

# tinyML<sup>®</sup> Talks

*Enabling Ultra-low Power Machine Learning at the Edge*

## “Tiny Machine Learning and its future”

tinyML:Enabling low Power ML at the edge-Southern California

May 25, 2023



[www.tinyML.org](http://www.tinyML.org)



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



# Executive Strategic Partners



# The Leading Development Platform for Edge ML

[edgeimpulse.com](https://edgeimpulse.com)

# 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

## A platform to scale AI across the industry



### Perception

Object detection, speech  
recognition, contextual fusion



### Reasoning

Scene understanding, language  
understanding, behavior prediction



### Action

Reinforcement learning  
for decision making



Edge cloud



Cloud



IoT/IIoT



Automotive



Mobile





Accelerate Your Edge Compute

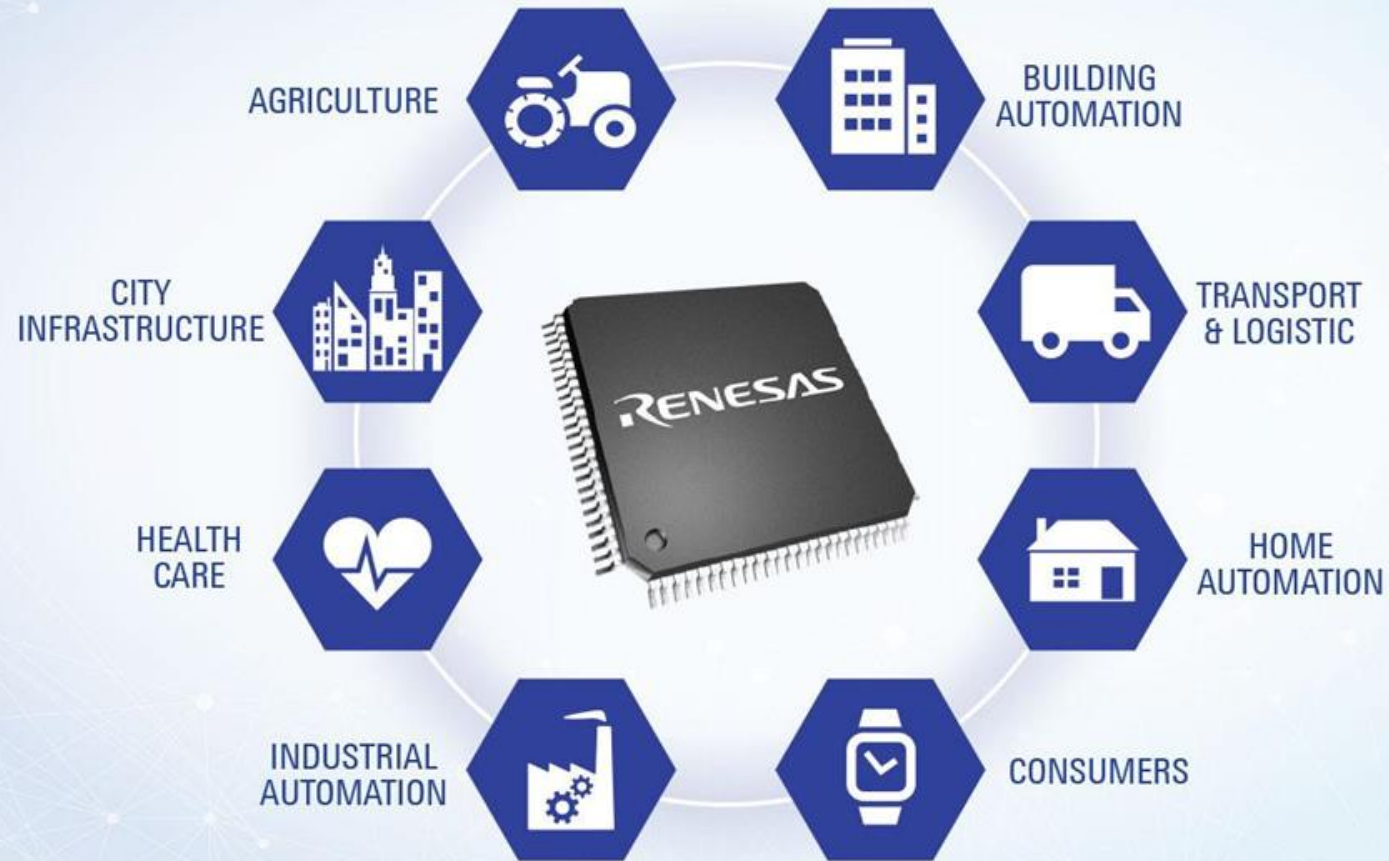
**SYNTIANT**

Making Edge AI A Reality

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# Platinum Strategic Partners

