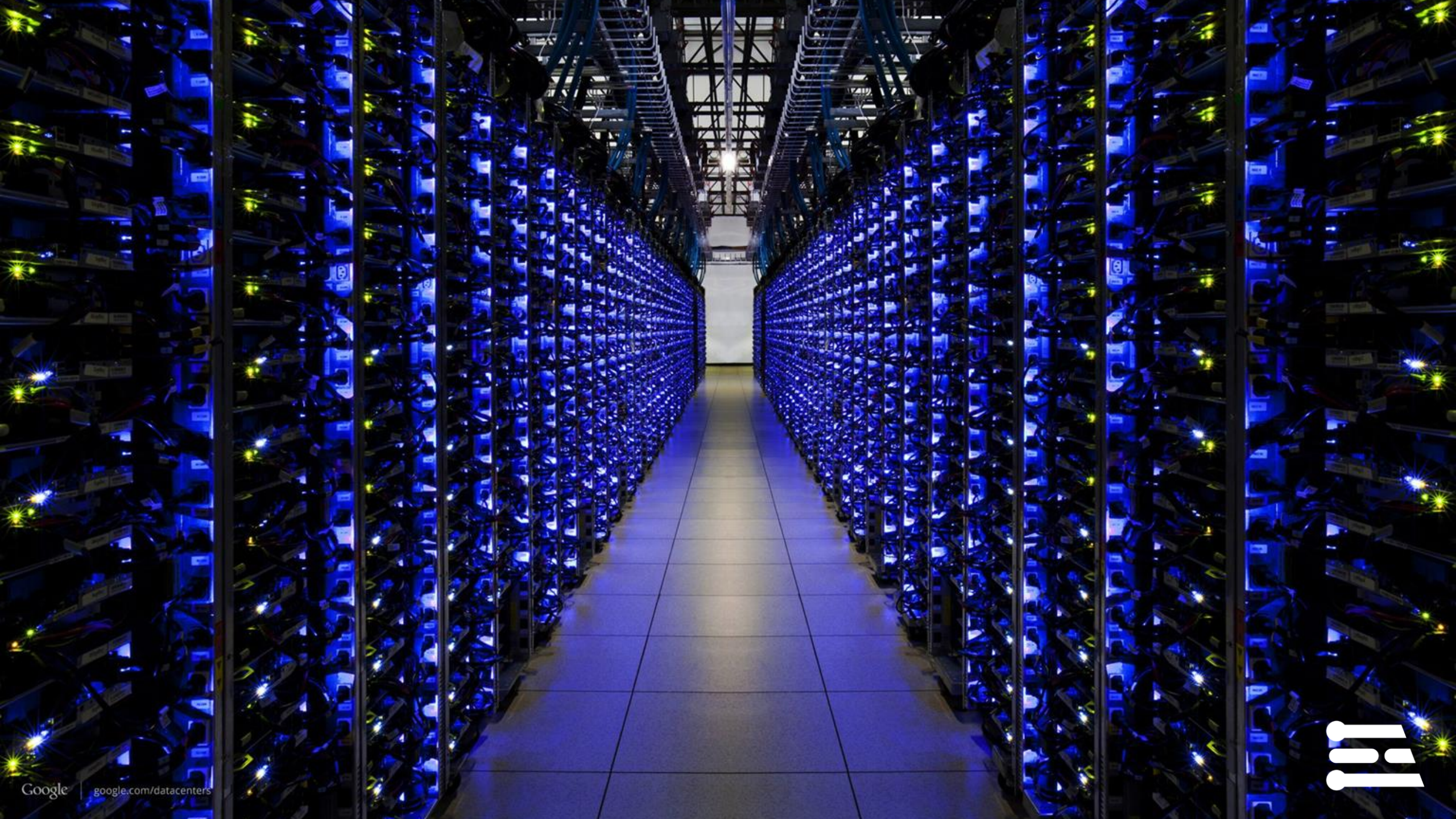
