Octonion

Industrial Machine Intelligence with Edge AI

Digitalizing Assets for Optimized Maintenance

May 2021

Unplanned Downtime Costs «a Lot»

Unplanned Downtime

- 46% caused by machine health*
- 23% caused by operating error**

Can cost up to €220K/hour for a manufacturer*

- Massive waste of energy and resources
- Reliability issues limit operational efficiency and innovative potential

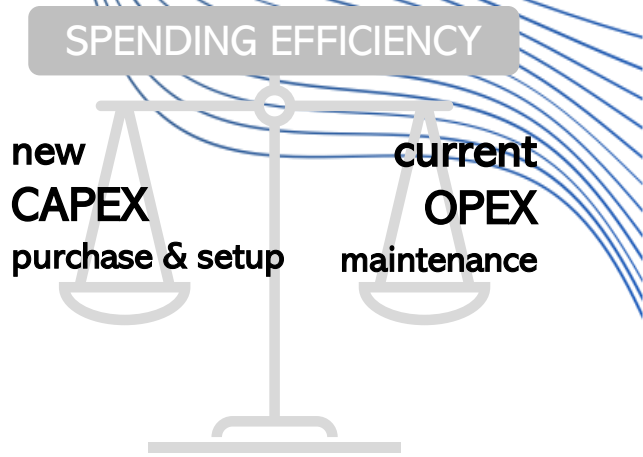
65% of companies think predictive maintenance could help prevent unplanned downtime and major failures*.

There is a need for automated machine intelligence solutions to **prevent unplanned downtime** and **increase machine value**.

Source: *Vanson Bourne Report; **Business Wire; Gartner EdgeAI Report 2021

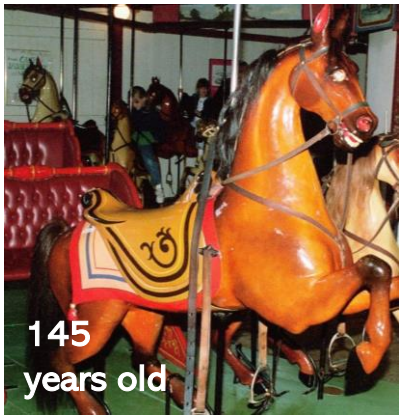
Strategic Decisions about Assets

70% of companies **lack complete awareness of when equipment is due for maintenance or upgrade***.



Replacing and maintaining machines is a strategic decision made without the necessary knowledge:

- **Machine health is unknown.**
- **Real machine age is unknown.**



Well maintained machines can outlive their life expectancy:

Machine intelligence is necessary to determine real machine age and machine health.

Source: *Vanson Bourne Report; 10 of the oldest carousels in the USA (usatoday.com); Heavy equipment: When to rebuild, repair, or replace capital assets - Funding Circle

When can AI / ML make the difference?

Through AI supported predictive maintenance, **zero unplanned downtime might be achievable** in many industries.**

Benefits of AI Based IIoT Solutions

- Uses existing data and infrastructure
- Setup and calibration is **quick** and **uncomplicated**
- Exponentially **faster pattern recognition** using ML
- Self-optimizes **autonomously**
- **Industrial scalability is increased**

- ✓ **Cost effective implementation of machine intelligence to the product**
- ✓ **Minimal dependency for optimizing maintenance and operations**
- ✓ **Increased autonomy and efficient operations advance innovation**
- ✓ **Effective digital transformation and IIoT scaling**

Source: *Vanson Bourne Report; **Predictive Maintenance Market: From Niche Topic to High ROI Application (iot-analytics.com)

Issues with Existing IIoT AI Solutions

Current solutions use **supervised machine learning**, with the downsides:

- Requires large datasets
- Only recognize known states
- Cannot self-optimize
- Requires large computation power and needs to be done in the Cloud

Further **challenges related to being centralized on Cloud**:

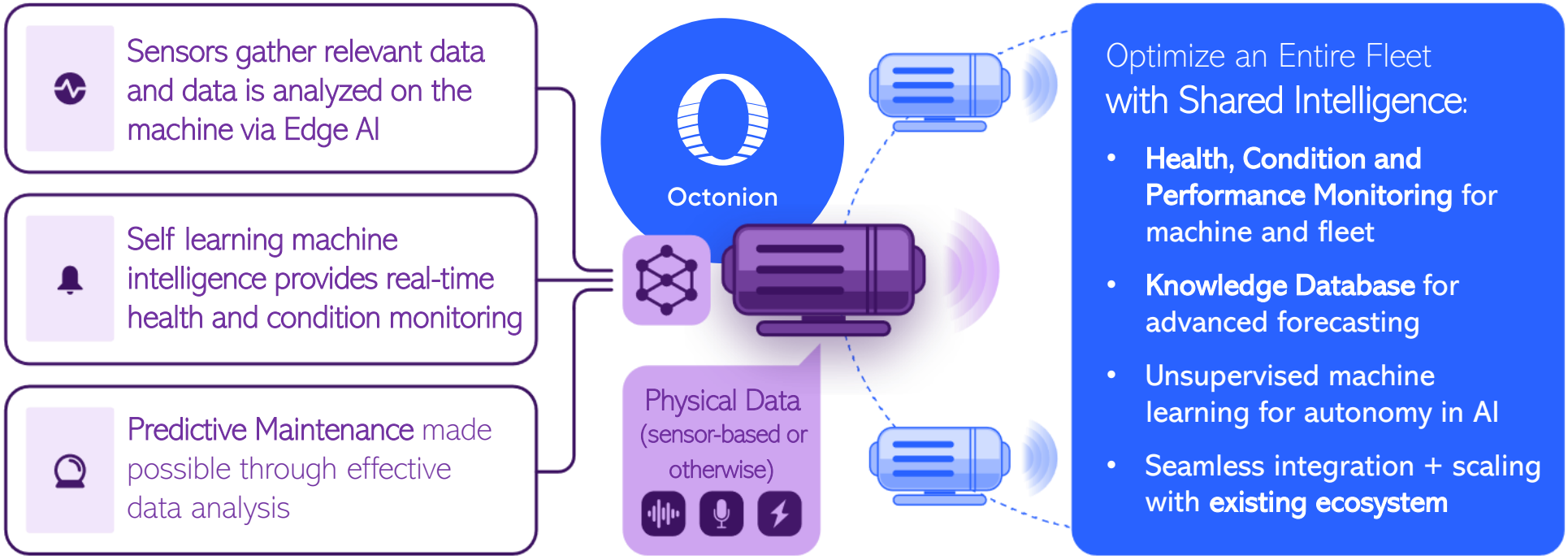
- Exponential costs from infrastructures and services
- Vulnerability to data breaches and security limitations
- Delays from network latency and connectivity limitations
- Limited capability for action at the asset level
- Insufficient data available for quality AI / ML analysis

