FINNISH INDUSTRIAL INTERNET FORUM

Decision Automation and AI-based Supervision

January 27th 2022

Kai Lehtinen, COO

Top Data Science

- Motto : **AI with Results**

- Located in Helsinki, Finland

- Specialized AI and Machine Learning solutions and services
  for multiple industries

- Highly experienced team of data scientists, software engineers
  and business professionals

- Excellent customer track record
  - Finland, Germany, Denmark, Japan, Vietnam,
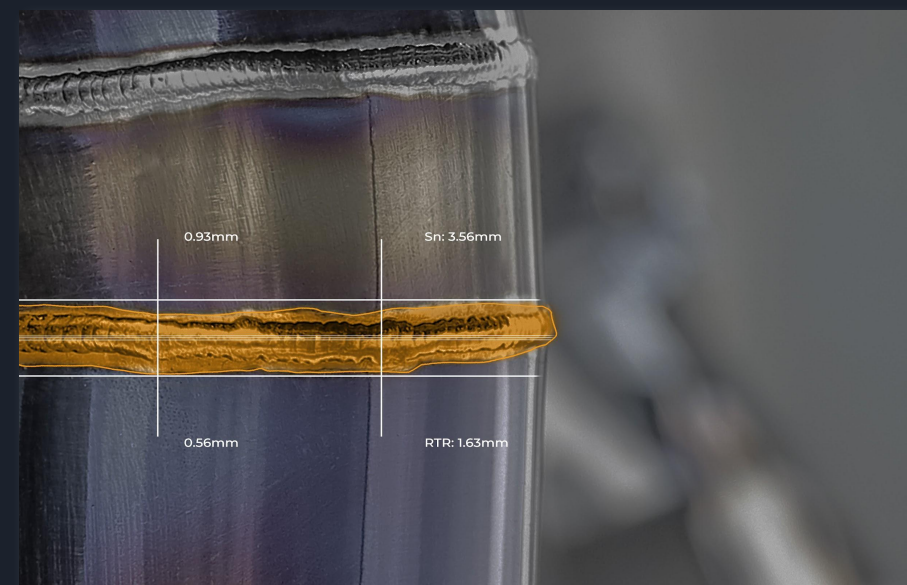   Israel, USA

Industrial Computer Vision

- We combine our **Computer Vision expertise** and our **clients domain knowledge** to co-create solutions for industrial sector that transform business processes for reduced costs, higher productivity, quality and safety

- We have an extensive set of CV application and technology knowhow in the following areas:

Factory & Process Automation

Quality Assurance

Safety & Security

- We are utilizing the most feasible and high-performing CV technologies for each industrial use case.

- Productized technology stack enables **fast prototyping and fluent scaling to production** deployments.

- We support all common cloud technology platforms including Amazon AWS, MS Azure and Google, and deploy also to on-premise and edge environments.
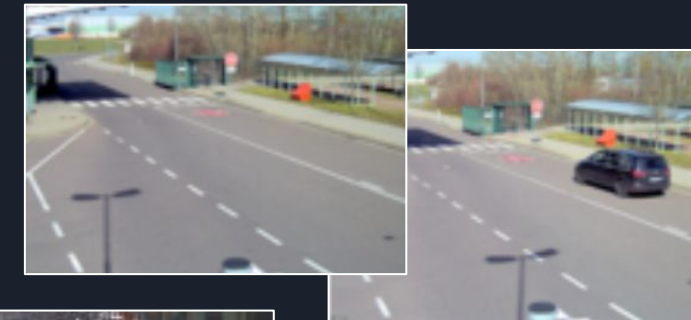
Factory & Process Automation - Case

Stora Enso is a leading global provider of renewable solutions in packaging, biomaterials, wooden construction and paper. Stora Enso has some 25 000 employees in more than 30 countries, and is publicly listed on the Helsinki and Stockholm stock exchanges.

