

About the Syllabus

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TinyML4D Academic Network Co-Chair



TINYML4D

About us

Marco Zennaro, PhD

Researcher at the International Centre for Theoretical Physics

Coordinator of the Science, Technology and Innovation Unit

Focal Point for the ITU Centre of Excellence in IoT, Big Data and Statistics

Sensemaking Senior Research Fellow of the MIT International Development Initiative

Visiting Professor at Kobe Institute of Computing (KIC) in Kobe, Japan

TinyML4D Academic Network Co-Chair

IEEE Senior Member and an ACM Senior Member

About us

Rytis Paškauskas, PhD

Ph.D in Physics, Georgia Institute of Technology, USA

Postdoc at the International Centre for Theoretical Physics

About us

Mahmoud Eltokhey, PhD

Ph.D. in Optical Communications, Ecole Centrale Marseille, France
Postdoctoral Fellow at the Communication Theory Lab, KAUST

About us

Eng. Salah Abdeljabar

Eng. Hasan Hasan

Eng. Karim Saifullin

Eng. Fares Fourati

Eng. Jose Maria Sosa Gomez

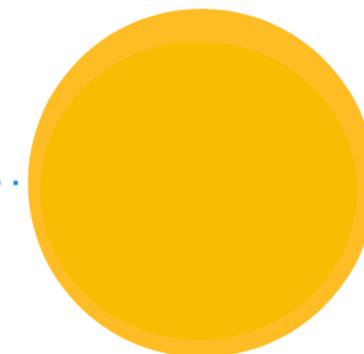
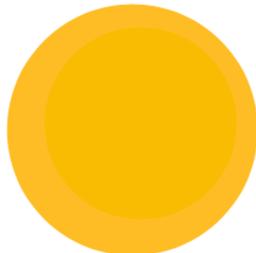
Ph.D. students at the Communication Theory Lab, KAUST

What will we learn?

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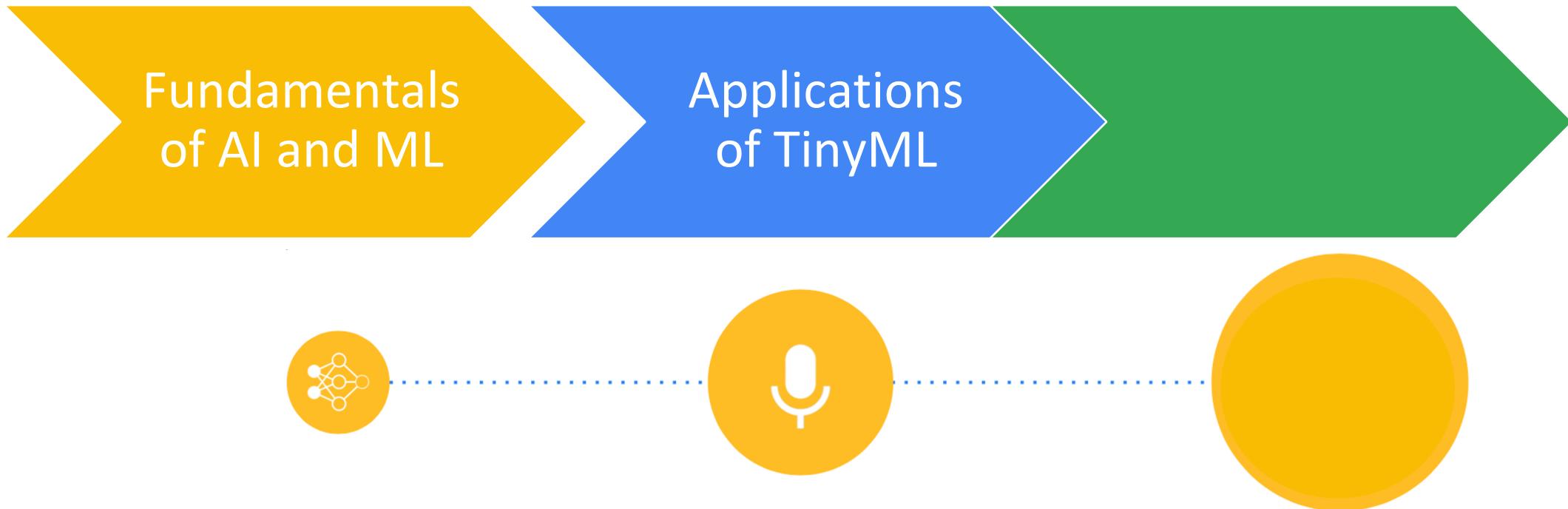