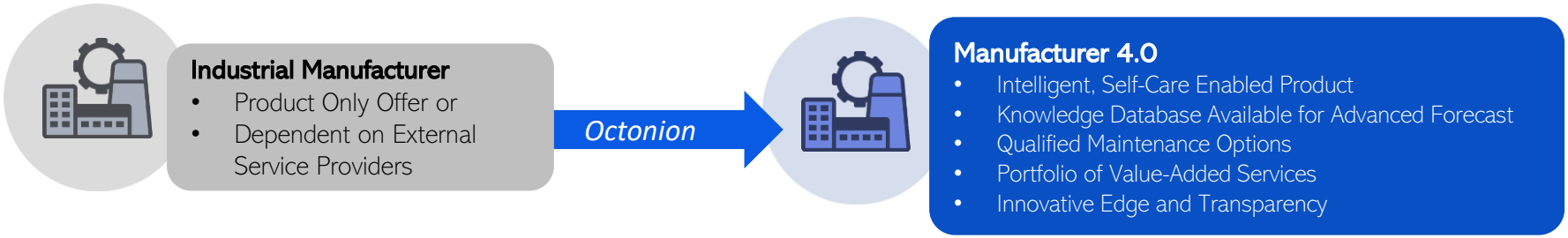
- **Edge solutions** handle data at the point of its collection **to make data actionable with minimal computation power**
- **Decentralized, autonomous solutions** using **Edge AI** can provide machine intelligence **at the asset level,** utilizing Cloud only where it makes sense.

Our Solution

Machine Intelligence at the Edge

Octonion software enables Machine Self-Care with real time, on device diagnosis to optimize maintenance for operational excellence.





Ecosystem

ECOSYSTEM ACCEELERATORS

TINY ML · AVNET INTEGRATED · arm

EDGE AI

ON DEVICE ANALYSIS

AI / ML

Octonion Machine Intelligence

SENSORS

lynxemi commercializing concepts · tatwah sa MANGO · Weidmüller · AVNET SILICA

DATA

ON DEVICE SENSING

CHIP COMPONENTS

life.augmented · ON Semiconductor

INSIGHTS

USER PLATFORM

Intelligence Portal

GUI for visualizing the insights and managing the application of AI to the whole fleet

USER PLATFORM

AI Lab

GUI for specializing AI for the need of the customer and improving the fit to the existing ecosystem

RESULTS

ON-DEVICE AI PERSONALIZATION

MAINTENANCE MANAGEMENT

DEPLOYMENT

Bosch IoT Suite

CUSTOMER PLATFORM

Software Components for deployment to customers ecosystem

CLOUD

Microsoft Azure IOT · AWS IoT Core · IBM Watson

MOTORS & OTHER ACTION HARDWARE

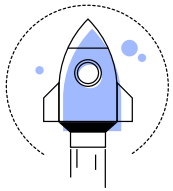
for Machine Self-Care Enablement

AI Lab

Device-to-cloud solution for customizing AI

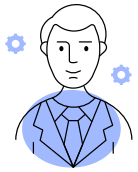
CUSTOMIZE LIKE AN EXPERT

Use your domain knowledge to quickly calibrate Octonion Machine Intelligence to the specific use case and equipment type.



OPTIMIZE AI QUALITY

Experiment with various modifiable parameters of the AI pipeline to reach the target quality for any of your equipment.



NO-CODE FINE TUNING

Your engineering team can manage the entire process of AI personalization and optimization of product creation processes.

Speed up AI model personalization by 50%

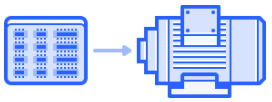
AI Lab Application:
a web application that helps to create an Edge AI Model suitable for the given customer use case.

Recorder Application:
a Raspberry PI based application, which collects data from the device and delivers it to the cloud for further exploration inside AI Lab application.

Embedded Lab Application:
a firmware binary for a target device that intended to grab sensor data and transfer it to the Recorder Application.

Intelligence Portal

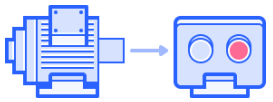
One-stop-shop to calibrate, evaluate and deploy AI



Setup Machine Intelligence

CALIBRATE

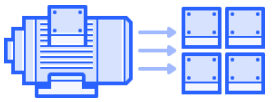
Setup workspaces to manage a variety of devices via shared intelligence. Add devices and utilize AI to benchmark patterns and anomalies automatically for later monitoring.



