

# AI IN MANUFACTURING — FINNISH-GERMAN COLLABORATION INITIATIVES 14.12.

**BUSINESS  
FINLAND**

10:00 Welcome & Introduction to Finnish AI landscape,  
Ms. Outi Keski-Äijö, Program Director for AI Business, Business Finland Oy

10:05 Introduction to German AI Landscape and AI competition  
Dr. Steffen Wischmann, VDI/VDE Innovation + Technology

10:10 FAMN — Finnish Advanced Manufacturing Network  
Mr. Antti Karjaluo, Disruptive Renewal Officer, Dimecc Oy

10:20 IIP-Ecosphere — An ecosystem for accelerating AI-Projects  
Mr. Per Schreiber, Leibniz University Hannover

10:30 Cases and products

- Case Brose: Weldseam Quality Assurance with AI & how to acquire customized AI solutions to midsized manufacturing companies, Mr Timo Heikkinen, CEO & Founder, TopDataScience
- Industrial Data Science Platform and Applications in the Electronics and Manufacturing Industries, Mr David Arnu, Lead Data Scientist and Ralf Klinkenberg, Head of Research, RapidMiner
- Case Körber: Edge AI in Pharma Industrial Environment – learnings from Körber & Silo AI, Mr Niko Vuokko, Head of Technology, Silo AI Oy

11:15 Co-operation proposal for upcoming Horizon Europe Calls: Edge AI in Industrial Applications,  
Dr. Ville-Veikko Mattila, Head of Multimedia Technologies, Nokia Technologies

11:30 Other co-operation proposals and short introductions from all attendees  
5 speakers, 5 min each

12:00 Event ends

## Housekeeping:

- Audience: Kindly please keep mic& camera closed
- Speaker: Kindly open camera & respect the schedule.
- Everyone: Please introduce yourself in the chat
- The event is not recorded but materials will be shared

Moderator: Eeva Viinikka, Program partner of Business Finland digitalisation programs



# FINNISH AI LANDSCAPE

Outi Keski-Äijö  
Program Director, AI Business  
Business Finland Oy  
14.12.2021





# AI STRATEGY DRIVES INNOVATION

BUSINESS  
FINLAND

FINLAND AIMS TO BE THE LEADING COUNTRY IN APPLYING ARTIFICIAL INTELLIGENCE. AS A TECHNOLOGY SUPERPOWER, WE ARE ABLE TO FULLY UTILIZE ALL THE POSSIBILITIES OF AI THROUGHOUT THE SOCIETY.

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# Finland's strenghts to build on

## EXTENSIVE RESEARCH

Finland's high level of education and decades of research in machine learning and signal processing have formed a solid basis for Finnish AI know-how and development. Finland has the second largest number of AI experts per capita in Europe.\*

## ACTIVE COOPERATION

Active cooperation between companies, universities and research centers is funded by the state via Business Finland. This strategic support has created an attractive research and innovation environment.

## VIBRANT STARTUP SCENE

The Helsinki region has been recognized as one of the most important AI startup ecosystems in Europe. Finland has over 300 AI startups in total, many of which are research spinoffs.









# FINNISH AI COMPANIES

FINLAND OFFERS A VARIETY OF DATA-DRIVEN COMPANIES, BRINGING CUTTING-EDGE AI SOLUTIONS TO THEIR CLIENTS IN ALL BUSINESS VERTICALS.

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BUSINESS  
**FINLAND**





# Current State of Finnish AI

BUSINESS  
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#3

IN AI INDEX  
IN EUROPE

STANFORD UNIVERSITY  
AI INDEX 2020

#3

IN AI USE BY  
ENTERPRISES  
IN THE EU

EUROSTAT 2021

#1

IN DATA SCIENCE  
AND MACHINE  
LEARNING  
PROFICIENCY  
GLOBALLY

COURSERA 2021

#3

IN GOVERNMENT  
AI READINESS  
IN THE WORLD

OXFORD INSIGHTS & IDRC  
AI READINESS INDEX 2020



# CONTACT INFORMATION

**BUSINESS  
FINLAND**

## BUSINESS FINLAND AI BUSINESS

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## INVEST IN FINLAND, DIGITALIZATION