Fundamentals
of AI and ML



You have been talking about what is the language of
Artificial Intelligence (AI) and Machine Learning (ML)

What will We learn?



In Part 2, we will get a sneak peek into the variety of different **TinyML (Embedded Machine Learning)** applications, as keyword spotting (“Alexa”), gesture recognition, understand how to leverage the sensors, and so forth.

What will We learn?

Fundamentals
of AI and ML

Applications
of TinyML

Deploying
TinyML



In Part 2, we will **also** learn how to deploy models on real devices such as **smartphones** and **microcontrollers**. Along the way, we will explore the challenges unique to and amplified by TinyML (e.g., preprocessing, post-processing, and dealing with resource constraints).

How are we going to get there?

TinyML4D/WALC_2023 at main · Mjrovai/TinyML4D · GitHub

github.com/Mjrovai/TinyML4D/tree/main/WALC_2023

main / TinyML4D / WALC_2023 / ↑ Top

WALC_2023-Applied_AI

[WALC 2023 - Guayaquil, Ecuador - Track 2 – Inteligencia Artificial Aplicada](#)

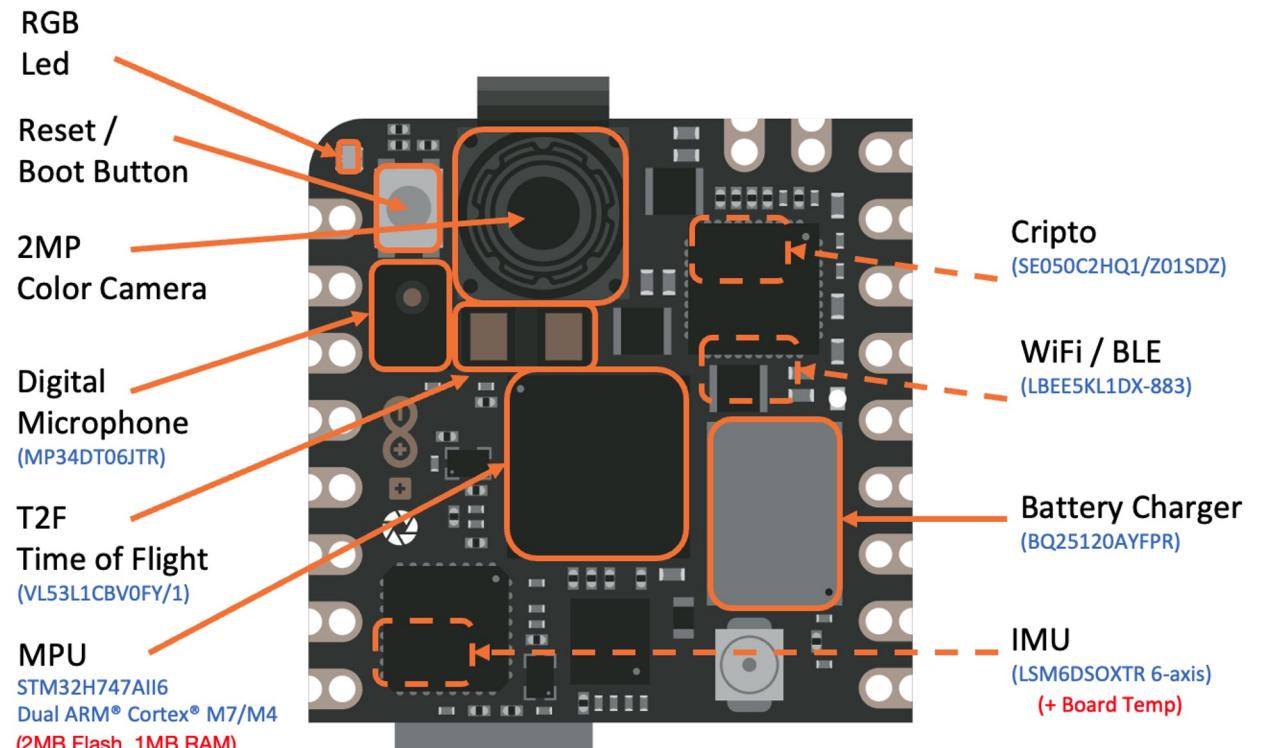
Introduction

Microcontrollers (MCUs) are cheap electronic components, usually with just a few kilobytes of RAM, and designed to consume small amounts of power. Today, MCUs can be found embedded in all residential, medical, automotive, and industrial devices. Over 40 billion microcontrollers are estimated to be marketed annually, and hundreds of billions are currently in service. But, curiously, these devices receive little attention because, many times, they are used just to replace functionalities that older electromechanical systems face in cars, washing machines, or remote controls.



Thank you, Prof. Marcelo Rovai!

