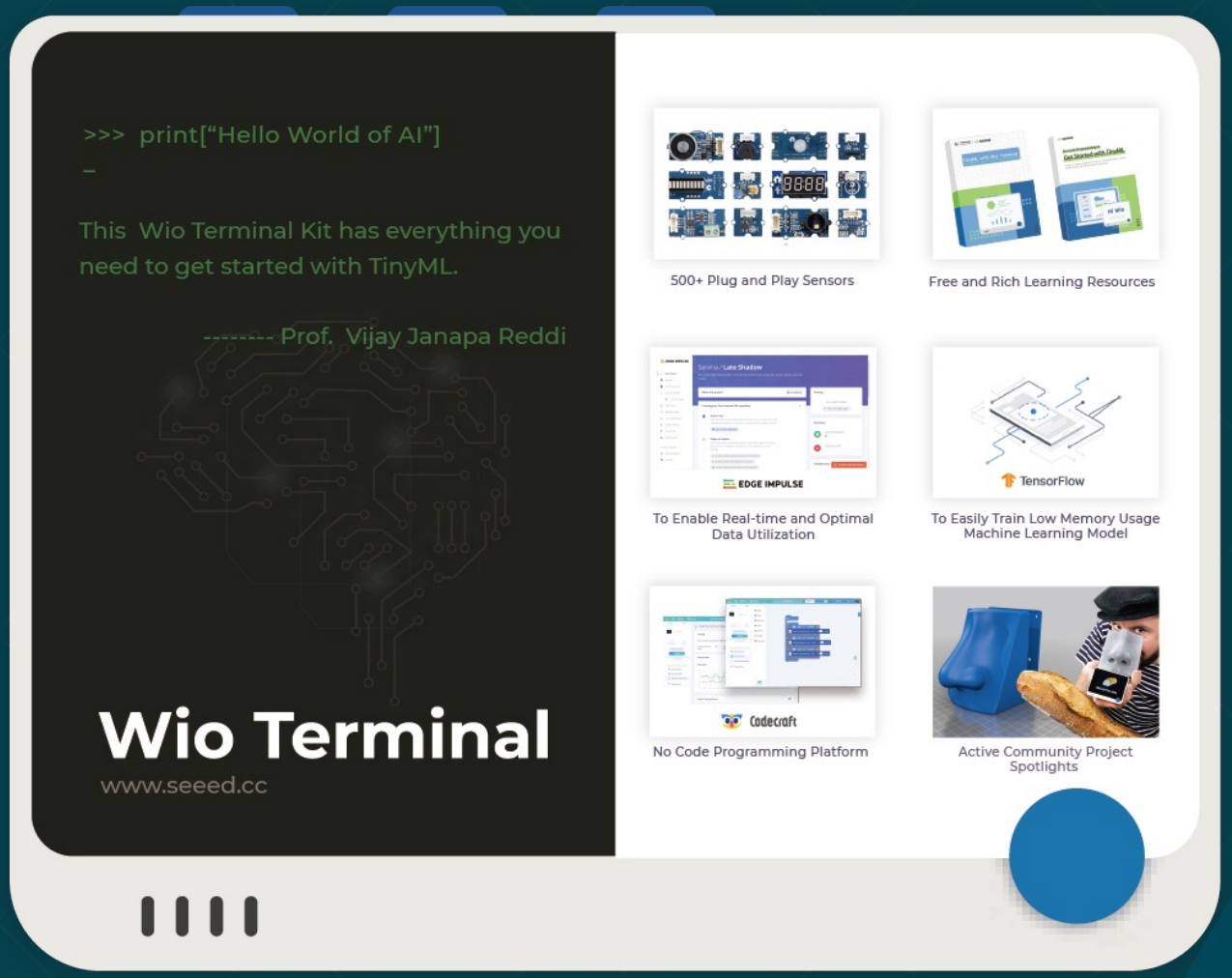
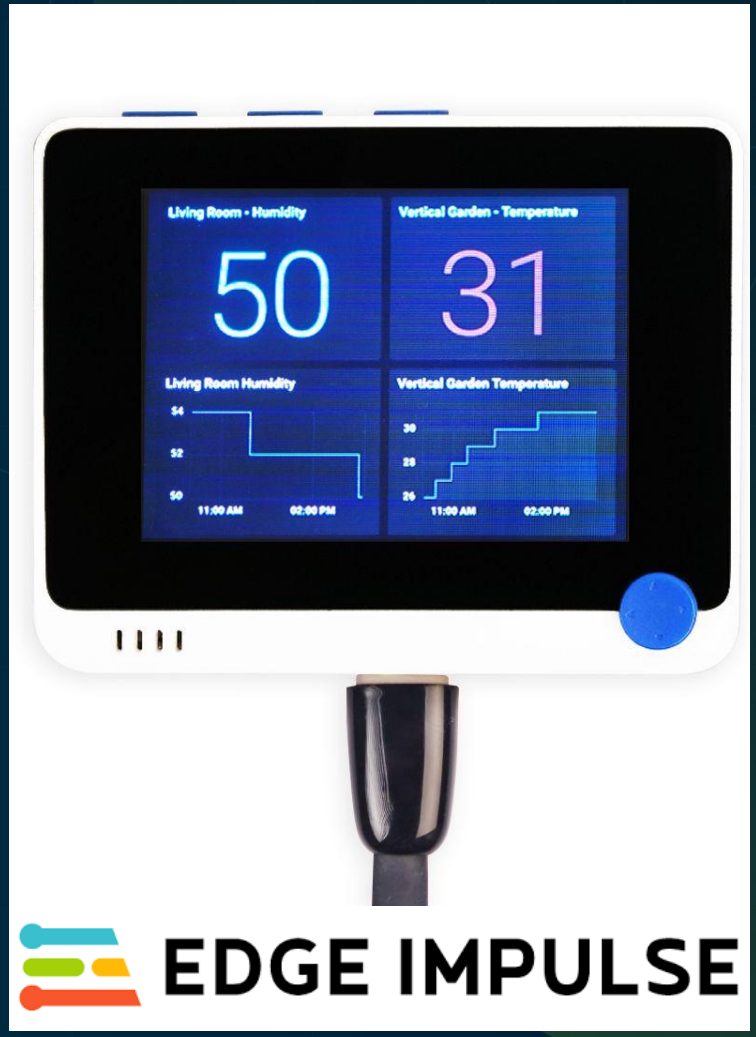


