


Workshop on Machine Learning on Low-Power Devices: Applications and Advanced Topics

Marco Zennaro,
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Workshop Team



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Barnard
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University



Vijay
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Harvard
University




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Rovai
UNIFEI
Brazil



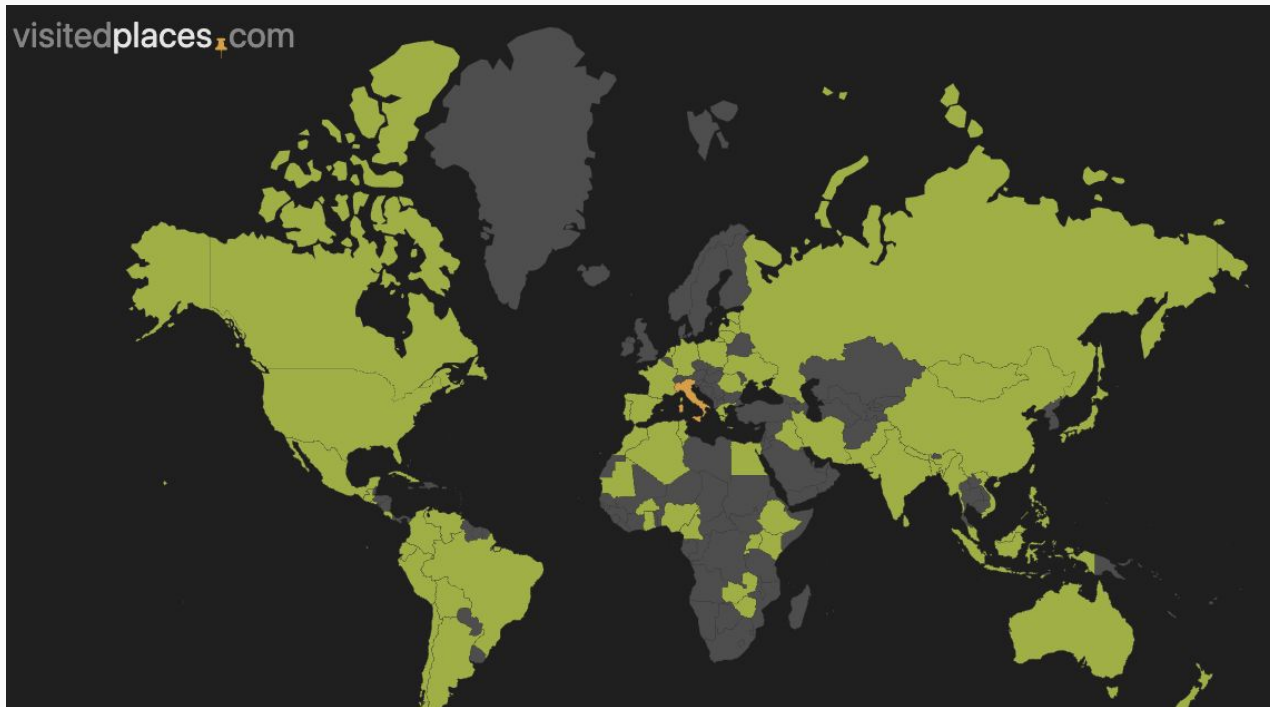
Jeremy
Ellis