Monitor State and Health Changes

EVALUATE

Visualize results and track the changes to machine health and performance on a detailed timeline. Provide further context into the database to optimize the predictive abilites of the AI.



Optimize and Scale Solution

DEPLOY

Expand machine intelligence onto the whole system through shared intelligence managment, optimize AI quality and predictive abilities through the growing database.

Features

Analytics
- Dashboards
- Reports

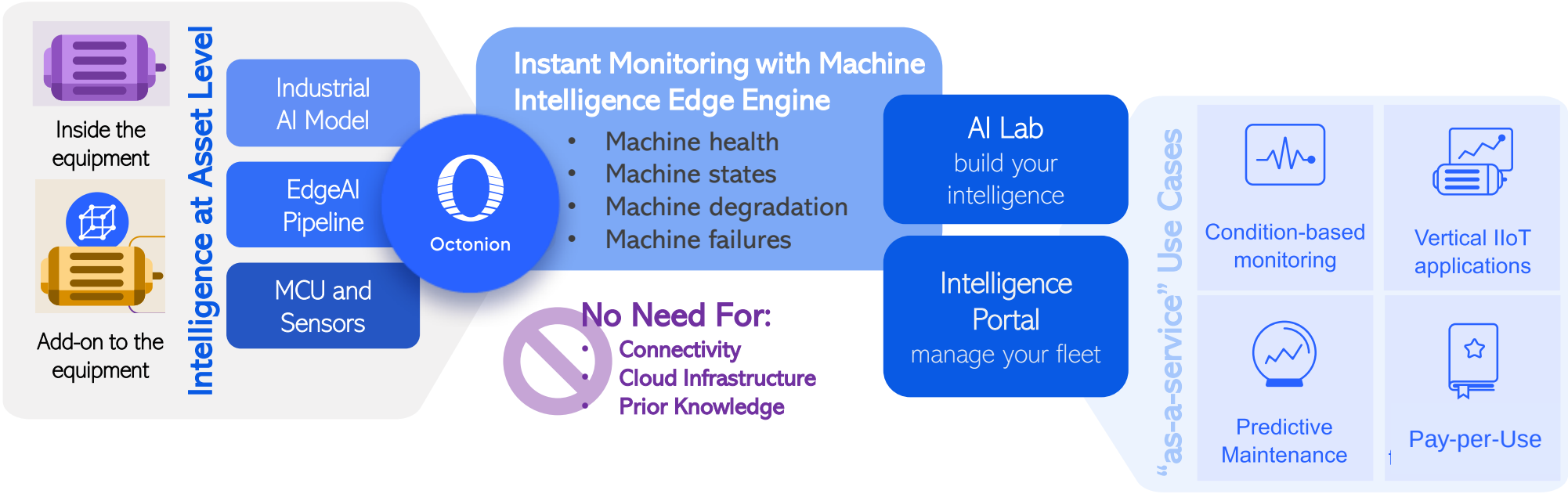
Events Timeline with KPIs
- Machine Health
- Count & Intensity of Anomalies
- Novelty Patterns
- Stationary Measure

- Default parameters for quick setup
- Possible to fine tune in AI Lab

Value Proposition: Fast Track to “as-a-service”

With serviceable intelligence and self-care capability:

Transforming industry equipment into IoT-enabled assets with real-time machine health to ensure reliability and add value.

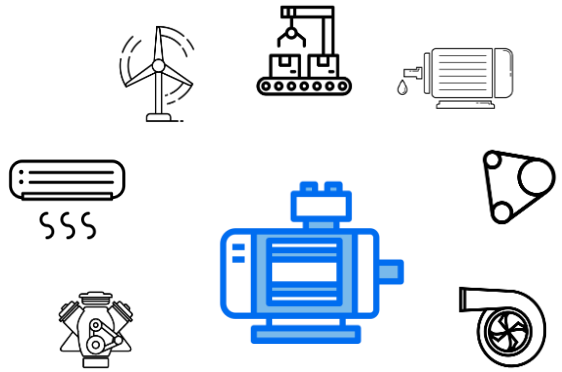


Growth of Industrial Edge AI

The growth in ultra-low bandwidth networks for IoT **compels more industrial enterprises to Edge AI*.**

By 2025:

- 50% of new IoT products will **ship with advanced diagnostics**, **compared to less than 1% in 2020.**
- More than 50% of all data analysis by Machine Learning **will occur at the point of capture in an edge system**, **up from less than 5% in 2020.**



160B machines in the world
23B chips are sold every year

90% are using ARM-based microcontrollers

Focusing on machine intelligence for microcontrollers allows Octonion to provide a **practical and unique solution at the Edge for Industrial IoT market.**

Source: *Gartner EdgeAI Report 2021

Enabling customers for emerging market trends

We understand our customers and provide them the access to advancing market trends like:

Servitization

Switch the responsibility of maintaining the assets from the end user **to the industrial manufacturer.**

Equipment-as-a-Service (EaaS)

- Move from B2B to **B2B2C**
- **Reduce in-house hardware infrastructure***
- **Reduce internal IT maintenance needs***
- **Increase uptime and throughput***

Product Differentiation

Stand out in the competition with Edge AI flexibility.

