



WALC 2024 Applied AI

About the Track & Syllabus

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TinyML4D Academic Network Co-Chair



TINYML4D

Marcelo Rovai is an educator and professional in the field of engineering and technology, holding the title of Professor Honoris Causa from the Federal University of Itajubá, Brazil. His educational background includes an Engineering degree from UNIFEI and an advanced specialization from the Polytechnic School of São Paulo University (POLI/USP). Further enhancing his expertise, he earned an MBA from IBMEC (INSPER) and a Master's in Data Science from the Universidad del Desarrollo (UDD) in Chile.

With a career spanning several high-profile technology companies such as AVIBRAS Airspace, ATT, NCR, and IGT, where he served as Vice President for Latin America, he brings a wealth of industry experience to his academic endeavors. He is a prolific writer on electronics-related topics and shares his knowledge through open platforms like [Hackster.io](https://hackster.io).

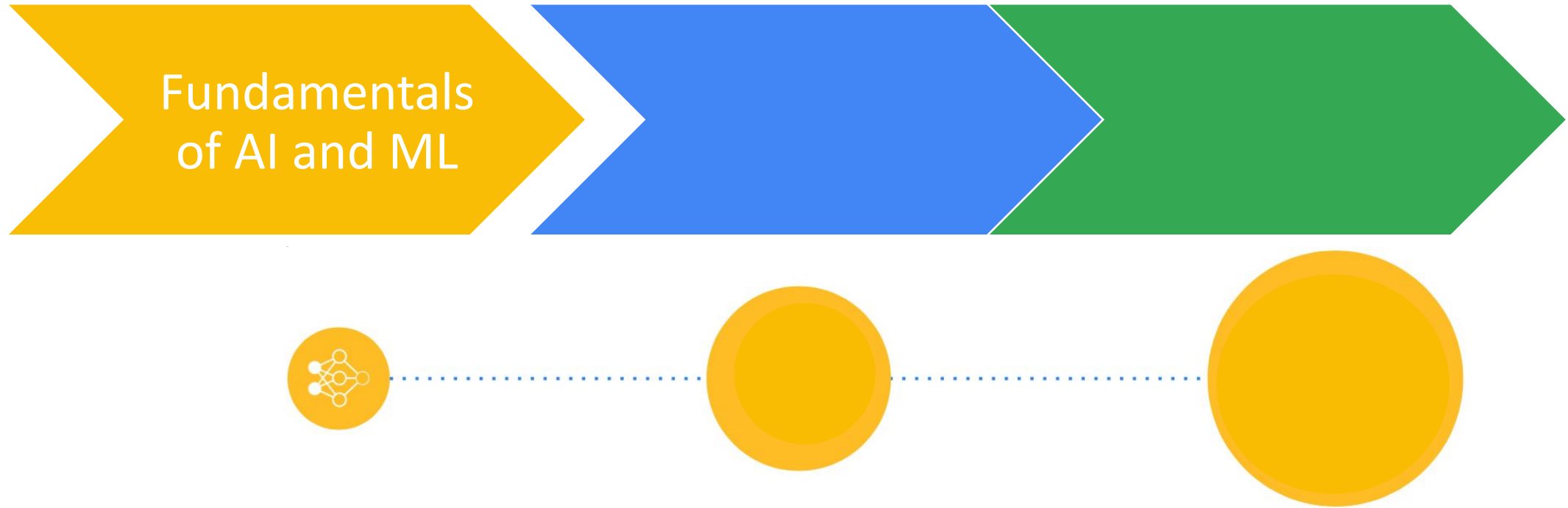
In addition to his professional pursuits, he is dedicated to educational outreach, serving as a volunteer professor at UNIFEI and engaging with the [TinyML4D group](#) as a Co-Chair, promoting EdgeAI education in developing countries. His work underscores a commitment to leveraging technology for societal advancement.



What will We learn?