Canada

Organizers




**15 Great
Speakers!**

201 participants from 44 countries



201 participants from 44 countries

Junior		103	51%
Regular		64	32%
Senior		34	17%
N/A		0	0%

Female		44	22%
Male		157	78%
N/A		0	0%

Why a TinyML Academic Network

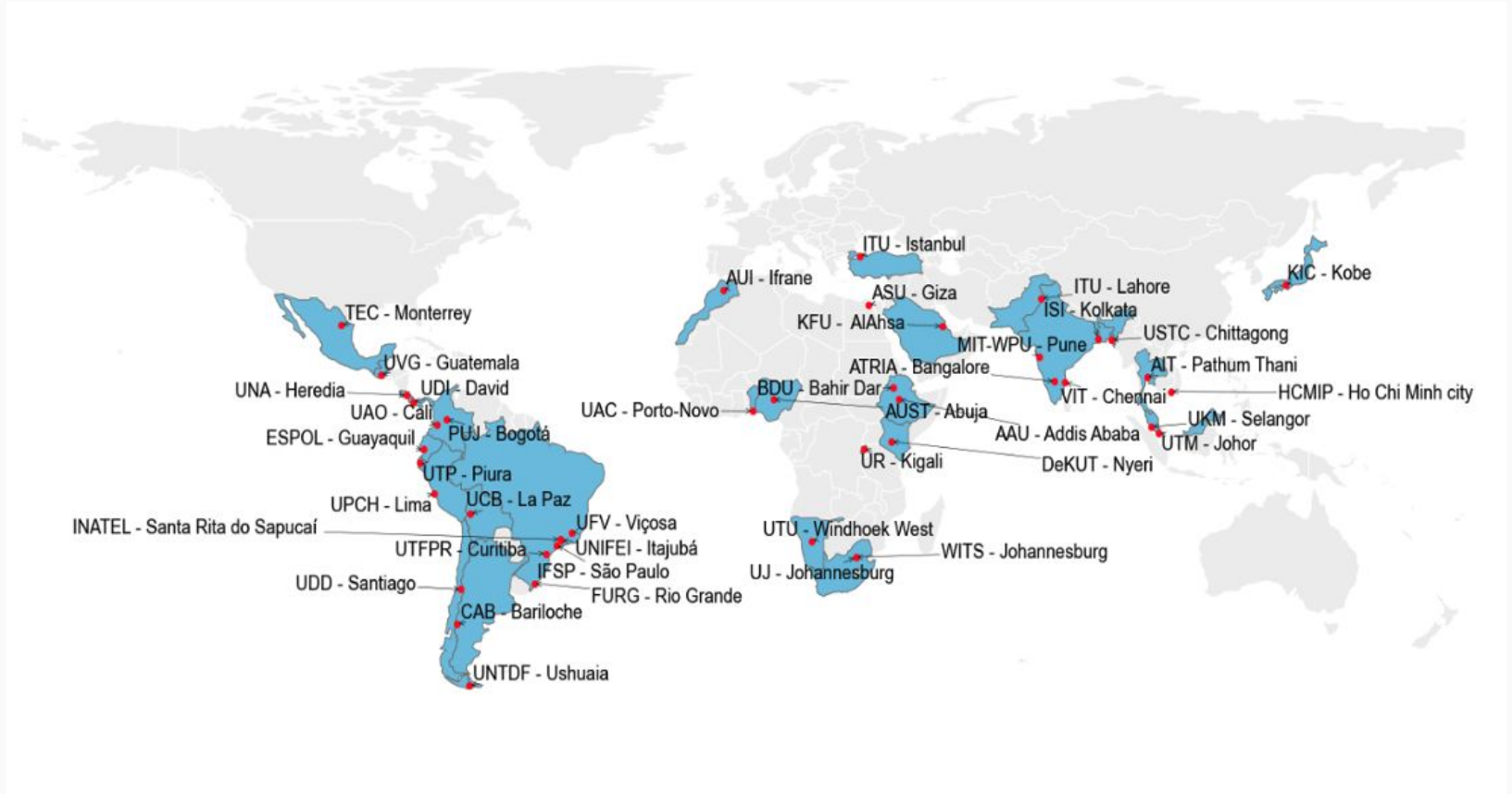
We aim to develop a **community of researchers and practitioners** focused on both improving **access to TinyML education** and **enabling innovative solutions** for the unique challenges faced by Developing Countries.