Wide spectrum of industrial process and task automation needs from basic monitoring to demanding operative process tracking and response
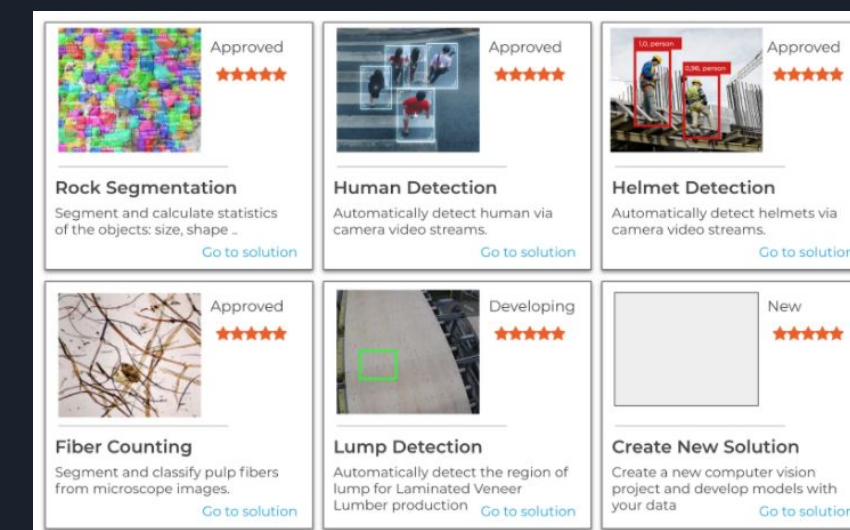
We started providing Stora Enso with Computer Vision applications for process and access monitoring and control. The collaboration in this area has extended and as one key result we co-created an internal CV application marketplace to them.
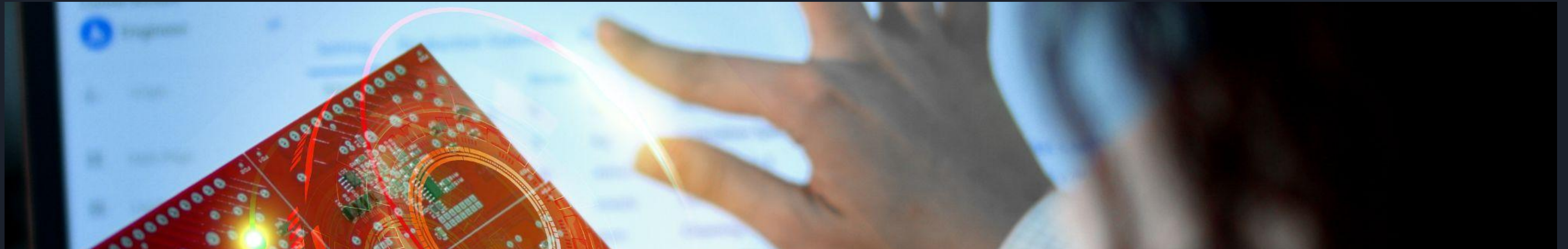
Business value

- **Productivity improvements and cost savings** through automation of manual process monitoring

- **Improved working conditions** through automation

- **Faster response** to problem situations

- Computer Vision platform:

  - Enabling **acceleration** of existing task specific **CV application utilization** across all units and in different production lines

  - Easy-to-use and efficient cloud-based tool to create, manage and distribute CV applications

Applications for different automation tasks

Computer Vision platform to accelerate application utilization

Quality Assurance

- CV technologies are a powerful tool to automate **repetitive**, **high-accuracy** inspection processes without jeopardizing the **quality** requirements of the process
- Our AI solutions for quality assurance are **robust** and **scalable** and can be configured to any manufacturing process

Standardization	**Costs**	**Risk**	**Quality**	**Productivity**
Improve compliance and traceability	Reduce cost and save time by replacing manual work processes with automation	Reduce risks and liabilities through improved quality	Improve quality through more standard quality assurance process	Improve working conditions due to less repetitive tasks