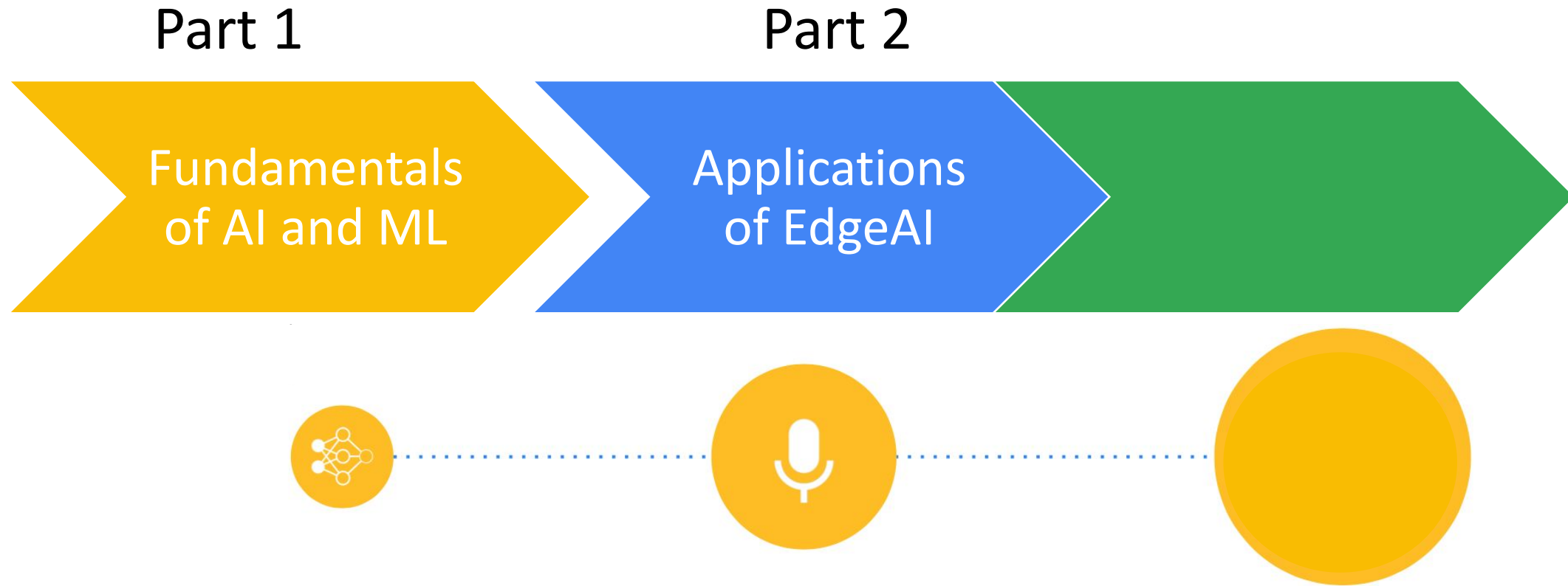
What will We learn?

Part 1 (2 days)



Part 1 is all about 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 **EdgeAI (Embedded Artificial Intelligence)** and applications, as keyword spotting (“Alexa”), gesture recognition, chatBots, understand how to leverage the sensors, and so forth.

What will We learn?

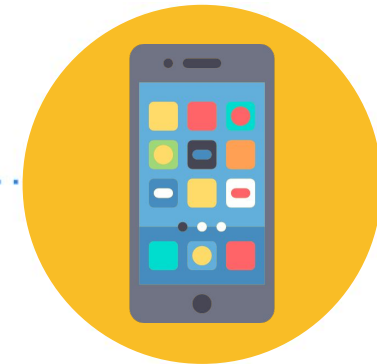
Part 1

Fundamentals
of AI and ML

Part 2

Applications
of EdgeAI

Deploying
EdgeAI



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 EdgeAI (e.g., preprocessing, post-processing, and dealing with resource constraints).

How are we going to get there?

Lectures and Hands-on Learning

- **Lectures/Labs**

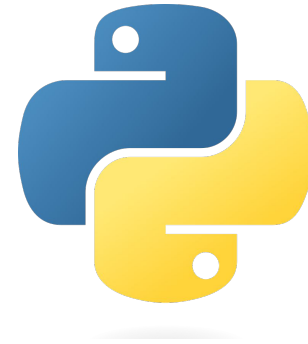
- Jesus Lopez (AI / Ethics)
- Diego Mendez (ML/DL)
- Marcelo Rovai (EdgeAI)
- Stanley Arciniegas (Hands-On Labs)

- **Software**

- Python
- Machine Learning (TensorFlow)
- Programming environment
 - Google Colab
 - Edge Impulse Studio

