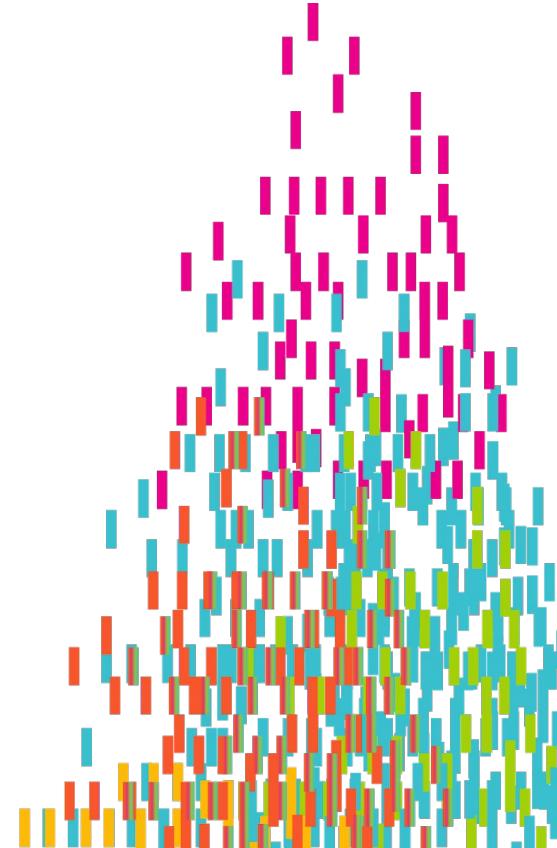




Making things smarter

CRESTLEX Workshop, Intro to TinyML

Jenny Plunkett, User Success Engineer



Agenda

Why is machine learning useful?

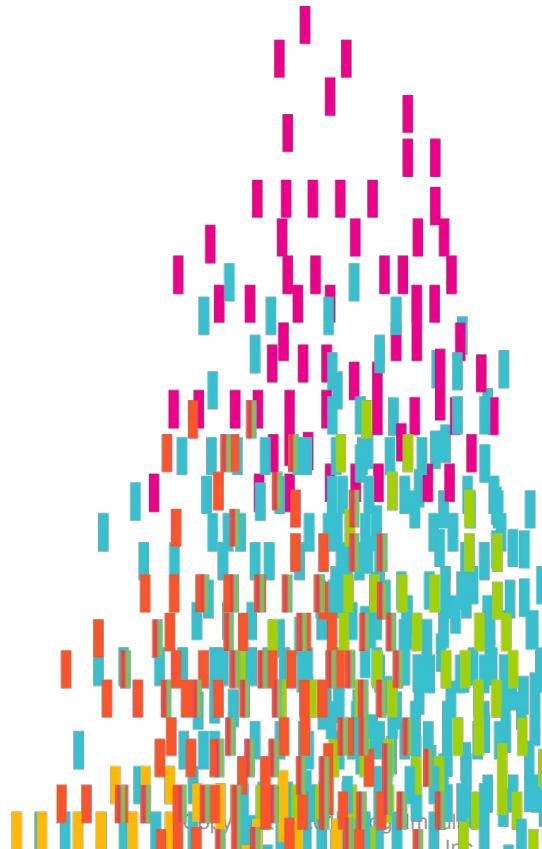
What is TinyML?

Overview of Edge Impulse

Workshop session (deploy stock models to phone)



Why is machine learning useful?



Typical industrial sensor in 2020



Vibration sensor (up to 1,000 times per second)

Temperature sensor

Water & explosion proof

Can send data >10km using 25 mW power
(LoRA, etc.)

