


African 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 2004.

Organized training activities in IoT in +30 countries.



Workshop Team



Vijay
Janapa
Reddi
Harvard



Brian
Plancher
Harvard,
Columbia
University



Marcelo
Rovai
UNIFEI
Brazil



Michael
Perkins
CMU
Rwanda



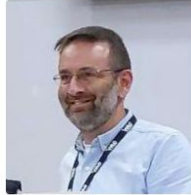
Shawn
Hymel
Edge
Impulse



Susan
Kennedy
Santa
Clara
University

11 lecturers in total

Workshop Team



Marco
Zennaro
ICTP



Gregg
Barrett
Cirrus



Vijay
Janapa
Reddi
Harvard

Organizers

187 participants from 29 African countries





187 participants from 29 African countries

Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Congo DR, Egypt, Eritrea, Ethiopia, Ghana, Kenya, Malawi, Mauritania, Morocco, Namibia, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe

187 participants from 29 African countries

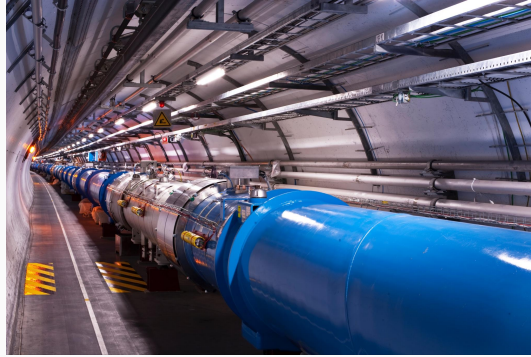
Junior		107	57%
Regular		60	32%
Senior		20	11%
N/A		0	0%

Female		39	21%
Male		148	79%
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

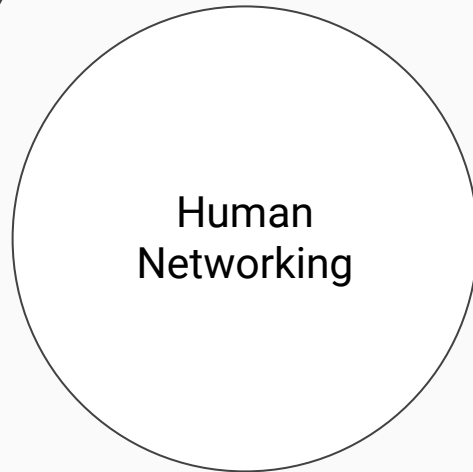
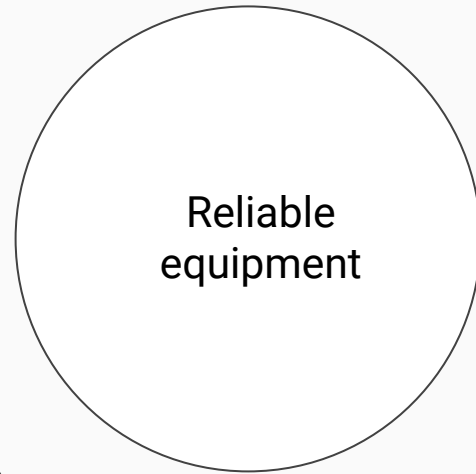
Why a TinyML Academic Network

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.

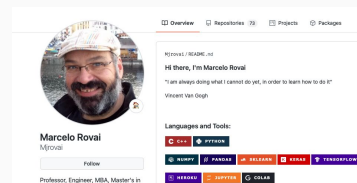
- Joint **workshops and seminars** on TinyML with lab sessions
- An **online forum** to consolidate the TinyML community
- **Open exchange** of student projects, lesson plans, real-world deployments and outreach materials

<http://tinymledu.org>

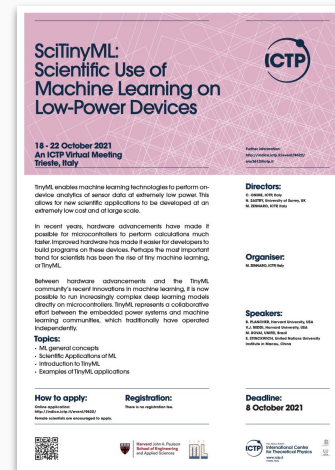




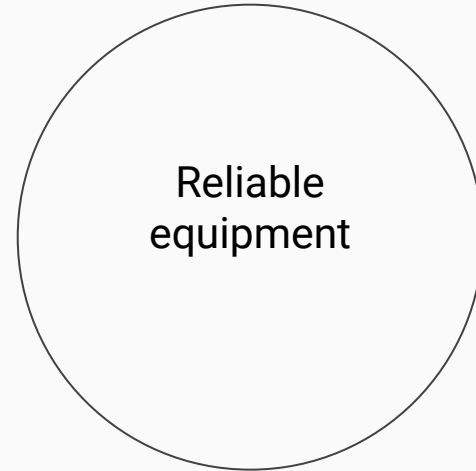
Good
Best
training
material



<https://tinymledu.org/teach>



Final goal is to provide
Open Educational Resources



Standard kit in each University

=

Exchange of code / tutorials / projects

Human
Networking



+300 members!