- **Hardware**

- SmartPhone
- PC



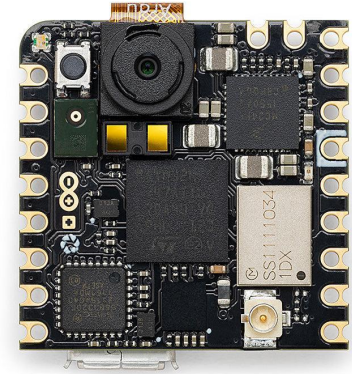
Hardware



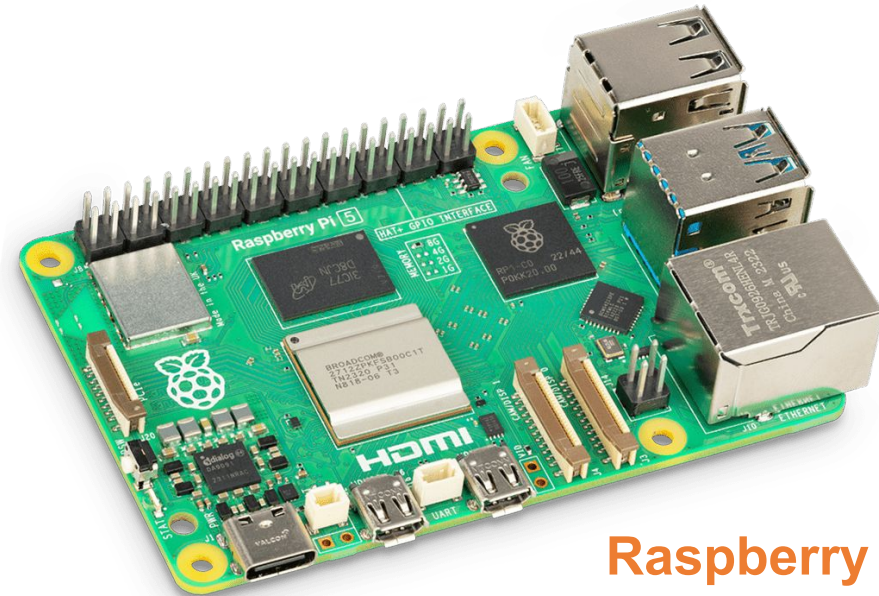
SmartPhone



Seeed XIAO
ESP32S3



Arduino