Processor capable of running >20 million instructions per second

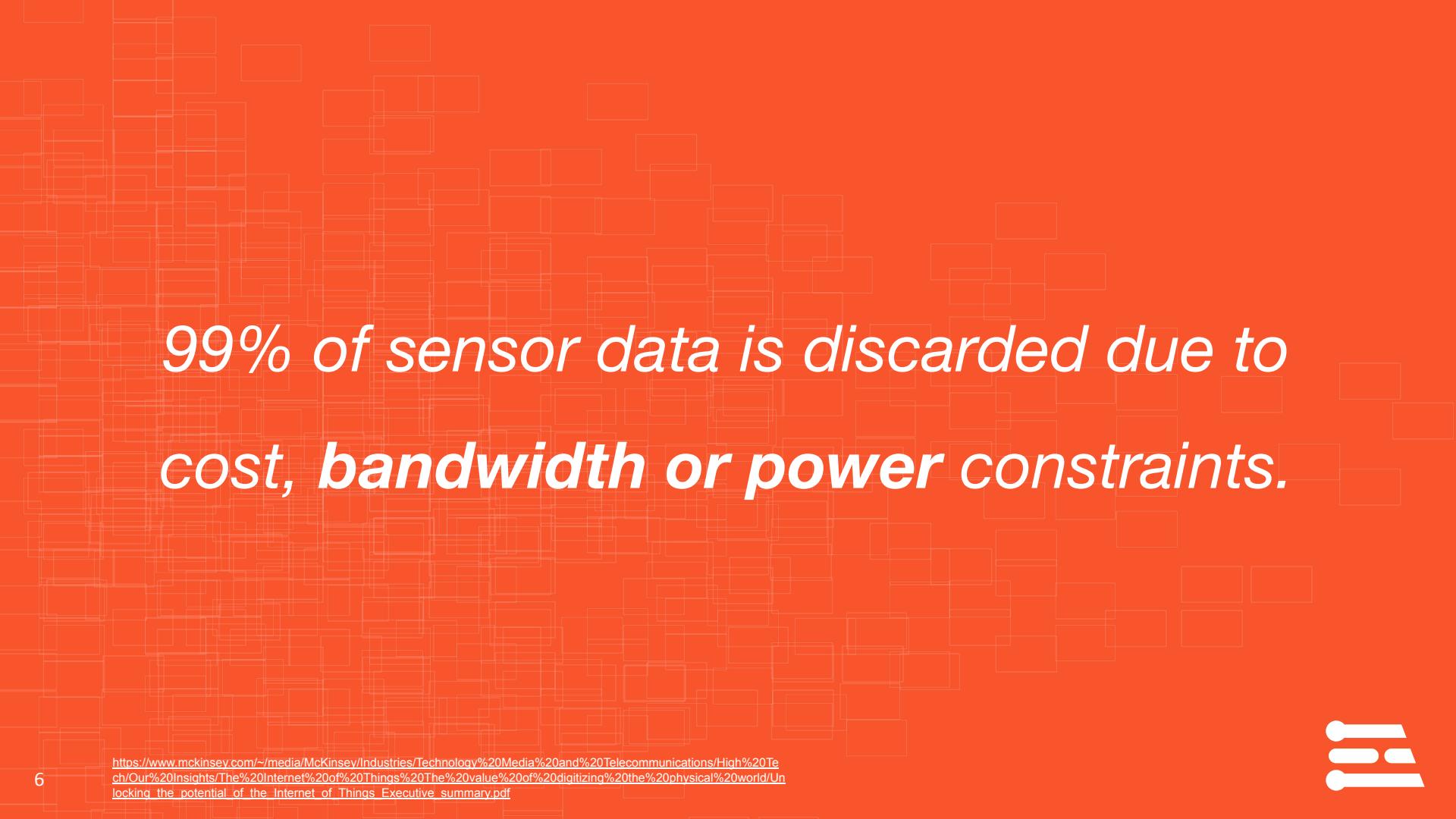


What does it do?

Once an hour:

- Average motion (RMS)
- Peak motion
- Current temperature

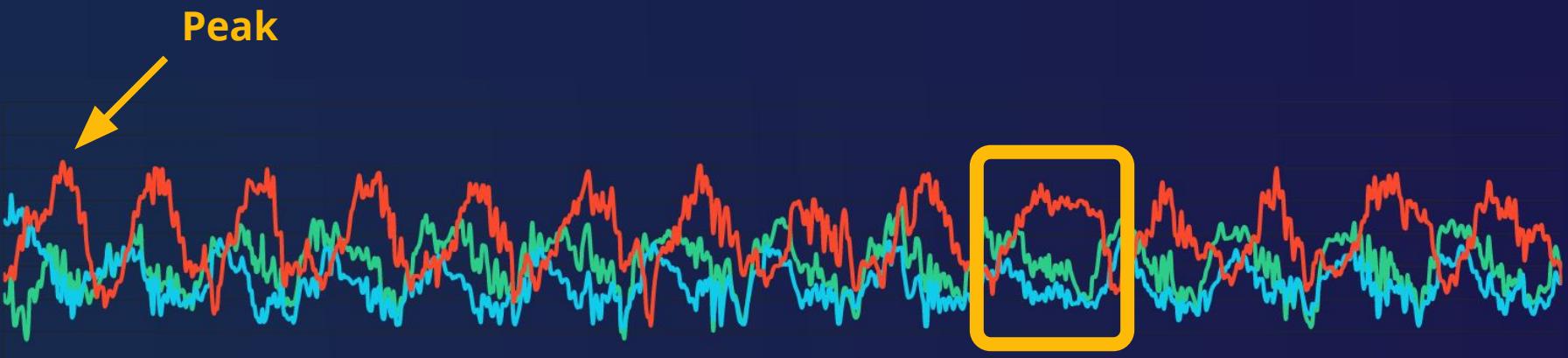




*99% of sensor data is discarded due to
cost, **bandwidth** or power constraints.*

