


Latin American regional workshop on SciTinyML: Scientific Use of Machine Learning on Low-Power Devices

Marco Zennaro,
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About myself

Research Scientist at the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy.

I have been working on IoT since 2006.

Organized training activities in IoT in +30 countries.



IoT evolution



2007
\$550



2022
\$5.40

Workshop Team



Marco
Zennaro
ICTP, Italy



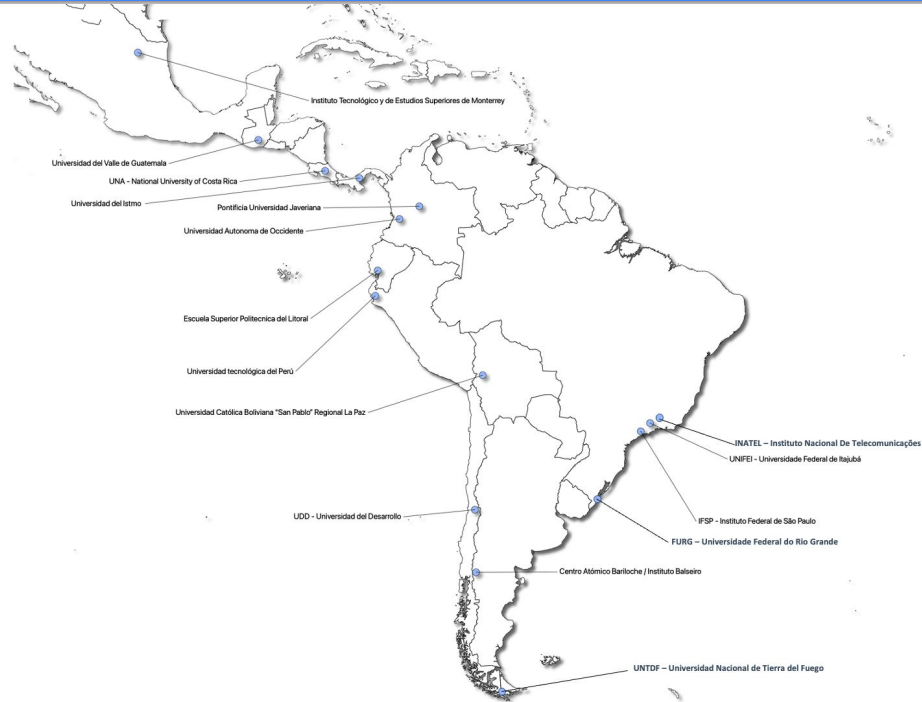
Marcelo
Rovai
UNIFEI,
Brazil



Vijay
Janapa Reddi
Harvard,
USA


Organizers

183 participants from 17 LatAm countries



183 participants from 17 LatAm countries

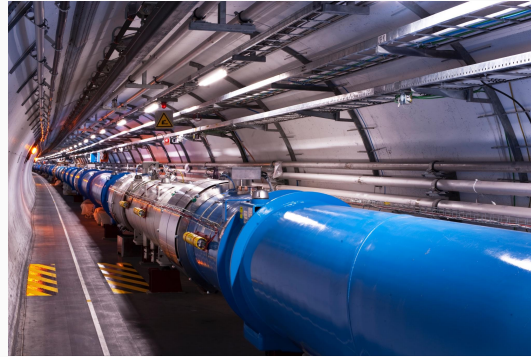
Junior		122	67%
Regular		35	19%
Senior		26	14%
N/A		0	0%

Female		26	14%
Male		157	86%
N/A		0	0%

Why a workshop on SciTinyML at ICTP



By Sebastiandoe5 - Own work, CC BY-SA 4.0,
<https://commons.wikimedia.org/w/index.php?curid=107917499>