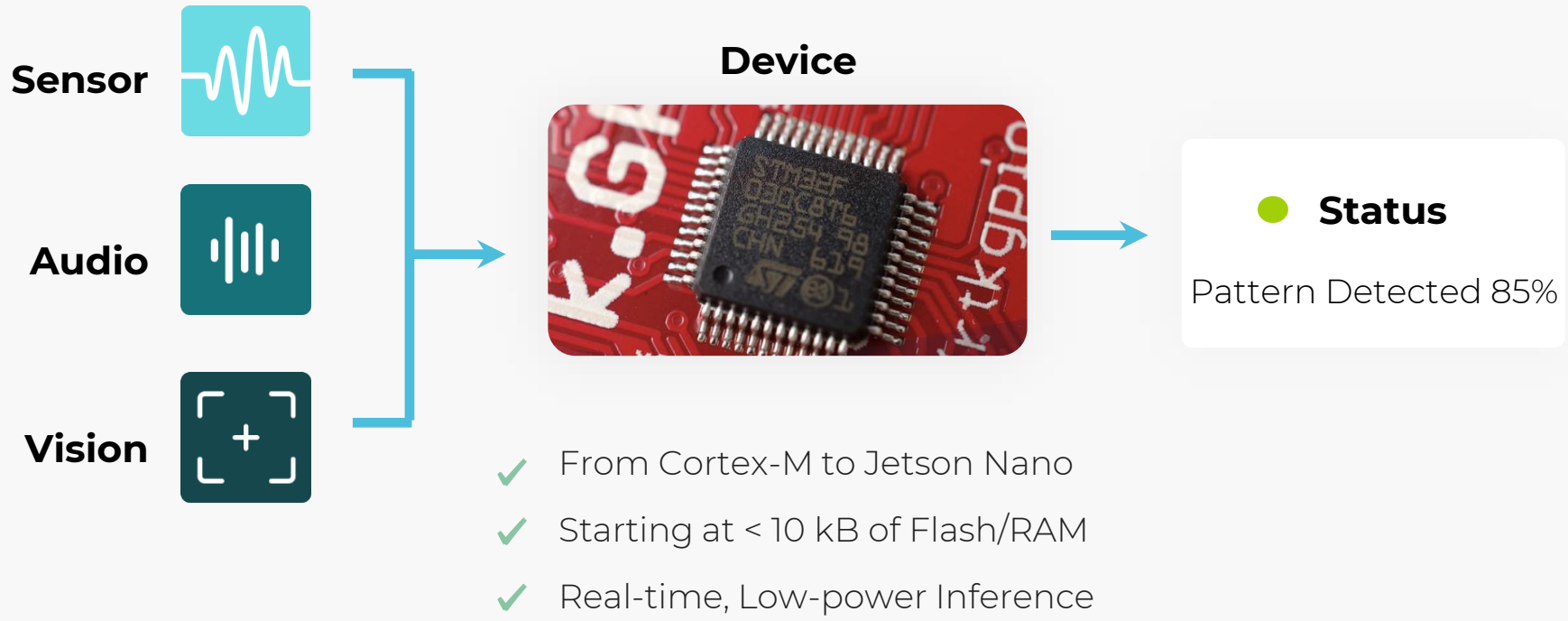
The Data-driven Engineering Revolution

