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

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# Introduction

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



Marcelo
Rovai
UNIFEI
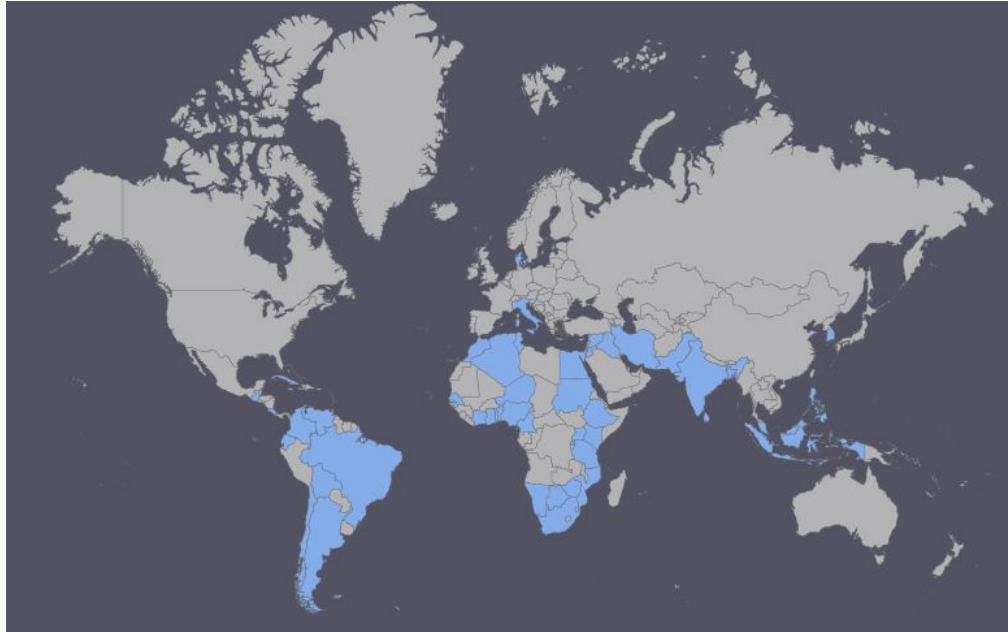


Marco
Zennaro
ICTP



Clement
Onime
ICTP



Nishanth
Sastry
Uni Surrey

**12 lecturers in total**

**Local Organizers**
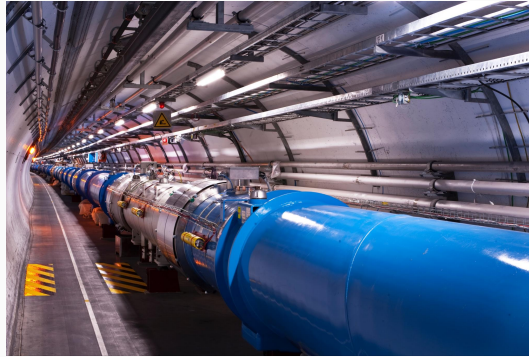
# Participants from 48 countries

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Algeria, Argentina, Bangladesh, Benin, Bolivia, Botswana, Brazil, Cameroon, Chile, Colombia, Costa Rica, Cote d'Ivoire, Cuba, Denmark, Ecuador, Egypt, Ethiopia, Ghana, Guatemala, India, Indonesia, Iran, Iraq, Italy, Jordan, Kenya, Malaysia, Morocco, Mozambique, Namibia, Niger, Nigeria, Pakistan, Palestine, Philippines, Rwanda, Senegal, South Africa, South Korea, Sri Lanka, Sudan, Syria, Tanzania, Togo, Tunisia, Uganda, Venezuela, Zimbabwe

# Why a workshop on SciTinyML



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https://commons.wikimedia.org/w/index.php?curid=107917499

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https://commons.wikimedia.org/w/index.php?curid=29068933

CambridgeBayWeather assumed

# Why a TinyML Academic Network

We aim to ultimately 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
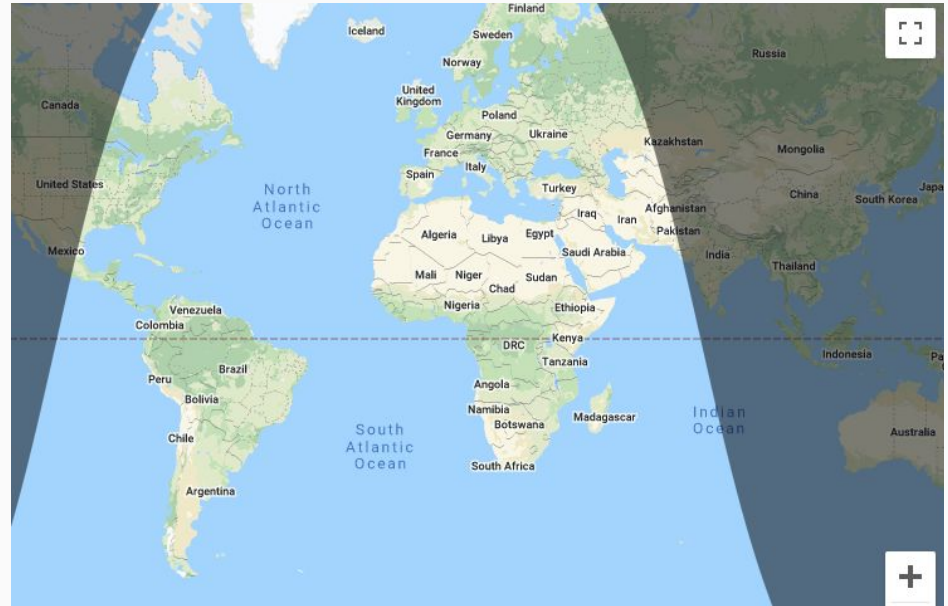
# Workshop Logistics