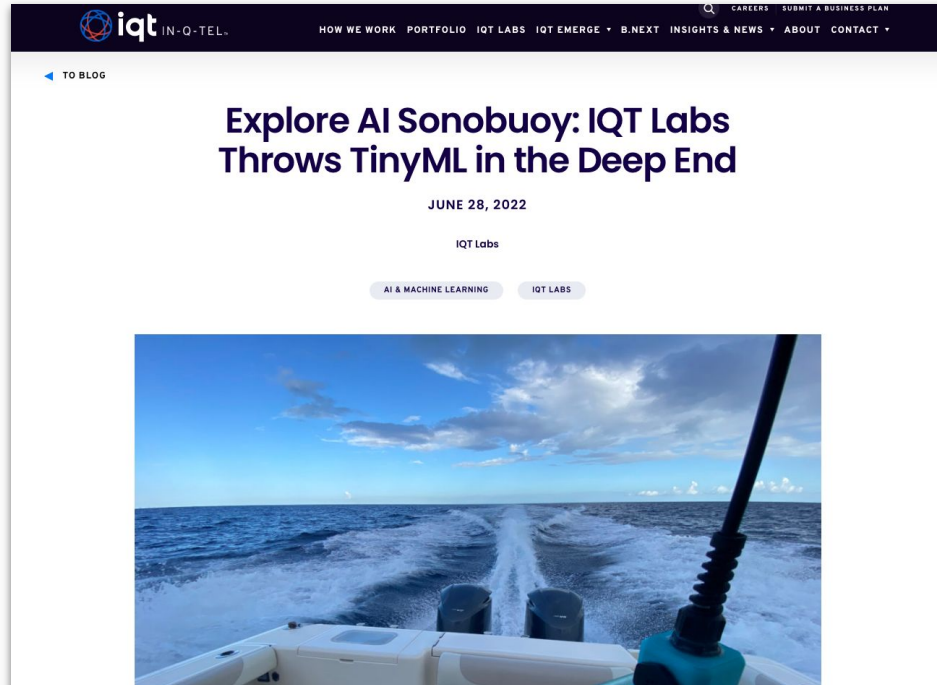


By Maximilien Brice (CERN) - CERN Document Server, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=29068933>



CambridgeBayWeather assumed

Why a workshop on SciTinyML at ICTP



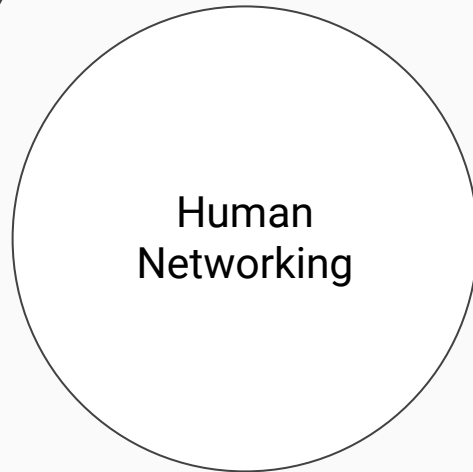
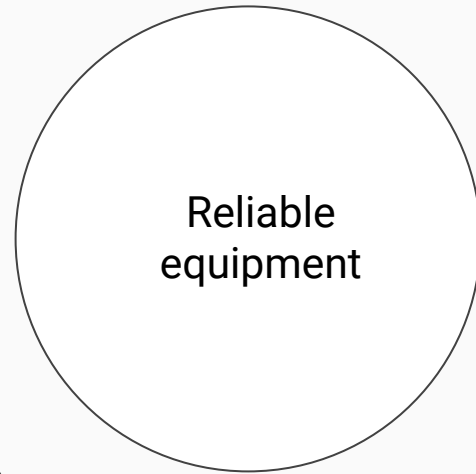
Why a TinyML Academic Network

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.