Wio Terminal TinyML Starter Kit Intro

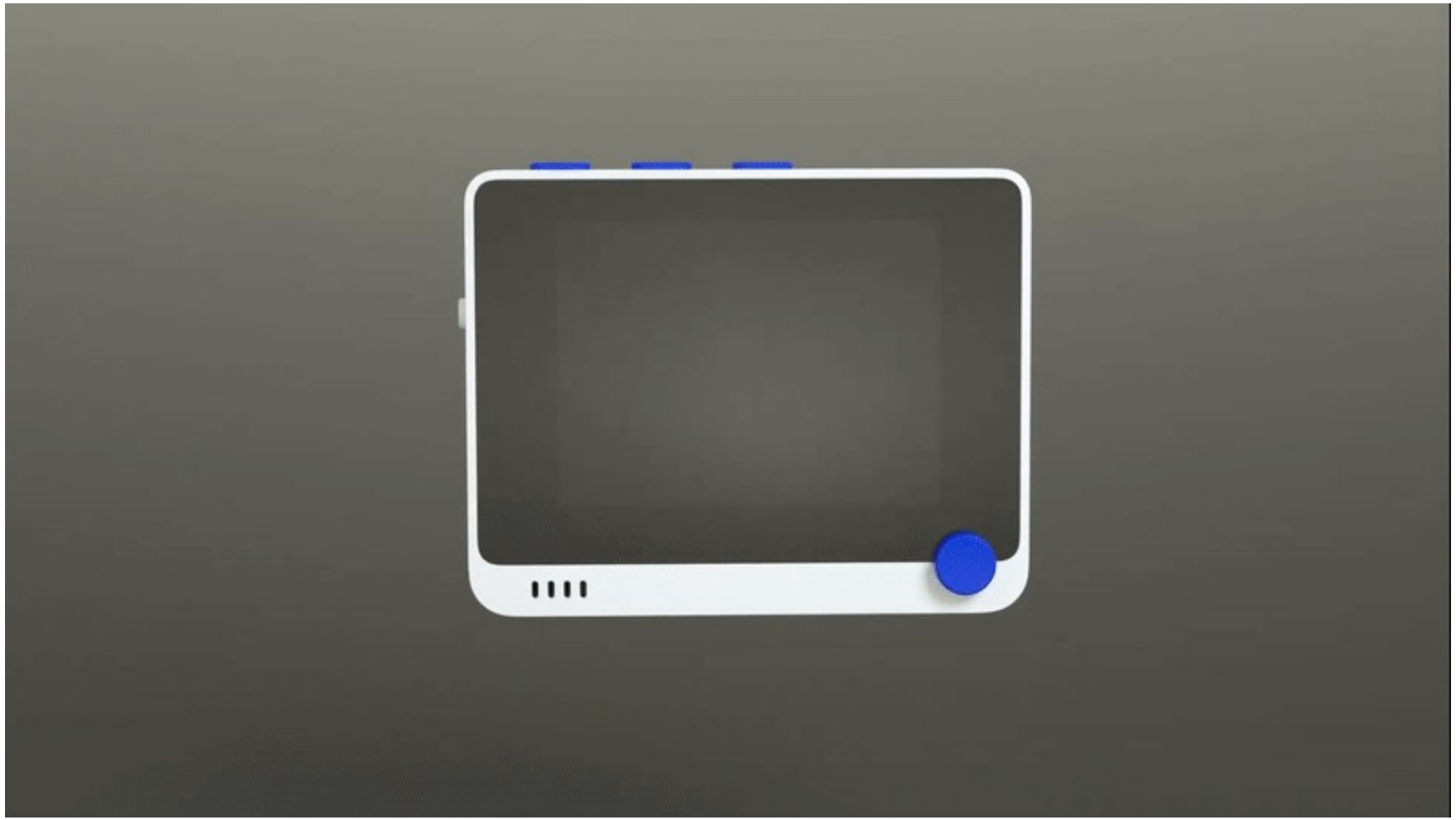
info@seeed.cc

Overview

- Brief introduction on Wio Terminal
  - Hardware
  - Add-on
  - Software
- Preparation on Wio Terminal & Edge Impulse
  - Environment setup (prepare for the workshop)
  - Demo
- Community project samples