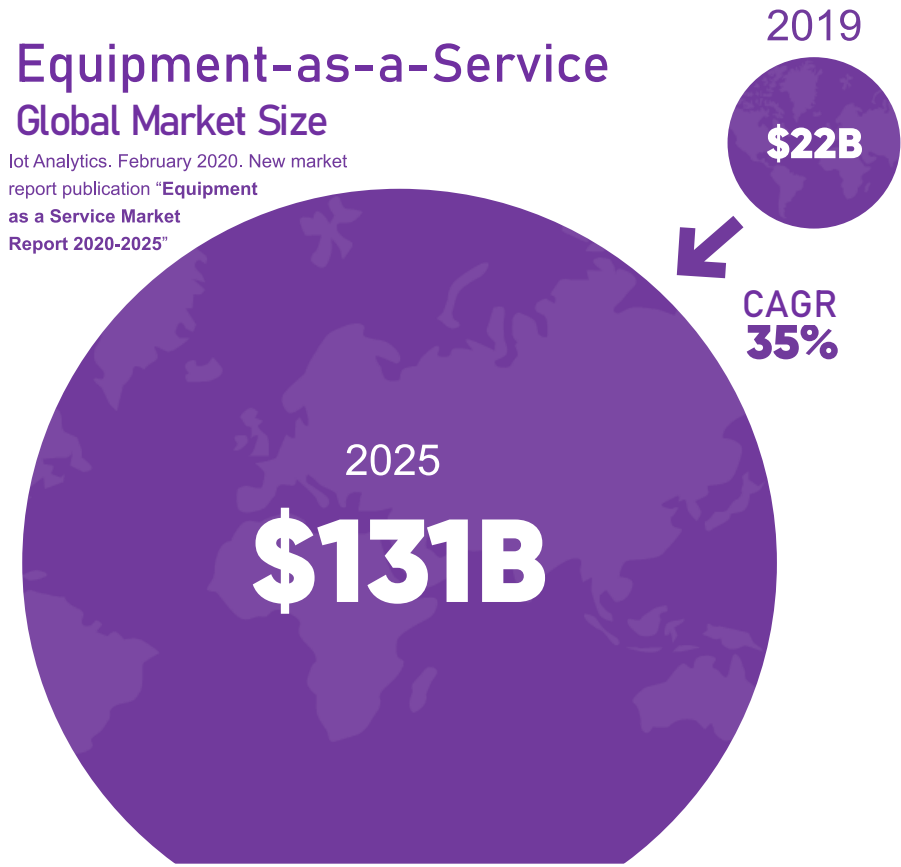
Innovative Edge

Digitalize assets and produce smart machines cost effectively, in a short time with unsupervised ML.

On-Demand and Micro Manufacturing

Optimize operations

Customize user experience cost effectively



 *2019 Manufacturing Trends report, * CPG Manufacturers Software as a Service (SaaS) and Machine as a Service | Automation World*

The future of industrial AI is “unsupervised”

Benefits of unsupervised machine learning:

Lower Cost of AI Implementation

Quicker Setup & Results

Easier AI Maintenance

Autonomous from the Get Go

Unsupervised ML has the capability to detect states of the machines without a database of known vibration signatures

Quality without the Big Datasets

No need for big datasets to train the state recognition algorithms and improve the quality of AI

Independence from the Cloud

No need to train the algorithm on Cloud due to the large computation power required for supervised learning

Anticipating the Unknown

Designed to detect states that were unforeseen at design stage and were not reproduced at machine qualification phase

Self Optimizing

No need for training the algorithm each time a new behaviour is detected

Octonion helps utilizing unsupervised ML for these unique benefits.

Industrially future proof, ready to scale

Non-invasive integration with existing equipment and IIoT solutions

Agnostic to HW and Industrial Setup

No mechanical and hardware changes

- Compatible with existing equipment (retrofitting)
- Easy to integrate inside to new products due to low power / computation requirements
- Whether your tools change, grow operations or adapt new tools, Octonion fits

No specific infrastructure changes

- Friendly for integration with existing IIoT solutions due to low bandwidth requirements
- No need for investment to new / one more IoT ecosystem
- Less resources wasted on specializing solutions

Effective digital transformation

- Lower entry cost and lower time-to-market for machine intelligence
- Innovation enabled cost effectively and quickly

Continuous autonomous optimization at the Edge

- Doesn't stop AI modelling at Lab and the solution evolves during equipment life cycle
- Able to detect new states and emergencies even after the adjustments done in AI Lab

Default compliance with data security requirements

- Utilizing Edge AI for insights eliminates the data security concerns related to Cloud
- Data is kept inside the organization and with the stakeholders that need it

Example Use Cases

PRODUCT USE CASE

MACHINE INTELLIGENCE

- Digitalizing Asset Management
- Predictive Maintenance
- Self-Care Enablement
- Improving UX

BUSINESS USE CASE

OPERATIONAL EXCELLENCE

- Maintenance Optimization
- Reducing Maintenance Costs
- Enabling Value-Added Services
- Competitive Differentiation

Outcomes

INDUSTRIAL OUTCOMES

SMART MACHINES
ensure reliability and track health

MAINTENANCE OPTIMIZATION
reduce costs, predictive maintenance

DIGITAL TRANSFORMATION
digitalize assets effectively

BUSINESS OUTCOMES

PRODUCT DIFFERENTIATION
enhance product abilities to stand out

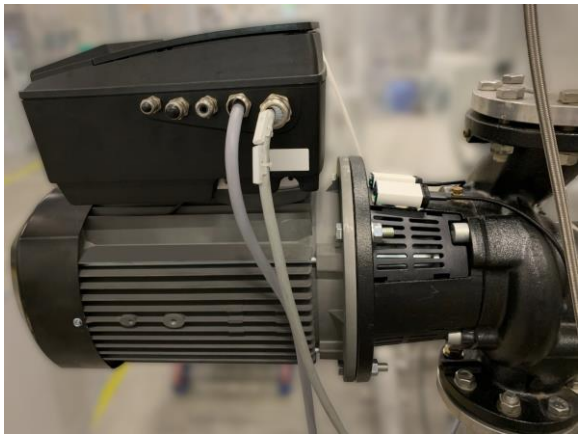
SERVITIZATION
introduce value-added services

INNOVATIVE EDGE
advance innovation by handling the hassle

Case Study: Smart Machines

Tracking water-pump health for predictive maintenance

Enabling pump's health monitoring at the pre-production state in order to validate health estimation behavior during manufacturing tests and provide the basis for predictive maintenance.