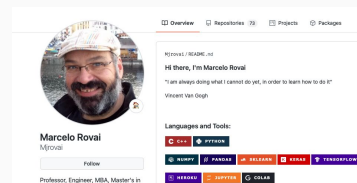
- Joint **workshops and seminars** on TinyML with lab sessions
- An **online forum** to consolidate the TinyML community
- **Open exchange** of student projects, lesson plans, real-world deployments and outreach materials

<http://tinymledu.org>





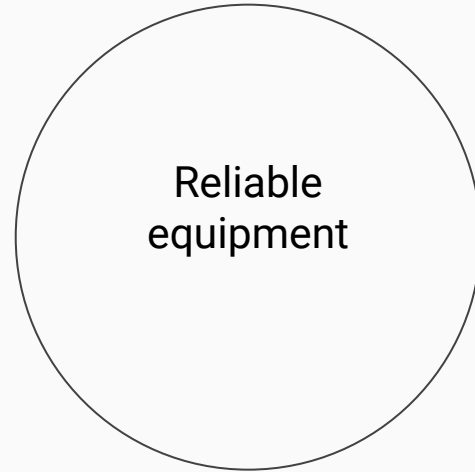
Good
Best
training
material



<https://tinymledu.org/teach>



Final goal is to provide
Open Educational Resources



Standard kit in each University

=

Exchange of code / tutorials / projects

Human
Networking



+650 members!

A screenshot of a Discord chat thread with a dark background. It shows four messages from different users, each with a profile picture, name, timestamp, and a thumbs-up icon with a number indicating likes. The messages are: 1. TucciMT (09/16/2021) introducing himself as Marcelo, an Electronic Engineering student from UNIFEI, Brazil, who was part of the TinyML course. 2. Rishi (09/17/2021) introducing himself as Myself Saptarshi, a PhD Student at Indian Statistical Institute, Kolkata. 3. Xola (09/17/2021) introducing herself as Xola Mapekula from the University of Johannesburg South Africa, a mechanical engineering PhD student using Classification Supervised learning at CERN. 4. itimane (09/18/2021) introducing himself as Ilidio Timane from Mozambique, currently pursuing a master's degree in computer science at Kobe Institute of Computing, Japan. 5. Fatima Zahra Belhadj (09/19/2021) introducing herself as Fatima Zahra from Morocco, currently pursuing a Bachelor's degree in Engineering and Management Science at Al Akhawayn university in Ifrane, happy to take part in the initiative and learn about machine learning.

TucciMT 09/16/2021
Hi everybody! My name is Marcelo. I'm at the moment an Eletronic Engineering student from UNIFEI, Brazil. I was part of the TinyML course taught by Marcelo Rovai last semester and became very interested by the subject. I'm very happy to be part of this network and eager to learn a lot from all of you.
6

September 17, 2021

Rishi 09/17/2021
Hello! Myself Saptarshi, a PhD Student at Indian Statistical Institute, Kolkata
6

Xola 09/17/2021
Hi everyone, my name is Xola Mapekula from the University of Johannesburg South Africa. I am a mechanical engineering PhD student currently using Classification Supervised learning to analyse scientific data from the ATLAS experiment at CERN
6

September 18, 2021

itimane 09/18/2021
Hello everyone, I'm Ilidio Timane from Mozambique. I'm currently pursuing my master's degree in computer science at Kobe Institute of Computing, Japan. It's a great honor to meet you all. Thank you
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September 19, 2021

Fatima Zahra Belhadj 09/19/2021
Hello everyone, I am Fatima Zahra from Morocco. I am currently pursuing a Bachelor's degree in Engineering and Management Science at Al Akhawayn university in Ifrane. I am happy to take part in this initiative and learn about machine learning, also share it with everyone!
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Workshop Logistics

Three hours per day

UTC: 1pm to 4pm

One “office hour” per day

UTC: 4pm to 5pm

Guatemala City, Guatemala
Mon, Jul 11, 7:00am (CST)

Mexico City, Mexico
Mon, Jul 11, 8:00am (CDT)

Guayaquil, Ecuador
Mon, Jul 11, 8:00am (GMT-5)

Bogota, Colombia
Mon, Jul 11, 8:00am (GMT-5)

Lima, Peru
Mon, Jul 11, 8:00am (GMT-5)

Panama, Panama
Mon, Jul 11, 8:00am (EST)

Boston, United States
Mon, Jul 11, 9:00am (EDT)

Santiago, Chile
Mon, Jul 11, 9:00am (GMT-4)

Buenos Aires, Argentina
Mon, Jul 11, 10:00am (GMT-3)

Brasilia, Brazil
Mon, Jul 11, 10:00am (GMT-3)

Trieste, Italy
Mon, Jul 11, 3:00pm (CEST)

Workshop Logistics

Attendance certificate only if you follow at least 80% of the lectures (according to Zoom's log file).



