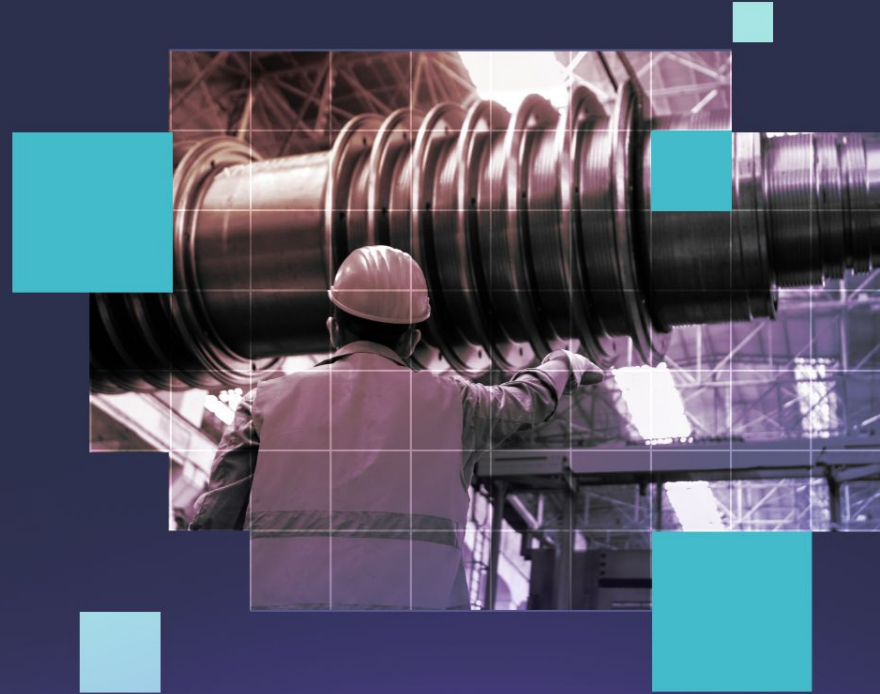


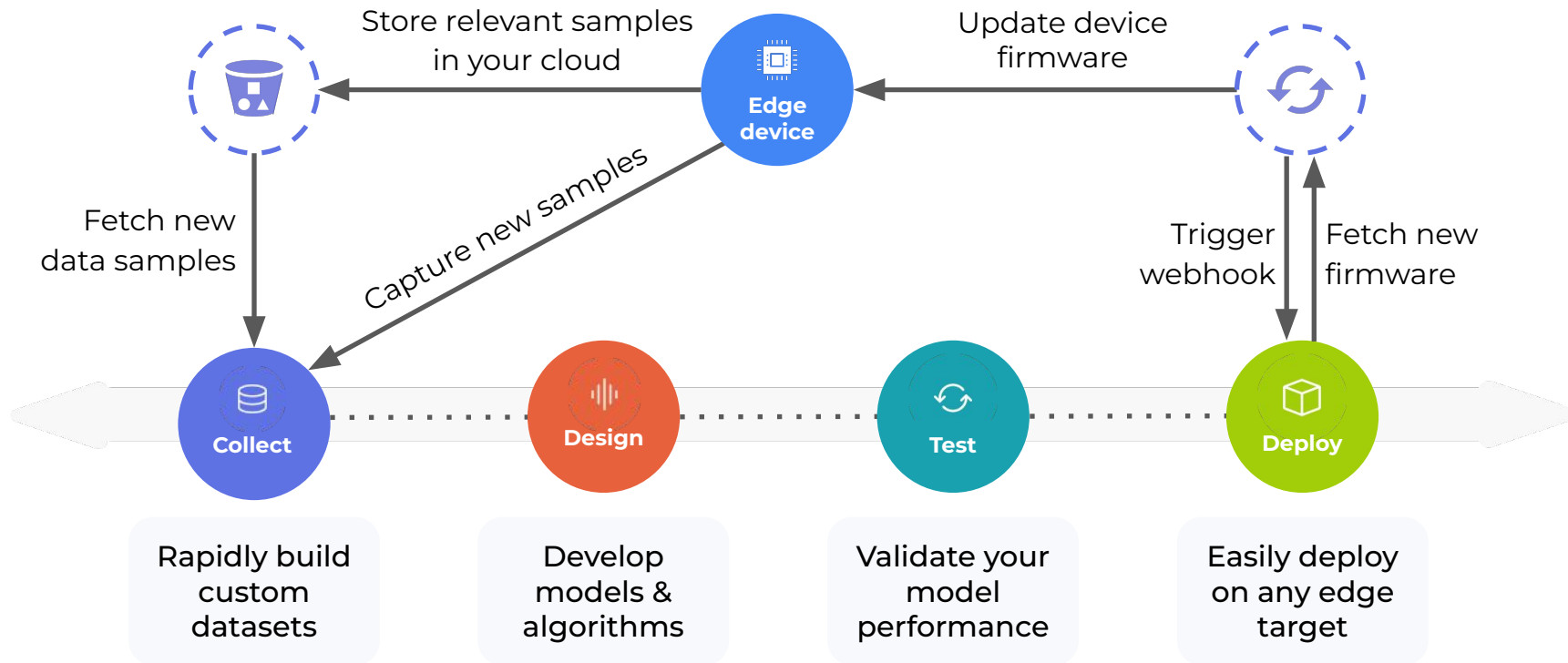
Edge Impulse overview and updates

Shawn Hymel
Senior DevRel Engineer



Studio





100,000+

Developers

200,000+

Projects

TRUSTED BY LEADING ENTERPRISES



ŌURA

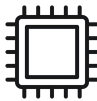


SONY





Low-end MCU



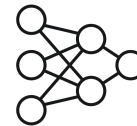
High-end MCU



MPU



GPU



NPU

Purpose

Low power/cost

Mid power/cost

General purpose

Parallel compute

Special purpose ML

Clock speed

10 MHz - 100 MHz

100 MHz - 500 MHz

500 MHz - 6 GHz

500 MHz - 3 GHz

100 MHz - 2 GHz

Memory (RAM)

10 kB - 100 kB

100 kB - 10 MB

100 MB - 100 GB

100 MB - 30 GB

20 kB - 30 MB

Time series



Audio



Image classification



Object detection



Edge Impulse Studio Tour

studio.edgeimpulse.com/public/82033/live

Last training performance (validation set)

ACCURACY
89.3%

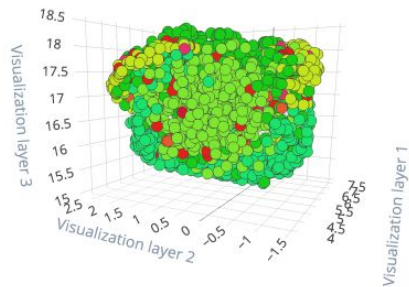
LOSS
0.39

Confusion matrix (validation set)

	NO	NOISE	UNKNOWN	YES
NO	92.3%	1.3%	2.1%	4.3%
NOISE	0.4%	95.6%	2.6%	1.3%
UNKNOWN	10.7%	9.9%	75.5%	4.0%
YES	0.4%	2.0%	2.8%	94.8%
F1 SCORE	0.90	0.91	0.83	0.93

Feature explorer (full training set) ?

- no - correct
- noise - correct
- unknown - correct
- yes - correct
- no - incorrect
- noise - incorrect
- unknown - incorrect
- yes - incorrect



New features



FOMO-AD

- Unique application of FOMO model
- Perform segmented anomaly detection
- Assembly lines, predictive maintenance

The screenshot displays the FOMO-AD web interface. At the top, it shows the target hardware as 'Nvidia Jetson Orin NX' and the engine as 'EON™ Compiler'. Performance metrics include 'On-device performance' with a bidirectional arrow icon, '160' and '160' values, and a clock icon. Below these are four circular icons representing 'IMAGE' (RGB), 'INFERENCIN...' (15 ms), 'PEAK RAM U...' (2.4M), and 'FLASH USAGE' (86.7K). The main content area is divided into two columns, each showing 'RAW DATA' and 'Anomaly result'. The left column shows a crack in a material with an anomaly score of max: 13.8865, mean: 1.8173. The right column shows a similar crack with an anomaly score of max: 10.4202, mean: 1.6580. Both anomaly result sections include a heatmap and a note: 'Anomalies are filtered by the confidence threshold, set thresholds.'