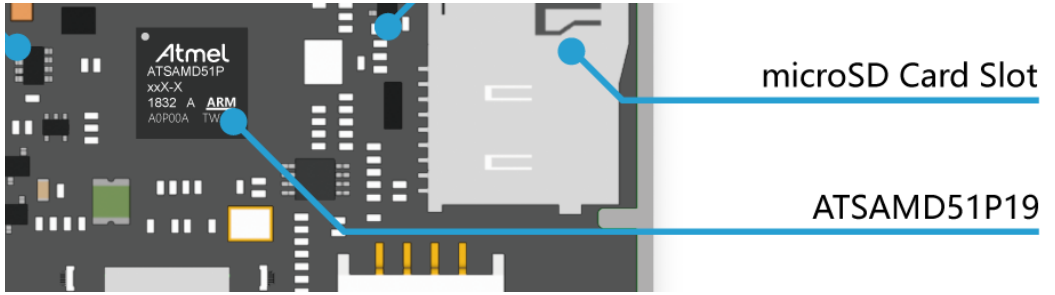


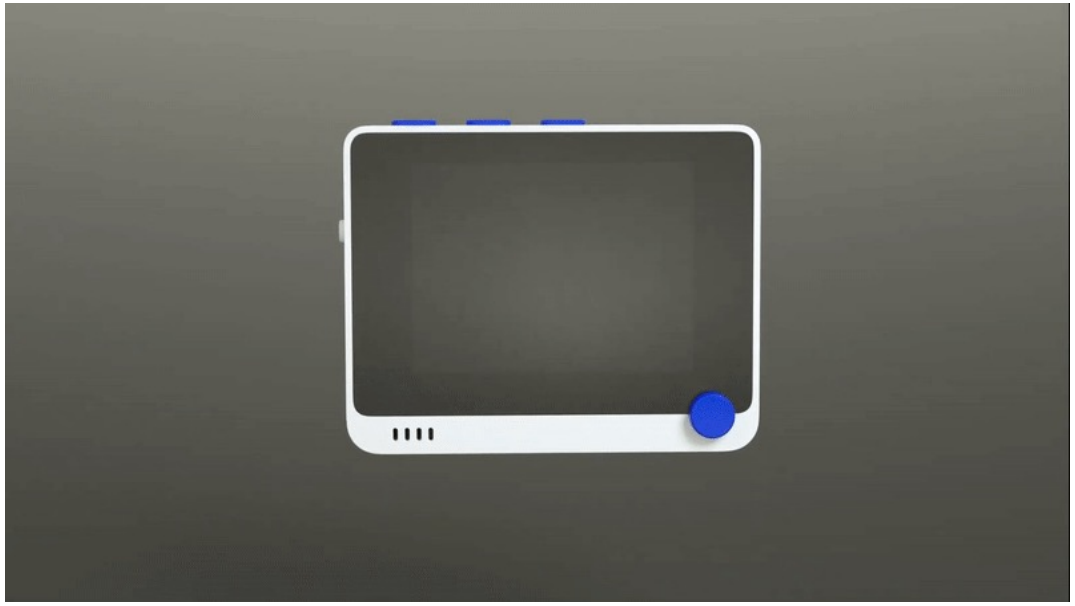
Wio Terminal – Hardware overview



Hardware – MCU

Main MCU	ATSAMD51P19
Architecture	ARM® Cortex®-M4F
Speed	120MHz(Boost up to 200MHz)
Program Memory Size	512KB
RAM Size	192KB
External Flash	4MB



