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Making Things Smarter

EON Tuner: AutoML for constrained devices
Hi, I’m Jan!

Co-founder and CTO at **Edge Impulse**, leading development platform for machine learning on edge devices.

Launched just before TinyML summit 2020...

Now 194 new projects daily (!)
Signal processing + ML = ❤️

Apply low-pass filter...

= much easier job for the ML algo
Leveraging signal processing

On-device intelligence is not new

Neural networks are inefficient, if you can preprocess? Do so!

Significantly reduce input features, leading to smaller networks.

Cleans up input
ML Sensor pipeline is often combination
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Much more interesting
Wide range of parameters

Window length, window step, downsample?
Wide range of parameters

+ endless configuration options
Constrained targets - what’s worth it?
Introducing the EON Tuner!

EON Tuner

Finding the most optimal architecture for your model (17 model variants evaluated / 50 variants total)

cortex-m7-216mhz  1000 ms  RAM: 128kB • ROM: 1024kB
EON Tuner

Find best model for **sensor data** over mix of input blocks, DSP blocks and ML blocks

Specify device constraints

Extensible with your own DSP and ML blocks

Biggest win: "we found DSP configuration that works so well, we no longer need ML"
That sounds too easy...
1. Understand the problem

Understand the business constraints
(response time = sampling time + inference)

See interesting frequencies?

Need custom DSP code?

Classification, regression or anomaly detection?

Still an engineering tool!
2. Dataset quality
3. Custom search space

Tuner comes with basic scenarios (keyword spotting, continuous audio, image classification, motion, etc.)

Customize search space (parameters, which preprocessing blocks, ML configuration)

Tied to performance APIs, to drop parts of the space that don't fit constraints

dspBlock: {
  type: 'spectrogram',
  noise_floor: [ -62, -52, -42 ],
  fft_length: [ 64, 128, 256 ]
}
Examples
Bird sound classifier

Built with Lacuna Space, counts birds locally and relays results back over satellite

Model built by Dan (hi Dan!) from our team:
82.62% test set accuracy

EON Tuner found one w/ 92.66% test set accuracy
(or even 95% if forego 1 sec. latency requirement)

Best models...
Lots of DSP? Lots of NN?
Getting started
Getting started

https://docs.edgeimpulse.com/docs

Very wide range of dev boards, from Cortex-M0+ to Jetson Nano

Deploy to any device that has a C++ compiler

Or use your phone!

Be one of today's 194 new projects!
FOMO - Object detection for MCUs
Recap

We've come so far!

Domain knowledge is key.

It's the AutoML track, but it's still engineering.

edgeimpulse.com
Questions?

Full docs:
https://docs.edgeimpulse.com

Tuner intro:
https://docs.edgeimpulse.com/docs/eon-tuner

FOMO
https://docs.edgeimpulse.com/docs/fomo-object-detection-for-constrained-devices

We're hiring!
https://edgeimpulse.com/careers

More questions:
forum.edgeimpulse.com / jan@edgeimpulse.com
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