INPUT ⓘ Target: Nvidia Jetson Orin NX

↔ 160 | ↑ 160 On-device performance ⓘ Engine: ⓘ EON™ Compiler ▾

IMAGE ⓘ INFERENCIN... PEAK RAM U... FLASH USAGE

🔴 RGB 15 ms. 2.4M 86.7K

RAW DATA anomaly.cracked.7125-172.jpg.3cpca6mu.inges...
Raw features ⓘ
0xafafad, 0xadadab, 0xa5a5a3, 0x9c9c9a, 0xa3a3a1, 0xa7a7a5, 0xa2a2a0...

RAW DATA anomaly.cracked.7126-81.jpg.3cpca6n8.ingesti...
Raw features ⓘ
0xa4a9ad, 0xa2a7ab, 0xa6abaf, 0xab0b4, 0xa9aeb2, 0xa8adb1, 0xa5aaae...

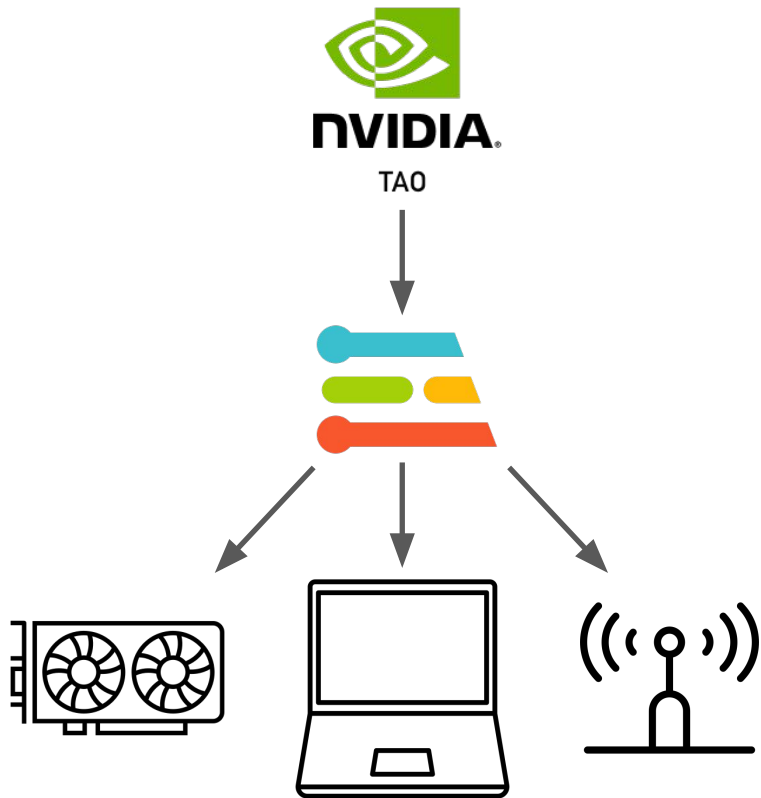
Anomaly result
Anomalies are filtered by the confidence threshold, set thresholds.

Anomaly scores ⓘ
max: 13.8865, mean: 1.8173

Anomaly result
Anomalies are filtered by the confidence threshold, set thresholds.