Quality Assurance - Case
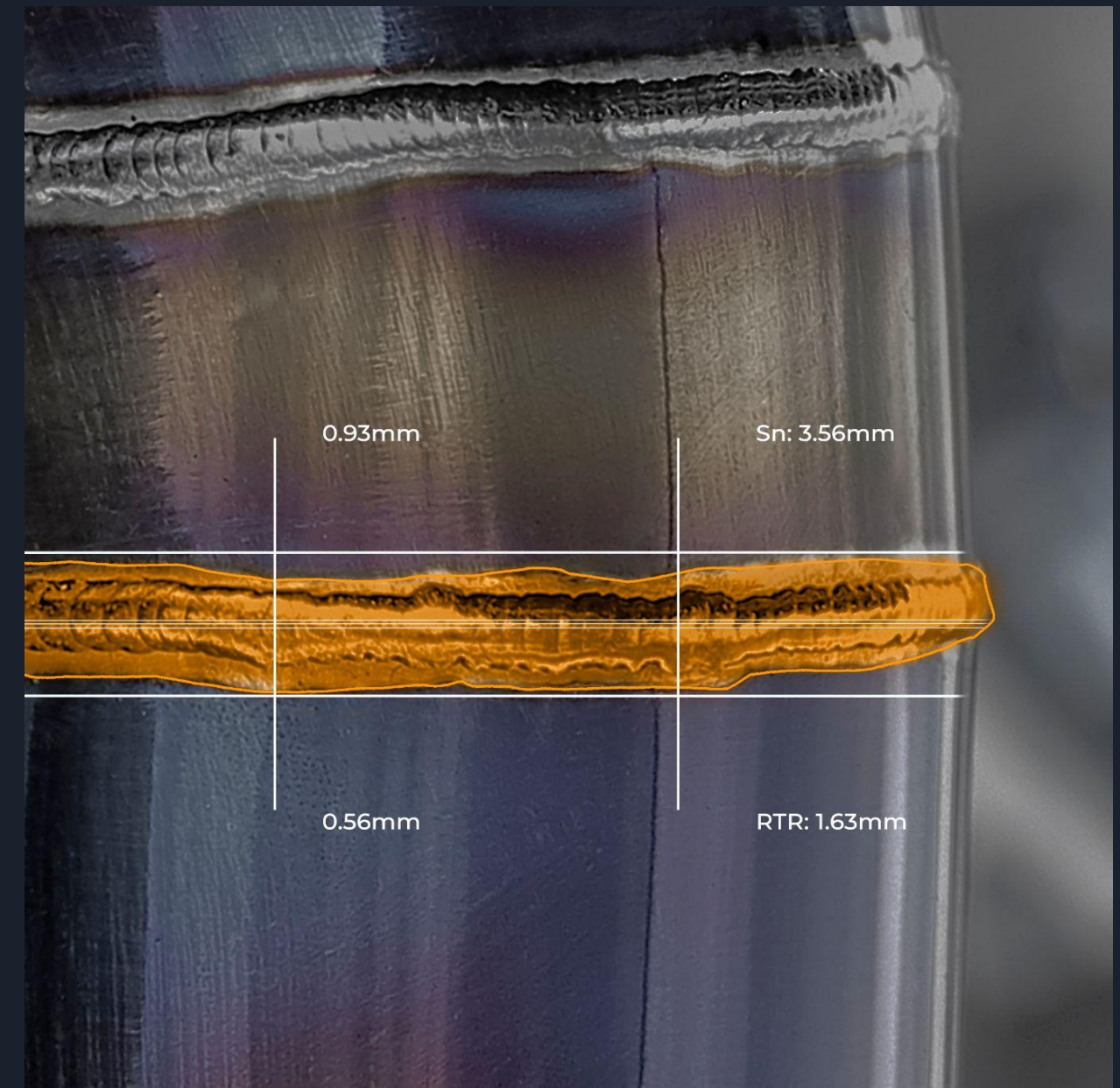
brose
Excellence in Mechatronics

Brose provides high-quality products to automotive industry. They have 25,000 employees at 65 locations in 24 countries and generated 6.2 billion euros turnover in 2019.

Brose performs destructive tests to measure whether the welding quality meets the required standards.

We enabled Brose to automate their highly accurate welding quality assurance process by **combining cloud-based software technology with deep neural network based machine learning**.

Business value

- **Improved speed** of quality assessment and significant **cost reduction** from automation

- **Generalized** AI-based computer vision systems for different weld seam types
  - This eliminates the need of implementation of specific rule-based logic for each new weld seam type in the future

- **Standardized** quality assurance process
  - This eliminates the quality assessment variability coming from subjective opinions of different operators

0.93mm   Sn: 3.56mm

0.56mm   RTR: 1.63mm

TOP data science
A MORPHO COMPANY

Safety and Security

- Our AI based Human Analytics solutions enable organizations to improve safety of business operations and working environment through automated **24/7 monitoring services**