**Renesas is enabling the next generation of AI-powered solutions  
that will revolutionize every industry sector.**



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# DEPLOY VISION AI AT THE EDGE **AT SCALE**

**SONY**

# Gold Strategic Partners



Where what if  
becomes what is.

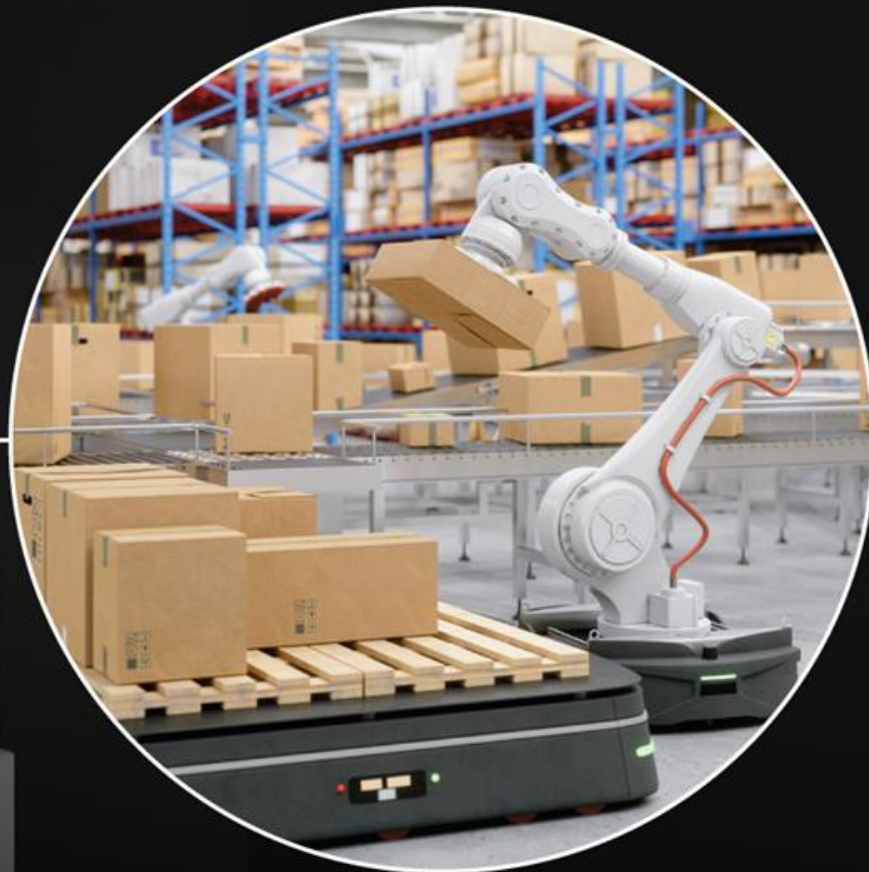
Witness potential made possible at [analog.com](http://analog.com).



PRO™

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**Arduino Pro**

[arduino.cc/pro](https://arduino.cc/pro)



Made In Italy



arm AI



Powering tinyML Innovation

# 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!

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Find out more:

[www.arm.com/techtalks](https://www.arm.com/techtalks)