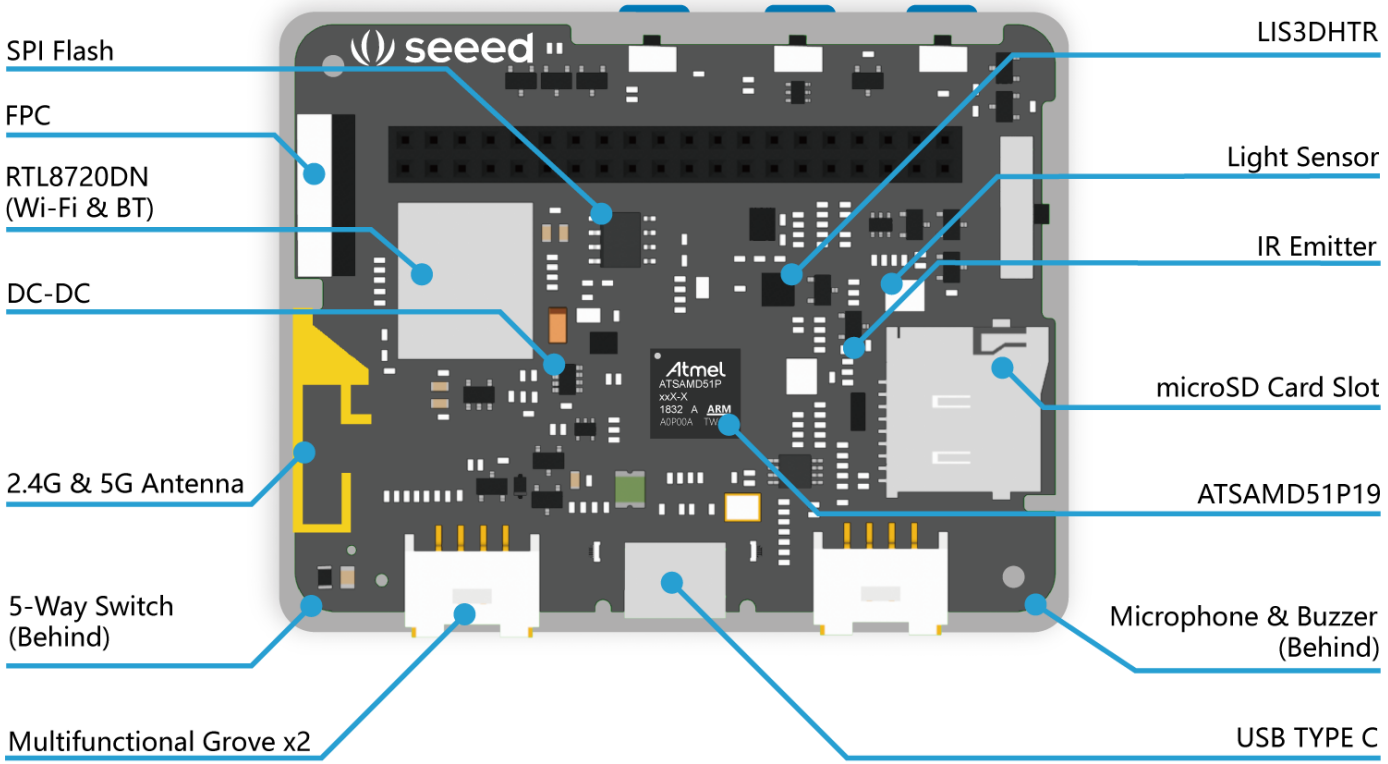


Hardware – LCD

Resolution	320 x 240
Display Size	2.4 inch
Driver IC	ILI9341

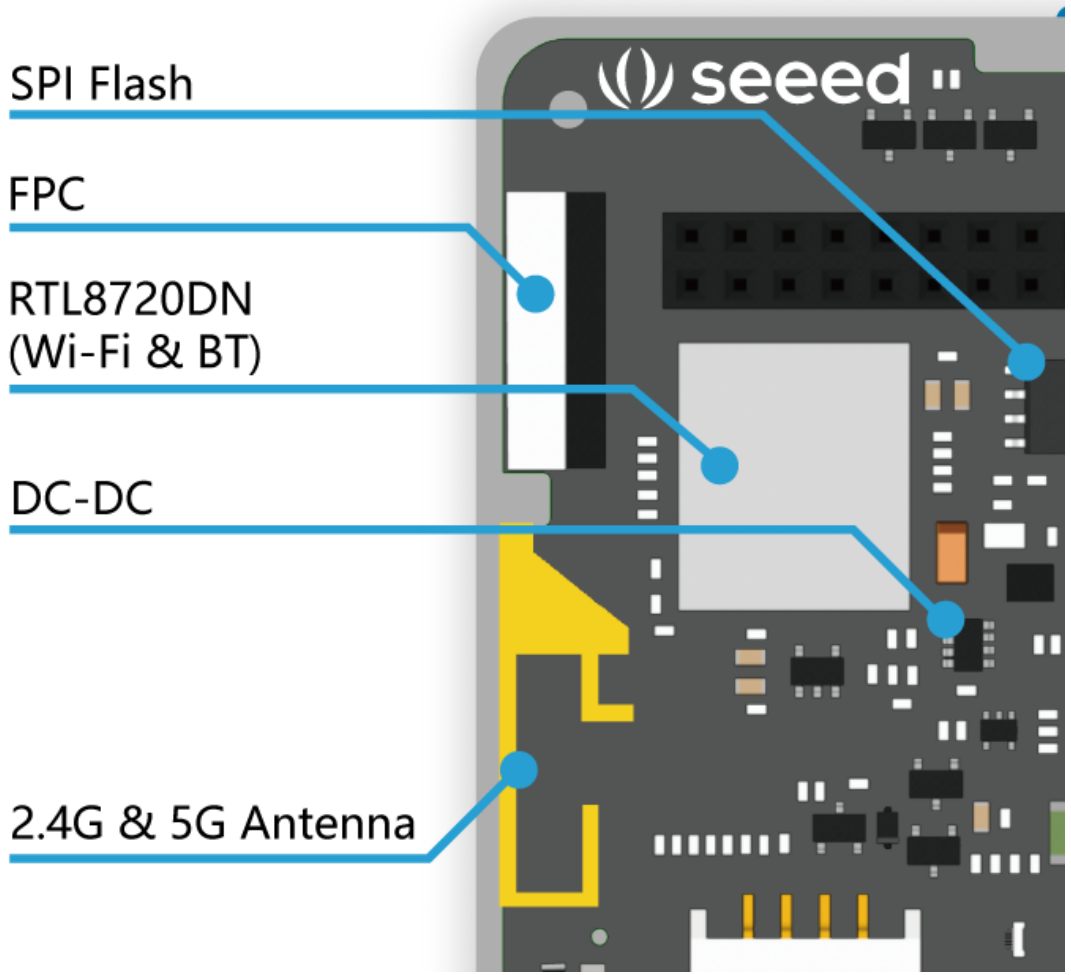
Hardware – Built-in Modules

3-axis Accelerometer	LIS3DHTR
Microphone	1.0V-10V -42dB
Buzzer	≥78dB @10cm 4000Hz
Light Sensor	400-1050nm
Infrared Emitter	940nm



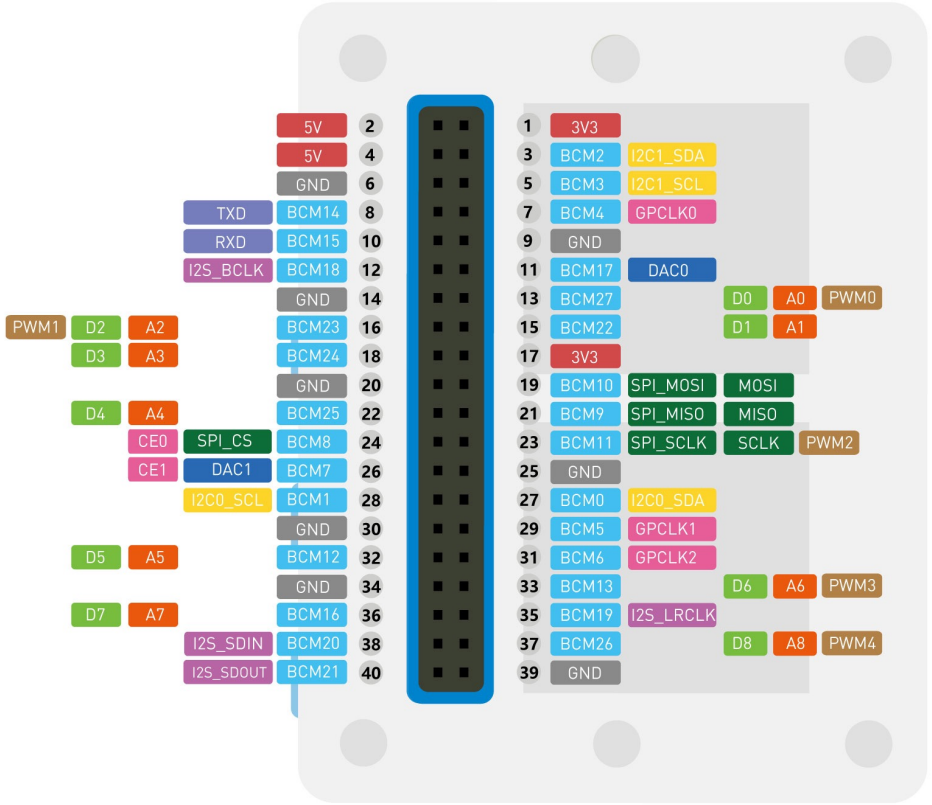
Hardware – Wireless Connectivity

WiFi & BT Module	RTL8720DN
KM4 CPU	ARM® Cortex®-M4F
KM0 CPU	ARM® Cortex®-M0
Wi-Fi	802.11 a/b/g/n 1x1, 2.4GHz & 5GHz
Bluetooth	Support BLE5.0
Hardware Engine	AES/DES/SHA



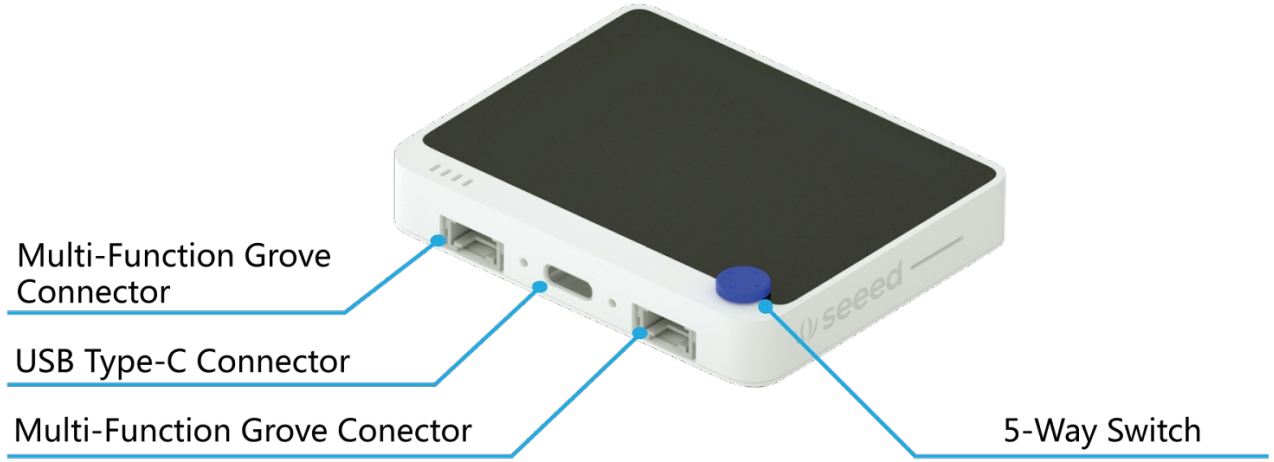
Hardware – I/O Ports

- Raspberry Pi 40-pin Compatible GPIO
- 2 x Grove Port
- Type-C Port
- Support protocol:
  - i2c
  - UART
  - SPI
  - PWM
  - Analog
  - Digital