Workshop Agenda

Day 1	Monday	<p>Introduction to Embedded ML (TinyML)</p> <p>3:00 PM (EN) Conference Opening and Schedule</p> <p>3:30 PM (SP) Keynote - David Cuartielles</p> <p>4:15 PM (EN) Introduction to TinyML</p> <p>5:15 PM (SP) Introduction to Deep Learning</p> <p>5:55 PM (EN) Day Closing</p> <p>6:00 PM (SP) Office Hour</p>	<p>Marco Zennaro of ICTP</p> <hr/> <p>David Cuartielles of Arduino (Co-Founder)</p> <hr/> <p>Brian Plancher of Barnard College, Columbia University and of Harvard University</p> <hr/> <p>Diego Mendez Chaves of Pontificia Universidad Javeriana</p>
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Workshop Agenda

Day 2	Tuesday	<p>Hands-on Motion Classification</p> <p>3:00 PM (EN) Day Opening</p> <p>3:05 PM (SP) Edge Impulse 101: Installation and First Use</p> <p>4:00 PM (SP) Hands-on Motion classification and Anomaly Detection</p> <p>5:20 PM (SP) Case Study: TFLite-Micro</p> <p>5:40 PM (SP) Case Study: TinyML for the Study of Animal Movement: Real Time Motion Detection</p> <p>5:55 PM (EN) Day Closing</p> <p>6:00 PM (SP) Office Hour</p>	<p>Marco Zennaro of ICTP</p> <hr/> <p>José Antonio Bagur Nájera of Universidad del Valle de Guatemala</p> <hr/> <p>Jesús Alfonso López Sotelo and Cinthia Kathalina Rodríguez Leguizamón of Universidad Autónoma de Occidente</p> <hr/> <p>Laila Daniela Kazimierski and David Córcova of Centro Atómico Bariloche</p>
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Workshop Agenda

Day 3	Wednesday	<p>Hands-on Computer Vision</p> <p>3:00 PM (EN) Day Opening</p> <p>3:05 PM (EN) Convolutions for Computer Vision</p> <p>3:45 PM (SP) Hands-On Computer Vision</p> <p>4:45 PM (SP) Case Study: Bee Counting with FOMO</p> <p>5:00 PM (SP) Case Study: Satellite Applications for TinyML</p> <p>5:15 PM (EN) Case Study: AI-vision Sensors for Water Quality Monitoring</p> <p>5:30 PM (EN) Case Study: Detecting Usage of Personal Protective Equipment with a CNN</p> <p>5:45 PM (SP) Case Study: Computer Vision - Mask/No-Mask</p> <p>5:55 PM (EN) Day Closing</p> <p>6:00 PM (SP) Office Hour</p>	<p>Marco Zennaro of ICTP</p> <hr/> <p>Brian Plancher of Barnard College, Columbia University and of Harvard University</p> <hr/> <p>Marcelo Rovai of Federal University of Itajuba - UNIFEI</p> <hr/> <p>Ivan Balsa of Universidad Carlos III de Madrid and of Federal University of Itajuba - UNIFEI</p> <hr/> <p>Mercy Torres of Universidad del Valle de Guatemala</p> <hr/> <p>Marcelo Pias and Bruna Guterres of Federal University of Rio Grande - FURG</p> <hr/> <p>G. França of Instituto Federal de São Paulo - IFSP</p> <hr/> <p>Jesús Alfonso López Sotelo and TBD of Universidad Autónoma de Occidente</p>
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Workshop Agenda

