tinyML Talks
Enabling Ultra-low Power Machine Learning at the Edge

“tinyML Meetup Italia with small-medium enterprises”
Danilo Pau – STMicroelectronics
Alessandro Grande – Edge Impulse

June 8, 2022

www.tinyML.org
Thank you, tinyML Strategic Partners*, for committing to take tinyML to the next Level, together

* as of March 28, 2022; several more under final reviews
Arm AI Virtual Tech Talks

The latest in AI trends, technologies & best practices from Arm and our Ecosystem Partners.

Demos, code examples, workshops, panel sessions and much more!

Fortnightly Tuesday @ 4pm GMT/8am PT

Find out more: www.arm.com/techtalks
Advancing AI research to make efficient AI ubiquitous

Power efficiency
- Model design, compression, quantization, algorithms, efficient hardware, software tool

Personalization
- Continuous learning, contextual, always-on, privacy-preserved, distributed learning

Efficient learning
- Robust learning through minimal data, unsupervised learning, on-device learning

Perception
- Object detection, speech recognition, contextual fusion

Reasoning
- Scene understanding, language understanding, behavior prediction

Action
- Reinforcement learning for decision making

A platform to scale AI across the industry
Neural Decision Processors
- At-Memory Compute
- Sustained High MAC Utilization
- Native Neural Network Processing

End-to-End Deep Learning Solutions for TinyML & Edge AI

ML Training Pipeline
- Enables Production Quality Deep Learning Deployments

Data Platform
- Reduces Data Collection Time and Cost
- Increases Model Performance

partners@syntiant.com
www.syntiant.com
Fastest Video Analytics Solutions on Arm CPUs
KLIKA·TECH
GLOBAL IOT SOLUTIONS
Add Advanced Sensing to your Product with Edge AI / TinyML

Pre-built Edge AI sensing modules, plus tools to build your own

Reality AI solutions
- Prebuilt sound recognition models for indoor and outdoor use cases
- Solution for industrial anomaly detection
- Pre-built automotive solution that lets cars “see with sound”

Reality AI Tools® software
- Build prototypes, then turn them into real products
- Explain ML models and relate the function to the physics
- 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
  - Arm ecosystem, Advanced security, Intelligent IoT
- Arm®-based High-end 32 & 64-bit MPUs
  - High-resolution HMI, Industrial network & real-time control
- Arm® Cortex®-M0+ Ultra-low Power 32-bit MCUs
  - Innovative process tech (SOTB), Energy harvesting

Renesas Core
- Ultra-low Energy 8 & 16-bit MCUs
  - Bluetooth® Low Energy, SubGHz, LoRa®-based Solutions
- 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™
- Arm®-based 32-bit MCUs for Qualified Platform
  - Qualified software and tools

Core technologies

AI
- A broad set of high-power and energy-efficient embedded processors

Security & Safety
- Comprehensive technology and support that meet the industry’s stringent standards

Digital & Analog & Power Solution
- Winning Combinations that combine our complementary product portfolios

Cloud Native
- Cross-platforms working with partners in different verticals and organizations

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Gold Strategic Partners
Maxim Integrated: Enabling Edge Intelligence

**Advanced AI Acceleration IC**

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.

[www.maximintegrated.com/MAX78000](http://www.maximintegrated.com/MAX78000)

**Low Power Cortex M4 Micros**

Large (3MB flash + 1MB SRAM) and small (256KB flash + 96KB SRAM, 1.6mm x 1.6mm) Cortex M4 microcontrollers enable algorithms and neural networks to run at wearable power levels.

[www.maximintegrated.com/microcontrollers](http://www.maximintegrated.com/microcontrollers)

**Sensors and Signal Conditioning**

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

[www.maximintegrated.com/sensors](http://www.maximintegrated.com/sensors)
LatentAI

Adaptive AI for the Intelligent Edge

Latentai.com
Deploy TinyML into the Real World - Plug and Play ML

Sensors:
- modulated and ready-to-use sensors to simplify the setup process
- support 500+ grove modules

Wio Terminal:
- completed AI platform integrated with a 2.4" LCD Screen, on-board IMU (LIS3DHTR), microphone, buzzer, microSD card slot, light sensor, infrared emitter (IR 940nm)

Codecraft:
- no code programming platform to Get Started With TinML
- supports Arduino, Python, C or JavaScript etc.

Edge Impulse:
- to optimize data utilization and enable deploy a machine learning model faster than ever

TensorFlow Lite:
- to easily train low memory usage machine learning models

Motion / Gesture / Speech / Smell / Sports
Barcode / Face / Image

 Sense  Train  Inference  Applications
Build Smart IoT Sensor Devices From Data

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

- End-to-end AI workflow
- Multi-user auto-labeling of time-series data
- Code transparency and customization at each step in the pipeline

We enable the creation of production-grade smart sensor devices.

sensiml.com
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
tinyML EMEA Innovation Forum 2022

Connect, Unify, and Grow the tinyML EMEA Community
October 10-12, 2022

https://www.tinyml.org/event/emea-2022

Event will be held in person in Cyprus.

EMEA 2022 Call for Presentations is open till August 1st, 2022.