A screenshot of a Discord chat thread on a dark background. It shows four messages from different users, each with a profile picture, name, timestamp, text content, and a thumbs-up icon with a number indicating likes.

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
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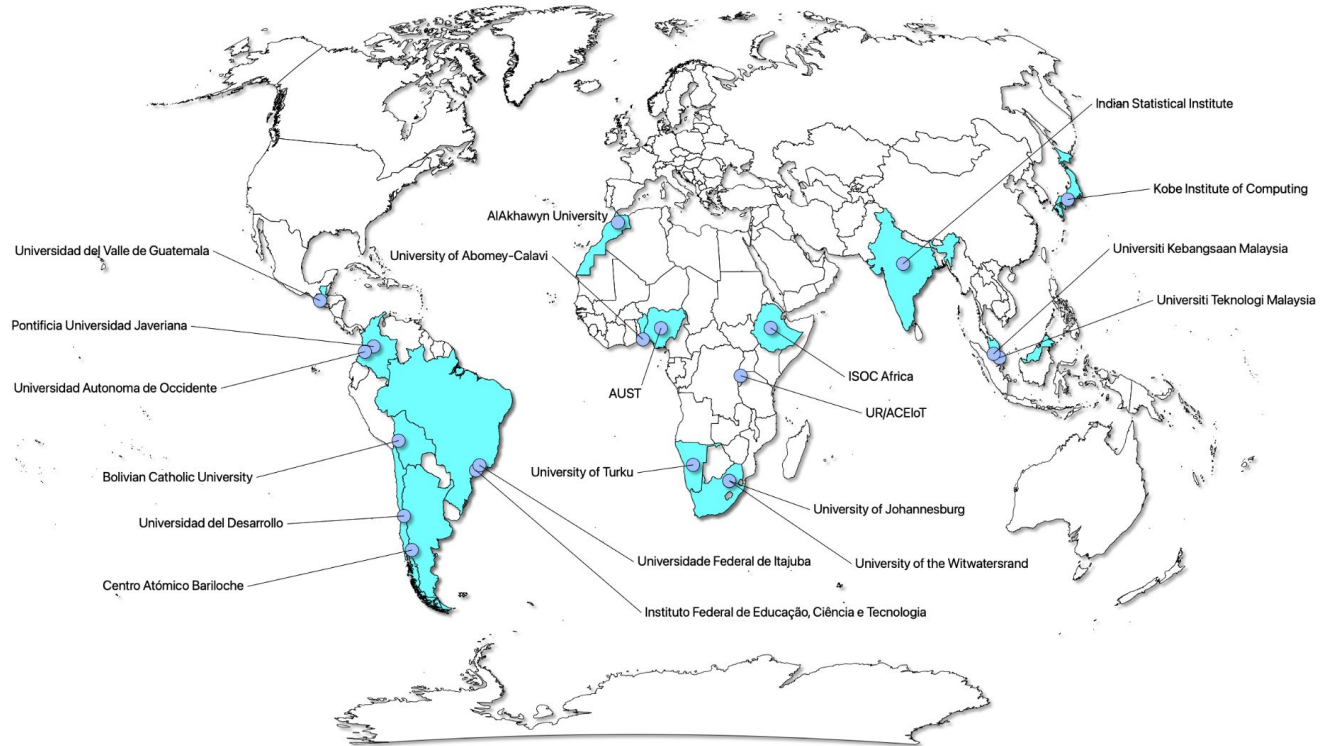
September 18, 2021

itimane 09/18/2021
Hello everyone, I'm Ildio 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
6

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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TinyML academic network



You can express your interest in joining the network by filling in this form:

<https://bit.ly/TinyML4D-Network-Call-2>

If you are **not part** of the network, you can benefit from this workshop:

- Most lectures are not related to the Arduino kit
- You will learn about the workflow and apply it once you will have the devices
- Find out if you should apply
- Join the social network of TinyML researchers/practitioners



Workshop Logistics

Three hours per day

GMT: 1pm to 4pm

(<https://time.is/GMT>)

GMT to Africa Time Zones

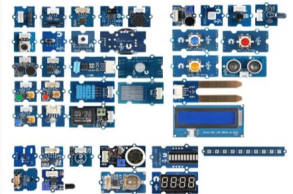


Workshop Logistics

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

5 Grove Creator kits will be drawn among the participants that have attended at least 80% of the lectures.

Thanks SeeedStudio!