Zach Shelby, Co-founder and CEO
May 25, 2021

EDGE IMPULSE


Google
google.com/datacenters

Embedded ML Makes Devices Smarter



Embedded Programming Today

Rule-based Code

```
Blink §

  This example code is in the public domain.

  http://www.arduino.cc/en/Tutorial/Blink
*/

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {$
  digitalWrite(LED_BUILTIN, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);                       // wait for a second
  digitalWrite(LED_BUILTIN, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
}
```

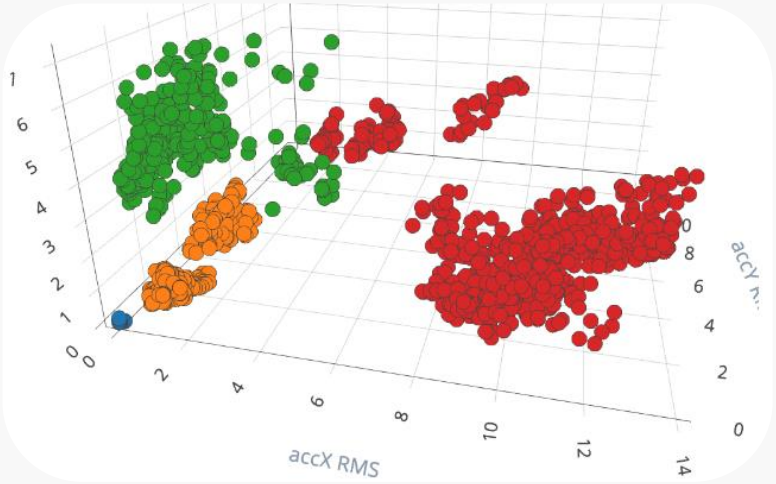
Trial and Error

Write More Code

Data-driven Engineering Is Here!