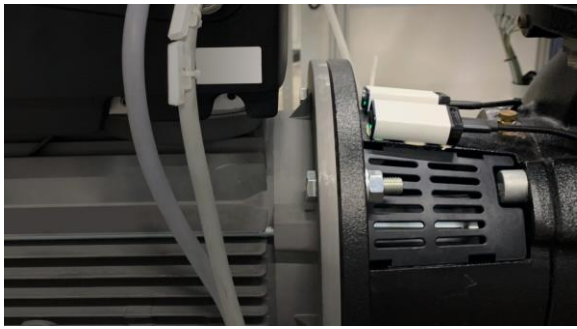
Goals

- Organizing remote evaluation of the pumps' health to optimize pre-production validation
- Alerting in case of issues forecasting due to pump degradation in order to organize on-site visit and check pump before its breakage

Results and Impact

"We use Octonion's Machine Intelligence to provide a forecast of our pump's health status. We identified Octonion as a valuable technology that we can leverage to provide direct information at the factory floor."

– Customer Testimonial, September 2020



Key Metrics:

50% increase in **Equipment Uptime**

30% decrease in **Maintenance Costs**

Case Study: Maintenance Optimization

Obstacle detection for rolling door safety systems

Overcoming the issues of rubber mechanical contact detection solutions which are prone to aging and self-damage, as well as costly to setup and maintain.

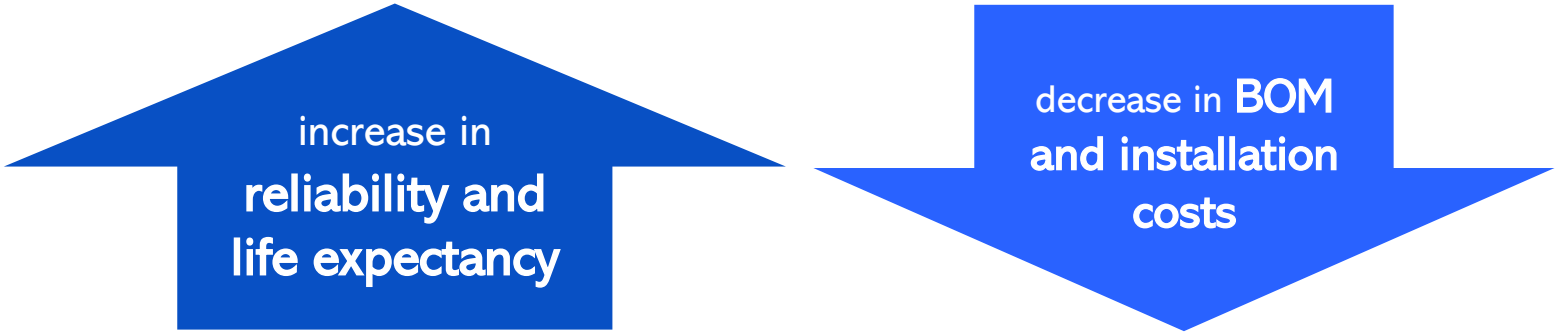
Goals

Providing alternative rolling door sensor design to:

- **Prevent reliability issues that come with material aging/misuse**
- **Reduce cost of installation and maintenance**

Results and Impact

- We provided an intelligent rolling door by using a lightweight accelerometer-based sensor setup which does not require rubber.
- This design overcame the issue related to rubber used in mechanical contact detection aging
- Our design also reduced the BOM and installation cost for rolling doors.



Case Study: Product Differentiation

Machine Health monitoring for value-added services

Industrial fans were being monitored manually by human intervention which is costly and prone to error. In addition to reducing maintenance costs, this large industrial provider for motors and fans wanted to differentiate their offer by adding innovative analytics services to their offering.

Goals

- **Automating the monitoring and detecting anomalies in motors and fans**
- **Creating value by integrating Octonion reporting in their product offering**

Results and Impact

- We enabled the automation of their maintenance activity by reducing the need for human intervention, which helped optimizing their quality control.
- Octonion analytic abilites being a part of their offer allowed them to expand their value-added services and increase their top line.