Hanna Hyttinen, Senior Advisor

+358 50 325 0610

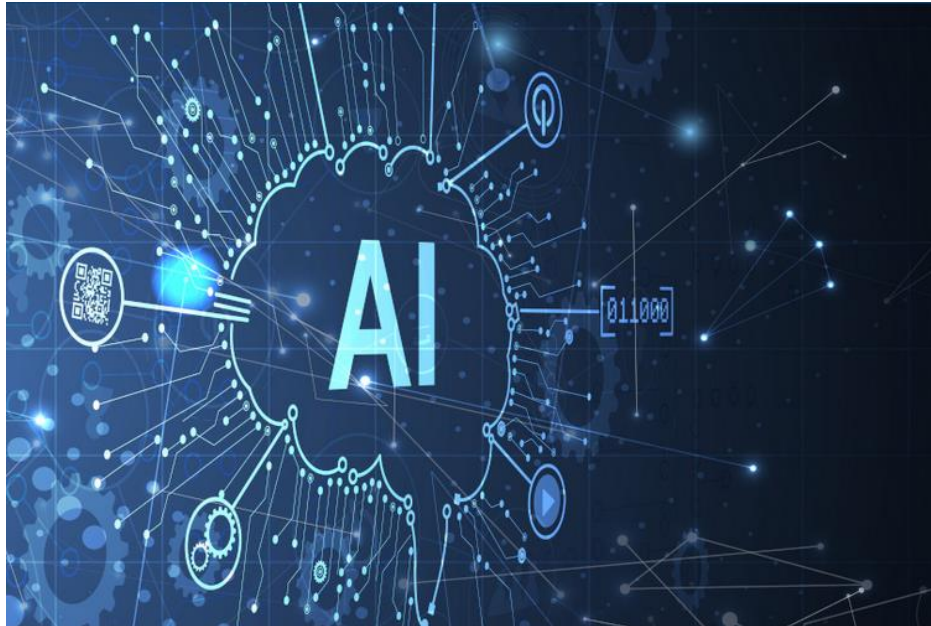
[hanna.hyttinen@businessfinland.fi](mailto:hanna.hyttinen@businessfinland.fi)

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# German AI Landscape and the AI Innovation Competition



**Steffen Wischmann**

[wischmann@iit-berlin.de](mailto:wischmann@iit-berlin.de)

**Institute for Innovation und Technology**

**VDI/VDE Innovation + Technology GmbH, Berlin**

<https://vdivde-it.de/en>



# Artificial Intelligence Strategy of the German Federal Government

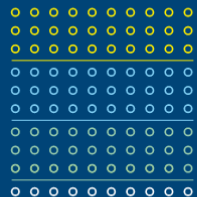
2020 Update

Status: December 2020

5 Billion €  
until 2025



## 100+ neue KI-Professuren für Deutschland



**30**  
Humboldt-Professur für KI

**30**  
KI-Kompetenzzentren

min. **30**  
Tenure-Track-Programm

min. **10**  
in weiteren Initiativen

Quelle: BMBF

## Kompetenzzentren für KI-Forschung



Quelle: BMBF

## GAIA-X als Wiege eines innovativen digitalen Ökosystems



europäische, vernetzte,  
sichere Dateninfrastruktur  
Beschleunigung KI-Ökosystem  
Wettbewerbsfähigkeit

**500+**  
Mitwirkende aus  
300 Unternehmen,  
KMU und  
Organisationen

Unternehmen • KMU  
Universitäten • Forschungseinrichtungen  
Öffentlicher Sektor • Verbände

Quelle: BMWI

## Transferhemmnisse abbauen – Unterstützungsangebote ausbauen



Die Bundesregierung fördert:

**26** Mittelstand 4.0-  
Kompetenzzentren mit mehr  
als **50** KI-Trainern

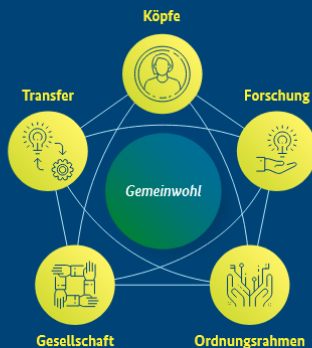
Die Bundesregierung plant:

**Regionale  
Zukunftszentren**  
+ ein KI-Wissens- und  
Weiterbildungszentrum

**KI4KMU**  
Projekte zur Erforschung,  
Entwicklung und Nutzung  
von Methoden der KI  
in KMU

Quelle: BMWI/BMAS/BMBF

## Förderung von KI-Ökosystemen



Quelle: Fortschreibungsbericht Bundesregierung

## Die Bundesregierung fördert den Auf- und Ausbau einer Qualitäts- infrastruktur für eine sichere und vertrauenswürdige KI