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**Digitalization**



# Driving decarbonization and digitalization. Together.

**Infineon serving all target markets as**  
**Leader in Power Systems and IoT**

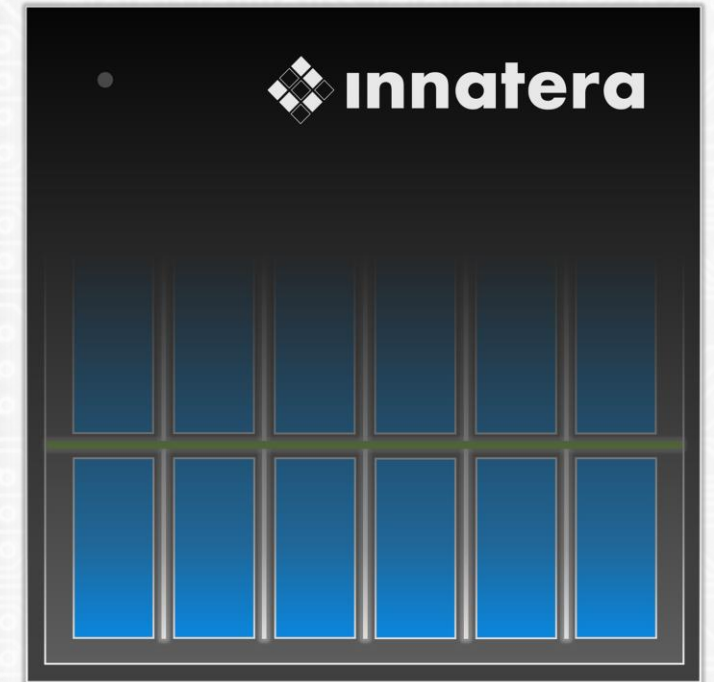
[www.infineon.com](http://www.infineon.com)







# NEUROMORPHIC INTELLIGENCE FOR THE SENSOR-EDGE



[www.innatera.com](http://www.innatera.com)



