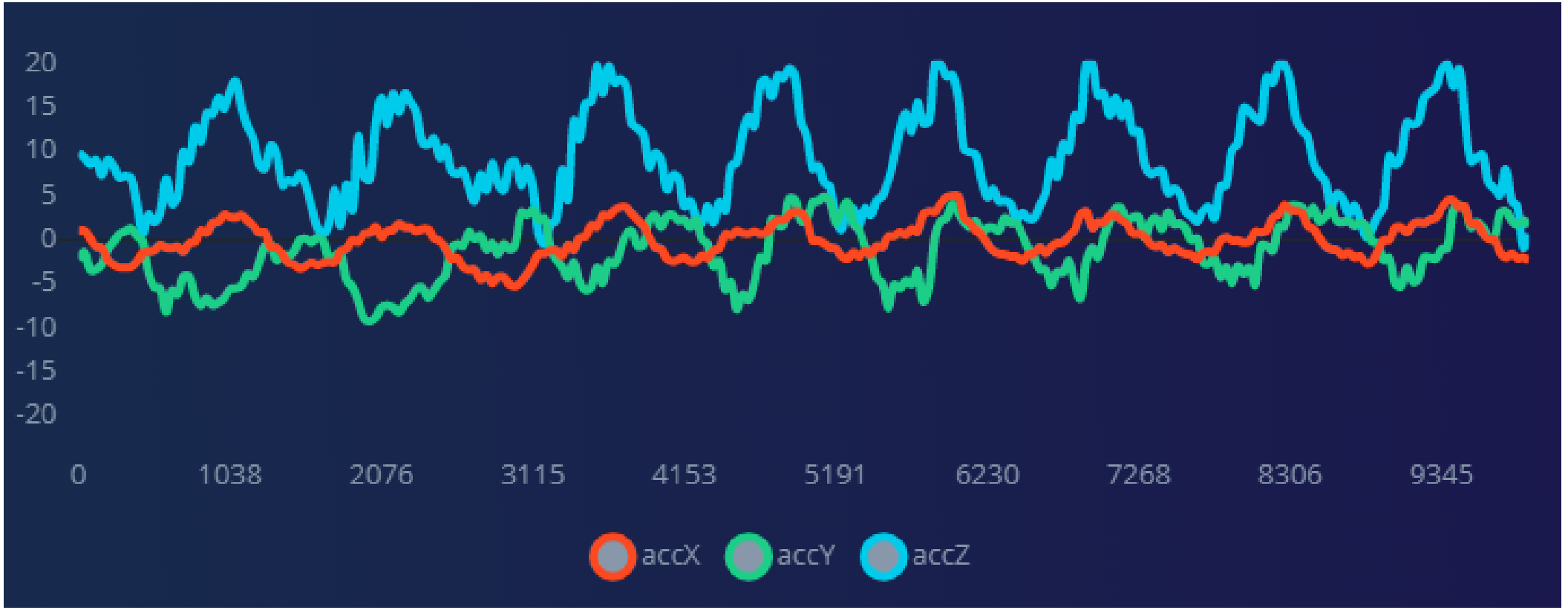
4 Verify that the device is connected



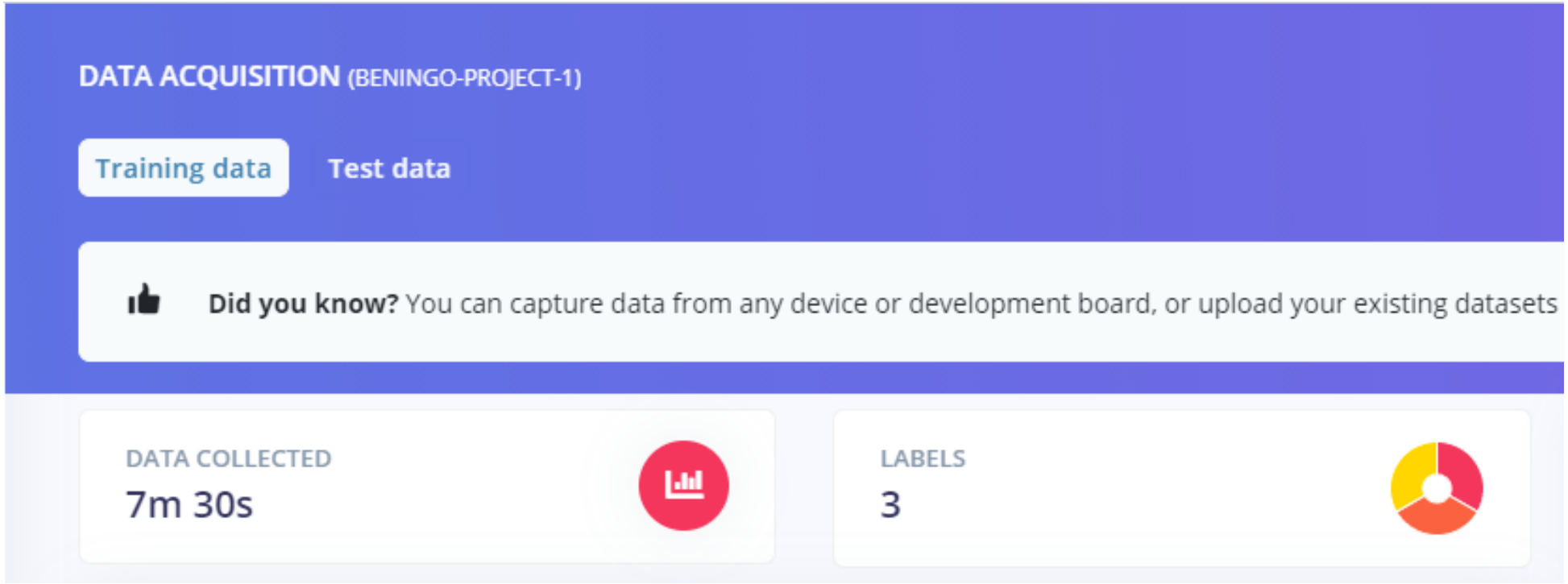
Capturing and Labeling Data



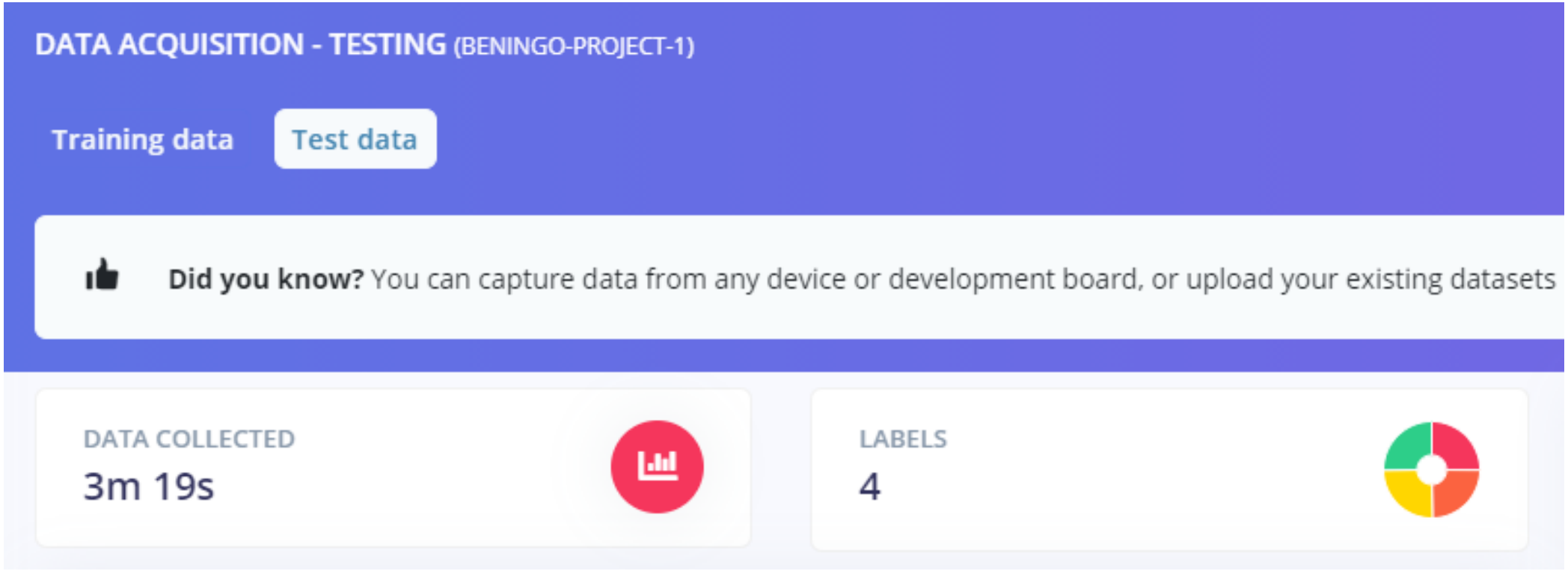
Capturing and Labeling Data



Capturing and Labeling Data



Capturing and Labeling Data



Do you plan on collecting your own data so that you can train your own model during tomorrows class?

- Yes
- No
- undecided

Thank you for attending

Please consider the resources below:

- www.beningo.com
  - Blog, White Papers, Courses
  - Embedded Bytes Newsletter
    - http://bit.ly/1BAHYXm

From www.beningo.com under

- Blog > CEC – Machine Learning Application Design using STM32 MCUs

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