Quelle: Fortschreibungsbericht Bundesregierung

## Deutschland arbeitet eng mit europäischen und internationalen Partnern zu KI zusammen



Quelle: Fortschreibungsbericht  
Bundesregierung



Die  
Bundesregierung



Nationale Strategie für  
Künstliche Intelligenz  
AI Made in Germany

www.ki-strategie-deutschland.de

## Das Potenzial von KI in Unternehmen

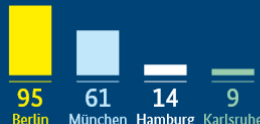
Eingesetzte KI-Verfahren von insgesamt 5,8 % KI-nutzenden deutschen Unternehmen im Jahr 2019



Quelle: BMWI

## KI Start-ups in Deutschland 2020 in ausgewählten Städten

Es werden mehr KI-Start-ups gegründet  
2019: 214 → 2020: 247



Quelle: Applied AI

## KI = Potenziale für Arbeitsmarkt und Weiterbildung

2019, in Prozent



Quelle: BMWI

## KI-Publikationen

Wissenschaftliche Veröffentlichungen 2018 nach Region




Deutschland liegt im  
internationalen Vergleich  
auf Platz 5\*

Quelle: The AI Index 2019



[Applications](#)[Research Institutions](#)[Strategy and Transfer](#)[Study programs](#)

- ☒ Map  
☐ List

Full text search 

- ☒ See all  
☒ AI Development Project  
☒ AI Provider  
☒ AI User

Type of Institution >

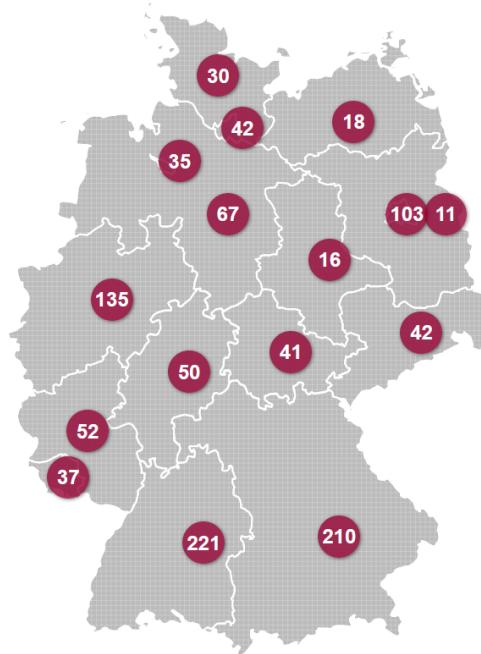
Search for companies or institutions

AI Technology Field

- ☒ See all  
☐ Image Recognition and Understanding  
☐ Data Management and Analysis  
☐ Human-Computer Interaction and Assistance Systems  
☐ Robotics and Autonomous Systems  
☐ Sensors and Communication  
☐ Natural Language Processing  
☐ Virtual and Augmented Reality

Application Market (Industry)

- ☒ See all  
☐ Agriculture  
☐ Construction and Infrastructure  
☐ Education  
☐ Energy and



<https://www.plattform-lernende-systeme.de/map-on-ai-map.html>

> 1.100 entries





Federal Ministry  
for Economic Affairs  
and Climate Action

A large, stylized graphic of a cloud with the letters 'AI' in the center. The cloud is surrounded by a complex network of glowing blue lines and dots, resembling a circuit board or a neural network. Various icons are scattered around the cloud, including a QR code, a play button, a gear, and a binary code '011000'. The background is dark blue with faint, larger-scale circuit patterns.

# AI

## AI Innovation Competition

[https://www.digitale-technologien.de/DT/Navigation/EN/ProgrammeProjekte/AktuelleTechnologieprogramme/Kuenstliche\\_Intelligenz/ai.html](https://www.digitale-technologien.de/DT/Navigation/EN/ProgrammeProjekte/AktuelleTechnologieprogramme/Kuenstliche_Intelligenz/ai.html)