Hardware – Other Peripherals

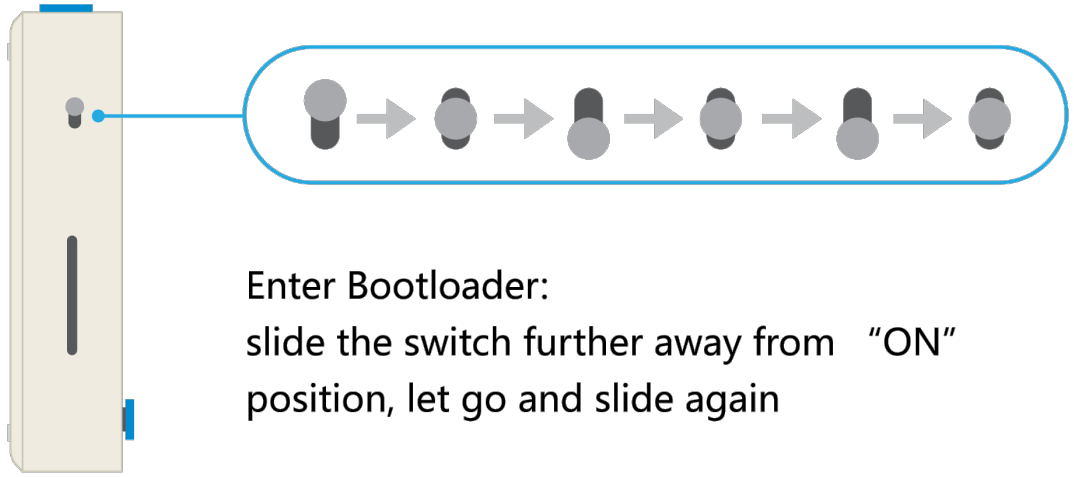
- Micro SD card Slot
- 3 Programable buttons
- 5 way Joystick
- Power/Reset Slide Switch



Software Overview

Software – UF2 bootloader

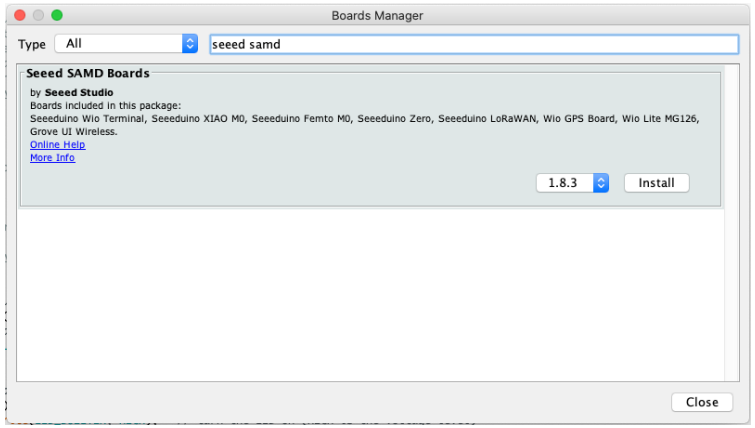
- UF2 stands for USB Flashing Format
- Developed by Microsoft for PXT (now known as MakeCode) for flashing microcontrollers over the Mass Storage Class (MSC)

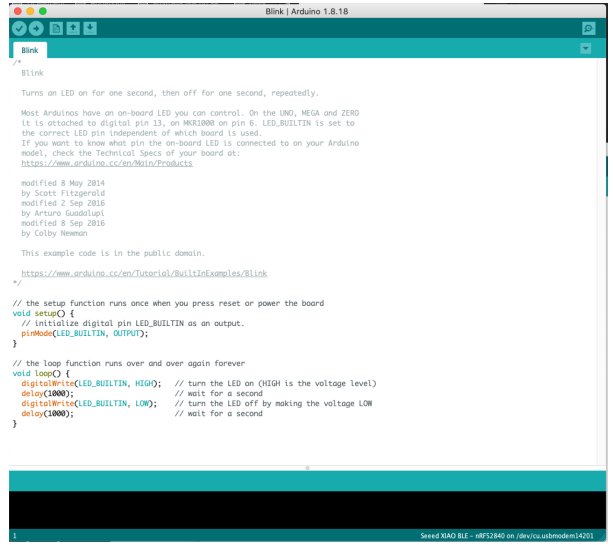


Enter Bootloader:
slide the switch further away from "ON" position, let go and slide again

Software – Arduino

- Arduino IDE
- C programming language
- Extensive libraries
- Cross platform
  - Windows
  - Mac
  - Linux / ARM





Additional Board Manager URLs:

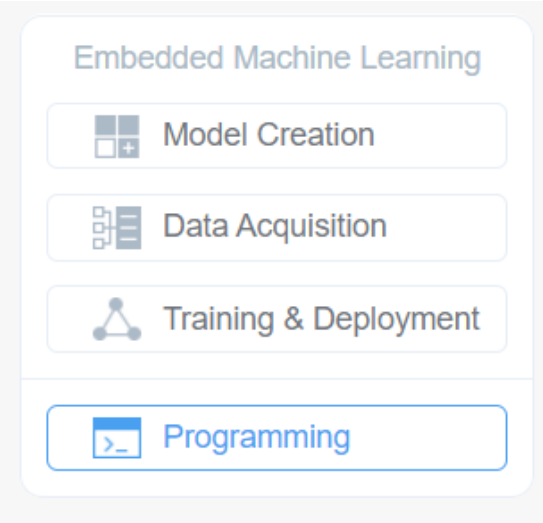
https://files.seeedstudio.com/arduino/package_seeeduino_boards_index.json