Sensor

Machine Learning

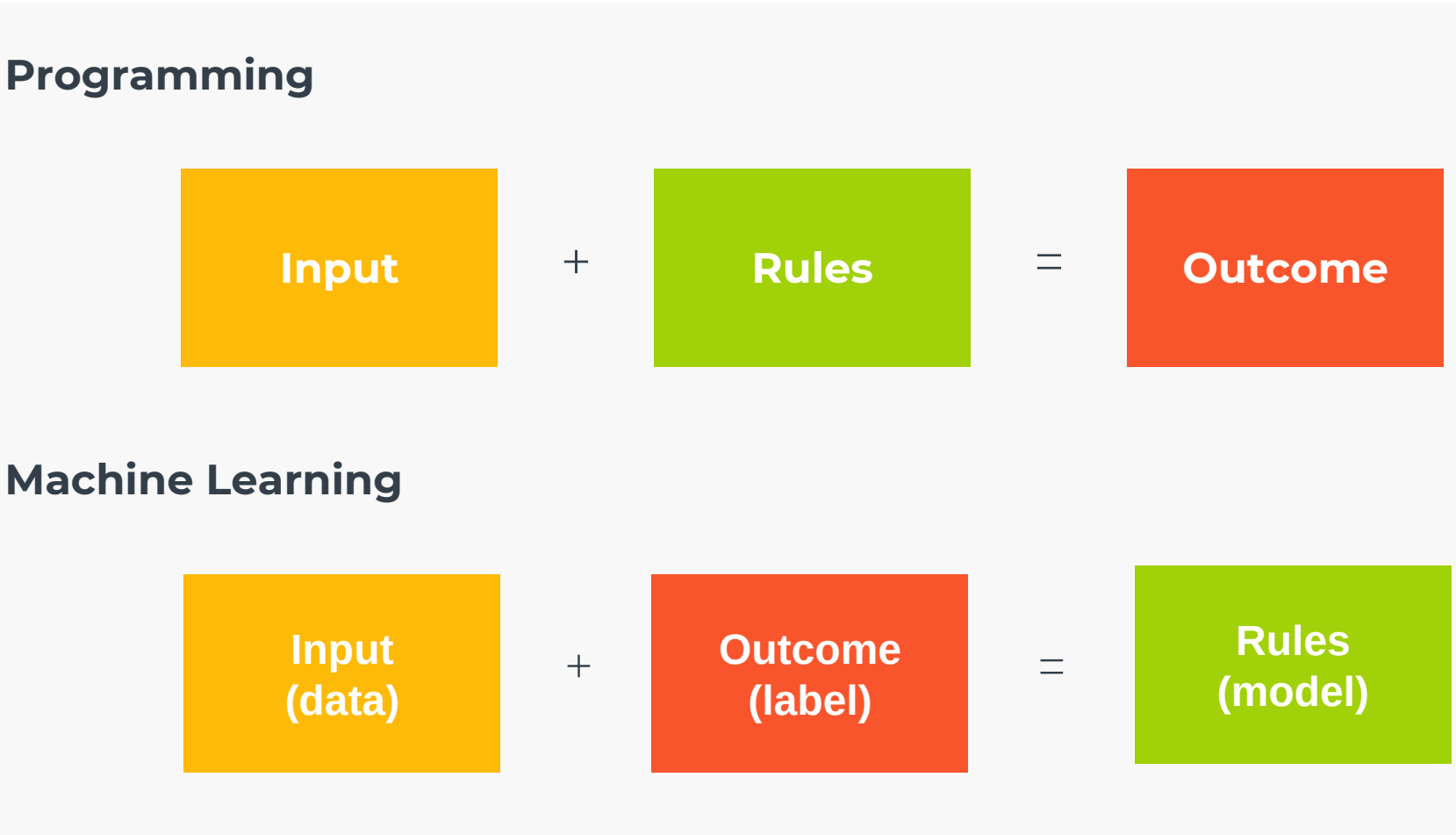


98.7%	0%
0%	100%
0%	0%
0%	0%
0%	0%
0%	0%
0.99	1.00

Collect More Data

EDGE IMPULSE

Machine Learning Finds The Rules



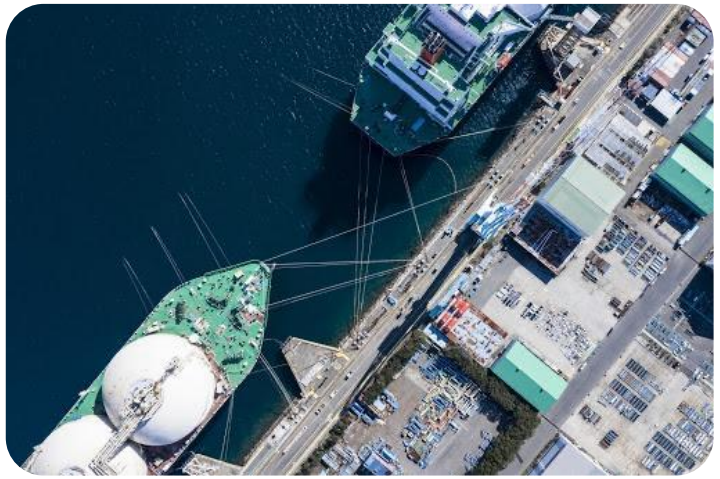
Predictive Maintenance

Motion, Current, Audio, Temp and Camera

- Industrial
- White goods
- Infrastructure
- Automotive

Asset Tracking & Monitoring

Motion, Temp, Humidity, Position, Audio and Camera



- Logistics
- Infrastructure
- Buildings

Human & Animal Sensing

Camera, Motion, Radar, Audio, PPG, ECG, Camera

- Health
- Consumer
- Industrial

EDGE IMPULSE

