

Semiconductor Chips that Support AI

for Smart Sensors and IoT

Examples for predictive maintenance

COMPANY AT A GLANCE

POLYN Technology – a fabless semiconductor company developing hardware-based AI solutions for electronic sensors

- ✓ Team of 40+, with 15 PhD, lead by serial high-tech entrepreneurs and seasoned Board of Directors. We operate out of UK, EU, and Israel offices.
- ✓ Angels and VC funded, with \$12M closed Seed Round; currently raising Round A of \$12M
- ✓ Target markets – wearables, earbuds and hearing aids, Industrial IoT, smart tires, healthcare monitoring
- ✓ Initial products are:
 - voice extraction for earphones, hearing aids, phones
 - health monitoring and human activity recognition
 - vibration monitoring in tires, automotive applications
 - eye positioning and gesture capturing for AR/VR applications
- ✓ 30+ patents; existing sales, and a strong pipeline.



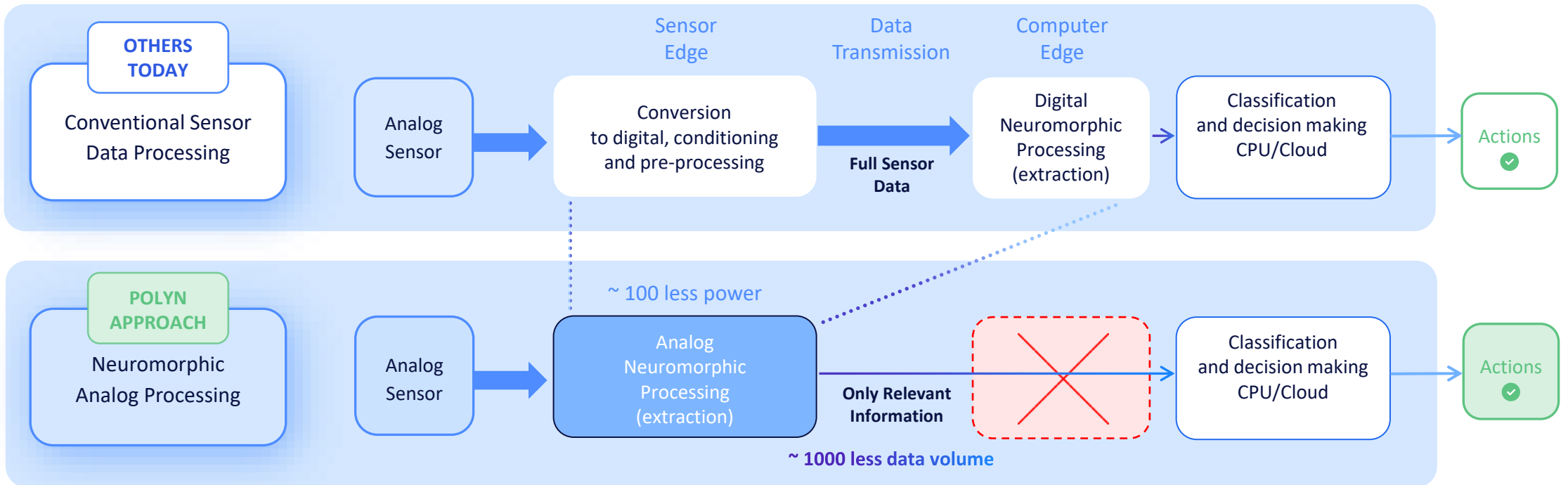
ALEX TIMOFEJEVS

CEO

SOLUTION: NEUROMORPHIC ANALOG SIGNAL PROCESSING FOR SENSOR RAW DATA

Analog neuromorphic cores based on true parallel process extract relevant information from sensor raw data more efficiently than traditional digital methods that are based on deterministic operations