Nicla Vision

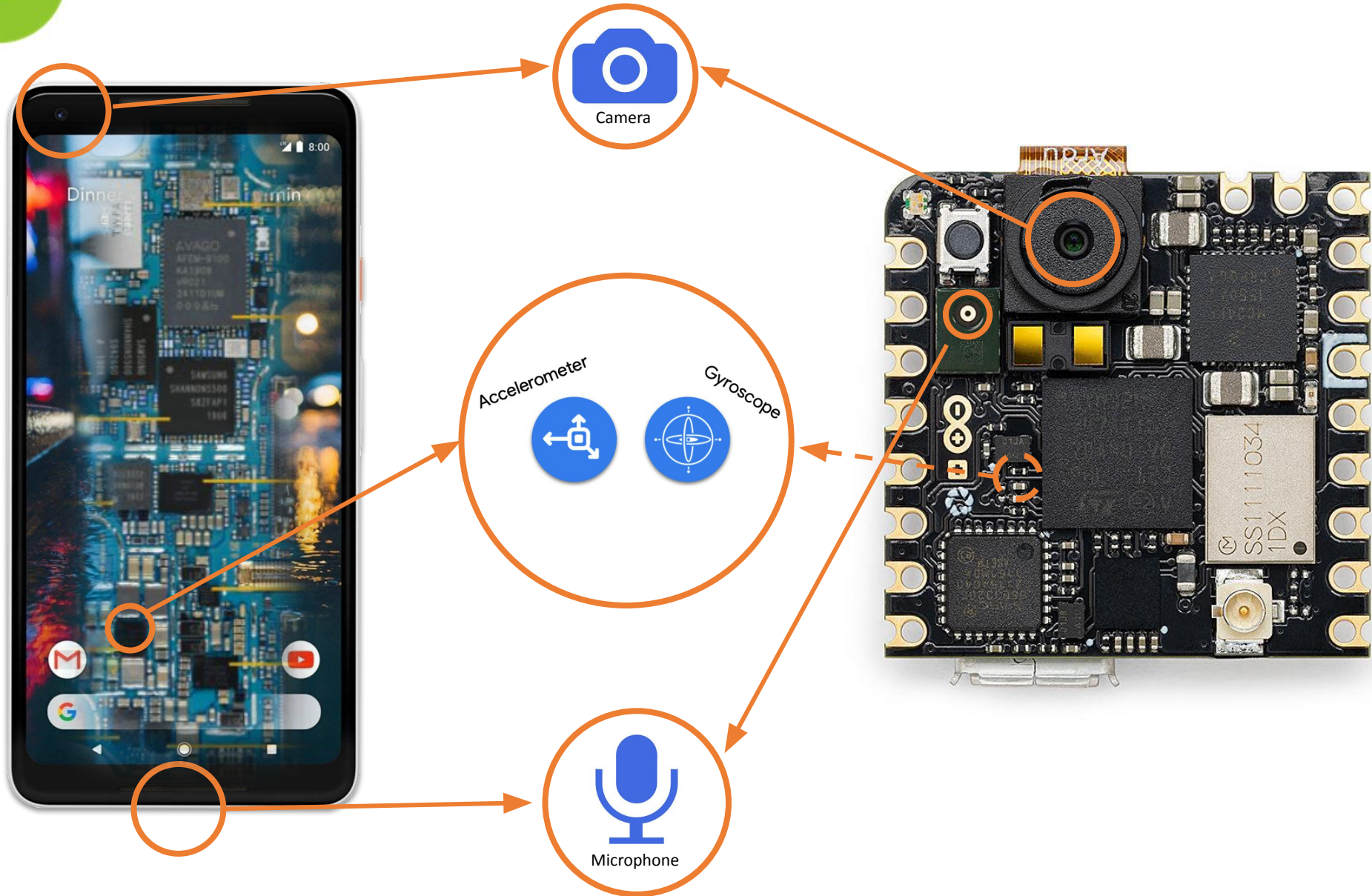


Raspberry Pi

Edge
Device



& Sensors



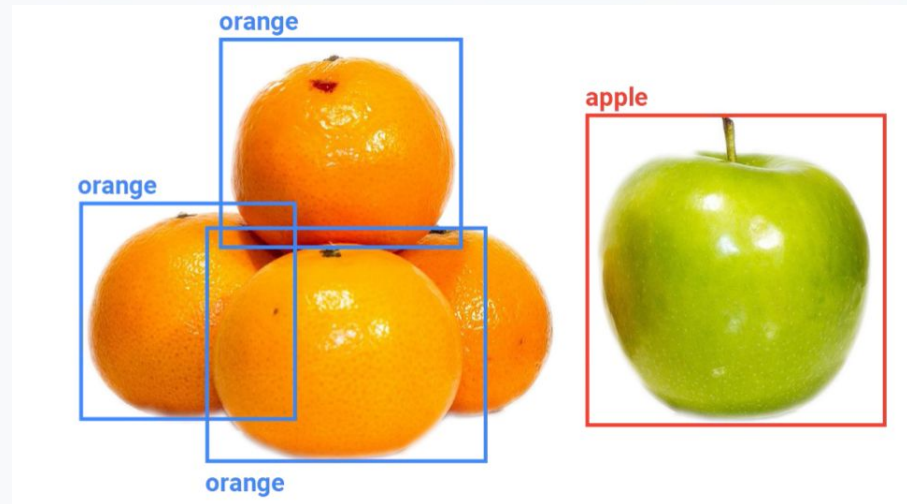
Hands-on Activities

Speech



Okay, Google.