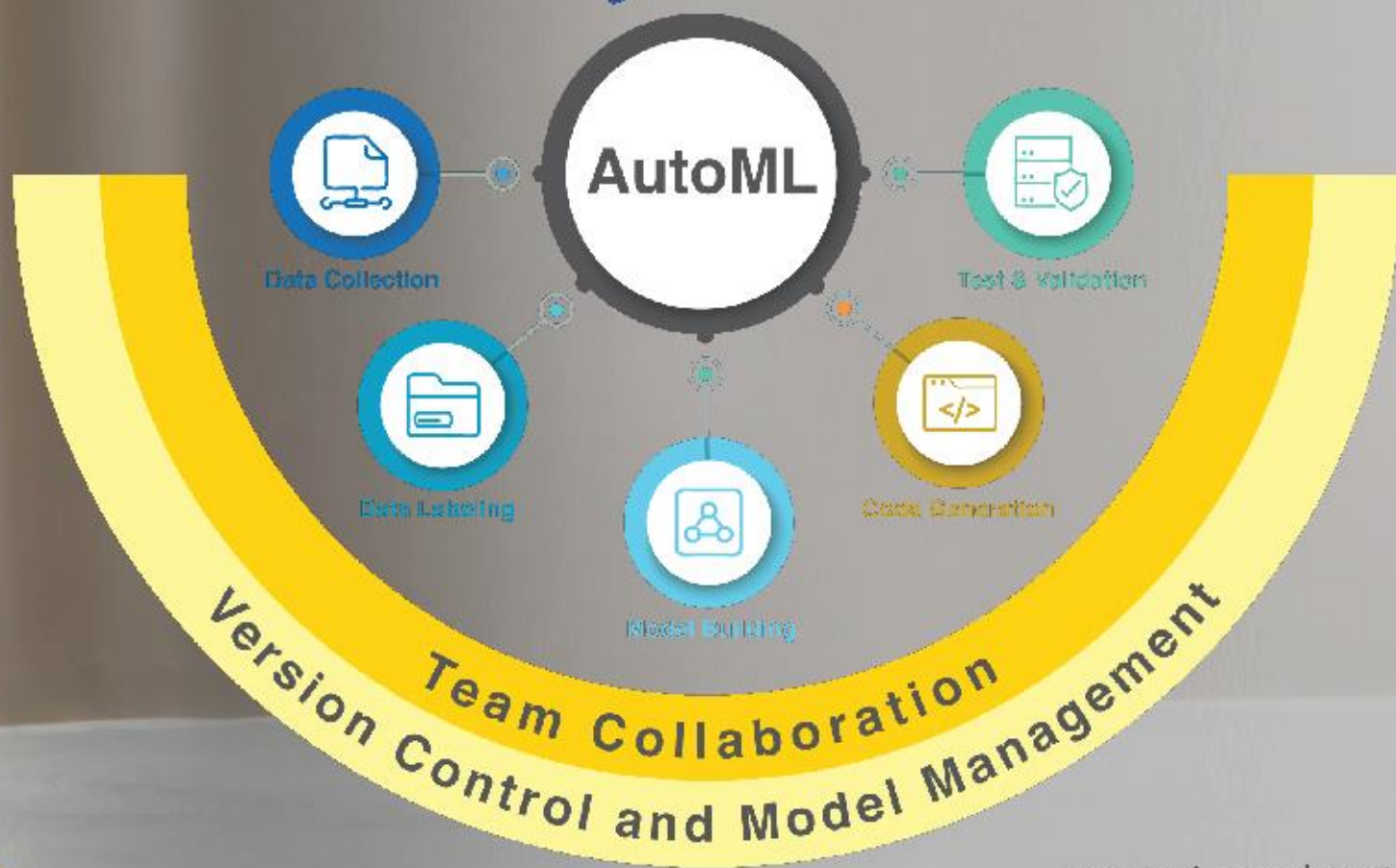
Microsoft

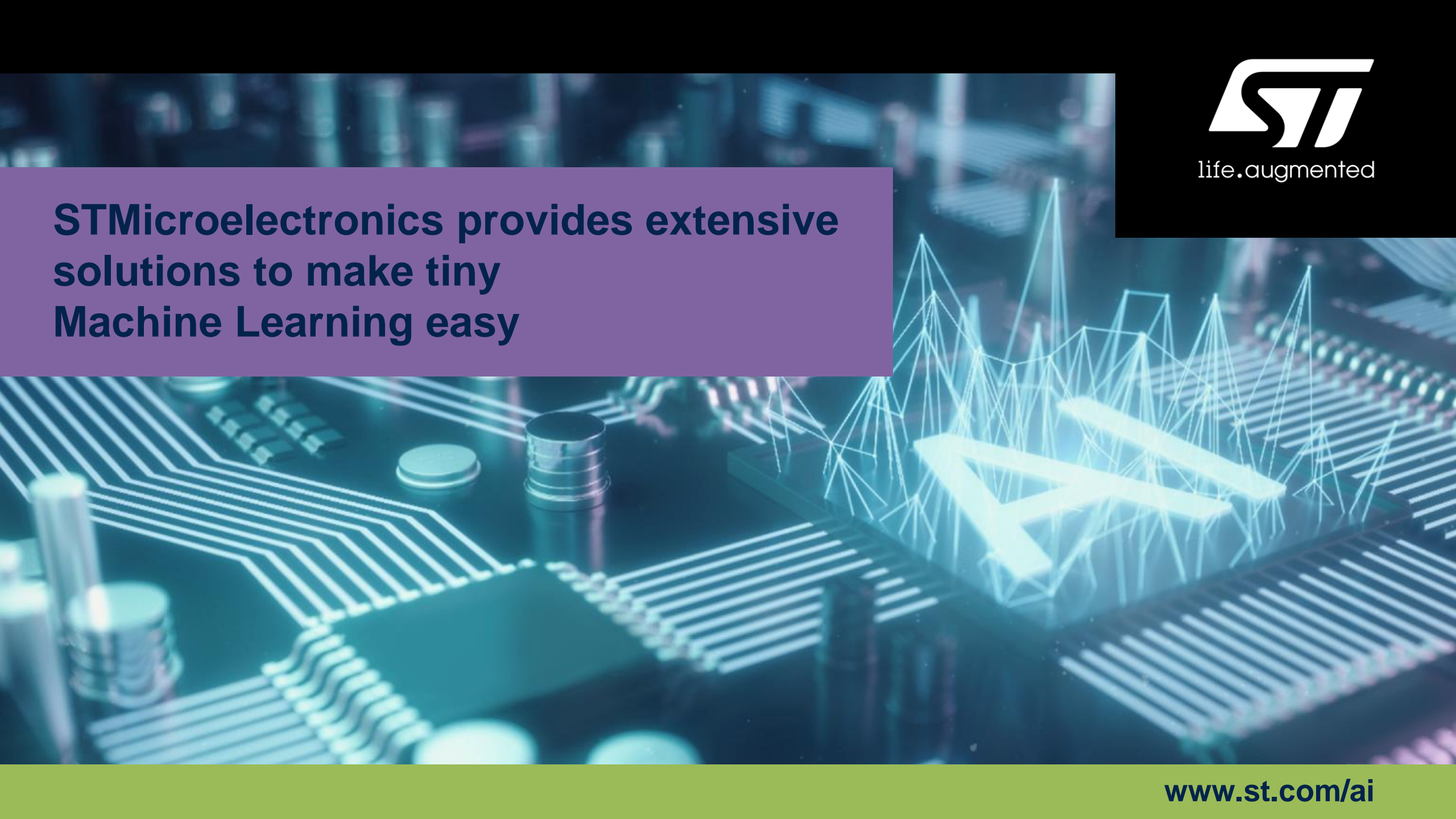


# The Right Edge AI Tools Can Make or Break Your Next Smart IoT Product



## Analytics Toolkit Suite



The background of the slide is a close-up, high-angle shot of a green printed circuit board (PCB). The board is populated with various electronic components, including several silver cylindrical capacitors and a black integrated circuit (IC) in the lower-left. A complex network of white, glowing lines is superimposed over the board, representing a neural network or data flow. These lines connect various points across the board, with some lines being thicker and more prominent than others. The overall lighting is a cool blue/cyan, giving it a technological and futuristic feel.

**STMicroelectronics provides extensive solutions to make tiny Machine Learning easy**



life.augmented





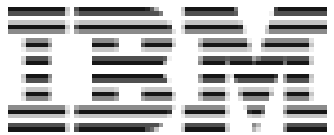
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We engineer exceptional experiences  
for consumers in the home, at work,  
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# Silver Strategic Partners







# Join Growing tinyML Communities:



14.8k members in  
47 Groups in 39 Countries

**tinyML - Enabling ultra-low Power ML at the Edge**

<https://www.meetup.com/tinyML-Enabling-ultra-low-Power-ML-at-the-Edge/>



4k members  
&  
11.6k followers

**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](https://www.youtube.com/tinyML)

A screenshot of the tinyML YouTube channel page. At the top right is the YouTube logo. Below it, the channel name "tinyML" is displayed with "4.33K subscribers". A yellow banner highlights "9.5k subscribers, 567 videos with 332k views". The navigation bar includes links for