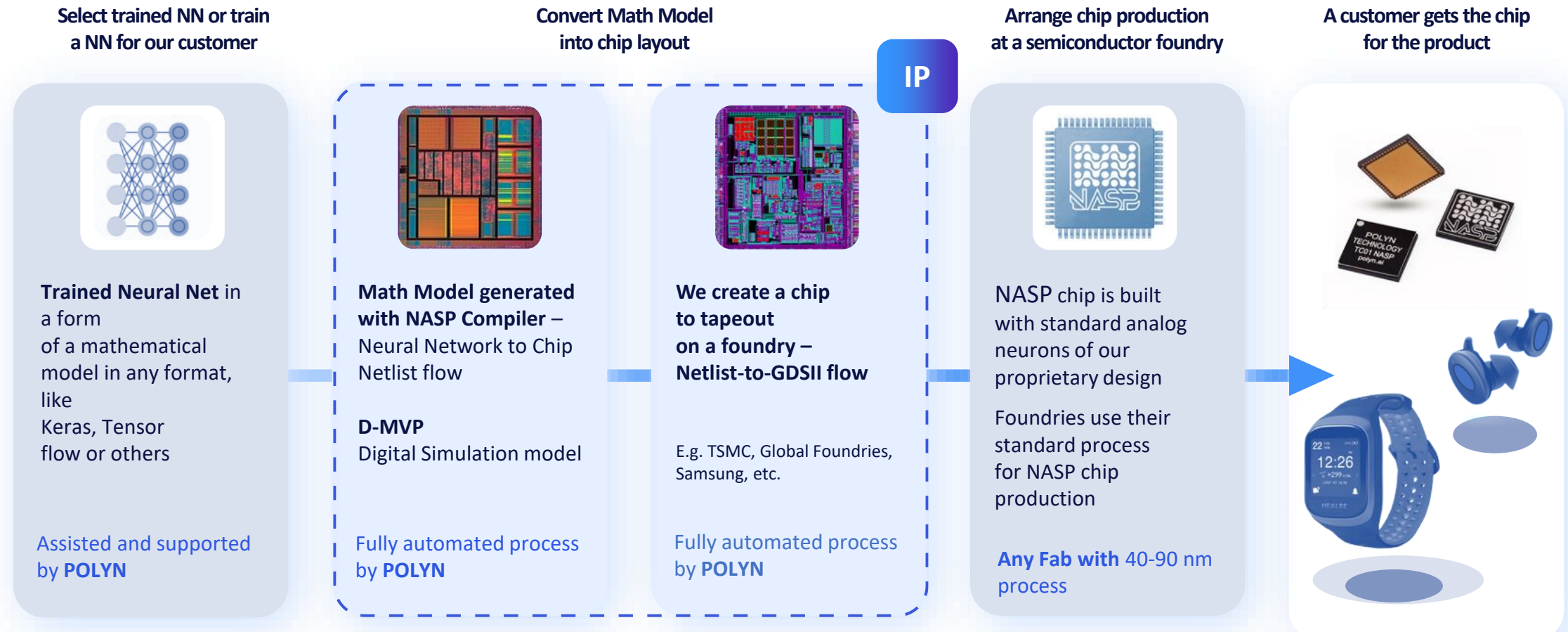
Our approach to extracting relevant information from sensor raw data is based on mimicking biological sensing processes of nature



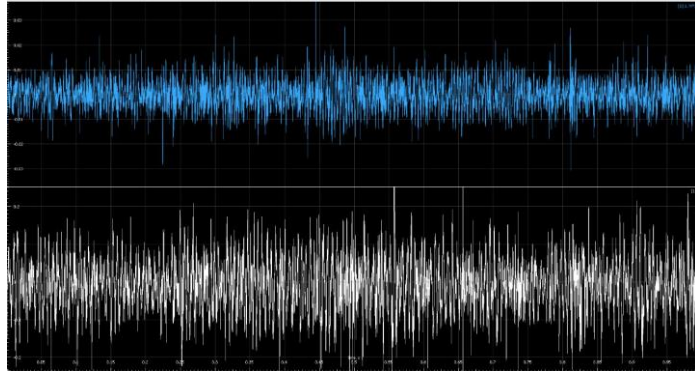
An analog neuromorphic front-end that **mimics the physical structure** of a neural network is several orders of magnitude **more efficient** than a digital system that is using deterministic calculation of a mathematical model

HOW WE DO THIS: A TECHNOLOGY PLATFORM

- Our NASP technology platform is the key to developing and manufacturing the neuromorphic front end
- The technology allows for the compilation of digital neural networks to analog neuromorphic core and its manufacture
- It is protected by **over 28 patents**



CHALLENGE OF VIBRATION (ACCELEROMETR) SIGNAL PROCESSING



Input signal from 1 axis accelerometer >0,6 Mbs for 10 KHz bandwidth

- Data compression with minimal information loss and efficient NN size
- Avoid lossy compression
- We need to find an encoder function to minimize the information loss or maximize mutual information:

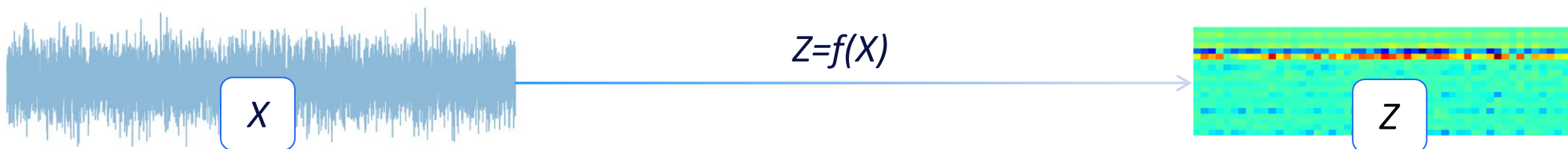
$$\hat{f} = \operatorname{argmax}_{f \in F} I(X; f(X))$$

where X is an input signal,
 f is an encoder,
 I is mutual information.