## AI Innovation Competition

25 large  
scale  
project

~250 Mio €  
funding

~385 Mio €  
total cost

Application  
oriented

B2B-  
Ecosystems

Plattformen  
for AI  
services

10 major  
application  
domains

Strong  
focus on  
Gaia-X

# AI Innovation Competition

## Retail



<https://knowledge4retail.org>



<https://www.speaker.fraunhofer.de>

## Quantum Computing



<https://planqk.de>

## Mobility



<https://bauhausmobilitylab.de>

## Smart Living

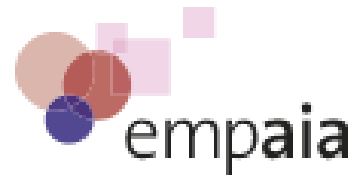


<https://foresight-plattform.de>

## Health



<https://aiqnet.eu>



<https://www.empaia.org>



<https://ki-sigs.de>



# AI Innovation Competition

## Crisis Management



<https://www.reskriver.de>



<http://spell-plattform.de>



<https://www.pairs-projekt.de>



<https://coypu.org>



<https://www.hhi.fraunhofer.de/en/departments/ai/projects/daki-fws.html>

## Finance



## Construction



<https://bimkit.eu>



<https://sdac.tech>

## Agriculture / Food



<https://nalamki.de>

# AI Innovation Competition

## Manufacturing

KE-EN

<http://keen-plattform.de>

FABOS 

<https://www.fab-os.org>

 SPAICER

<https://www.spaicer.de>

 SERVICE  
MEISTER

<https://www.servicemeister.org>



IIP-Ecosphere

<https://www.iip-ecosphere.de>



Marketplace

<https://ki-marktplatz.com>





**DIM-ECC**

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**Finnish Advanced  
Manufacturing  
Network - FAMN**

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**In co-operation with Technology  
Industries of Finland (TIF)**

**Contact persons:**

**Antti Karjaluoto & Kari Muranen**

**10/2021**

# FINNISH ADVANCED MANUFACTURING NETWORK - FAMN

## Idea originated from TIF member companies

Prepared carefully:

- Pre-study & company interviews conducted by Gaia Consulting Oy:n during fall 2020
- TIF company survey, open webinar and discussions during January 2021
- Task force of TIF company representatives created the guidelines during spring 2021.
- Request for solutions for FAMN coordination during summer 2021.  
→ **DIMECC Ltd and its Intelligent Industry ecosystem was selected as implementation partner in August 2021.**

### Intelligent Industry ecosystem

- DIMECC has facilitated Intelligent Industry (II) ecosystem since 2017. II is an innovative ecosystem focusing on value co-creation and connecting leading Finnish equipment manufacturers and digital solutions providers to drive and realize the immense opportunities in the industrial data economy and digital transformation.
- Intelligent industry ecosystems thematical focus areas are data and advance analytics, autonomous systems, human factor and value co-creation in ecosystems.
- Ecosystem's operations have been kept as business driven and network has been open to all new partner companies.
- By using II as foundation for FAMN we can speed up FAMN ramp up significantly