1. Joint **workshops and seminars** on TinyML with lab sessions
2. An **online forum** to consolidate the TinyML community
3. **Open exchange** of student projects, lesson plans, real-world deployments and outreach materials

<http://tinymledu.org>



TinyML academic network



TinyML academic network

SciTinyML: Scientific Use of Machine Learning on Low-Power Devices

18 - 22 October 2021
An ICTP Virtual Meeting
Trieste, Italy

Directors:
- **Gianni Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Organiser:
- **ICTP**

Speakers:
- **Giuseppe Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Topics:
- General concepts
- Scientific Applications of ML
- Introduction to TinyML
- Examples of TinyML applications

How to apply:
- [https://tinyml.edu](#)

Registration:
- Free of charge

Deadline:
- 8 October 2021

African Regional Workshop on SciTinyML: Scientific Use of Machine Learning on Low-Power Devices

20 - 22 April 2022
Online

Directors:
- **Gianni Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Organiser:
- **ICTP**

Speakers:
- **Giuseppe Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Topics:
- General concepts
- Scientific Applications of ML
- Introduction to TinyML
- Examples of TinyML applications

How to apply:
- [https://tinyml.edu](#)

Registration:
- Free of charge

Deadline:
- 15 April 2022

Asian Regional Workshop on SciTinyML: Scientific Use of Machine Learning on Low-Power Devices

6 - 10 June 2022
Online

Directors:
- **Gianni Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Organiser:
- **ICTP**

Speakers:
- **Giuseppe Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Topics:
- General concepts
- Scientific Applications of ML
- Introduction to TinyML
- Examples of TinyML applications

How to apply:
- [https://tinyml.edu](#)

Registration:
- Free of charge

Deadline:
- 22 May 2022

Latin American Regional Workshop on SciTinyML: Scientific Use of Machine Learning on Low-Power Devices

17 - 21 April 2022
An ICTP Virtual Meeting
Trieste, Italy

Directors:
- **Gianni Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Organiser:
- **ICTP**

Speakers:
- **Giuseppe Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Topics:
- General concepts
- Scientific Applications of ML
- Introduction to TinyML
- Examples of TinyML applications

How to apply:
- [https://tinyml.edu](#)

Registration:
- Free of charge

Deadline:
- 22 April 2022

Workshop on Scientific Use of Machine Learning on Low-Power Devices: Applications and Advanced Topics

17 - 21 April 2022
An ICTP Virtual Meeting
Trieste, Italy

Directors:
- **Gianni Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Organiser:
- **ICTP**

Speakers:
- **Giuseppe Borri**
- **Antonio Chiantera**
- **Stefano Scudato**

Topics:
- General concepts
- Scientific Applications of ML
- Introduction to TinyML
- Examples of TinyML applications

How to apply:
- [https://tinyml.edu](#)

Registration:
- Free of charge

Deadline:
- 7 April 2022

<https://tinyml.edu.org/teach>

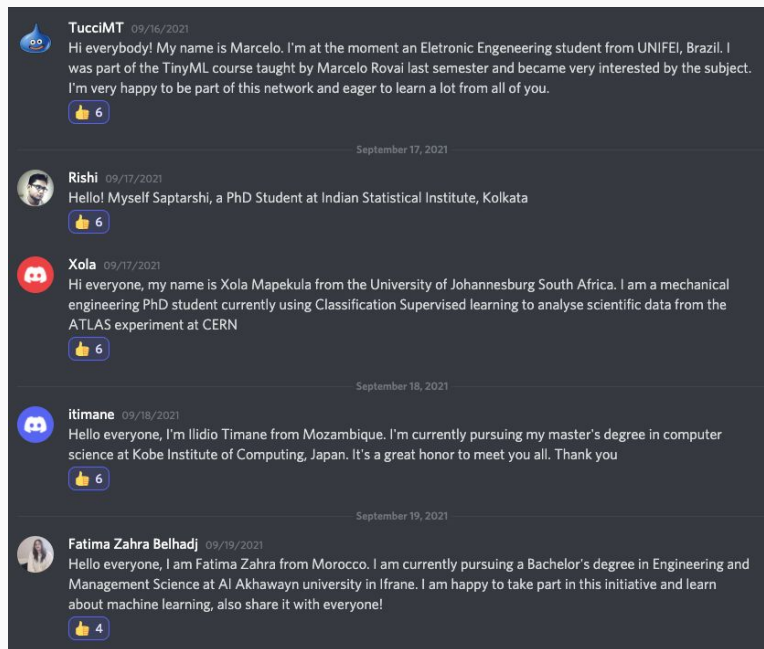
Final goal is to provide
Open Educational Resources