**Three hours** per day

GMT: 1pm to 4pm

Guatemala: 7am to 10am

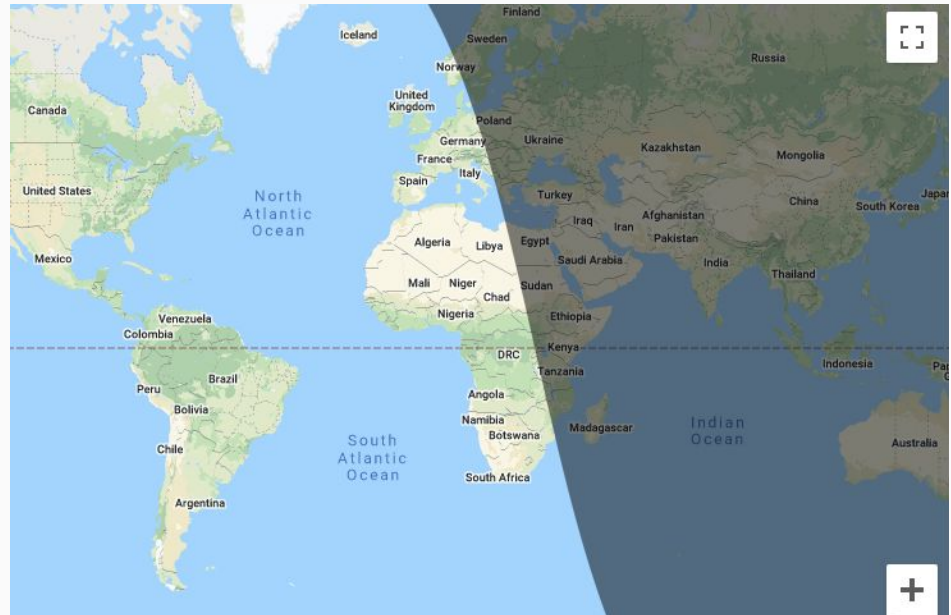Japan: 10pm to 1am

Boston: 9am to 12pm

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# Workshop Agenda

| Day | Date | Topics | Speakers |
|-----|------|--------|----------|
| Day 1 | Monday | Introduction to Embedded ML (tinyML) | Vijay Janapa Reddi of Harvard University and Laurence Moroney of Google |
| Day 2 | Tuesday | Hands on Embedded ML - Vision and Audio | Brian Plancher and Mark Mazumder of Harvard University |
| Day 3 | Wednesday | Sensors and Ethical Issues for ML and IoT | Serge Stinckwich and Attlee Gamundani of United Nations University Institute in Macau and Sebastian Büttrich of IT University of Copenhagen |
| Day 4 | Thursday | Hands on Embedded ML - Motion/Anomaly Detection and Scientific Applications | Marcelo Rovai of UNIFEI and Matthew Stewart of Harvard University |
| Day 5 | Friday | Academic Network Next Steps and Closing Keynotes | Marco Zennaro of ICTP, Hal Speed of Robotical, Susan Kennedy of Santa Clara University, and Pete Warden of Google |

# Monday

| Date | Topics | Speakers |
|------|--------|----------|
| Monday | **Introduction to Embedded ML (tinyML)**<br>*3:00 PM* Conference Opening and Schedule<br>*3:20 PM* Introduction and Applications of Embedded ML<br>*4:20 PM* Break<br>*4:30 PM* Introduction to Machine Learning<br>*5:50 PM* Day Closing | Vijay Janapa Reddi of Harvard University<br><br>Laurence Moroney of Google |

# Open Material

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

ICTP official webpage:
http://indico.ictp.it/event/9622/other-view?view=ictptimetable

TinyMLedu webpage: https://tinyml.seas.harvard.edu/SciTinyML/
(with videos, slides and code)

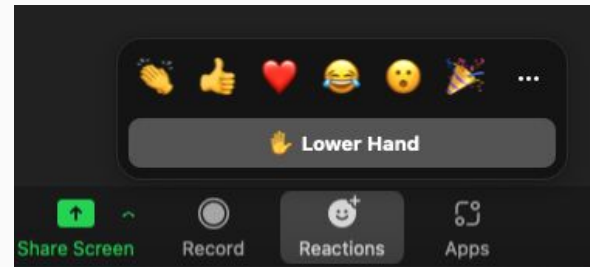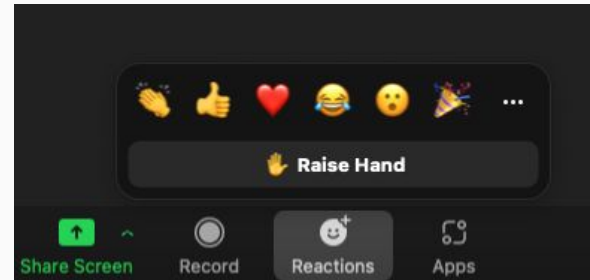Tell me and I forget, teach me and I may remember, involve me and I learn.
-- Benjamin Franklin

# Interaction

30% of the workshop time is for Q&A

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/rQ76x9Zypr 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-PreSurvey

# Thanks!