- The AI-based human analytics applications are designed to support multiple use cases, ranging from **movement analysis** and **crowd density analysis** to **human posture detection**

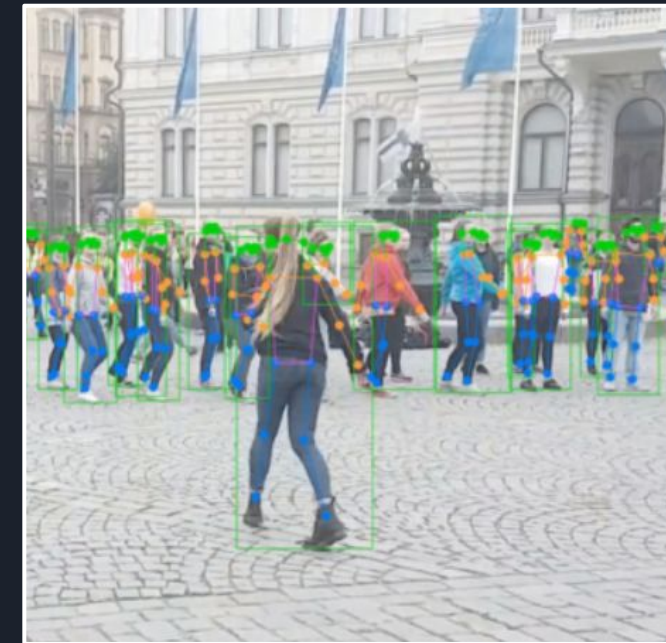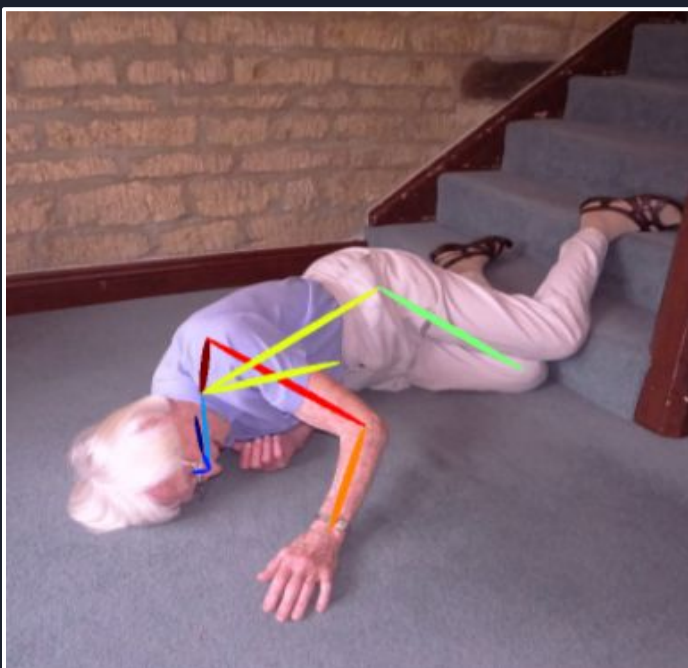| **Safety**	**Security**	**Costs & Scalability**	**Privacy preserved**
Improved ability to detect and respond to emerging or materialized safety risks	Reliable 24/7 monitoring providing improved security procedures	Cost-efficient and scalable 24/7 automated monitoring	Human analytics are designed and deployed according to privacy regulation

Human Analytics AI applications

Crowd Counting & Density Analysis

- Based on Image-to-image learning and predicting with 2D probability densities

- Developed for security and smart cities, actively improving and guiding the operation of officials and security staff

SURE Tampere - City and Event Safety

- Quick trials project where our CV application is detecting human movements and postures

- Use case relate to innovating ways to secure safety e.g. during events

- Technology integration with Nokia Scene Analytics

Pose Estimator

- A state-of-the-art human pose estimation technology

- Wide range of use cases including
  - Surveillance & Security
  - Eldercare
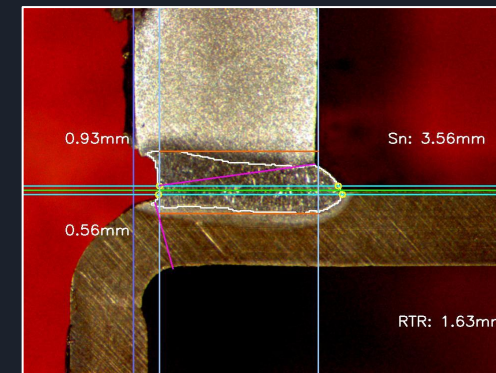 - Retail: Shopper Behaviour Analysis
  - Sport Analytics