Vision



IMU

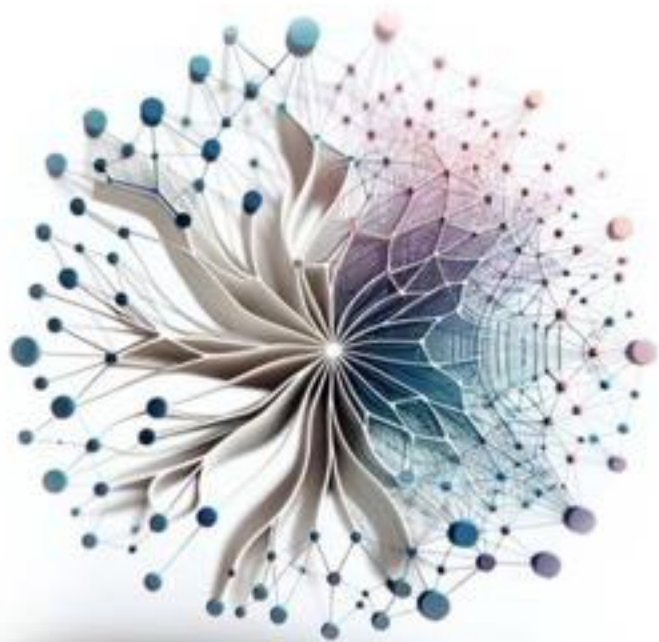


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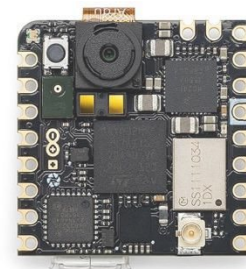


Machine Learning Systems

with TinyML

Written, edited and curated by
Prof. Vijay Janapa Reddi
Harvard University

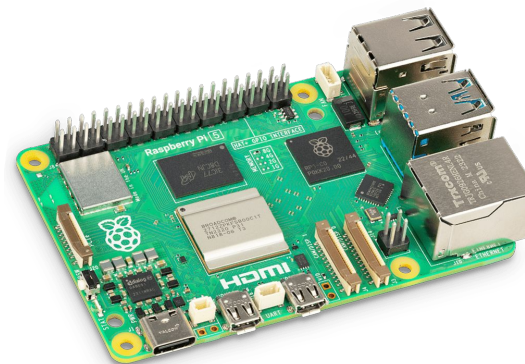
With special thanks to the community for their contributions and support.



Nicla Vision



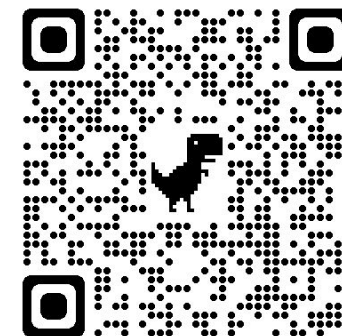
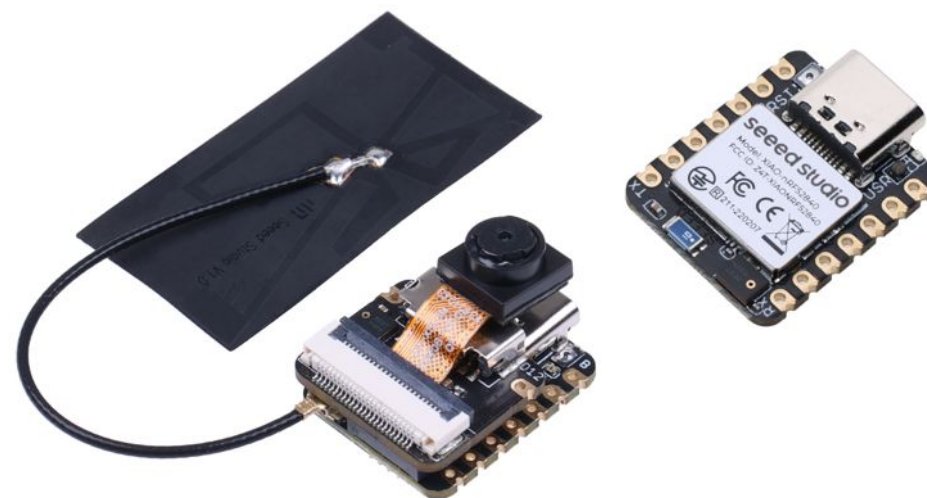
XIAO ESP32S3