30% decrease in **on-site interventions**

10% increase in **their top line by leveraging services**

Case Study: Servitization

Machine intelligence for value-added services for industrial ACBs

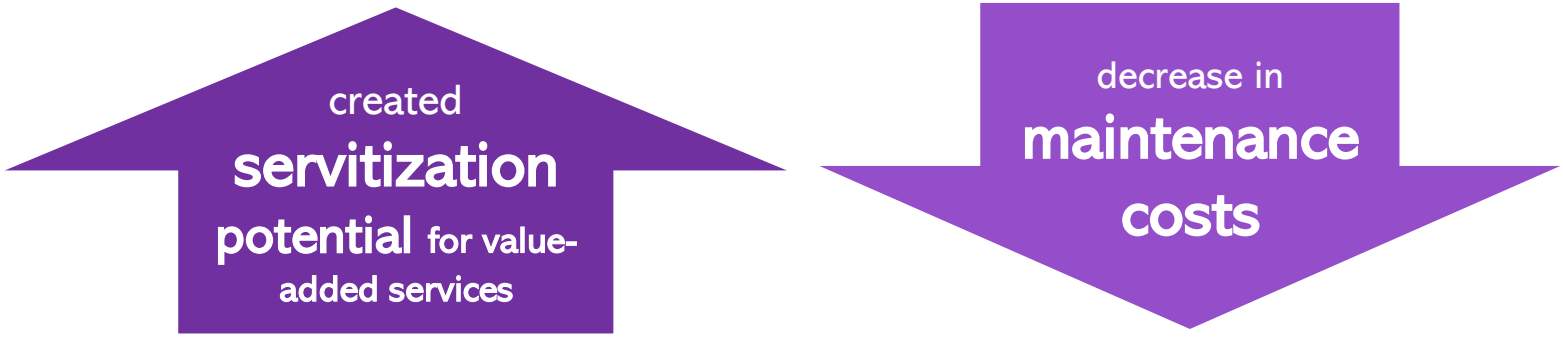
Detection and monitoring of air circuit breakers (ACB) to maintain the perfect health value during operation, to be provided as internal maintenance service to add value to the hardware.

Goals

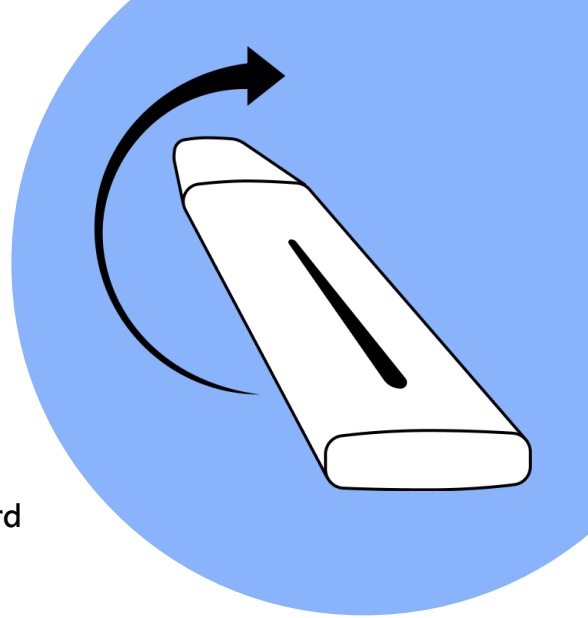
- **Help creating smart ACBs by allowing them to communicate health issues with operators**
- **Reduce cost of maintenance by speeding up evaluation**

Results and Impact

- Built an AI model to identify changes of health in the 3 different stages of operation for ACBs and implemented the model for the self-care enabled, smart ACB.
- Made issues and health analytics available to operators for actionability at the machine level.



Case Study: Innovative Edge



Machine Intelligence for the small consumer device

Enrich user experience via a new level of device control and functions updatability

Goals

- Empower consumer devices with the ability to recognize gestures via inertial sensors on-board
- Initiate device functions triggered by recognized gestures
- Make a future-proof product by utilizing Firmware Update Over the Air feature
- Enable device usage analytics

Results and Impact

- **Possibilities to interact with a device increased dramatically** from the number of mechanical controls to the unlimited variety of gestures.
- The company moved **from zero knowledge** about product usage **to the detailed analytics** of its operation and user behavior.

Key Metrics:

90%
highlight an **engaging UX** that **differentiates** the brand

feature and firmware update
delivery time reduced
from **years to months**

Customer Journey: Scaling with the Industrial Customer

Project Kick Off (1 month)

- Allign on Project Scope
- Set Milestones and KPIs
- Establish Risks
- Select HW
- Ship HW to Customer

Intelligence Set-up & Training

- Setup devices (up to 5) and configure software
- Customer onboarded to product (1 week)
- Setup and support a channel for customer feedback
- Monitor calibration results against predetermined KPIs
- Evaluate calibration results and outcomes with customer

Calibration (3 months)

Evaluation (3 months)

- AI Model tuning based on calibration outcomes
- Scale to 20 devices for evaluation
- Support customer interactions regularly
- Monitor equipment availability
- Monitor validation criteria and set up a recovery plan
- Finalize HW setup for scaling

AI Adaptation (ongoing throughout)

- Adapt AI base on raw data
- Provide FW with new AI

Deployment (6 months)

- Deploy the product up to 100 devices to a fleet of similar machines
- Perform field tests for (up to 6 months)
- Visualize machine states and health value on a fleet of machines
- Enable automatic sharing of intelligence database across the fleet
- Improve intelligence database by labelling new states
- Validate project KPIs with the customer.

Scaling (6 months – 5 years)

- **Pilot (up to 6 months): 100 to 1000 devices to validate the scalability within customer infrastructure**
- **Mass Deployment (5 years minimum)**

R&D Evolution Journey of Octonion

Securing the future with advance technology purpose built for the Industrial IoT ecosystem

2016

- Introduced Edge AI running multiple motion analyzer algorithms on **low-power MCU**
- Inhouse toolset evaluated to the holistic, automated system for machine learning.