# FAMN partners

DIMECC

## Current Intelligent Industry-partners:

\* Will continue as FAMN members



## Announced to join FAMN:

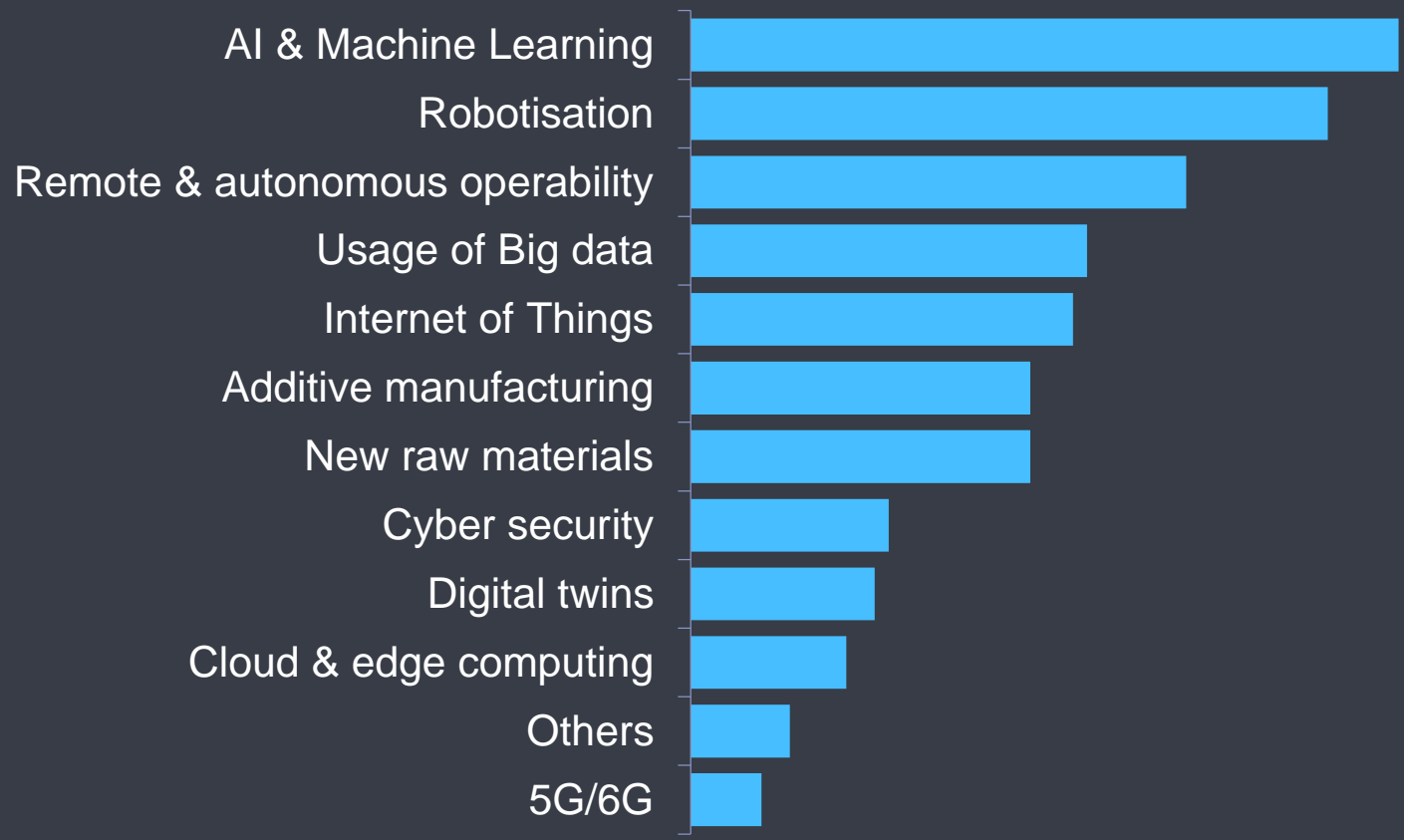


## Mission Statement

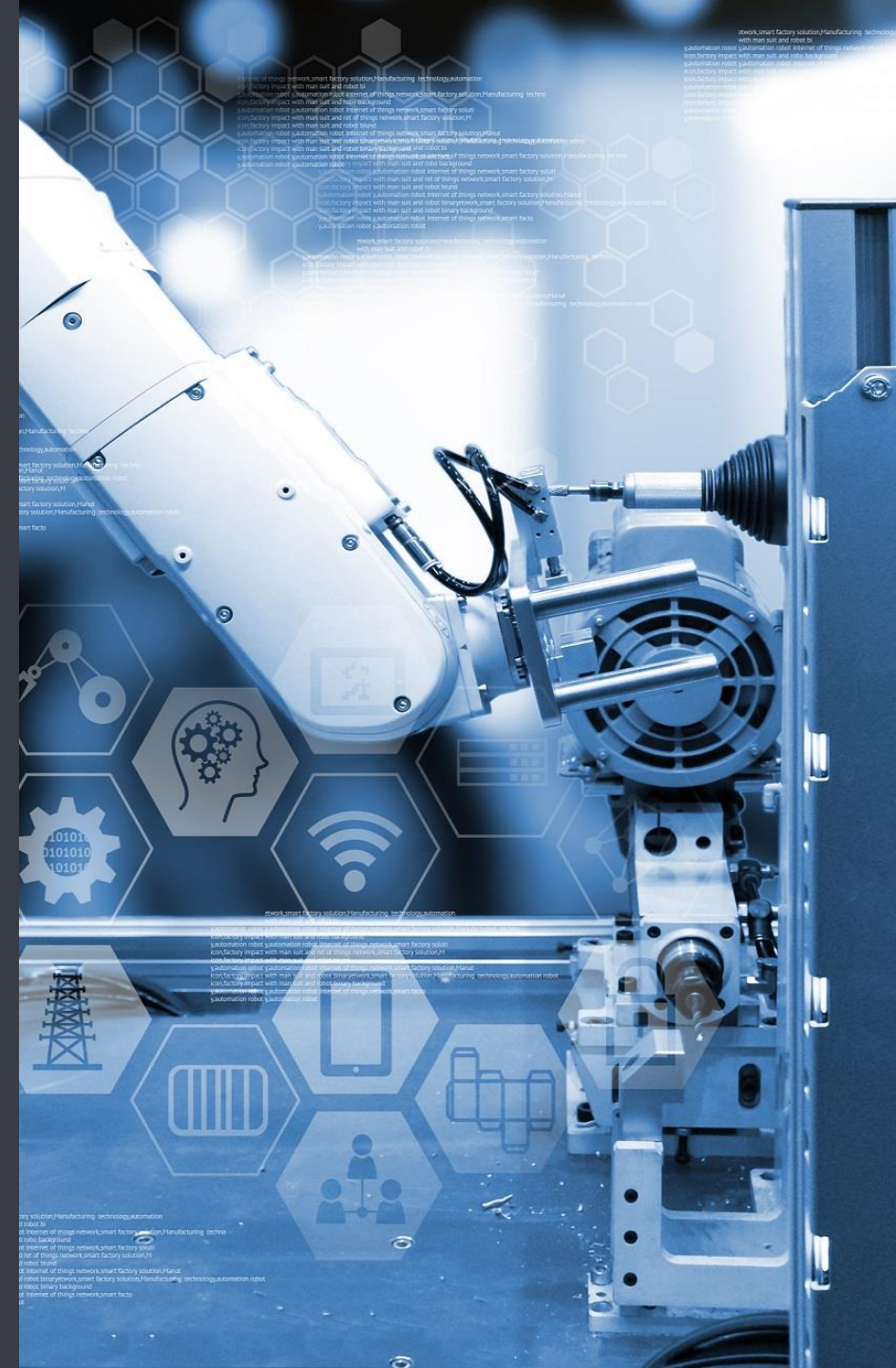
**The Finnish Advanced Manufacturing Network (FAMN) improves the global competitiveness of industrial companies and accelerates their sustainable renewal and digitalisation**