Crowd Tracking & People Flow Analysis

- A state-of-the-art technology for tracking of people flow and counting of large groups of humans

- Suitable for aeriel- and static video/images, like drones or city cameras

TOP data science

A MORPHO COMPANY

Solution Framework

Customer value through dedicated applications

High-end, productized AI capabilities

Efficient and flexible solution creation from problem statements to deployment

Real-time inference and edge processing

Factory & Process Automation	**Quality Assurance**	**Human Analytics**	**Transportation & Asset Management**

Pre-built AI packages to be used as a basis for customer solutions

Technology Foundation

Morpho Imaging AI / Edge AI	State-of-the-Art Computer Vision technology and problem solving know-how	Optimal utilization of latest AI / ML technologies

TOP data science
A MORPHO COMPANY

AISA Project:
Solution Framework extended towards Decision Making

Solution Framework extended towards Decision Making

Computer Vision Application Framework

Action Proposal Framework

Plant information systems

Customer value through dedicated applications

Fast and flexible solution creation from problem statements to deployment

Real-time inference and edge processing

High-end, productized AI capabilities

| Factory & Process automation | Quality Assurance | Human Analytics | Transportation & Asset Management |

Pre-built AI packages to be used as a basis for customer solutions

Technology Foundation

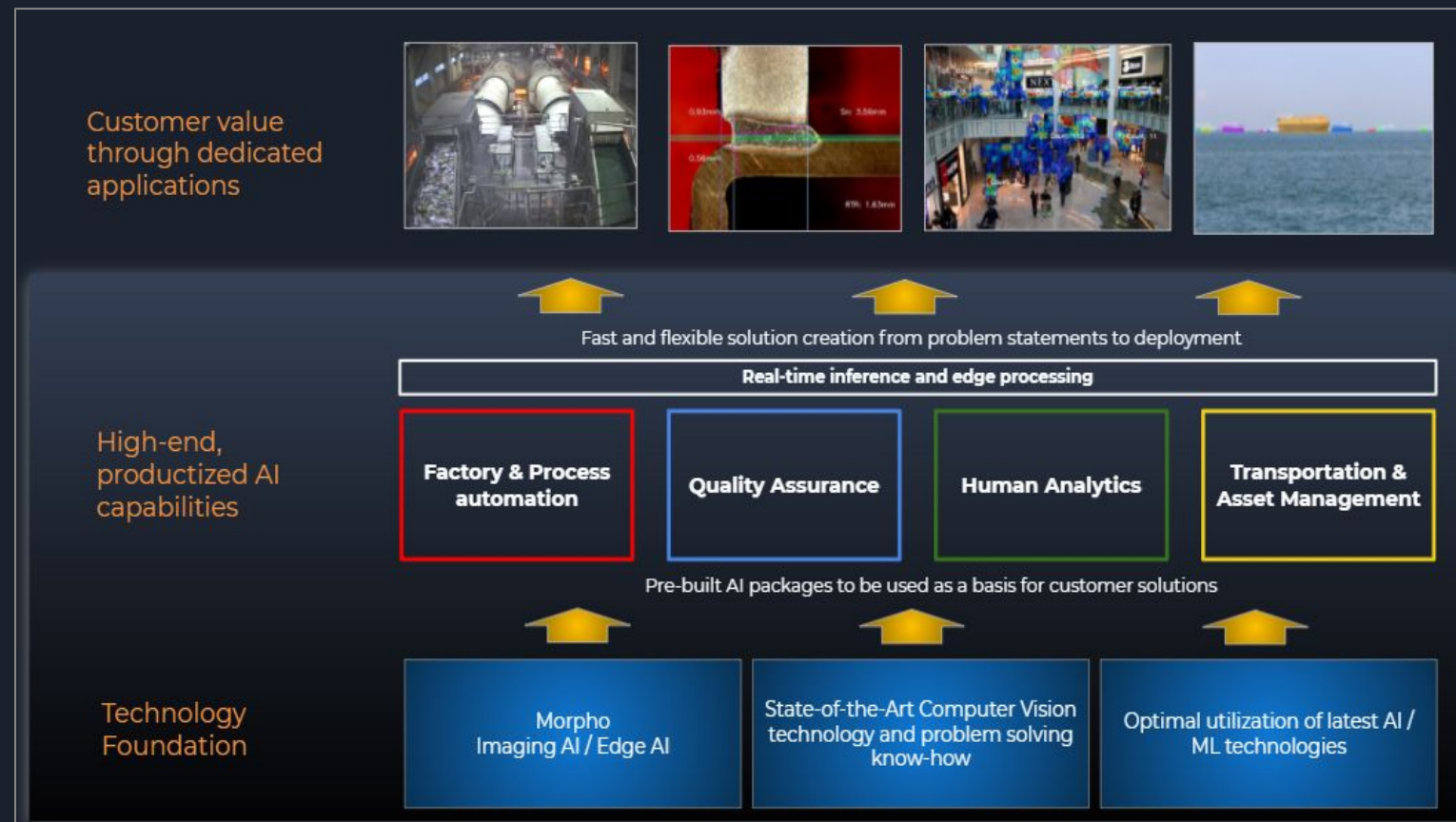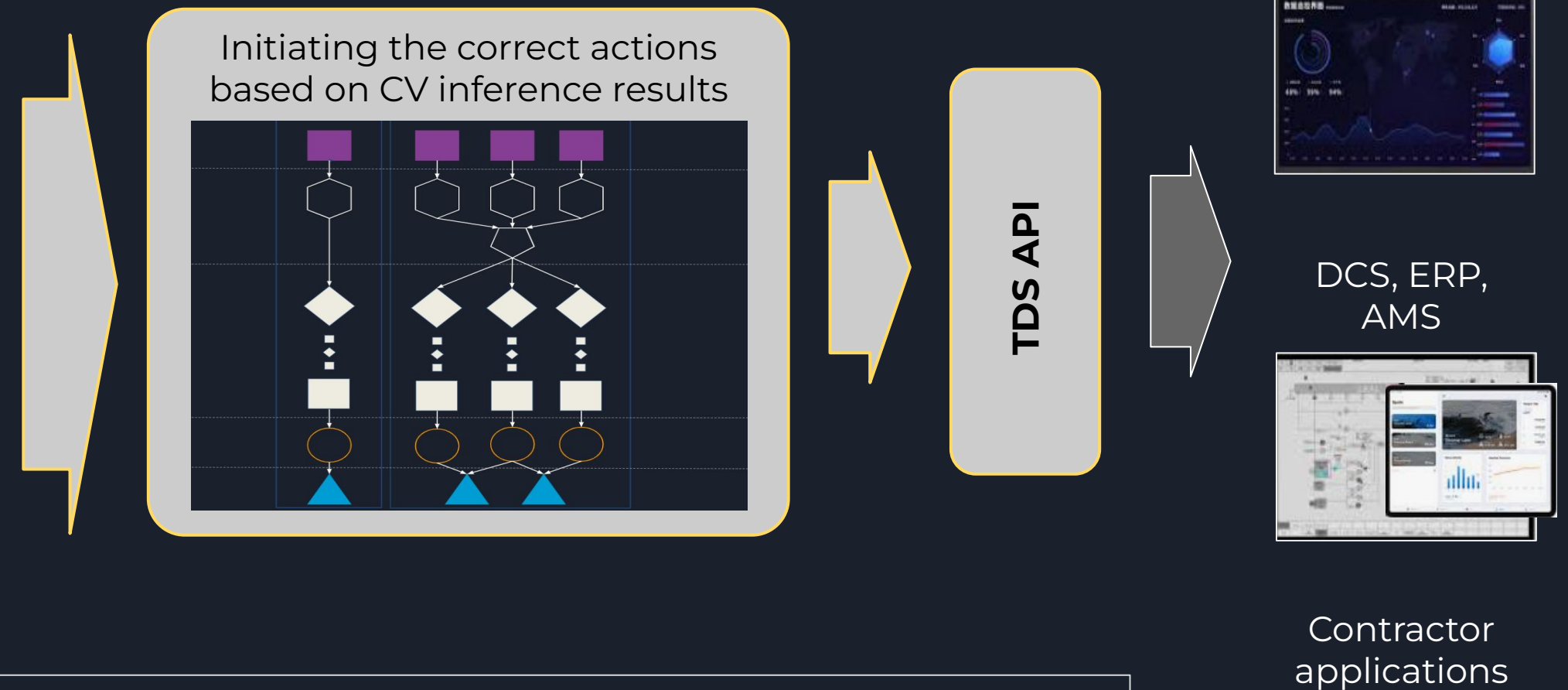| Morpho Imaging AI / Edge AI | State-of-the-Art Computer Vision technology and problem solving know-how | Optimal utilization of latest AI / ML technologies |