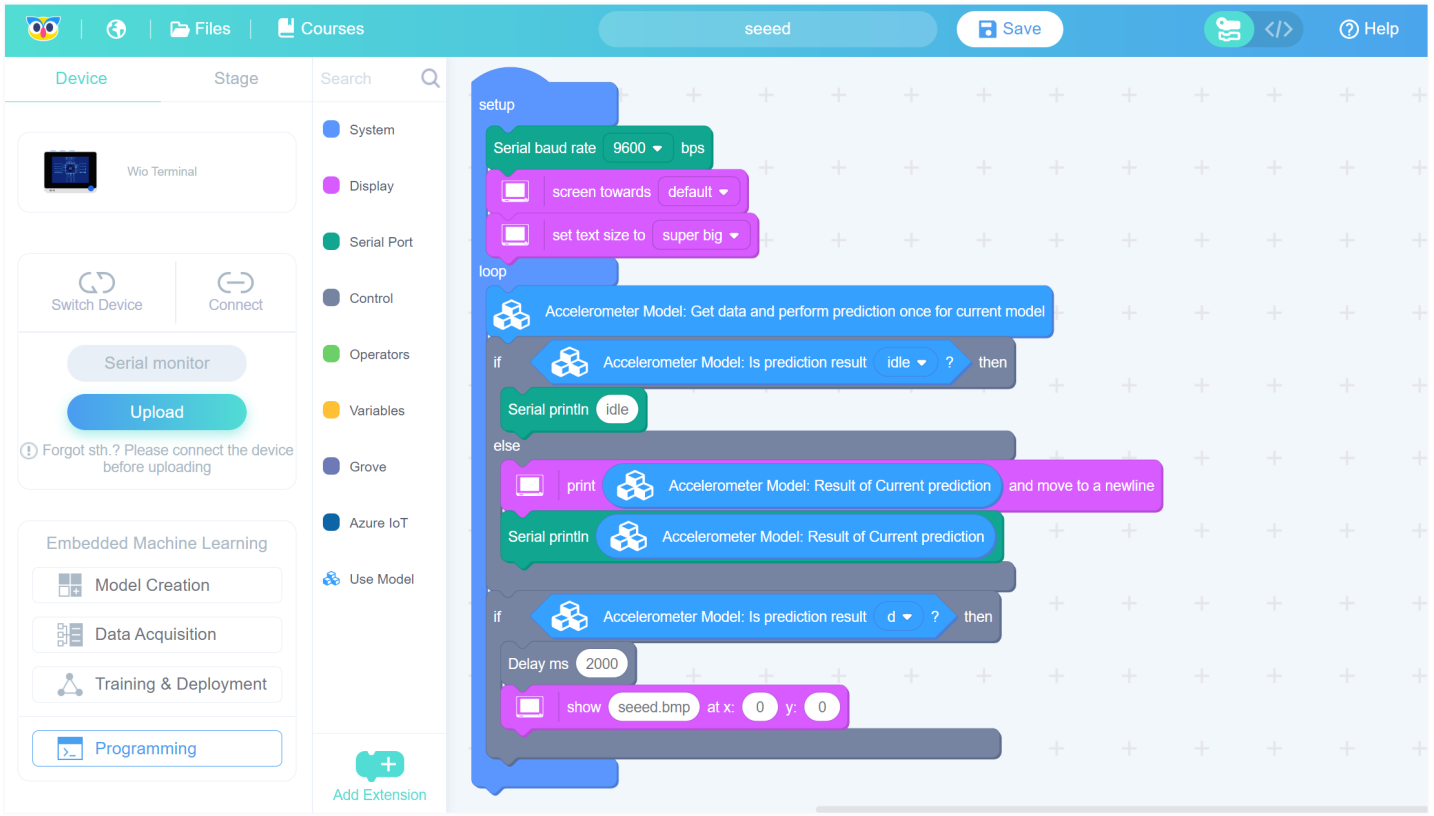
WIKI:

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

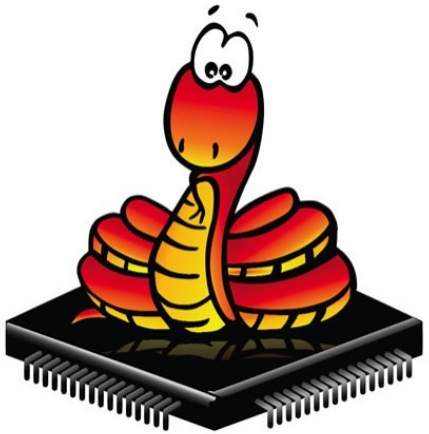
Software – Codecraft

- Graphical programming platform
- Powered by EDGE IMPULSE
- Whole TinyML pinpeline
- Web IDE: https://ide.tinkergen.com/





Software – Onboard Python



MicroPython

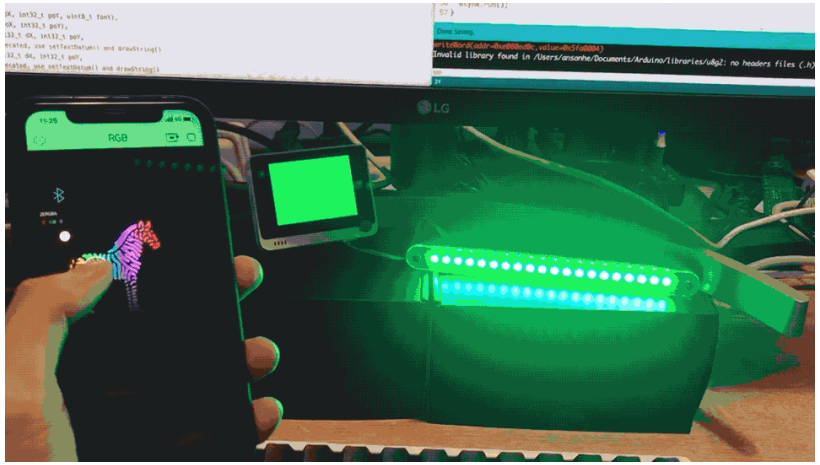
- UF2 Firmware: https://micropython.org/download/SEEED_WIO_TERMINAL/

CircuitPython

- UF2 Firmware: https://circuitpython.org/board/seeeduino_wio_terminal/
- Wiki: https://wiki.seeedstudio.com/Wio-Terminal-CircuitPython/