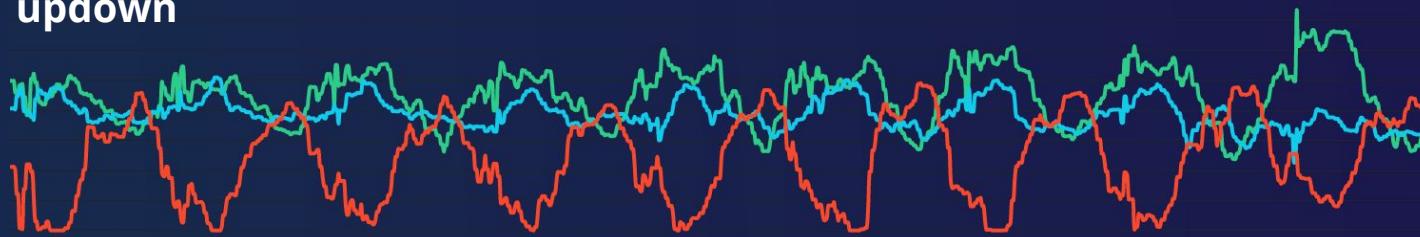


Lots of interesting events get lost



Single numbers can be misleading

updown



avg. RMS

3.3650

circle



3.3515



On-device intelligence is the only solution



On-device intelligence is the only solution



Temperature varies in a way
that I've never seen before



Can we find patterns in our data?

Classification

What's happening right now?

Anomaly detection

Is this behavior out of the ordinary?

Forecasting

What will happen in the future?

Machine
Learning

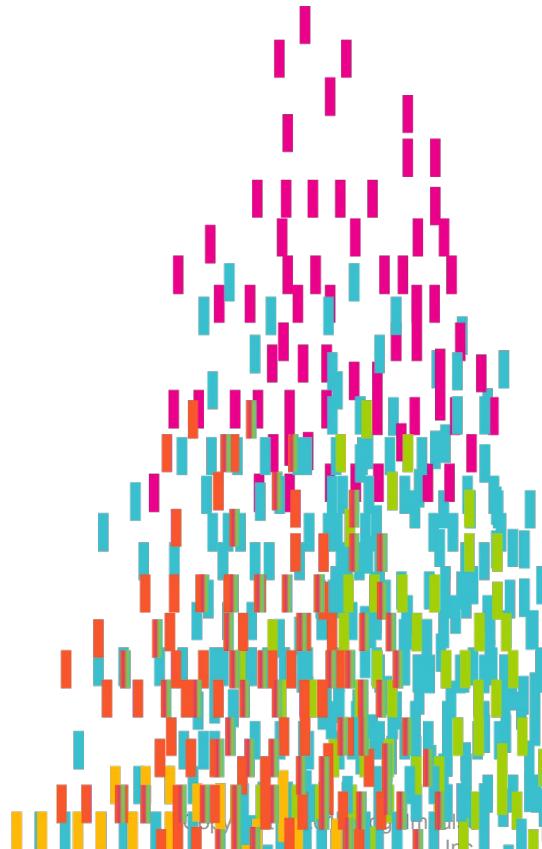




Machine learning



What is TinyML?



TinyML

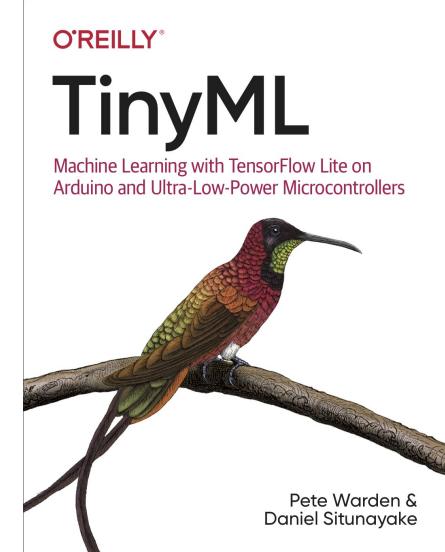
Inspired by “OK Google”