Embedded ML Makes Devices Smarter

Anomaly Detection
Sensor Classification

20 kB

Cortex-M0+

Voice Keywords
Audio Classification

50 kB

Arduino Nano
Cortex-M4

Image
Classification

250 kB+

Arduino Pro
Cortex-M7

Object Detection
Complex Voice
Processing

1 MB+

Raspberry Pi
Cortex-A

Video
Classification

Jetson Nano
Cortex-A + GPU

Vision

Audio

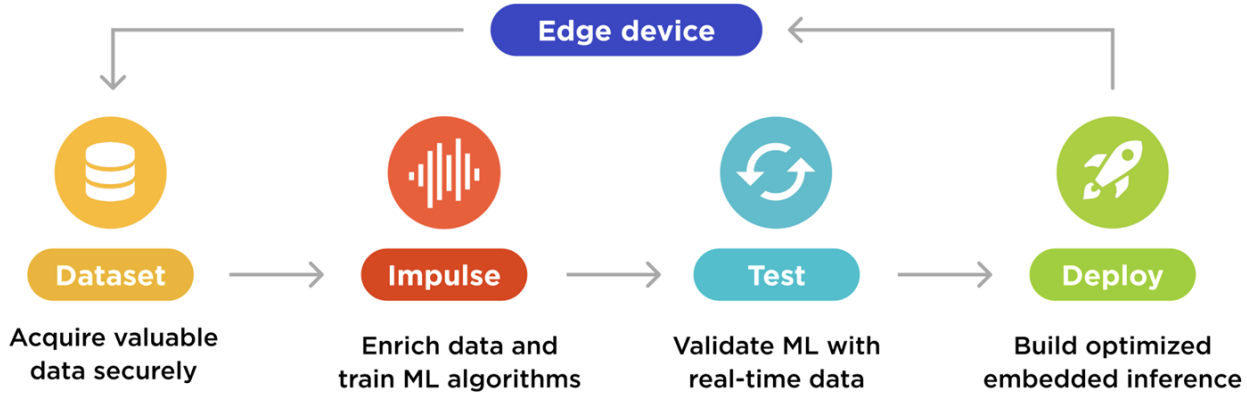
Sensor

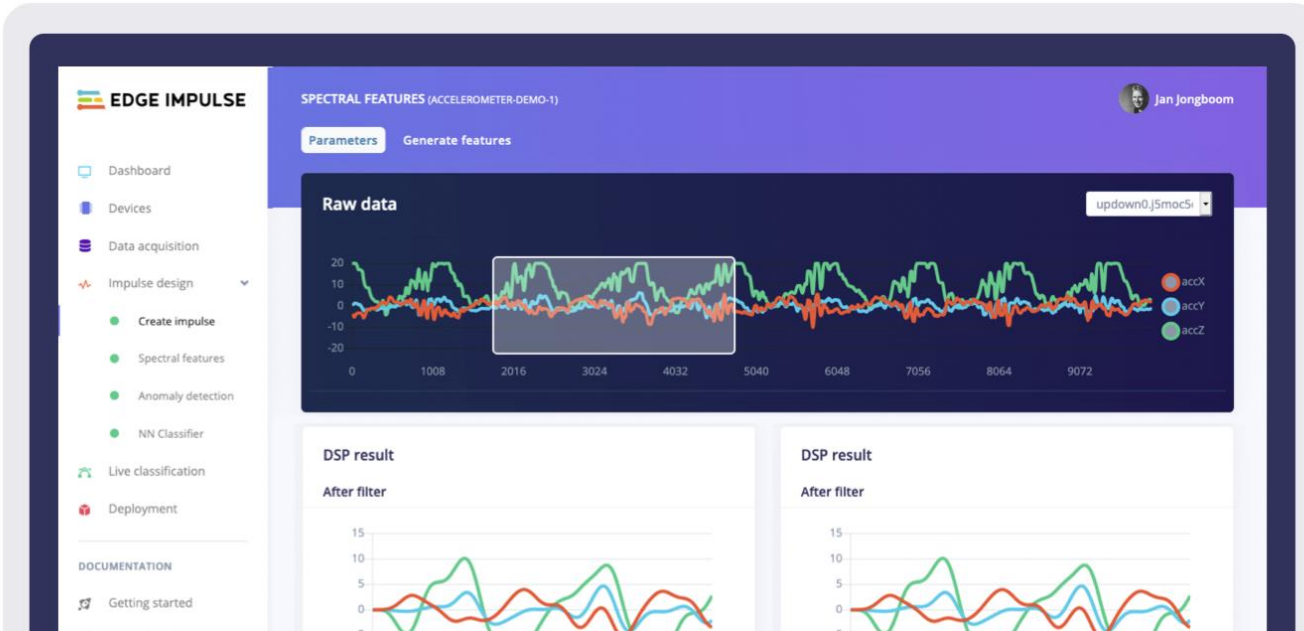
Enabling ML For All Developers

2021 embedded VISION summit

ML lifecycle from sensor to deployment

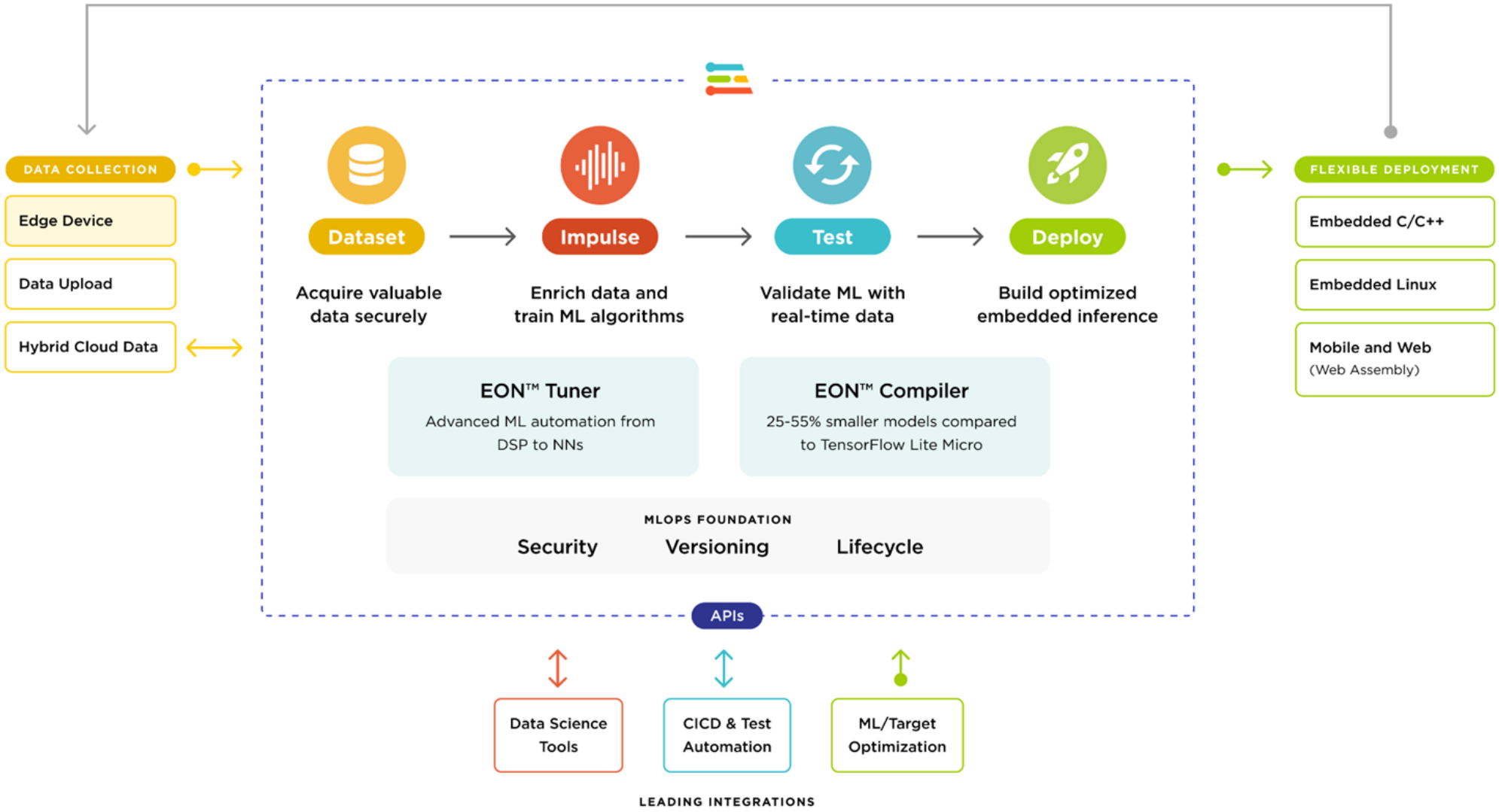