Hardware

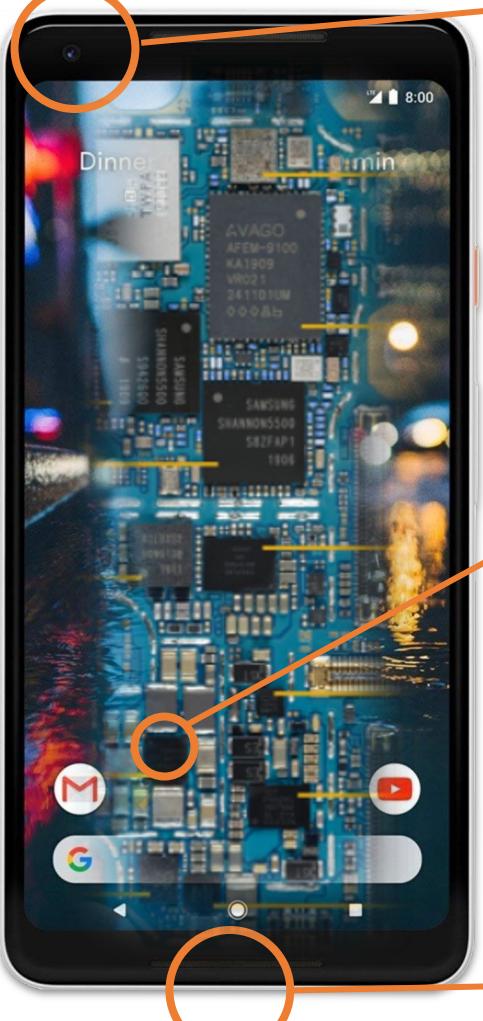


Arduino Nicla Vision

Edge Device



& Sensors



Camera



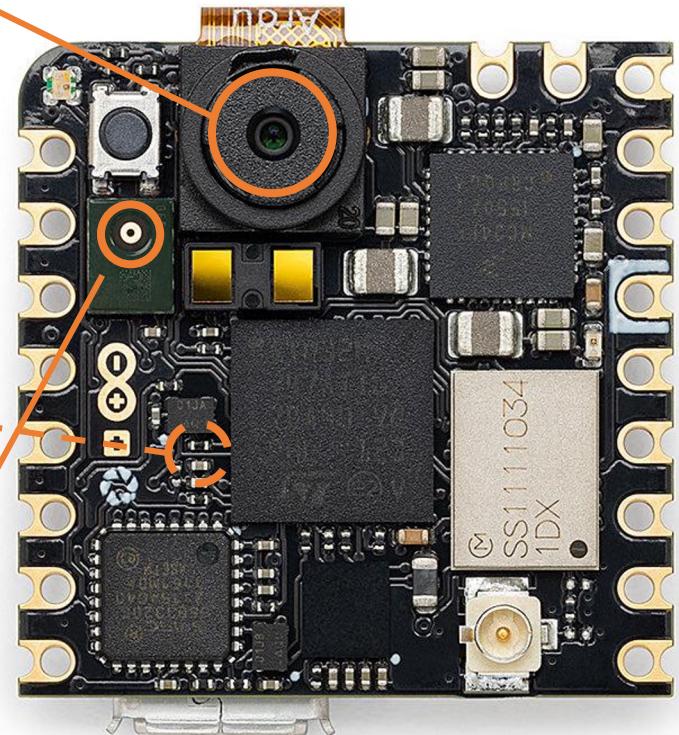
Accelerometer



Gyroscope