2017

- **AutoML evaluation**: model is trained automatically based on data instead of manual per-use-case setup
- Introduced the Autoencoder-based and **Recurrent Neural Networks (RNN)** motion classifiers

2018

- Unsupervised Motion Detector for automatic data labeling
- Data augmentation based on **Generative Adversarial Network (GAN)** allows training accurate enough models with the small data set.
- Benchmark tool implemented **for selecting top-performing AI pipeline** for the generic use case

2019

- Running **MobileNet-based Neural Network** using 10kb RAM on MCU.
- Unsupervised Learning evolution: Pattern of Patterns, Machine health

2020

- Sound pattern detection and classification approach based on **Gated Recurrent Union and Convolutional Neural Networks** on low-power MCU
- Cross-device Predictive Maintenance model distribution with health measure and sound pattern recognition

About Octonion

Experienced

Formed in 2014, we perfected our product through R&D and gathered immense knowledge about our market, our product and our industrial customers' needs.

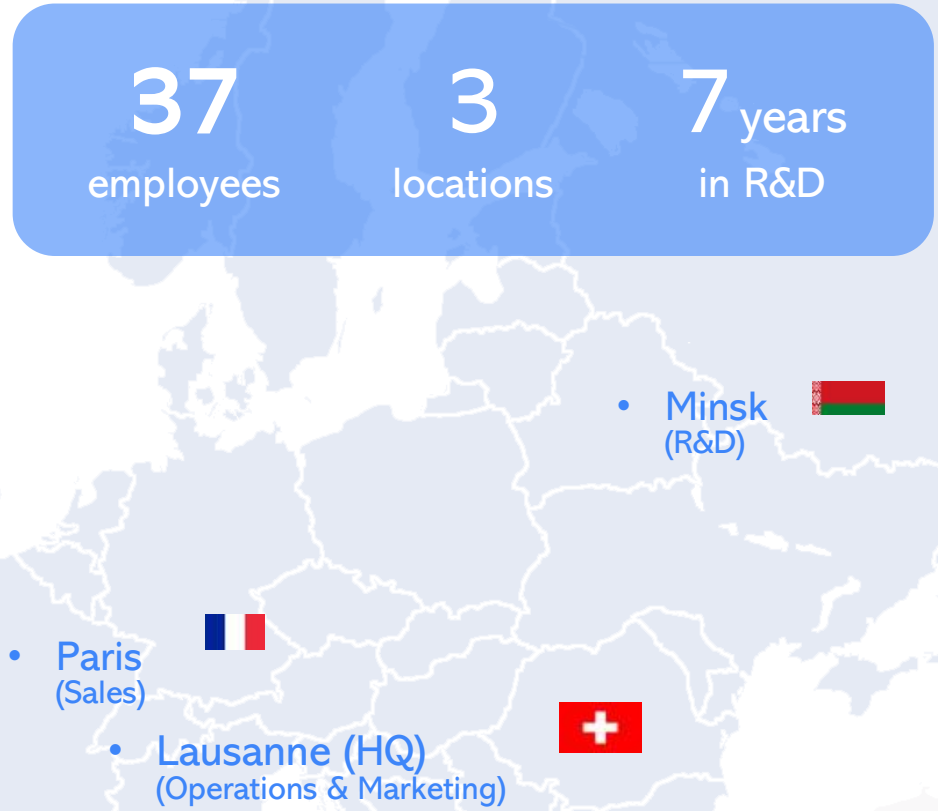
Skilled

Our team has immense expertise in technical fields of **unsupervised machine learning** and AI model training; and experience in operations, finance, sales and marketing.

Diverse

We work with an international team with multiple locations. Being culturally dynamic is a key factor in how we operate as a company.

37 employees | **3** locations | **7** years in R&D



Key Partners:

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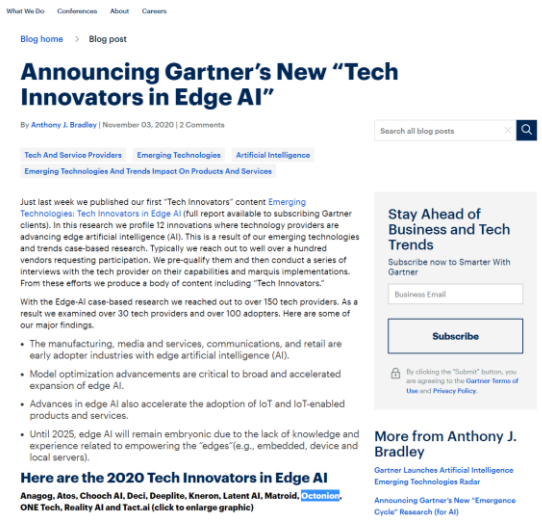

What We Do Conferences About Careers

Blog home > Blog post

Announcing Gartner's New "Tech Innovators in Edge AI"

By Anthony J. Bradley | November 03, 2020 | 2 Comments

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Tech And Service Providers | Emerging Technologies | Artificial Intelligence | Emerging Technologies And Trends Impact On Products And Services

Just last week we published our first "Tech Innovators" content Emerging Technologies: Tech Innovators in Edge AI (full report available to subscribing Gartner clients). In this research we profile 12 innovations where technology providers are advancing edge artificial intelligence (AI). This is a result of our emerging technologies and trends case-based research. Typically we reach out to well over a hundred vendors requesting participation. We pre-qualify them and then conduct a series of interviews with the tech provider on their capabilities and marquis implementations. From these efforts we produce a body of content including "Tech Innovators."

With the Edge-AI case-based research we reached out to over 150 tech providers. As a result we examined over 30 tech providers and over 100 adopters. Here are some of our major findings.

- The manufacturing, media and services, communications, and retail are early adopter industries with edge artificial intelligence (AI).
- Model optimization advancements are critical to broad and accelerated expansion of edge AI.
- Advances in edge AI also accelerate the adoption of IoT and IoT-enabled products and services.
- Until 2025, edge AI will remain embryonic due to the lack of knowledge and experience related to empowering the "edges"(e.g., embedded, device and local servers).