Anomaly scores ⓘ
max: 10.4202, mean: 1.6580

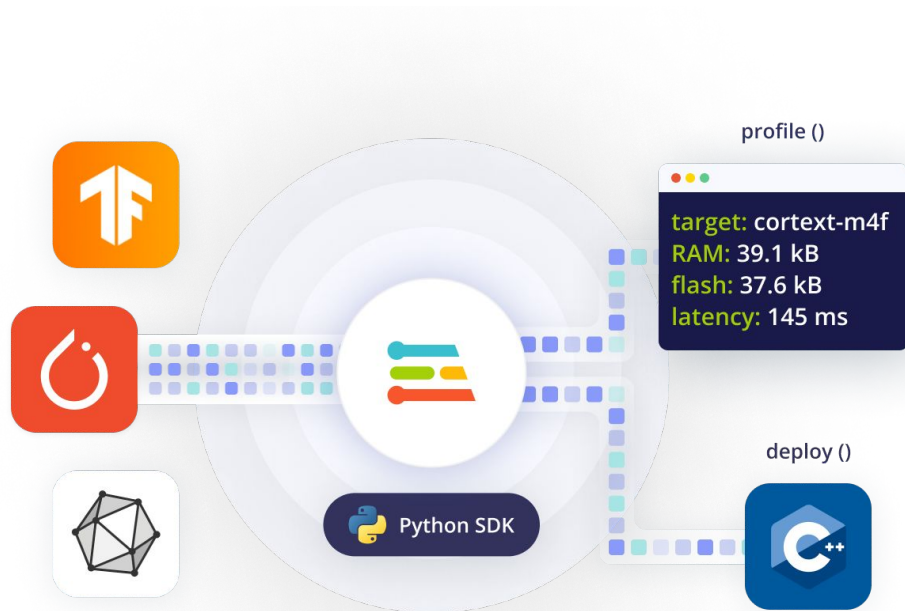
NVIDIA TAO Integration



- Pull models from TAO
- Transfer learning on custom data
- Deploy to any device

Python SDK

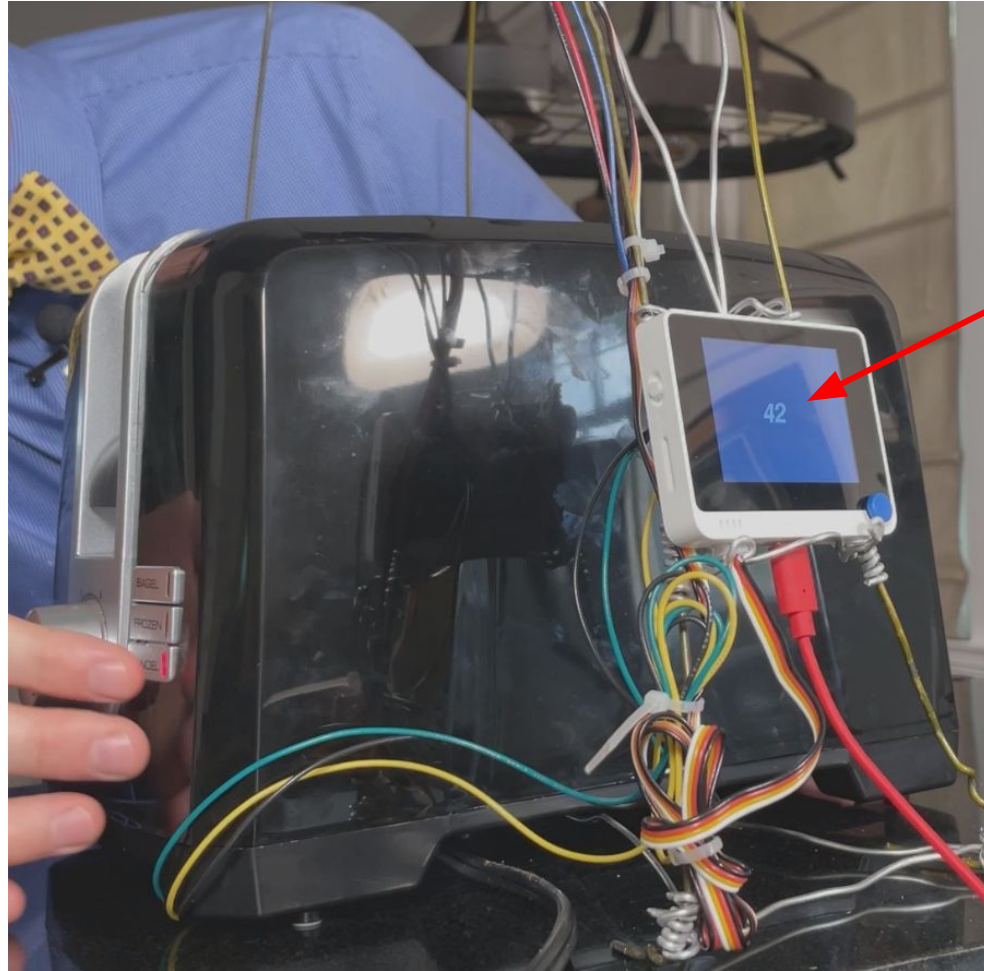
- Script parts of Studio
- Integrate with other ML tools
- Features:
 - Profile
 - Deploy
 - Upload data
 - Download data