Microphone



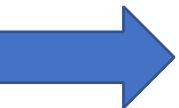
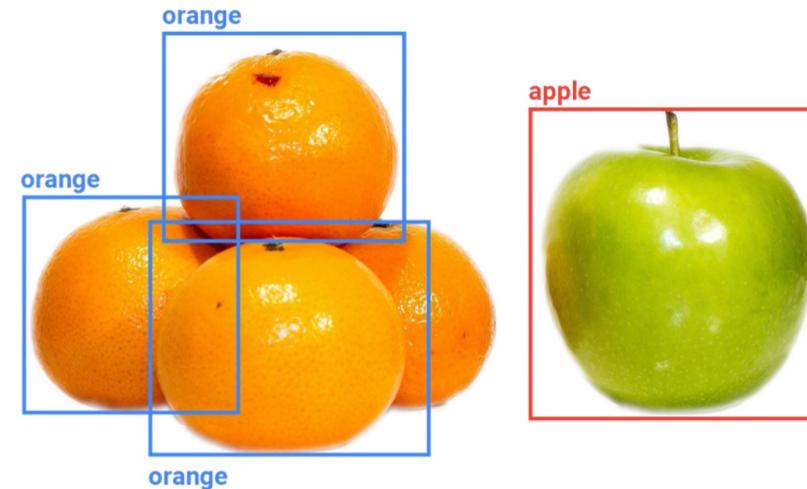
Hands-on Activities

Speech

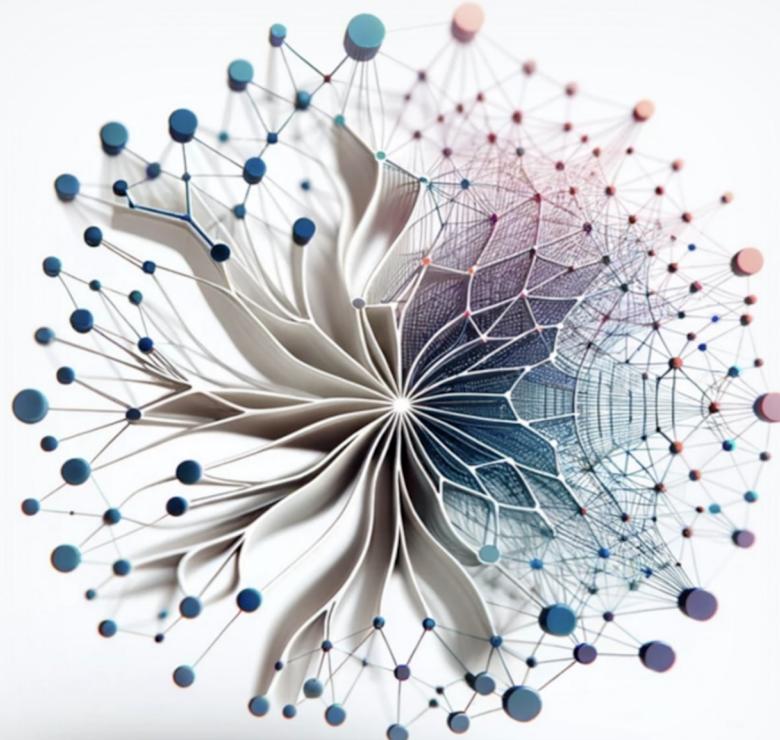


Okay, Google.