Raspberry Pi



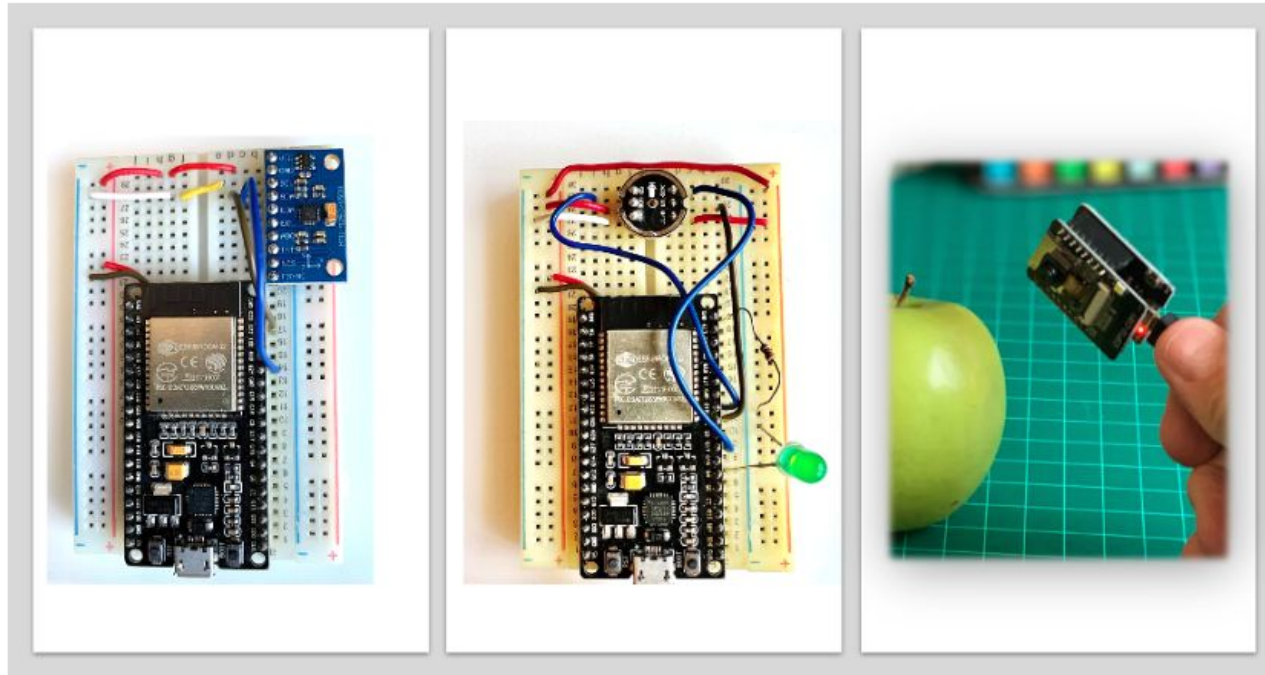
Seeed Studio **XIAO**



More MCUs...

ESP32-TinyML

Exploring TinyML with ESP32 MCUs.



Seeed-XIAO-BLE-Sense

KWS, Anomaly Detection & Motion Classification and Micropython - Exploring the Seeed XIAO BLE Sense.



Programming Tiny devices with
MicroPython. The easiest way!
MJoRoBot (Marcelo Rovali)



Sensor DataLogger
MJoRoBot (Marcelo Rovali)



TinyML Made Easy: Anomaly
Detection & Motion Classification
MJoRoBot (Marcelo Rovali)



TinyML Made Easy: Sound
Classification (KWS)
MJoRoBot (Marcelo Rovali)



XIAO-ESP32S3-Sense



TinyML Made Easy: KeyWord Spotting
(KWS)
MJoRoBot (Marcelo Rovali)



Exploring Machine Learning with the
new XIAO ESP32S3
MJoRoBot (Marcelo Rovali)



TinyML Made Easy: Image
Classification
MJoRoBot (Marcelo Rovali)



Tentative Agenda

- **Monday**
 - About the Track & Syllabus – M Rovai
 - EdgeAI - Introduction – M Rovai
 - Artificial Intelligence Overview – J Lopez
 - Tools Setup - M Rovai
- **Tuesday**
 - Introduction to Machine Learning – D Mendez
 - Introduction to Neural Networks – D Mendez
 - DNN – Regression – D Mendez
 - DNN – Classification – D Mendez
 - ML Metrics – D Mendez
 - Introduction to Convolutions – M Rovai
 - Image Classification using Convolutions (CNN) – M Rovai
 - Preventing Overfitting & DL Wrap-Up – M Rovai
 - Image Classification Hands-On - S Arciniegas

Tentative Agenda

- **Wednesday**
 - Advanced CV – M Rovai
 - Audio Applications – J Lopez
 - KWS Hands-On - S Arciniegas
- **Thursday**
 - Time Series Applications (RNN/LSTM) – M Rovai
 - Motion Classification (DNN) – M Rovai
 - Anomaly Detection (K-Means) – M Rovai
 - Motion Classification Hands-On - S Arciniegas
- **Friday**
 - AI Ethics – J Lopez
 - LLMs – M Rovai
 - GenAI and the The future of the Edge AI – M Rovai
 - Applied AI Track Wrap-up – M Rovai

Questions?