Projects



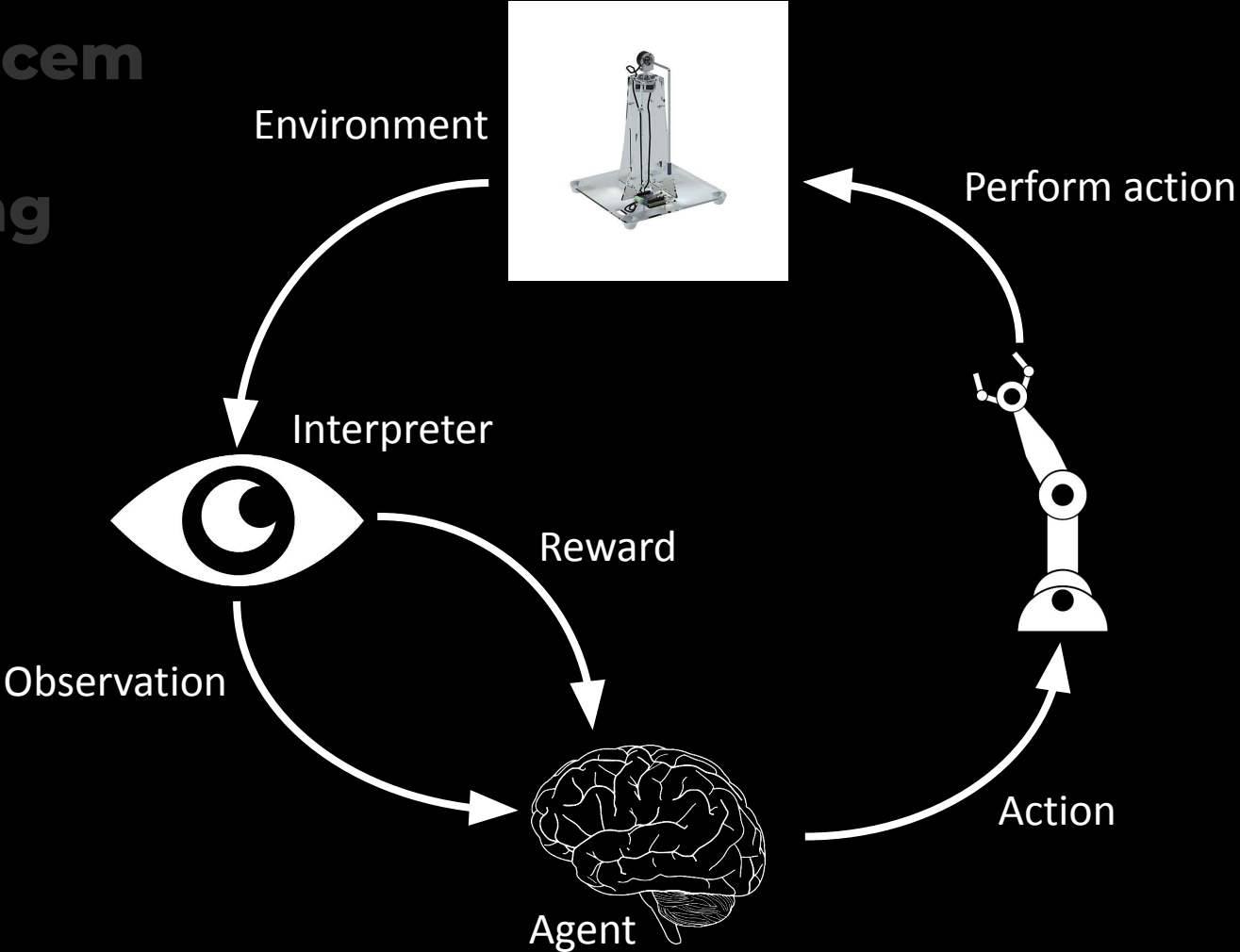
AI Toaster



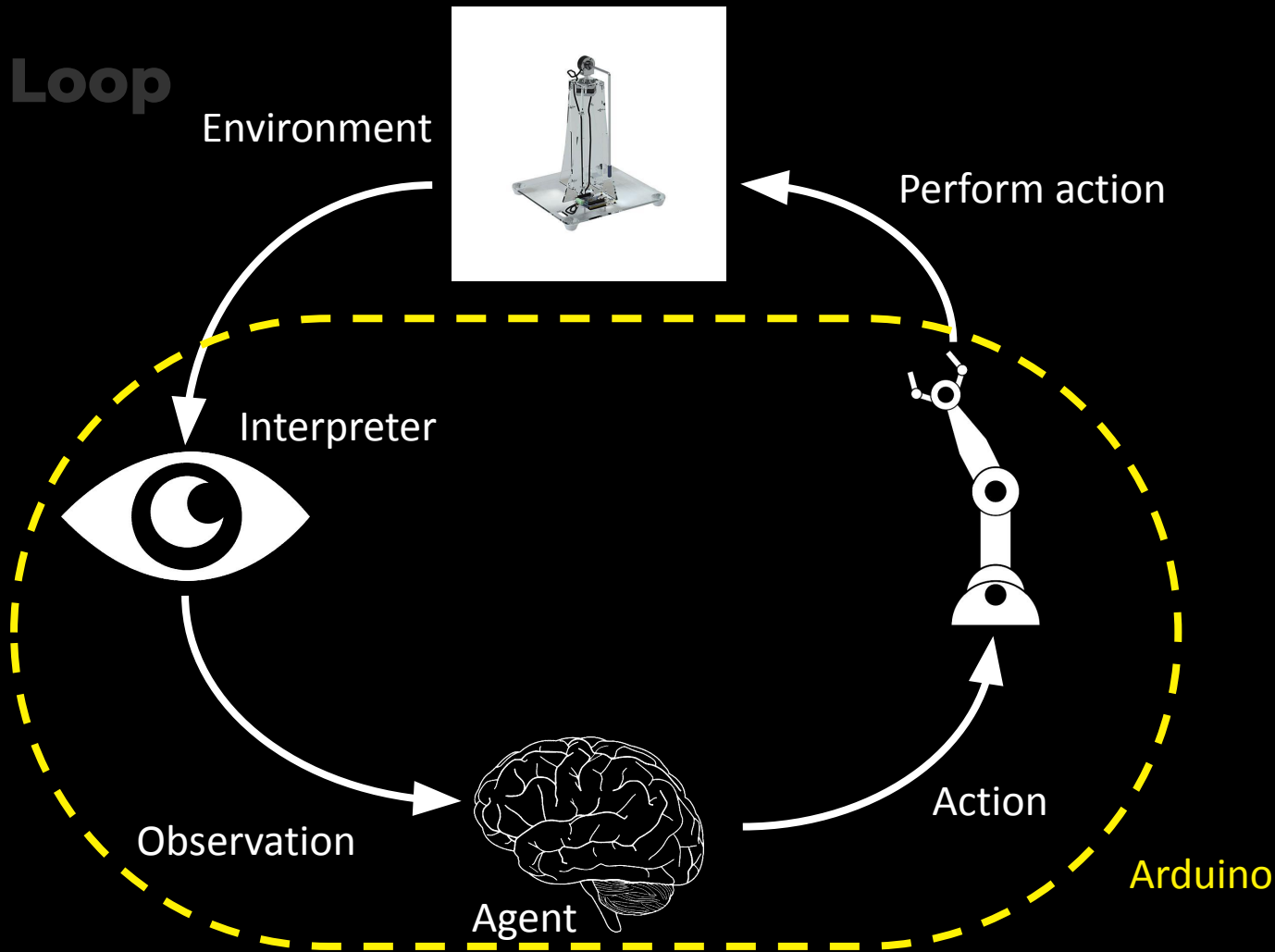
Predicts
number of
seconds
until burnt



Reinforcement Learning



Edge AI: Loop

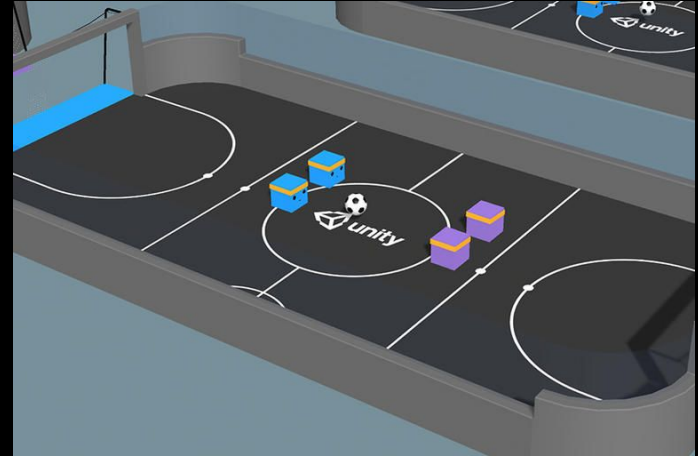




Future Efforts: Virtual Simulation

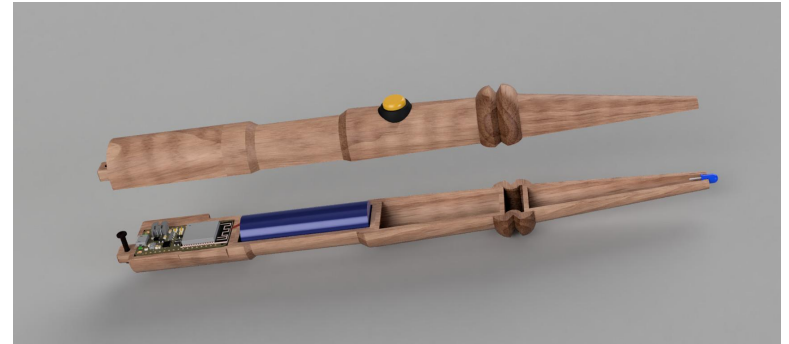


NVIDIA Omniverse