Learn more at http://edgeimpulse.com/





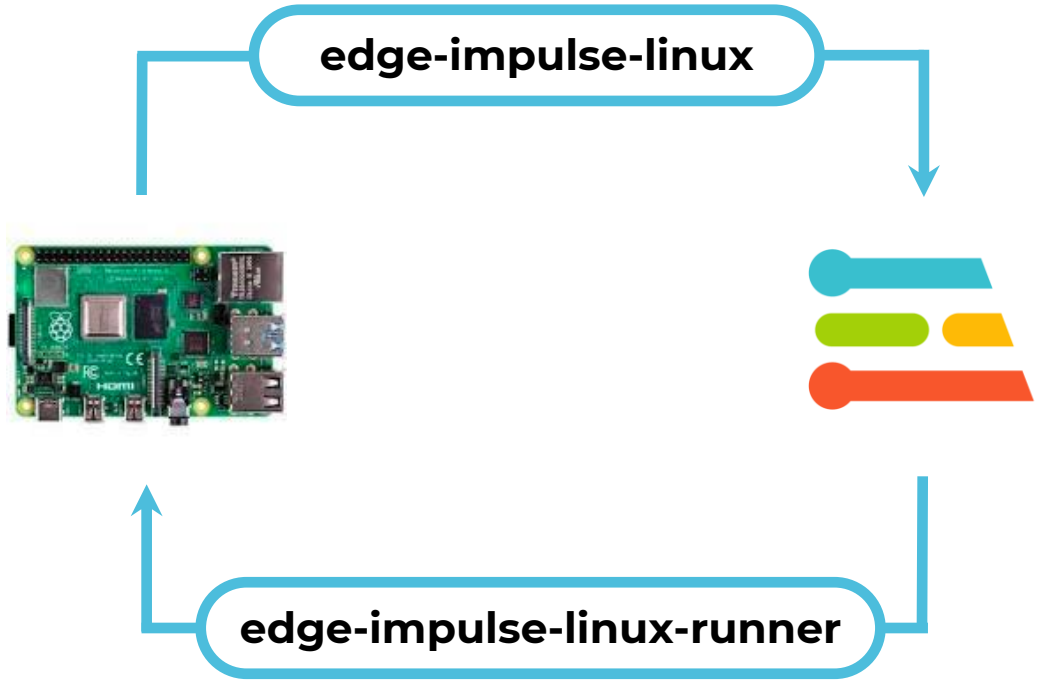
EDGE IMPULSE

Solving The Entire ML And DevOps Lifecycle



Edge Impulse For Linux

- Less than 5 minutes from data collection to custom ML deployment
- Announcing full support for the Raspberry Pi 3 and 4, NVIDIA Jetson and compatible Linux targets
  - Full native hardware acceleration for CPU and GPU
- Data collection from cameras, microphones, and any custom sensor over GPIO
- Integrate with a few lines of code: Python, Node.js, Go or C++



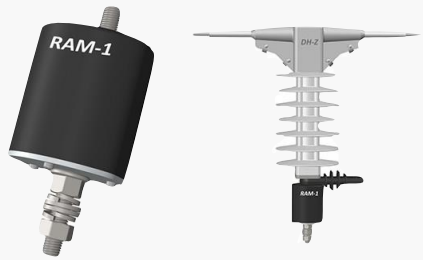
Making The Grid Smarter With ML

Electric grid solution to enable fault detection in real time with Edge Impulse

2021 embedded VISION summit

Current

Motion



Status

Power line fire detected!

Outcomes

- **Enable automated monitoring of poles and lines**
- **NB-IoT with 20+ year battery life made possible by ML**
- **Avoid disastrous wildfires and reduce maintenance costs**

IRNAS IZOELEKTRO NORDIC SEMICONDUCTOR arm

Testimonial from IRNAS: *"The efficiency gain in this project is from 1 man year for 3 FTE (embedded dev, data scientist and ML expert man month for 1 FTE by 1 subject matter expert who can do it all by himself"*