Software – IoT Platforms

- Blynk
  - https://wiki.seeedstudio.com/Wio-Terminal-Blynk/



- Microsoft Azure IoT
  - https://wiki.seeedstudio.com/Wio-Terminal-Azure-IOT/

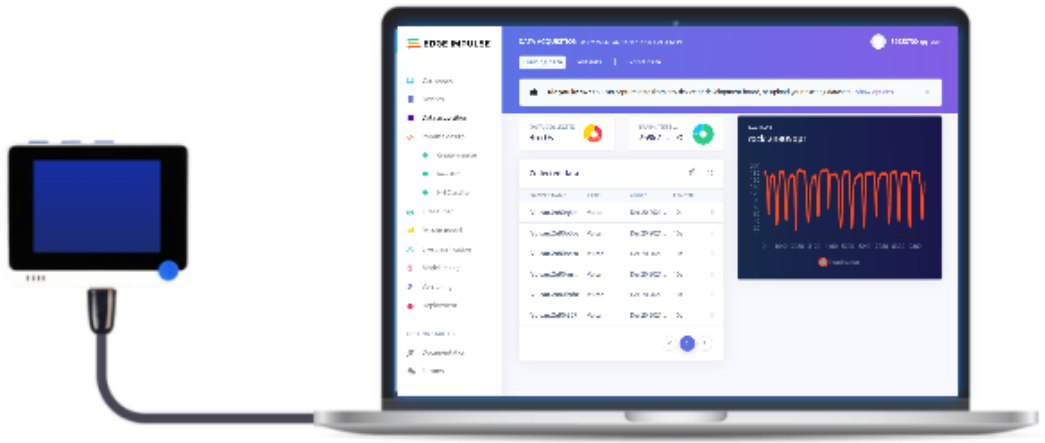
Software – TinyML Platform

- Edge Impulse:

Enables developers to create the next generation of intelligent device solutions with embedded Machine Learning

- Wiki:

https://wiki.seeedstudio.com/Wio-Terminal-TinyML-EI-1/



EDGE IMPULSE

Part II : Getting Started

Preparation for Wio Terminal with Edge Impulse

Development Environment Preparation

Hardware requirement:

- PC
  - Windows
  - Mac
  - Linux
- USB Type-C data cable
- Wio Terminal
  - Edge Impulse UF2 firmware

  https://github.com/Seeed-Studio/Seeed_Arduino_edgeimpulse/releases/download/1.4.0/wio-terminal-ei-1.4.0.uf2

Software requirement:

- Python3
- Arduino IDE
- Arduino-cli(optinal)
- Nodejs
- Edge-impulse-cli

LIVE DEMO

Install Arduino and add library

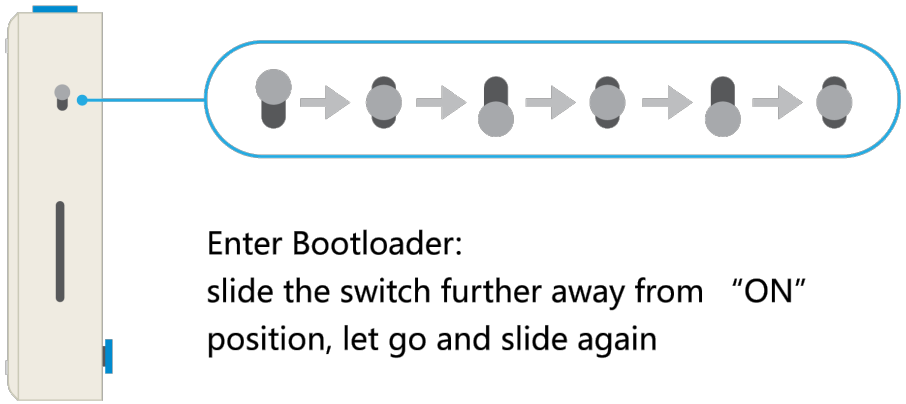
- Arduino IDE: https://www.arduino.cc/en/software
- Additional Boards Manager URLs:
  https://files.seeedstudio.com/arduino/package_seeeduino_boards_index.json
- Add library for Grove Ultrasonic sensor and Grove BME280
- (Optional) Arduino CLI: https://arduino.github.io/arduino-cli/0.23/installation/

Install Edge Impulse CLI

- Setup instruction: https://docs.edgeimpulse.com/docs/edge-impulse-cli/cli-installation
- Node.js: https://nodejs.org/en/
- CLI install script: `npm install –g edge–impulse–cli ––force`

Wio Terminal Edge Impulse Firmware

- Download Firmware: https://github.com/Seeed-Studio/Seeed_Arduino_edgeimpulse/releases
- Plug-in Wio Terminal and put in uf2 bootloader mode
- Drag'n'drop the wio-terminal-ei-1.4.0.uf2 file to the Wio Terminal USB drive



Connect Wio Terminal with Edge Impulse

- Open Edge Impulse website and create account: https://studio.edgeimpulse.com/signup
- Login to Edge Impulse : https://studio.edgeimpulse.com/login
- Create project
- Run CLI script: `edge-impulse-daemon`
- login with the Edge Impulse login credentials
- Choose project to connect to
- Collect Data

Data Collection Through Wio Terminal

- Choose sensor
- Create Label
- Collect Data

Model Training

- Choose and add processing block
- Choose and add a learning block
- Save impulse
- Extract features, Save parameters and Generate features
- Start training

Model Testing

- Live classification
- Collect data sample
- Model testing and Classify test data