Day 4	Thursday	<p>Hands-on Key Word Spotting</p> <p>3:00 PM (EN) Day Opening</p> <p>3:05 PM (SP) Hands-on Keyword Spotting</p> <p>4:40 PM (SP) Case Study: Indoor Localization</p> <p>5:00 PM (SP) Case Study: Early detection of faults in electric motors</p> <p>5:15 PM (SP) Case Study: Audio Processing to Prevent Possible Femicides</p> <p>5:30 PM (EN) Case Study: TinyML for Key Recognition from the Sound of a Physical Keyboard</p> <p>5:45 PM (EN) Case Study: Domestic Appliance Classification with TinyML via Current and Voltage Signals</p> <p>5:55 PM (EN) Day Closing</p> <p>6:00 PM (SP) Office Hour</p>	<p>Marco Zennaro of ICTP</p> <hr/> <p>José Antonio Bagur Nájera of Universidad del Valle de Guatemala</p> <hr/> <p>Diego Méndez Chaves of Pontificia Universidad Javeriana</p> <hr/> <p>Ronald Criollo of Escuela Superior Politécnica del Litoral</p> <hr/> <p>Renan Castro of Instituto Federal de São Paulo - IFSP</p> <hr/> <p>Ivan Lucas Arandes of Instituto Federal de São Paulo - IFSP</p>
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Workshop Agenda

Day 5	Friday	<p>Applications of TinyML for Latam</p> <p>3:00 PM (EN) Day Opening</p> <p>3:05 PM (EN) TinyML on Computer Vision - New Advances</p> <p>4:00 PM (SP) Preventive Maintenance using Arduino Pro devices</p> <p>4:30 PM (SP) Why is it Important to Talk about Ethics in AI Applications?</p> <p>5:00 PM (EN) University Case Studies (Open Presentations / Pitch Future ideas)</p> <p>5:50 PM (EN) Workshop Closing</p> <p>6:00 PM (SP) Office Hour</p>	<p>Marco Zennaro of ICTP</p> <hr/> <p>Shawn Hymel of Edge Impulse</p> <hr/> <p>Sebastian Romero of Arduino</p> <hr/> <p>Jesús Alfonso López Sotelo of Universidad Autónoma de Occidente</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://tinymledu.org/SciTinyML-22/latam>

(with videos, slides and code)

ICTP official webpage: <https://indico.ictp.it/event/9811>

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

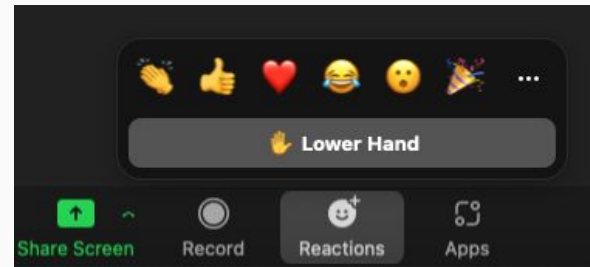
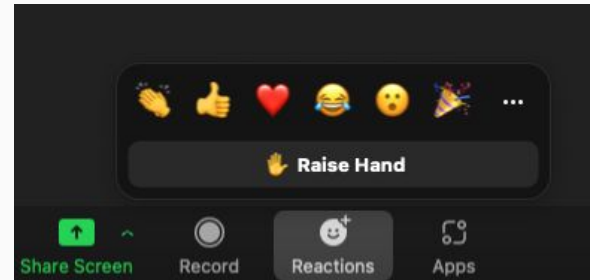
-- Benjamin Franklin

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.**

Surveys (pre and post workshop)

We put together a short anonymous survey to try to get some background information from all of you so that we can try to update the materials to be as helpful as possible.

If you could fill it out that would be very helpful:

<https://bit.ly/SciTinyML-22-Latam-Bg>

Thanks!



UNIFEI



Harvard John A. Paulson
School of Engineering
and Applied Sciences



Google



EDGE
IMPULSE

HarvardX