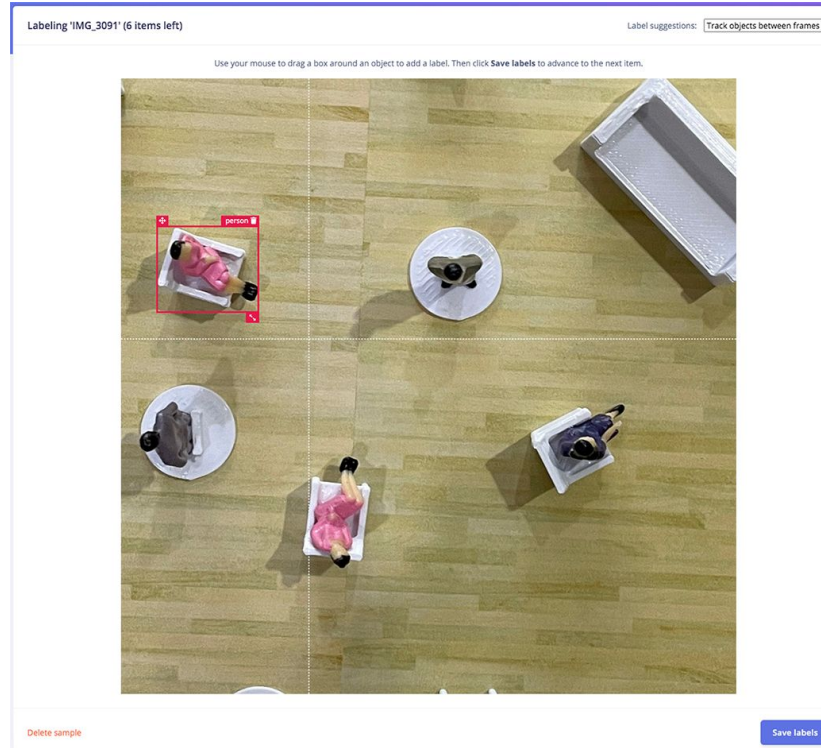
Unity

Magic Wand



Magic wand duel, CMU hackathon
Images courtesy of Bill Nace

Smart HVAC



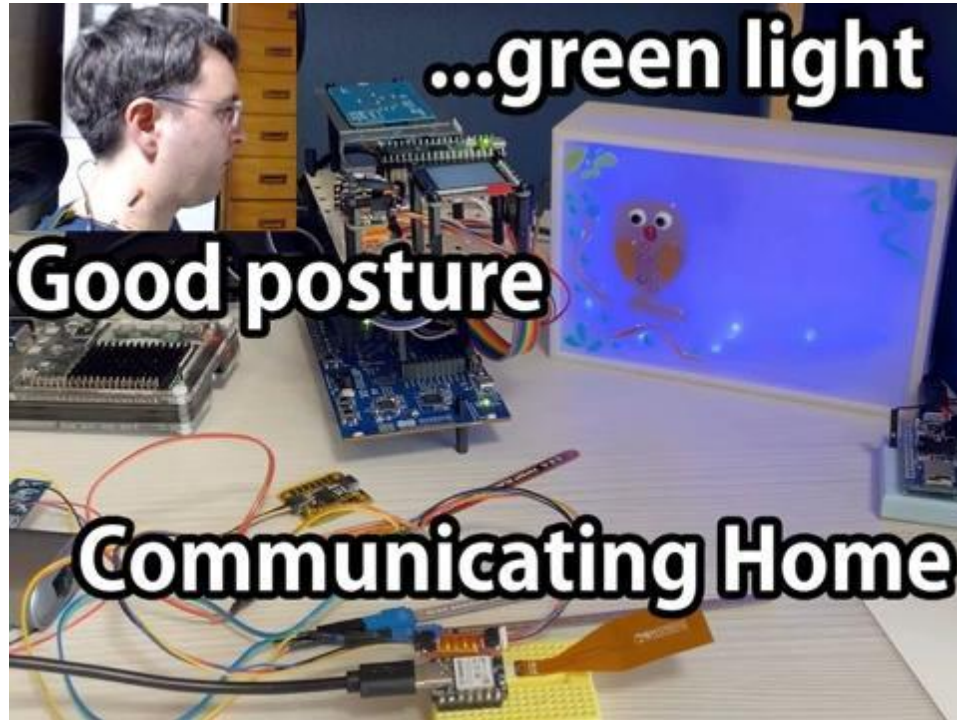
edgeimpulse.com/blog/if-an-hvac-unit-turns-on-in-a-room-and-theres-no-one-around-to-notice-it-does-it-consume-energy/

Bee Counting



matpalm.com/blog/counting_ees/

Posture Monitoring



