“Presenting the upcoming Tiny Cookbook and the next in-person activities for the UK group”

Gian Marco Iodice - Arm

March 23, 2022
tinyML Talks Strategic Partners

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A platform to scale AI across the industry
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Optimize the hardware, including sensor selection and placement

https://reality.ai  info@reality.ai  @SensorAI  Reality AI
BROAD AND SCALABLE EDGE COMPUTING PORTFOLIO

Microcontrollers & Microprocessors

**Arm® Core**
- Arm® Cortex®-M 32-bit MCUs
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- Arm® Cortex®-M0+ Ultra-low Power 32-bit MCUs
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- High Power Efficiently 32-bit MCUs
  - Motor control, Capacitive touch, Functional safety, GUI
- 40nm/28nm process Automotive 32-bit MCUs
  - Rich functional safety and embedded security features

**Renesas Synergy™**
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Core technologies

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**Digital & Analog & Power Solution**
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The new MAX78000 implements AI inferences at low energy levels, enabling complex audio and video inferencing to run on small batteries. Now the edge can see and hear like never before.

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www.maximintegrated.com/microcontrollers

Health sensors measure PPG and ECG signals critical to understanding vital signs. Signal chain products enable measuring even the most sensitive signals.

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Latent AI

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Latentai.com
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SensiML pioneered TinyML software tools that auto generate AI code for the intelligent edge.

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SynSense builds sensing and inference hardware for ultra-low-power (sub-mW) embedded, mobile and edge devices. We design systems for real-time always-on smart sensing, for audio, vision, IMUs, bio-signals and more.

https://SynSense.ai
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tinyML Summit 2022
Miniature dreams can come true...
March 28-30, 2022
Hyatt Regency San Francisco Airport
https://www.tinyml.org/event/summit-2022/

The Best Product of the Year and the Best Innovation of the Year awards are open for nominations between November 15 and March 14.

tinyML Research Symposium 2022
March 28, 2022
https://www.tinyml.org/event/research-symposium-2022

More sponsorships are available: sponsorships@tinyML.org
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(Founder, Seeed Studio and Chaihuo Makerspace)

LIVE ONLINE April 6th, 2022 at 8 am PST

Register now!
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tinyML - Enabling ultra-low Power ML at the Edge

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The tinyML Community
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8.5k members in 43 Groups in 34 Countries

2.7k members & 5.4k followers
Subscribe to tinyML YouTube Channel for updates and notifications (including this video)

www.youtube.com/tinyML
<table>
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<tr>
<th>Date</th>
<th>Presenter</th>
<th>Topic / Title</th>
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<tbody>
<tr>
<td>Friday, March 25</td>
<td>Mithun Das, Distinguished Software Engineer, Cox Automotive</td>
<td>How A Middle School Girl Solves a Real-Life Challenge Using TinyML: Gas Leak Detection</td>
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<tr>
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<td>Sashrika Das, 6th Grade Student, East Lyme Middle School</td>
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Webcast start time is 6:00 am Pacific time

Please contact talks@tinylm.org if you are interested in presenting
Reminders

Slides & Videos will be posted tomorrow

tinyml.org/forums  youtube.com/tinyml

Please use the Q&A window for your questions
Gian Marco Iodice

Gian Marco Iodice is the team and tech lead in the Machine Learning Group at Arm, for the Arm Compute Library project. Gian Marco was behind the development of the Arm Compute Library from the very beginning, and with several years of experience in the field of development and optimization of machine learning and computer vision on embedded devices, Gian Marco is now leading the ML performance optimization software team on Arm Mali GPUs and Arm Cortex-A CPUs. He received the MSc degree, with honours, in electronic engineering from the University of Pisa (Italy) where he specialized in SW/HW Co-design. In the last few years Gian Marco has been a frequent speaker at Embedded Vision Summit where he presented optimization techniques and design solutions for CNNs. In 2020, Gian Marco co-founded the TinyML UK group with Dominic Binks, Alessandro Grande and Neil Cooper.
TinyML Cookbook

Combine artificial intelligence and ultra-low-power embedded devices to make the world smarter

Gian Marco Iodice
Tech Lead Machine Learning Group, Arm

Author

Release date: 1st April 2022
Pre-order: https://amz.run/5QmC
tinyML

Fast growing field at the intersection of machine learning (ML) and embedded systems to enable smart applications on extremely low-powered devices

Machine learning
Deep learning

Embedded device
Microcontroller

Low-power
mW or below

TinyML Cookbook
Looking at My Past

“If walls could talk!”

First lesson of Ambient Intelligence (MSc), University of Pisa (Italy) – 2013*

The course was about the elements for building pervasive computing (ML, sensors, low-power communication protocols, and embedded devices) that allows humans to interact with the environment in a “natural way” (for example, with the voice or user habits)

However, it wasn’t the era of TinyML yet...

* First time I heard about ML on microcontrollers
Now

Machine Learning (ML)

• More sophisticated neural network architectures
  • Free, open source, and easy to use machine learning frameworks

• End-to-end tools that can make ML design straightforward

• ML is no longer just for experts!

Microcontrollers

• Can be programmed easily
  • IDEs offer plug-and-play experience
  • With a few lines of codes, we can control external LEDs or interact with other devices
  • Code is portable among different platforms

• There are more low-cost sensors and microcontroller boards to experiment or build products with
Motivation

Demonstrate how easy TinyML is for everyone now, even for those with no or little familiarity with embedded programming.
Target Audience

ML developers/engineers interested in developing ML applications on microcontrollers through practical examples.

However, embedded developers who have some basic understanding of ML can also benefit from this book.
Two microcontroller boards for two different development scenarios
## What you will Learn

<table>
<thead>
<tr>
<th>The relevant microcontroller programming fundamentals for TinyML</th>
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<tbody>
<tr>
<td>Use real-world sensors such as the microphone, camera, and accelerometer</td>
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<tr>
<td>Run machine learning on microcontrollers</td>
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<tr>
<td>Implement an application that responds to human voice or gestures</td>
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<tr>
<td>Leverage transfer learning to classify indoor rooms</td>
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<tr>
<td>Design a CIFAR-10 model for microcontrollers with just 64KB of SRAM</td>
</tr>
<tr>
<td>Run an image classifier on a virtual Arm Ethos-U55 microNPU with microTVM</td>
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Let’s have a look at chapter 6
Building a Gesture-Based Interface for YouTube Playback with Raspberry Pi Pico and Edge Impulse
Thanks! Grazie!

In alphabetical order:

- Arduino
- Arm (TVM team)
- Edge Impulse
- Packt
- Raspberry Pi
- TinyML Foundation
- You...the TinyML ecosystem!
Official Book Release Events (FREE)

Date: 24th of March 2022, 10 AM PST
Hosted by: Neuton.AI
Registration link:
https://us06web.zoom.us/webinar/register/7916470259060/WN_QgDNXsDyS1-H6vVFJoVGUg

Date: 20th of April 2022, 11:30 AM ET
Hosted by: Edge Impulse
Registration link:
TinyML UK Meet-up In-person Activities!
April 6\textsuperscript{th} | 6PM GMT @ Makespace

Developing TinyML Applications for the Real-World

April 6th | 06:00PM GMT

TinyML Talks

https://www.meetup.com/Makespace/events/284359590/

Open to anyone!
April 27th | 5:30PM GMT @ Raspberry Pi Store

Work in progress...
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