“tinyML: AutoML + TinyML with Edge Impulse's EON Tuner”

David Schwarz - Edge Impulse

October 12, 2021
tinyML Talks Sponsors and Strategic Partners

Additional Sponsorships available – contact Olga@tinyML.org for info
WE USE AI TO MAKE OTHER AI FASTER, SMALLER AND MORE POWER EFFICIENT

**Automatically compress** SOTA models like MobileNet to <200KB with little to no drop in accuracy for inference on resource-limited MCUs

**Reduce** model optimization trial & error from weeks to days using Deeplite’s **design space exploration**

**Deploy more** models to your device without sacrificing performance or battery life with our **easy-to-use software**

BECOME BETA USER [bit.ly/testdeeplite](bit.ly/testdeeplite)
TinyML for all developers

Dataset
- Acquire valuable training data securely
- Enrich data and train ML algorithms

Edge Device
- Real sensors in real time
- Open source SDK
- Embedded and edge compute deployment options

Test
- Test impulse with real-time device data flows

www.edgeimpulse.com
The Eye in IoT
Edge AI Visual Sensors

- Machine Learning algorithm
- <1MB memory footprint
- Microcontrollers computing power
- Trained algorithm
- Processing of low-res images
- Human detection and other classifiers

CMOS Imaging Sensor
- Ultra Low power CMOS imager
- AI + IR capable

Computer Vision Algorithms

IoT System on Chip
- Machine Learning edge computing silicon
- <1mW always-on power consumption
- Computer Vision hardware accelerators
Enabling the next generation of **Sensor and Hearable products** to process rich data with energy efficiency.

- **Visible Image**
- **Sound**
- **IR Image**
- **Radar**
- **Bio-sensor**
- **Gyro/Accel**

**Wearables / Hearables**

**Battery-powered consumer electronics**

**IoT Sensors**
HOTG is building the **distributed infrastructure** to pave the way for **AI enabled edge applications**.
LatentAI
Adaptive AI for the Intelligent Edge
Latentai.com
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

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

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
Qeexo AutoML

Automated Machine Learning Platform that builds tinyML solutions for the Edge using sensor data

Key Features

- Supports 17 ML methods:
  - Multi-class algorithms: GBM, XGBoost, Random Forest, Logistic Regression, Gaussian Naive Bayes, Decision Tree, Polynomial SVM, RBF SVM, SVM, CNN, RNN, CRNN, ANN
  - Single-class algorithms: Local Outlier Factor, One Class SVM, One Class Random Forest, Isolation Forest
- Labels, records, validates, and visualizes time-series sensor data
- On-device inference optimized for low latency, low power consumption, and small memory footprint applications
- Supports Arm® Cortex™- M0 to M4 class MCUs

End-to-End Machine Learning Platform

For more information, visit: www.qeexo.com

Target Markets/Applications

- Industrial Predictive Maintenance
- Automotive
- Smart Home
- Mobile
- Wearables
- IoT
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
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
- Pre-built 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
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
\textit{SynSense} builds sensing and inference hardware for \textit{ultra-low-power} (sub-mW) \textit{embedded, mobile and edge} devices. We design systems for \textit{real-time always-on smart sensing}, for audio, vision, IMUs, bio-signals and more.

https://SynSense.ai
SYNTIANT

Neural Decision Processors
- At-Memory Compute
- Sustained High MAC Utilization
- Native Neural Network Processing

ML Training Pipeline
- Enables Production Quality Deep Learning Deployments

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

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

partners@syntiant.com
www.syntiant.com
LIVE ONLINE November 2-5, 2021
(9-11:30 am China Standard time)
https://www.tinyml.org/event/asia-2021/

Free event courtesy of our sponsors and strategic partners

More sponsorships are available: sponsorships@tinyML.org
Focus on:
(i) developing new use cases/apps for tinyML vision; and (ii) promoting tinyML tech & companies in the developer community

Submissions accepted until September 17th, 2021
Winners announced on October 5th, 2021 ($6k value)
Sponsorships available: sponsorships@tinyML.org

https://www.hackster.io/contests/tinyml-vision
Next tinyML Talks

<table>
<thead>
<tr>
<th>Date</th>
<th>Presenter</th>
<th>Topic / Title</th>
</tr>
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<tbody>
<tr>
<td>Thursday, October 14</td>
<td><strong>Jan Jongboom,</strong> Co-founder and CTO, Edge Impulse</td>
<td>Chasing cows: Making Africa smarter with embedded ML</td>
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Webcast start time is 8 am Pacific time

Please contact talks@tinymce.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
David Schwarz is a User Success Engineer at Edge Impulse, helping customers build and deploy products powered by machine learning. He is a University of Texas graduate with previous experience in embedded systems design and applications engineering. He lives in Austin Texas and enjoys reading, swimming, and programming in his spare time.
The leading embedded ML platform

Learn more at edgeimpulse.com
A world-class team of industry leaders, delivering the ultimate developer experience for embedded machine learning solutions, at scale.

1,000+ Enterprises
50,000+ Developers
35,000+ Projects
40M+ Datasets

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Embedded ML gives devices real-time intelligence

- Any data source
- Sensor
- Audio
- Vision

- From Cortex-M to Jetson Nano
- Starting at < 10 kB of Flash/RAM
- Real-time, low-power inference

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From rule-based engineering

Rule-based Code

Trial and Error

Write More Code
To data-driven engineering!

Sensors → Machine Learning → Collect more data

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EON Tuner

AutoML for sensor data
Improve accuracy in two clicks with EON Tuner!

- EON Tuner API coming later this year
We care about devices!

- Do more with less hardware
- Make the most of limited or heterogenous compute
- Target brownfield devices with spare cycles

[1] Excl. Cortex-M0, M0+ and M3

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EON Tuner Demo
Q&A

Contact: david@edgeimpulse.com
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