Focus on inferencing, not training

Machine learning model is just a mathematical function with lots of parameters

Accuracy vs. speed, reducing parameters, hardware optimized paths

Targeting battery-powered microcontrollers



Machine learning on the edge

Inferencing on device: typically more efficient than sending raw data over the network

Signal processing is key

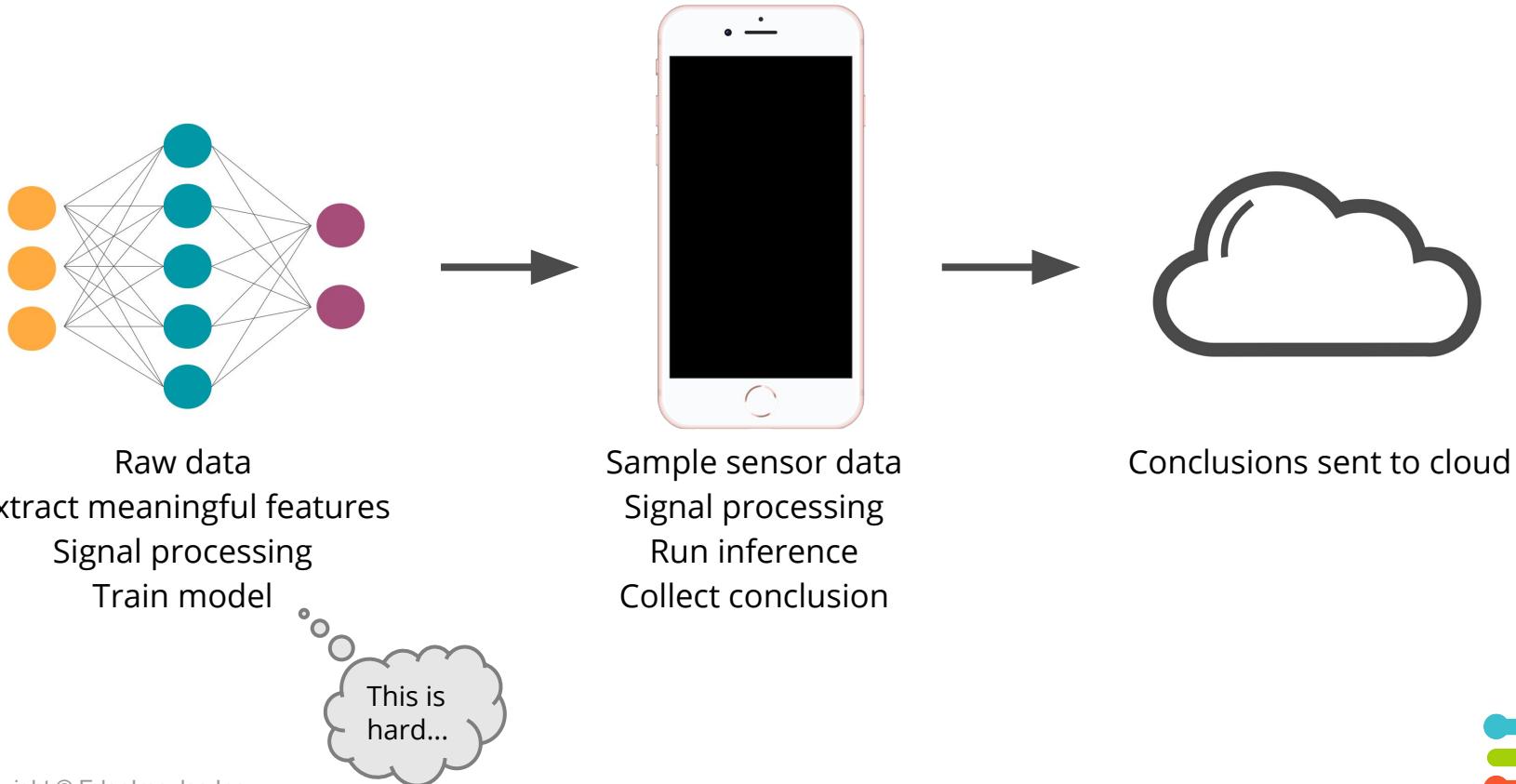
Use cases with messy, high frequency data