EDGE IMPULSE

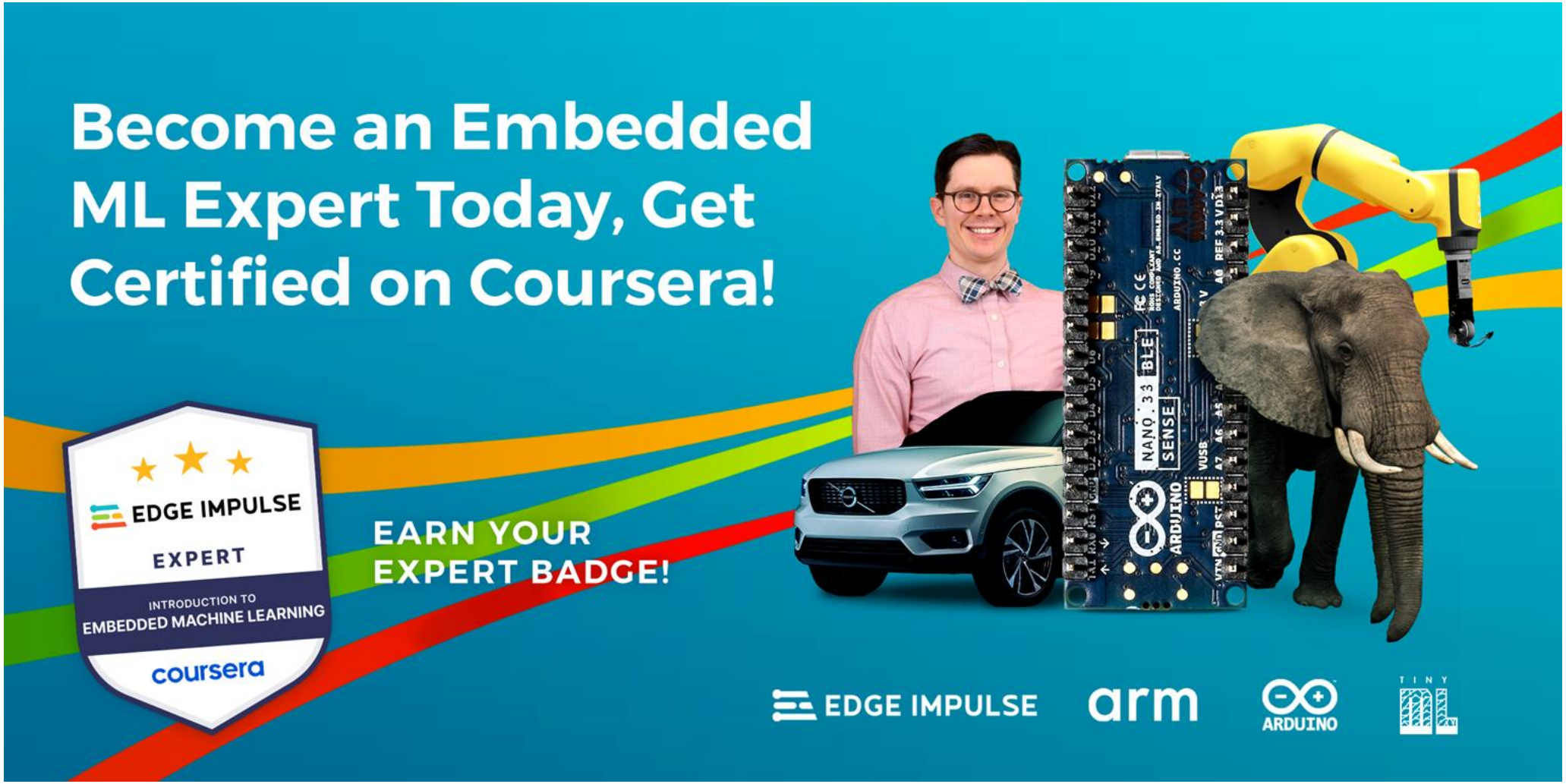
Advanced Grid Monitoring System

IoT Data! = ML Data

50 Billion Devices

4.4 Zettabytes

Deploy ML Where It Makes Sense



https://www.coursera.org/edgeimpulse

Further Resources

[Coursera Course on Embedded ML]

[Smart Grid Case Study]

[Get Started with Edge Impulse for Linux]

2021 Embedded Vision Summit

Demos

- Low-compute Image Classification with Himax Grayscale Camera
- Effortless Digit Recognition with Arduino Portenta
- Power Up with Jetson Nano Object Detection
- Build an Image Classification Solution Under $5

Panel Discussion

- Can You Make Production ML Work Without Dozens of PhDs?

Over-the-Shoulder Tutorial

- Build Industrial Embedded ML Solutions on CPUs and MCUs

EDGE IMPULSE