The above is hard to optimize directly. We can minimize an autoencoder loss searching for the decoder function g as well:

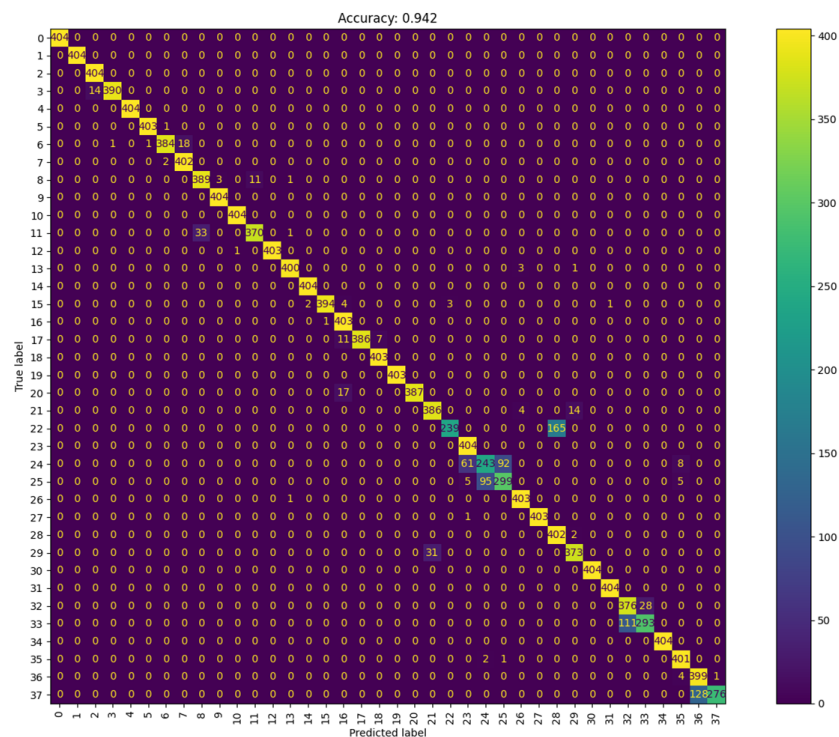
$$\hat{f}, \hat{g} = \operatorname{argmin}_{f \in F, g \in G} L(X, g(f(X)))$$

Visualization of the encoding process: transforming input signal into latent representation



METRICS AND RESULTS ON TEST DATA SET

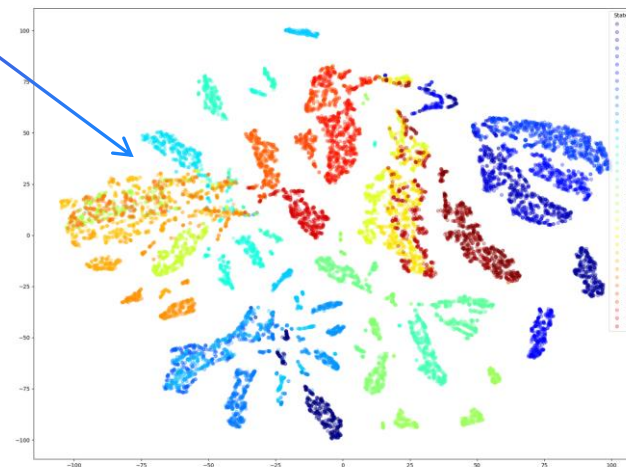
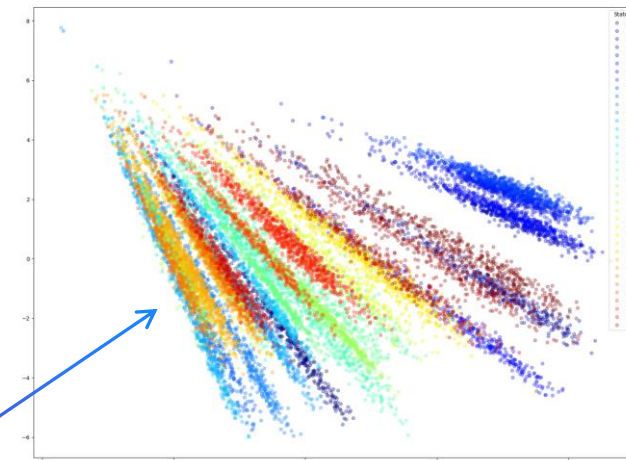
- 38 classes (balanced)
- 11 hours
- 921 millions of data points