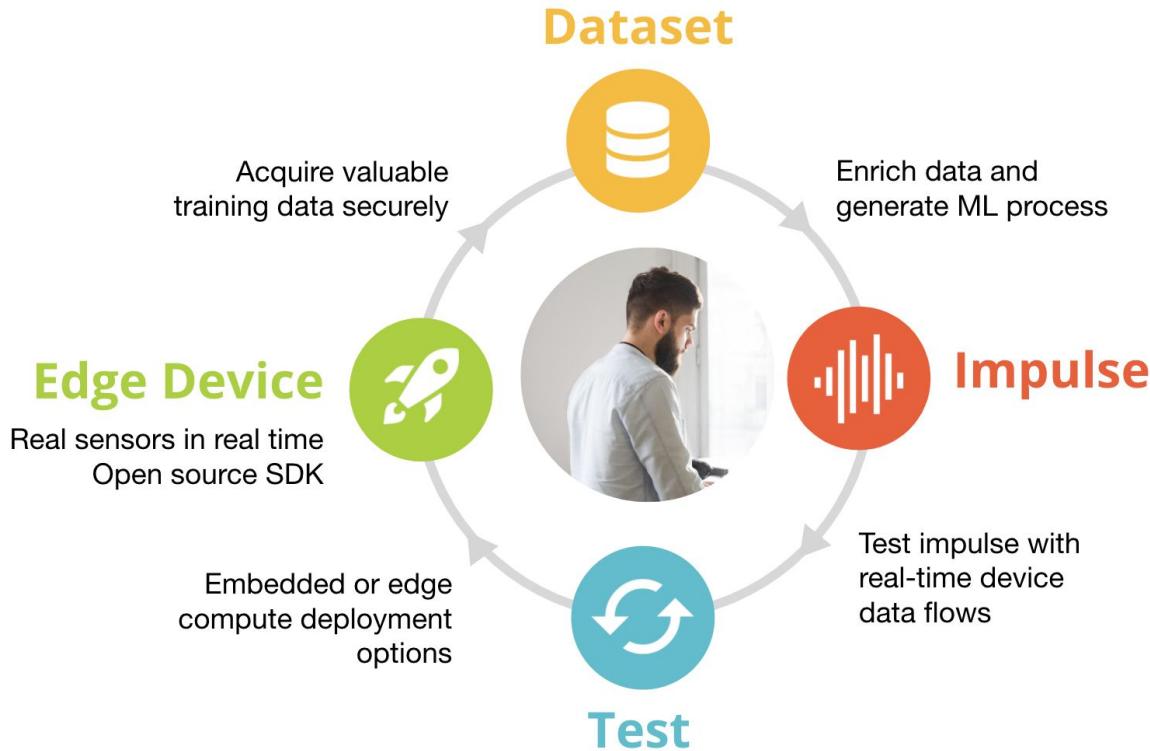
What can we do with ML on the edge?



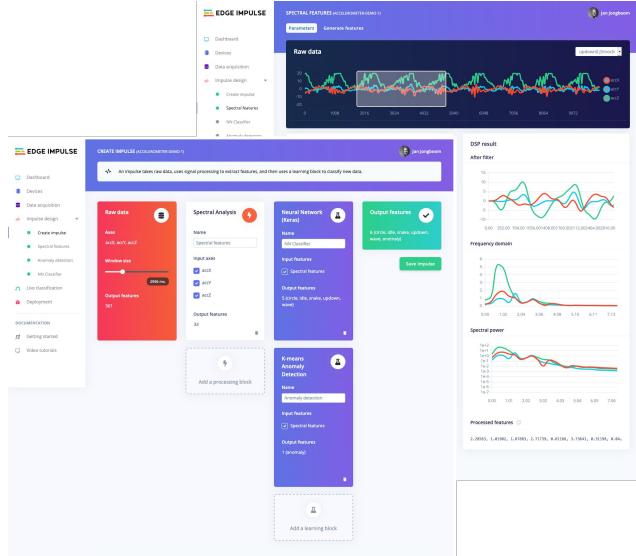
From model to device to cloud



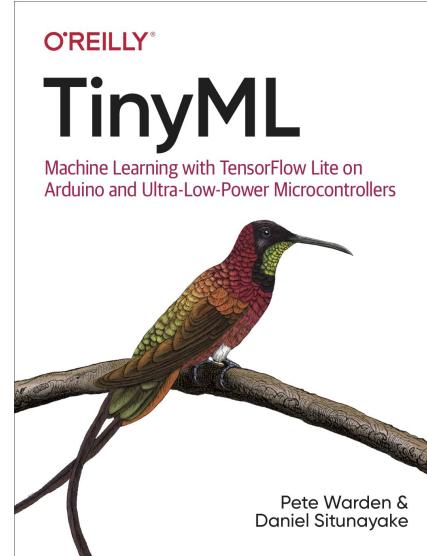
Edge Impulse - TinyML as a service



Further resources



edgeimpulse.com



tinymlbook.com