Vision



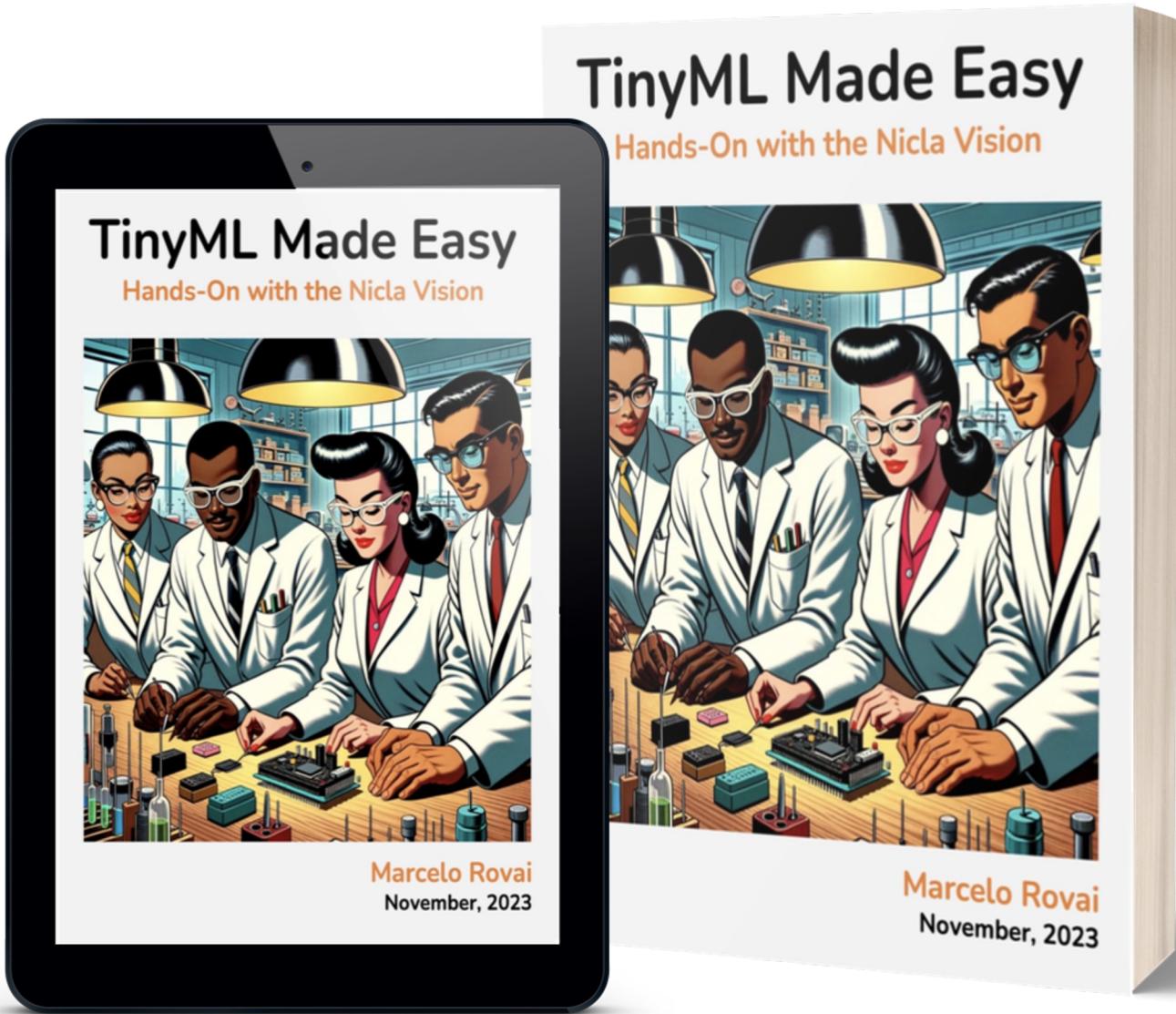
Machine Learning Systems with TinyML



Edited by Prof. Vijay Janapa Reddi
Harvard University



https://github.com/harvard-edge/cs249r_book



https://github.com/Mjrovai/TinyML_Made_Easy_NiclaV_eBook



Tentative Agenda

- Day 1
 - Introduction to TinyML
 - Demo slide show - Remote control a slide show
 - Introduction to Edge Impulse
 - Lab: Introduction to Edge Impulse
- Day 2
 - Introduction to Arduino and Nicla Vision
 - Lab: Nicla Vision
 - Introduction to MQTT
 - Lab: MQTT
 - Tensorflow for TinyML
 - Lab: Control Basic

Tentative Agenda

- Day 3
 - Image Classification with Edge Impulse
 - Lab: Image Classification (serious vs smiling face)
 - Lab Project: Image classification applied to date fruits
 - Introduction to OpenMV and FOMO
- Day 4
 - Introduction to Audio Processing
 - Lab: Keyword Spotting
 - Lab: Dialect Keyword Spotting
 - Lab Project: Controlling Slides using voice / gesture