PCA
projection

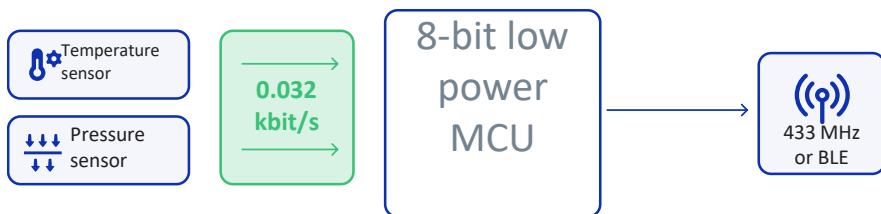
Well-structured
low-dimensional
space

T-SNE
projection



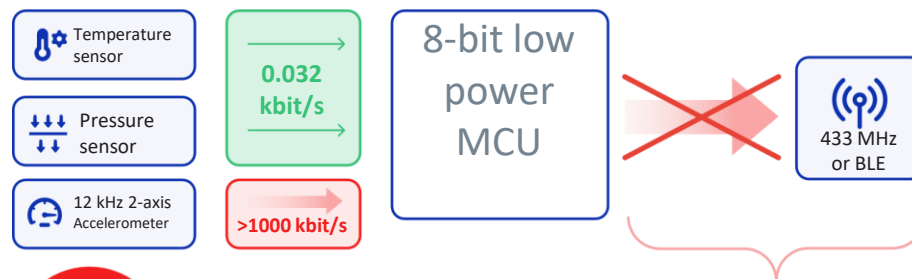
NFE – ENABLING SOLUTION

TPM sensor node As Is Low-rate data flow



CR2405 battery - 5Y lifetime

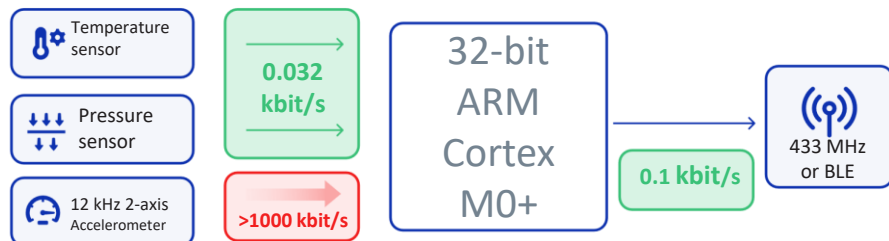
TPM + accelerometer



CR2405 ~ 2 hours lifetime

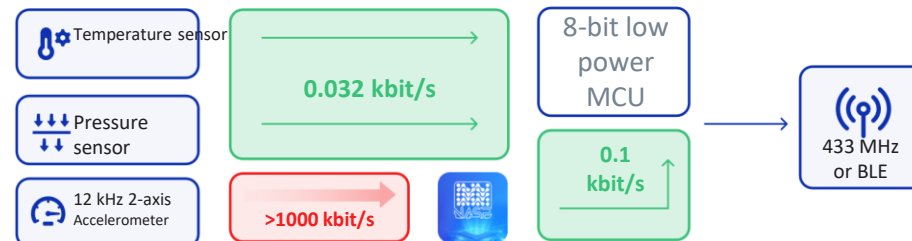
No way transmit such High-rate data flow

On-sensor preprocessing Digital MCU



CR2405 battery ~ 30 days lifetime

On-sensor preprocessing NASP VibroSense NFE



Power consumption: <100 μ W
Enabling Energy harvesting operations

WHAT WE DO TODAY: ADDRESSING IMMEDIATE MULTI-BILLION-UNIT MARKETS

POLYN Technology platform delivers enabling solutions for various applications



[YouTube](#)


IoT [1 min video](#)
enabling solution

VibroSense™

VibroSense is a standalone chip that **extracts relevant information** from vibration sensors, significantly reducing data and power needs for condition monitoring and predictive maintenance. This **enables** widespread use of **wireless transmission**, wireless power, and **energy-harvesting** solutions

Paid PoC now

TAM: ~4B units by 2027



[YouTube](#)


Voice Processing [1 min video](#)

NeuroVoice™

NeuroVoice is a standalone chip providing ultra low-power voice detection and **voice extraction**, in most challenging noise environments, leading to enhanced functionality and new customer experiences across a wide range of voice communication products

Sales contract

TAM: ~2B units by 2027



[YouTube](#)

Always-ON monitoring for wearables [2 min video](#)

NeuroSense™

NeuroSense is a standalone chip providing ultra low-power **always-on solution** for continuous detection and monitoring of human activity and its multiple bio-parameters, revolutionizing wearables functions and user experiences

TAM: ~1B units by 2027