Initiating the correct actions based on CV inference results

TDS API

DCS, ERP, AMS

Contractor applications

- We further develop the CV Application Framework to enable faster creation of new applications to new customers and use cases
    - Both cloud & edge, collaboration relating to video coding with Tampere University (TAU) UVG team
- We extend our technology stack by creating Action Proposal Framework that enables instant automated action initiation based on new data
    - Human in the loop & machine automation, collaboration with TAU Edge Computing team

AISA Project & Edge AI for Top Data Science

- Top Data Science is a dedicated AI provider with clear focus on AI / ML competences

- Primarily our business is based on cloud deployments and we are currently not utilizing 5G or Edge to wider extent

- AISA has a well-structured framework to help us in identifying and verifying the future role of AI

- The research will provide critical insight on what 5G will enable also in the Computer Vision context and how it will transform industrial processes
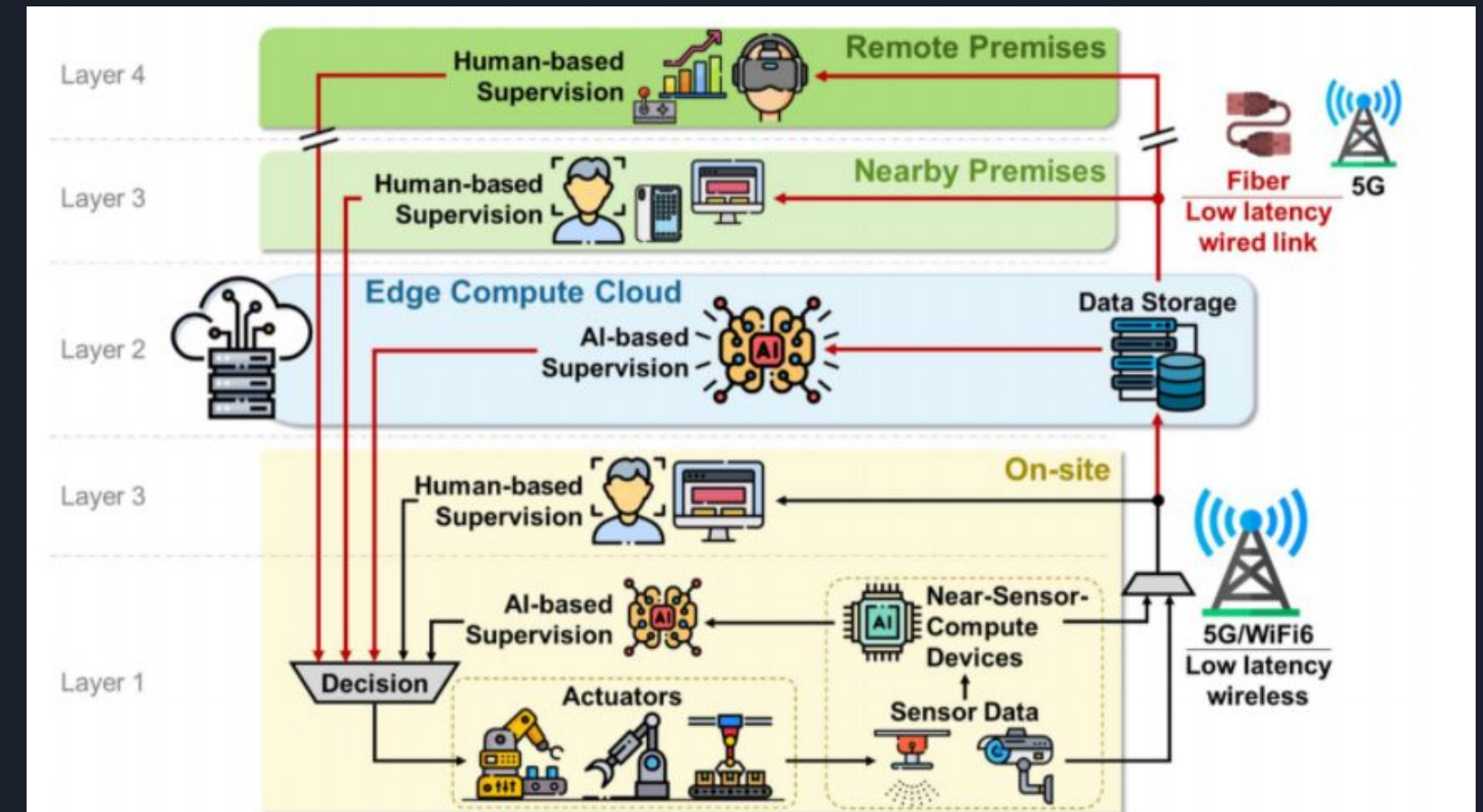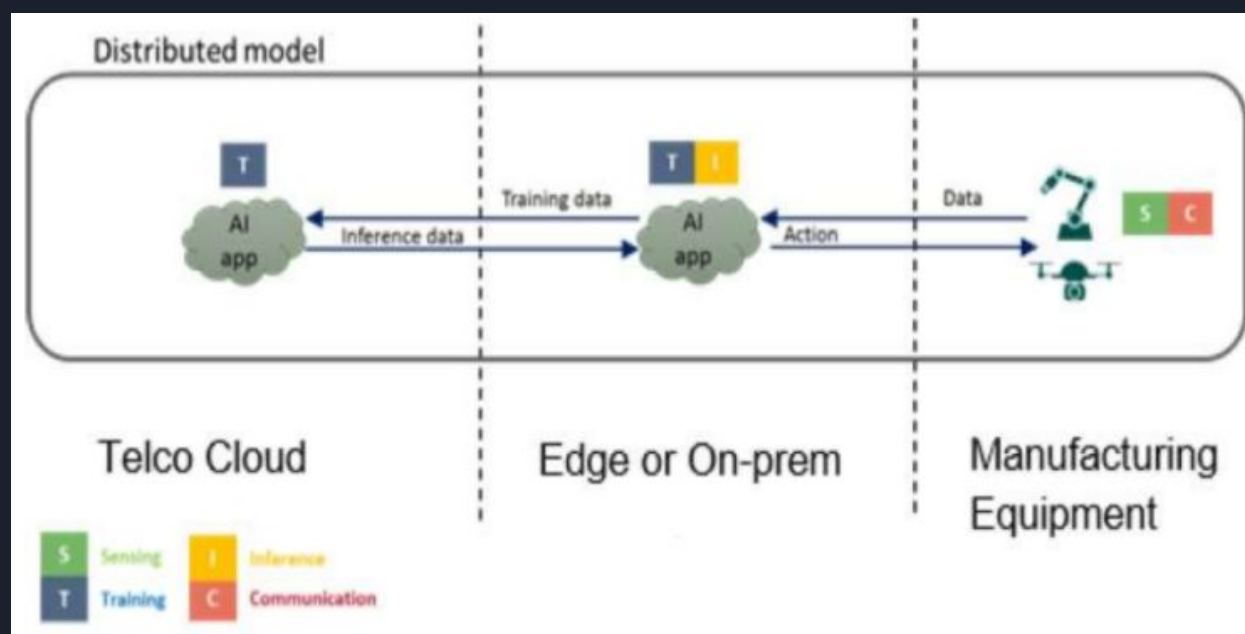

Figure 2: A conceptual design framework for situation-aware process monitoring, control, and maintenance in connected manufacturing.

- Although our solutions today are mostly cloud-based there is a constant requirement to deploy solutions to on-premise and initial enquiries for Edge

- In order to proactively utilize the future opportunities of 5G, we need to be able to make right choices and invest to Edge AI. AISA will have a major role for Top Data Science in enabling this.

TOP data science
A MORPHO COMPANY

Thank you!

Kai Lehtinen, COO

Hung Ta, CTO and Co-Founder

Phone Number
+358 40 5912369

Email Address
kai.lehtinen@topdatascience.com

Website
wwww.topdatascience.com