Workshop Agenda

Day 1	Monday	Introduction to Embedded ML (tinyML) <i>3:00 PM</i> Conference Opening and Schedule <i>3:20 PM</i> Keynote - Vijay Janpa Reddi <i>4:00 PM</i> Introduction to Machine Learning <i>5:15 PM</i> Keynote - Kate Kallot <i>5:55 PM</i> Day Closing	Marco Zennaro of ICTP <hr/> Vijay Janapa Reddi of Harvard University <hr/> Michael Perkins of CMU-Africa <hr/> Kate Kallot of NVIDIA
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Workshop Agenda

Day 2	Tuesday	<p>Hands-on Embedded ML - Anomaly Detection with Edge Impulse</p> <p>3:00 PM Day Opening</p> <p>3:05 PM Introduction to Edge Impulse</p> <p>3:20 PM Connecting the TinyML Kit and Edge Impulse</p> <p>3:35 PM Supervised Learning and Motion Classification</p> <p>3:50 PM Hands-on Motion Classification</p> <p>4:35 PM Unsupervised Learning and Anomaly Detection</p> <p>4:50 PM Hands-on Anomaly Detection</p> <p>5:35 PM Conclusion and Q&A</p> <p>5:55 PM Day Closing</p>	<p>Marcelo Rovai of UNIFEI</p> <hr/> <p>Shawn Hymel of Edge Impulse</p> <hr/> <p>Set Up and Motion Detection Slides</p> <p>Anomaly Detection and Post-Processing Slides</p>
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Workshop Agenda

Day 3	Wednesday	Hands-on Computer Vision and Applications of TinyML <i>3:00 PM</i> Day Opening <i>3:05 PM</i> Convolutions for Hands-on Computer Vision <i>4:50 PM</i> TBD Application Case Study <i>5:20 PM</i> TBD Application Case Study <i>5:50 PM</i> Day Closing	Brian Plancher of Harvard University and Barnard College, Columbia University <hr/> <p>TBD of TBD</p> <hr/> <p>TBD of TBD</p>
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Workshop Agenda

Day
4

Thursday

Hands-on Key Word Spotting and Ethical TinyML

3:00 PM Day Opening

3:05 PM Data Pre-Processing for Hands-on Keyword Spotting

4:15 PM Anti Poaching with TinyML

4:45 PM TinyML Ethics

5:50 PM Day Closing

[Brian Plancher of Harvard University and Barnard College, Columbia University](#)

[Maedin Seid and Betemariam Assamnew of Addis Ababa University](#)
[Slides](#) | [Project Description](#)

[Susan Kennedy of Santa Clara University](#)

Workshop Agenda

Day 5	Friday	<p>Applications of TinyML for Africa</p> <p>3:00 PM Day Opening</p> <p>3:05 PM UNESCO and Disaster Response</p> <p>3:35 PM ITU AI/ML in 5G Challenge</p> <p>3:50 PM Detecting Powerline Noise with Low-Cost Noise Sensors</p> <p>4:20 PM Wildfire Detection</p> <p>4:50 PM AI Africa Consortium</p> <p>5:05 PM TinyML Research in Africa</p> <p>5:45 PM Workshop Closing</p>	<p>Soichiro Yasukawa of UNESCO</p> <hr/> <p>Alessandro Grande of Edge Impulse</p> <hr/> <p>Steve Chan of Vit Tall Healthcare Analytics & Informatics</p> <hr/> <p>Peter Ing of TFG (The Foschini Group)</p> <hr/> <p>Gregg Barrett of Cirrus</p> <hr/> <p>Marco Zennaro of ICTP</p>
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Case studies

Are you working on a TinyML-based project?

Do you have a problem that **could** be solved using Tiny?

Do you have an ML project that could use TinyML for deployment?

We have up to three awards for the best presentations from early career/students from developing countries. Send me a message if you want to present.

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-22/africa/>

(with videos, slides and code)

ICTP official webpage: <https://indico.ictp.it/event/9792/>

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

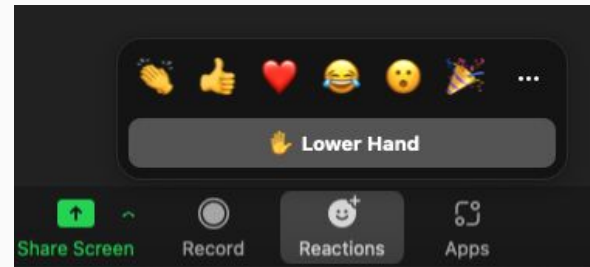
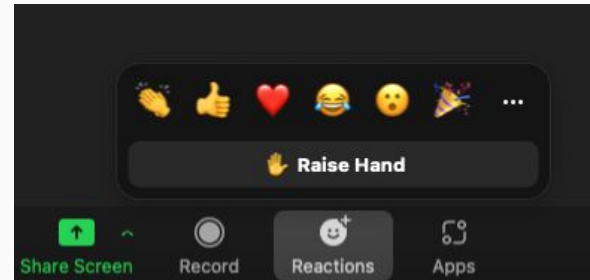
-- Benjamin Franklin

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/fFTmVGtq> 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-Africa-Background>

Thanks!



Harvard John A. Paulson
School of Engineering
and Applied Sciences



**EDGE
IMPULSE**

HarvardX