<https://discord.gg/zKWgwhSAEY>

#ictp-workshop

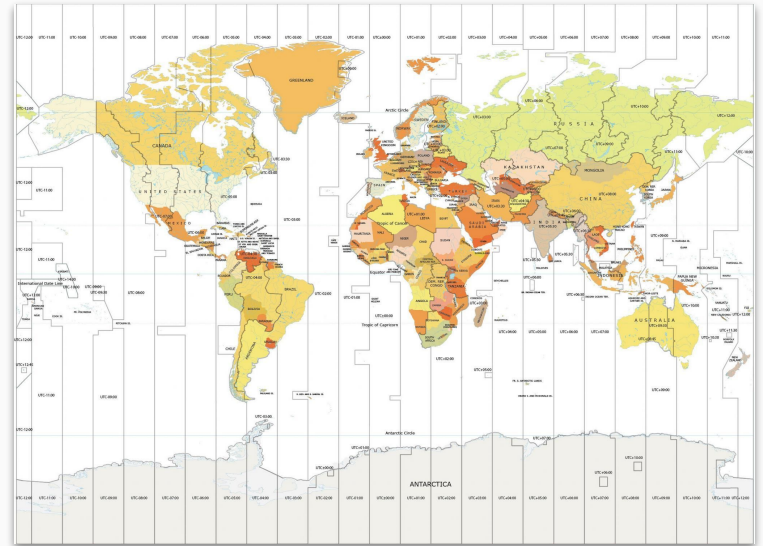
+1000 members on Discord!



Workshop Logistics

Three hours per day

GMT: 1pm to 4pm
(worldtimebuddy.com/)



Workshop Agenda

Day 1	Monday	<p>Introduction to (tiny)ML</p> <p><i>3:00 PM</i> Workshop Opening and Schedule</p> <p><i>3:10 PM</i> Opening Keynote</p> <p><i>4:00 PM</i> AI and ML Overview</p> <p><i>5:00 PM</i> Introduction to Embedded ML</p> <p><i>5:45 PM</i> Education in TinyML</p> <p><i>6:15 PM</i> Day Closing</p>	<p>Marco Zennaro of ICTP</p> <hr/> <p>Gian Marco Iodice of ARM</p> <hr/> <p>Jesús Alfonso López Sotelo of Universidad Autónoma de Occidente</p> <hr/> <p>Robert Thas John of Versus</p> <hr/> <p>Vijay Janapa Reddi of Harvard University</p>
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Workshop Agenda

Day 2	Tuesday	<p>The TinyML Development Workflow</p> <p>3:00 PM Day Opening</p> <p>3:05 PM Academia-Industry Partnerships</p> <p>3:50 PM Edge Impulse Overview and Update</p> <p>4:35 PM Hands-on Motion Classification and Anomaly Detection</p> <p>5:55 PM Day Closing</p>	<p>Marcelo Rovai of UNIFEI</p> <hr/> <p>Pete Bernard of tinyML Foundation</p> <hr/> <p>Shawn Hymel of Edge Impulse</p> <hr/> <p>José Antonio Bagur Nájera of Universidad del Valle de Guatemala</p>
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Workshop Agenda