More sponsorships are available: sponsorships@tinyML.org
Register now!
Our next tinyML Trailblazers Series
Success Stories with Yoram Zylberberg
(CEO, Emza Visual Sense)

LIVE ONLINE July 6th, 2022 at 8 am PDT

Register now!
Join Growing tinyML Communities:

tinyML - Enabling ultra-low Power ML at the Edge

The tinyML Community
https://www.linkedin.com/groups/13694488/
Subscribe to tinyML YouTube Channel for updates and notifications (including this video)

www.youtube.com/tinyML
tinyML MeetUp Italy 2022
Naples - 8 June
5pm - 7.30pm
Hosted by STI
### AGENDA

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<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>17:40-17:45</td>
<td>Welcome and introduction – Danilo Pau – STMicroelectronics</td>
</tr>
<tr>
<td>17:45-18:00</td>
<td>tinyML introduction – Alessandro Grande – Edge Impulse</td>
</tr>
<tr>
<td>18:00-19:00</td>
<td>Zoom panel discussion with start-ups – Davide RUGGIERO (ST), Flora AMATO (Arcadia); Gian Domenico LICCIARDO (UniSalerno); Daniele BUONOCORE (Metering Research); Giovanni GOGLIETTINO (ST)</td>
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Reminders

Slides & Videos will be posted tomorrow

tinyml.org/forums  youtube.com/tinyml

Please use the Q&A window for your questions

Since 2019 Danilo is an IEEE Fellow. He served as Industry Ambassador coordinator for IEEE Region 8 South Europe, was ice-chairman of the “Intelligent Cyber-Physical Systems” Task Force within IEEE CIS, and Member of the Machine Learning, Deep Learning and AI in the CE (MDA) Technical Stream Committee IEEE Consumer Electronics Society (CESoc).

With over 80 patents, 124 publications, 113 MPEG authored documents and 50 invited talks/seminars at various worldwide Universities and Conferences, Danilo's favorite activity remains mentoring undergraduate students, MSc engineers and PhD students from various universities in Italy, US, France, and India.
Alessandro Grande

Alessandro is a physicist, an engineer, a community builder and a communicator with a visceral passion for connecting and empowering humans to build a more sustainable world through the aid of technology. Alessandro is the Director of Technology at Edge Impulse and co-organizes the tinyML Meetups in UK and Italy. Prior to Edge Impulse, Alessandro worked at Arm as a developer evangelist and ecosystem manager with a focus on IoT and TinyML. While at Arm Alessandro launched a weekly live stream – Innovation Coffee with his colleague Robert Wolff. Alessandro holds a master’s degree in nuclear physics from the University of Rome “La Sapienza”.
# Next tinyML Talks/Events

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<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Topic / Title</th>
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<tbody>
<tr>
<td>July 9</td>
<td>tinyML Taiwan Community Meet Up with Gian Marco Iodice</td>
<td>Gian Marco Iodice, Team and Tech Lead in the Machine Learning Group - ARM</td>
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<tr>
<td>June 15</td>
<td>tinyML Auto ML Forum</td>
<td>Chair: Elias Fallon</td>
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<td><a href="https://www.tinyml.org/event/auto-ml-forum/">https://www.tinyml.org/event/auto-ml-forum/</a></td>
</tr>
<tr>
<td>Aug 31 – Sept 1</td>
<td>On Device Learning Workshop</td>
<td>Chair: Danilo Pau</td>
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Webcast start time is 5:00 am PTD

Please contact talks@tinyml.org if you are interested in presenting
The Panelists

Davide RUGGIERO (STMicroelectronics)
Flora AMATO (Arcadia)
Gian Domenico LICCIARDO (Università di Salerno)
Daniele BUONOCORE (Metering Research)
Giovanni GOGLIETTINO (STMicroelectronics)
Fabio CAPRABIANCA (Hybrid Sensors)
## The Panel

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
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<tbody>
<tr>
<td>1</td>
<td>Who are you? Introduce your company</td>
</tr>
<tr>
<td>2</td>
<td>What are the main reasons that brought you to focus on TinyML?</td>
</tr>
<tr>
<td>3</td>
<td>Your approach to tiny Machine Learning is...</td>
</tr>
<tr>
<td>4</td>
<td>What are the interesting tinyML use cases you have worked on?</td>
</tr>
<tr>
<td>5</td>
<td>Opportunities vs challenges offered by Machine Learning</td>
</tr>
<tr>
<td>6</td>
<td>What is tinyML enabling in your industry?</td>
</tr>
<tr>
<td>7</td>
<td>Biggest challenges you are facing in deploying tinyML</td>
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<tr>
<td>8</td>
<td>What break-thru technologies do you envisage in the future of tinyML?</td>
</tr>
<tr>
<td>9</td>
<td>What would you like to see more happening in the tinyML community?</td>
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# Next tinyML Talks

<table>
<thead>
<tr>
<th>Date</th>
<th>Presenter</th>
<th>Topic / Title</th>
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<tbody>
<tr>
<td>Wednesday, June 8</td>
<td>Danilo Pau, ST Microelectronics</td>
<td>TinyML Meetup Italia with small-medium industries</td>
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</tbody>
</table>

Webcast start time is 8:00 am Pacific time

Please contact [talks@tinyml.org](mailto:talks@tinyml.org) if you are interested in presenting
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