hackster.io/jens-ajisai/gently-communicating-home-using-matter-ca97fb

Smart Recycling Bin



hackster.io/s4muela/ai-audio-classifier-recycle-bin-babe02

Plant Health Monitoring



hackster.io/gatoninja236/determining-a-plant-s-health-with-tinymt-085003

Dog Bark Stopper



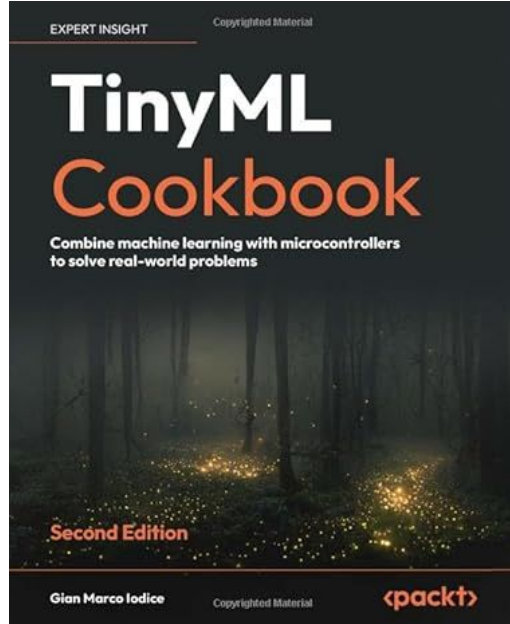