Day 3	Wednesday	<p>Education & Applications</p> <p><i>3:00 PM</i> Day Opening</p> <p><i>3:05 PM</i> TinyML Devices Enabling Physical GPT</p> <p><i>3:45 PM</i> Experiences using TinyML Tools in Teaching Biomedical Engineering</p> <p><i>4:25 PM</i> Data Fusion in Tinyml and Applications in Biology and Federated Learning</p> <p><i>5:00 PM</i> Arduino and Education</p> <p><i>5:55 PM</i> Day Closing</p>	<p>Marco Zennaro of ICTP</p> <hr/> <p>Eric Pan of Seeed Studio</p> <hr/> <p>Moises Meza of UPCH, Peru</p> <hr/> <p>Claudio Miceli of UFRJ, Brazil</p> <hr/> <p>David Cuartielles of Arduino (Co-Founder)</p>
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Workshop Agenda

Day 4	Thursday	TinyML Show and Tell 3:00 PM Day Opening 3:05 PM Show and Tell Introduction 3:20 PM Show and Tell Talks 5:55 PM Day Closing	Jeremy Ellis of School District 75 Mission
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10 presentations, 15 minutes each (10 min presentation + 5 min Q&A)

Please present at our monthly Show and Tell!

Workshop Agenda

Day 5	Friday	<p>Recent Research and Advanced Topics in TinyML</p> <p><i>3:00 PM</i> Day Opening</p> <p><i>3:05 PM</i> On-Device Learning</p> <p><i>3:50 PM</i> Fingerprinting</p> <p><i>4:35 PM</i> Materiality and Risk in the Age of Pervasive AI Sensors</p> <p><i>5:05 PM</i> Workshop Closing and Future Events</p> <p><i>5:25 PM</i> TinyML4D Regional Networking</p>	<p>Marcelo Rovai of UNIFEI</p> <hr/> <p>Marcus Rüb of Hahn-Schickard</p> <hr/> <p>Diego Mendez Chaves of Pontificia Universidad Javeriana</p> <hr/> <p>Brian Plancher of Barnard College, Columbia University</p> <hr/> <p>Marco Zennaro of ICTP</p>
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Open Material

The material used in the workshop (slides, videos, code) will be **openly available** for you to use as a teacher/student/practitioner.

TinyMLedu webpage: <https://tinyml.seas.harvard.edu/SciTinyML-24/>

(with videos, slides and code)

ICTP official webpage: <https://indico.ictp.it/event/10464>

Tell me and I forget,
teach me and I may
remember, involve me
and I learn.

– Benjamin Franklin

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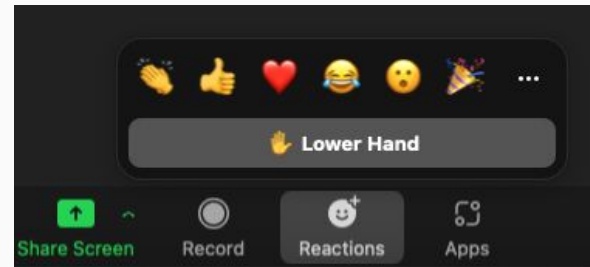
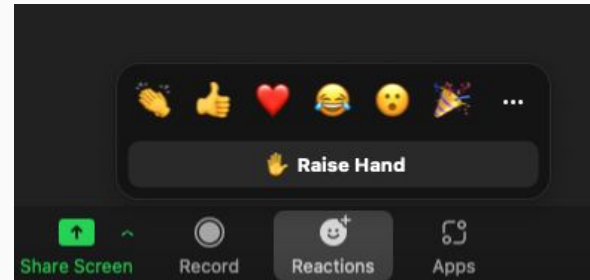
- ~~Benjamin Franklin~~
- Xun Kuang

Interaction

You are more than welcome to ask questions!

Please raise your hand in Zoom to ask questions.

Unmute, turn on your camera and ask your question. Please lower your hand and mute yourself afterwards.



Interaction via Discord

If you have longer questions/ don't want to talk, please use the “**#ictp-workshop**” Discord channel. Questions and answers in Discord will remain after the workshop (--> good reference!).

Please join Discord by following this link:

<https://discord.gg/zKWgwhSAEY> if you haven't already done so!

We will use **Zoom chat only for announcements.**

Thanks!



Harvard John A. Paulson
School of Engineering
and Applied Sciences