HOME, VIDEOS, PLAYLISTS, COMMUNITY, CHANNELS, and ABOUT. The main content area shows a grid of video thumbnails. Each thumbnail includes a video preview, a title, and a duration. Below each thumbnail, the video title is repeated, followed by the channel name and view/view count information.

Video Title	Duration	Views	Time Ago
On Device Learning	13:24	106 views	4 days ago
On Device Learning - Forum - Professors...	33:27	138 views	4 days ago
Oon Device Learning	32:39	54 views	4 days ago
On Device Learning	36:41	47 views	4 days ago
On Device Learning	34:03	132 views	4 days ago
On Device Learning	34:58	137 views	4 days ago
Join the tinyML Challenge!	1:13	122 views	4 days ago
Introduction to Knowledge Distillation	1:07:43	262 views	2 weeks ago
Why not just use public data?	53:41	511 views	3 weeks ago
Scalable TinyML	45:46	229 views	3 weeks ago
TinyML board: Easy to program	51:01	265 views	3 weeks ago
TinyML Trailblazers	1:03:24	286 views	1 month ago
tinyML Auto ML	58:50	351 views	1 month ago
tinyML Auto ML	34:36	462 views	2 months ago
Convolutional Neural Networks (CNN)	55:01	374 views	2 months ago
tinyML Trailblazers	59:51	133 views	2 months ago
tinyML Auto ML	59:48	287 views	2 months ago
tinyML Auto ML	58:09	336 views	2 months ago
tinyML Challenge	1:02:30	378 views	2 months ago
Example - Self Driving Car	34:31	214 views	2 months ago
tinyML Talks South	1:00:30	448 views	2 months ago
tinyML Talks	1:06:44	159 views	2 months ago
tinyML Auto ML Forum	1:53:07	190 views	2 months ago
tinyML Auto ML Forum	42:13	545 views	2 months ago



## tinyML EMEA Innovation Forum

June 26 -28, 2023  
Amsterdam

*EMEA 2023*

<https://www.tinyml.org/event/emea-2023>

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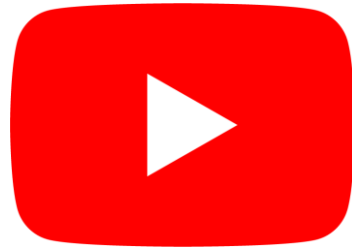