hackster.io/NathanielF/tinymI-dog-bark-stopper-77e436

Snoring Guardian

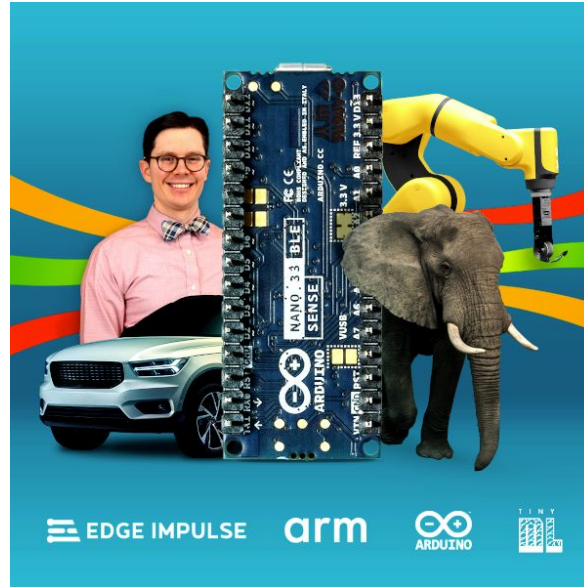


hackster.io/naveenbskumar/snoring-guardian-dccc34

Getting Started



“TinyML Cookbook”
by Gian Marco Iodice



“Introduction to Embedded
Machine Learning” on Coursera



“Tiny Machine
Learning” on edX



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