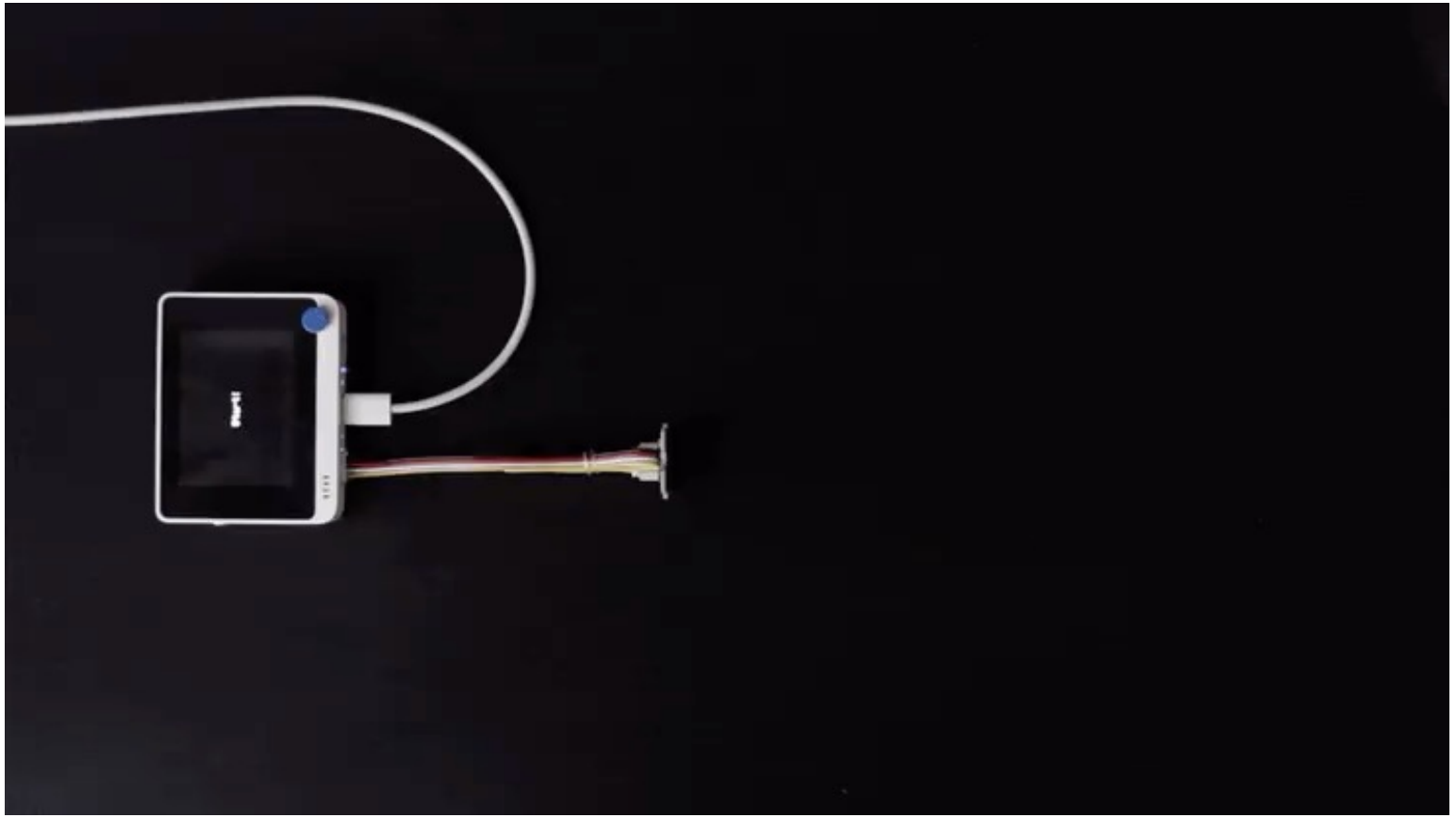
Deployment

- Download library
- Import library in Arduino
- Build and Upload firmware to Wio Terminal
- Test the result

Part III :

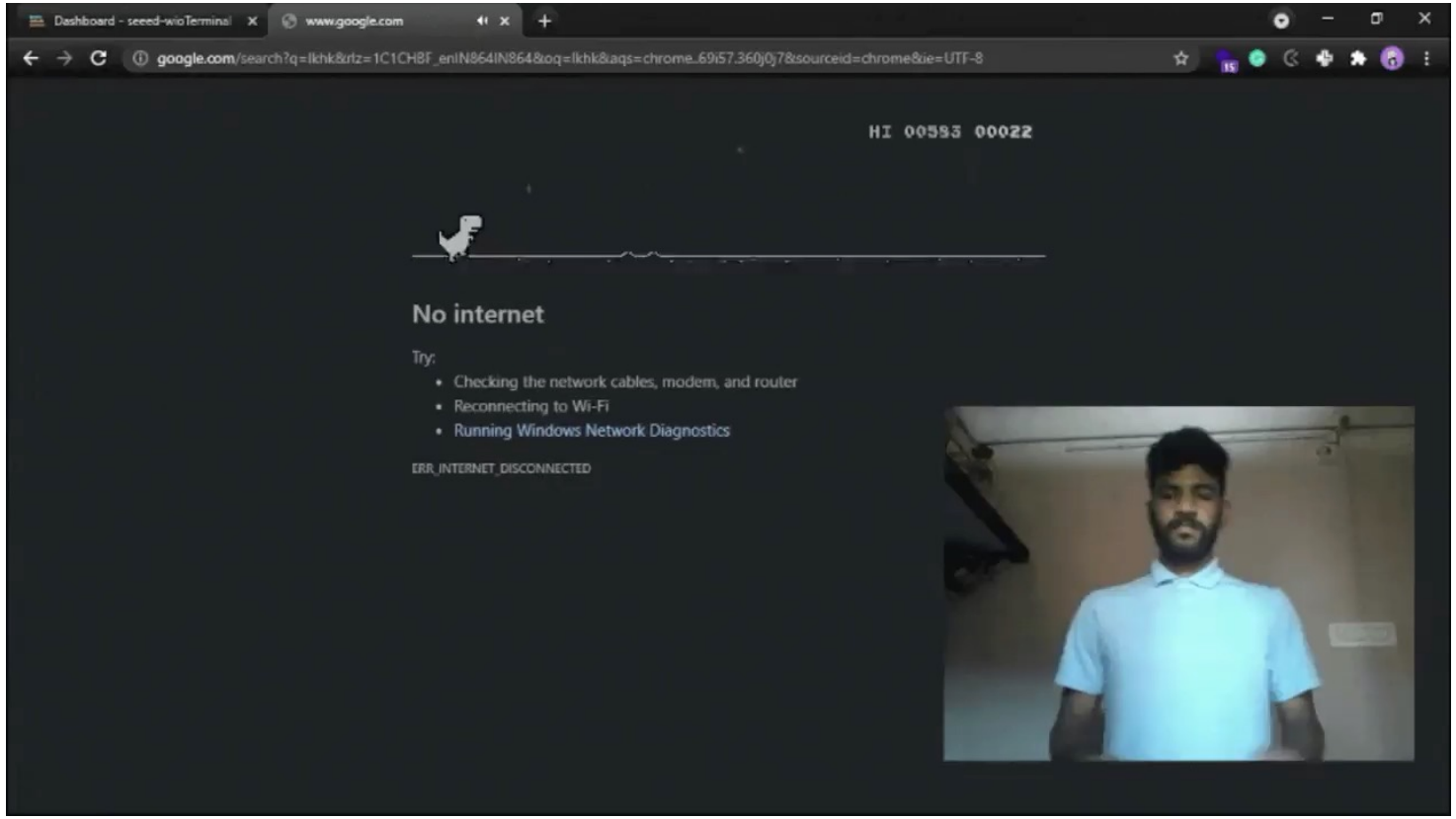
Community project samples

Handwriting Recognition



https://www.hackster.io/supperted825/handwriting-recognition-with-wio-terminal-edge-impulse-804ee3

Play Chrome's Dino Game Physically



https://www.hackster.io/Salmanfarisvp/play-chrome-s-dino-game-physically-db42c2#toc-step-5---model--deployment-----9

Q & A

Thanks !