# Reminders

Slides & Videos will be posted  
tomorrow



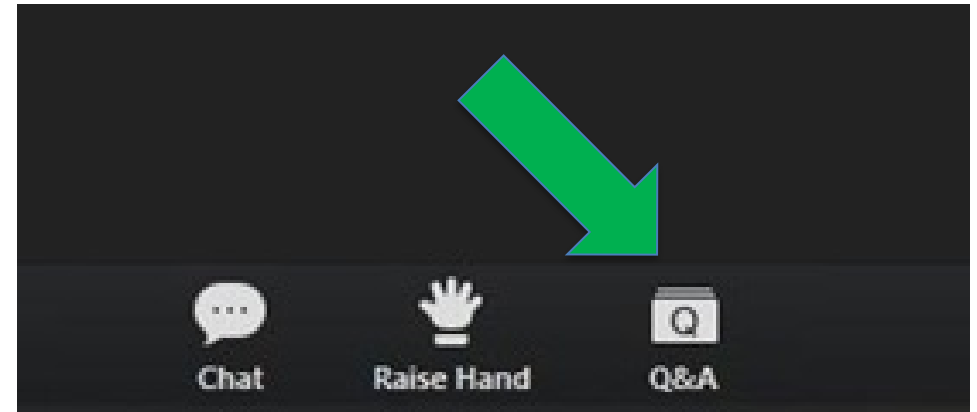
[tinymml.org/forums](https://tinymml.org/forums)



[youtube.com/tinymml](https://youtube.com/tinymml)



Please use the Q&A window for your  
questions







## Ashutosh Pandey



Ashutosh Pandey is currently a Lead Principal Systems Engineer at Infineon Technologies where he is responsible for Machine learning solutions, architecture, and tooling. He holds a PhD from the University of Utah and has over 50 papers and patents on speech/audio/machine learning systems and algorithms.



## Venkat Rangan



Venkat Rangan is a Maker and seasoned engineer with extensive experience in IoT system design and implementation. He is the founder of tinyVision.ai Inc., a hardware and system design consulting company. Venkat previously served as a Director of Engineering at Qualcomm Inc. Venkat holds a MSEE from the University of Cincinnati and a BTech from the Indian Institute of Technology, Roorkee. He is an inventor/co-inventor on over 40 issued patents.



## Moenes Iskarous



Chief Technology Officer at Infineon, AI and Machine Learning - Build and lead teams to develop Embedded Intelligence





## Mouna Elkhatib



Mouna Elkhatib, CEO, CTO, and Co-Founder of AONDevices, Inc., is an innovative and passionate entrepreneur who successfully grew AONDevices into one of the leading Edge AI providers. An industry expert in voice and audio processing, Mouna has over 20 years of experience in semiconductor technology with a successful track record in both engineering and leadership. Prior to AONDevices, Mouna architected and led the development of cutting-edge voice and audio semiconductor solutions for smartphones, PCs, smart speakers, and Internet of Things (IoT) at Qualcomm and Conexant. Mouna serves on the Global Semiconductor Alliance Women's Leadership Council, runs the WLI Entrepreneurial Committee and is a member of several industry organizations and actively contributes to the advancement of Edge AI. She holds an engineering degree from Ecole Nationale Supérieure d'Electricité et de Mécanique (ENSEM), thirteen US patents and fourteen pending patents.

## Avik Santra



Avik Santra received his M.S. (Hons) in signal processing from Indian Institute of Science and Ph.D in electrical, electronics, and informatics from FAU University of Erlangen, Germany. He is currently principal machine learning engineer responsible for developing system solutions for Wi-Fi, image and radar/depth sensors at Infineon, Irvine. Earlier in his career, he has worked as system engineer at Broadcom and research engineer at Airbus. He is associate editor at 'IEEE Sensors Journal' and 'Elsevier Machine Learning with Applications'. He is co-author of two books on Deep Learning for mm-wave radars published at Artech and Wiley-IEEE. He is TPC at several conferences (ICMLA, RWW, Conasense), and has delivered 20+ invited talks at different venues. He has filed over 70 patents (38+ granted sofar) and published over 65 research papers. He is a senior member of IEEE



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