 - Introduction to Anomaly Detection

Tentative Agenda

- Day 5
 - Introduction to final projects
 - Working on projects together
 - Workshop closing

Labs



Things will not work (we all have different operating systems, network setups, etc)

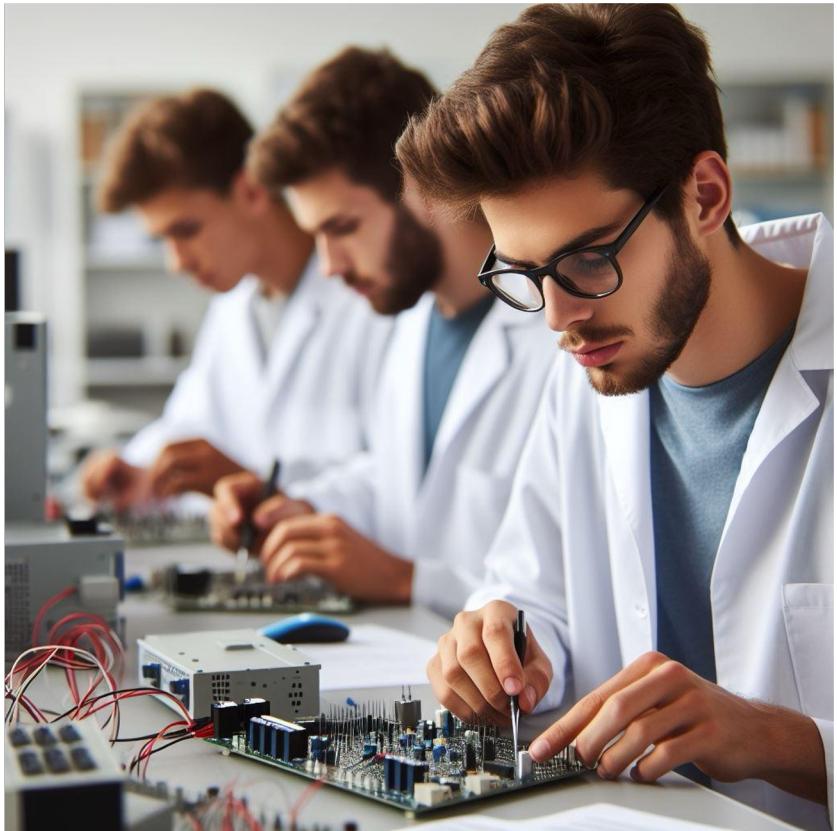
We will make things work together.

Please be nice to your colleagues and share your knowledge.

"What we have to learn to do, we learn by doing."

Aristotle

Labs



Warm-up Task: try the examples, with small/no modification

Primary Task: modify the examples, adding new features or merging different examples

Final Task: a more complex project that could become a commercial product / that solves a real-world problem

About you

Please introduce yourself and let us know:

what is your interest in TinyML?

do you have a project/application in mind already?

have you worked with Arduino?

Thanks



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