Here are the 2020 Tech Innovators in Edge AI

Anagog, Atos, Chooch AI, Deci, Deeplite, Kneron, Latent AI, Matroid, Octonion, ONE Tech, Reality AI and Tact.ai (click to enlarge graphic)

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Gartner Launches Artificial Intelligence Emerging Technologies Radar

Announcing Gartner's New "Emergence Cycle" Research (for AI)

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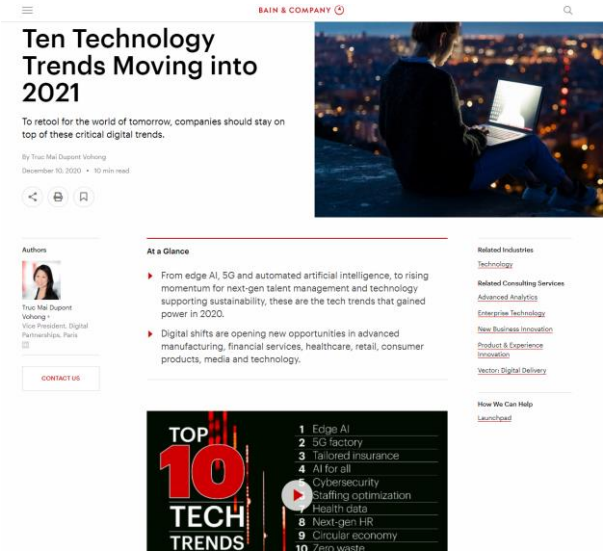


BAIN & COMPANY

Ten Technology Trends Moving into 2021

To retool for the world of tomorrow, companies should stay on top of these critical digital trends.

By Truc Mai Dupont Vohong

December 10, 2020 • 10 min read

Authors

Truc Mai Dupont Vohong
Vice President, Digital Partnerships, Paris

CONTACT US

At a Glance

- From edge AI, 5G and automated artificial intelligence, to rising momentum for next-gen talent management and technology supporting sustainability, these are the tech trends that gained power in 2020.
- Digital shifts are opening new opportunities in advanced manufacturing, financial services, healthcare, retail, consumer products, media and technology.

TOP 10 TECH TRENDS

1 Edge AI
2 5G factory
3 Tailored insurance
4 AI for all
5 Cybersecurity
6 Staffing optimization
7 Health data
8 Next-gen HR
9 Circular economy
10 Zero waste

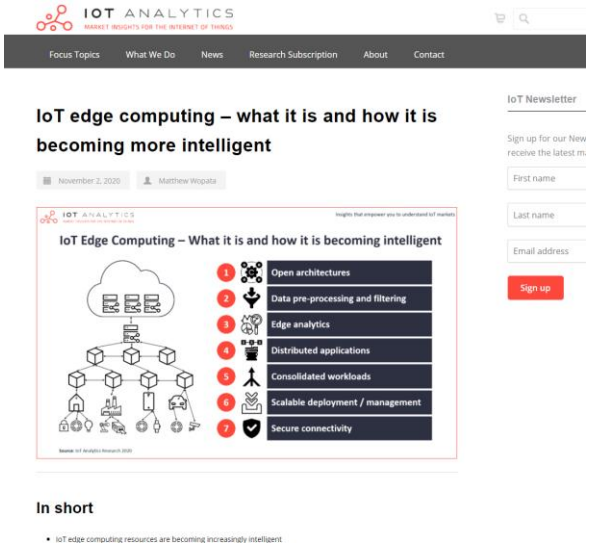
Related Industries
Technology

Related Consulting Services
Advanced Analytics
Enterprise Technology
New Business Innovation
Product & Experience Innovation
Vector: Digital Delivery

How We Can Help
Launchpad

IOT ANALYTICS
MARKET INSIGHTS FOR THE INTERNET OF THINGS

Edge Analytics 2020



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IoT edge computing – what it is and how it is becoming more intelligent

November 2, 2020 Matthew Wopata

IOT ANALYTICS

IoT Edge Computing – What it is and how it is becoming intelligent

1 Open architectures
2 Data pre-processing and filtering
3 Edge analytics
4 Distributed applications
5 Consolidated workloads
6 Scalable deployment / management
7 Secure connectivity

IoT Newsletter

Sign up for our New receive the latest m

First name

Last name

Email address

Sign up

In short

- IoT edge computing resources are becoming increasingly intelligent

Our Vision

Become the **industry standard** for machine intelligence **in industrial machines through effective digitalization of assets.**

Our Mission

Guarantee asset reliability without compromising data security by providing innovative unsupervised Edge AI machine intelligence solutions.

Our Values

Industrial

- Provide **the blueprint for the ideal machine and the optimal performance** by collection and analysis of machine and fleet operation data with increasing accuracy.
- Enable **intelligent manufacturing** and identify the cause of lost operational availability through predictive analysis, in order to promote **sustainable production and value chain optimization**.

Organizational

- Collaborate successfully against the odds of **internationality** and **digital collaboration**.
- Flat hierarchies that enable the whole team to be **functionally innovative** through **transparency** and **open communication**.

Octonion

Core Team

Ongan Mordeniz
CEO
omordeniz@octonion.com

Andrei Sheleh
CTO
asheleh@octonion.com

Philippe Fremont
CRO
pfremont@octonion.com

Olivier Broders
CFO
obroders@octonion.com

Gilbert Khawam
Board Advisor
gkhawam@octonion.com

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