# FAMNs technology focus areas based on company needs:



\* Results from survey executed by TIF to it's member companies.



# Promises of FAMN

- We **connect** existing and new manufacturing & ICT industry networks
- We **facilitate** initiatives around automation, data, AI/ML and establish digitalisation projects and programs.
- We **help member companies to establish RDI co-innovation projects.**
- We **’ll establish shared infrastructure/data platform** focusing on latest technology
- We **supplement the competence development** of member companies and meaningful co-operation with research institutes and universities.
- We **share information of regulation & industrial standardisation**
- Together we **boost the manufacturing industry brand**
- We **’ll drive the Finnish manufacturing industry to a world-class level.**

# Five FAMN focus areas

## 1. Facilitation



- FAMN maps the identified development needs and competitiveness needs of companies, education and research institutes and existing manufacturing ecosystems and clusters.
- On the basis of these results, FAMN develops an innovation agenda for the manufacturing industry and an implementation plan for it

## 2. Competence Development



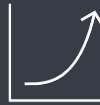
- FAMN promotes the availability of skilled resources and raises the quality of skills, as well as enhances the attractiveness and diversity of the industry.
- Together with training and research institutes, FAMN will create regional business cooperation structures with agreed division of labor.
- The aim is to increase training and research activities that support the sustainable growth and renewal of companies' businesses
- World-class competence centers and quality infrastructures inspire Finns and attract foreigners.

## 3. Innovation funding



- FAMN network has technological know-how, on the basis of which it supports the launch of companies joint research and innovation projects and cooperation with universities and research institutes.

## 4. Acceleration



- Promoting cooperation between companies in the network: FAMN helps companies to accelerate product development, launch innovation activities and exploit the potential of digitalisation.

## 5. RDI infrastructures



- FAMN acquires the latest technology and research data for the benefit of companies and companies and research organizations as a centers of excellence.
- Concentrations of expertise are company-led and can also consist of companies alone.



# Collaborative organisations and networks

Close co-operation with different networks enables the advancement of world-class industrial ecosystem, it enables to working together, to find EU project partners and to influence larger entities.

We cooperate with, for example, the following international networks:



# Contact us for more details!



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*Disruptive Renewal Officer*

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Mobile: +358 40 772 5440



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*Senior Ecosystem Lead*

Email: [kari.muranen@dimecc.com](mailto:kari.muranen@dimecc.com)

Mobile: +358 40 772 5934



**IIP-Ecosphere**

Next Level Ecosphere for  
Intelligent Industrial Production



# IIP-Ecosphere

An ecosystem for accelerating AI-projects

Gefördert durch:



Per Schreiber (IFW Hannover)  
AI in Manufacturing- 14th Dec. 2021









IIP-Ecosphere

# Potential vs. Reality

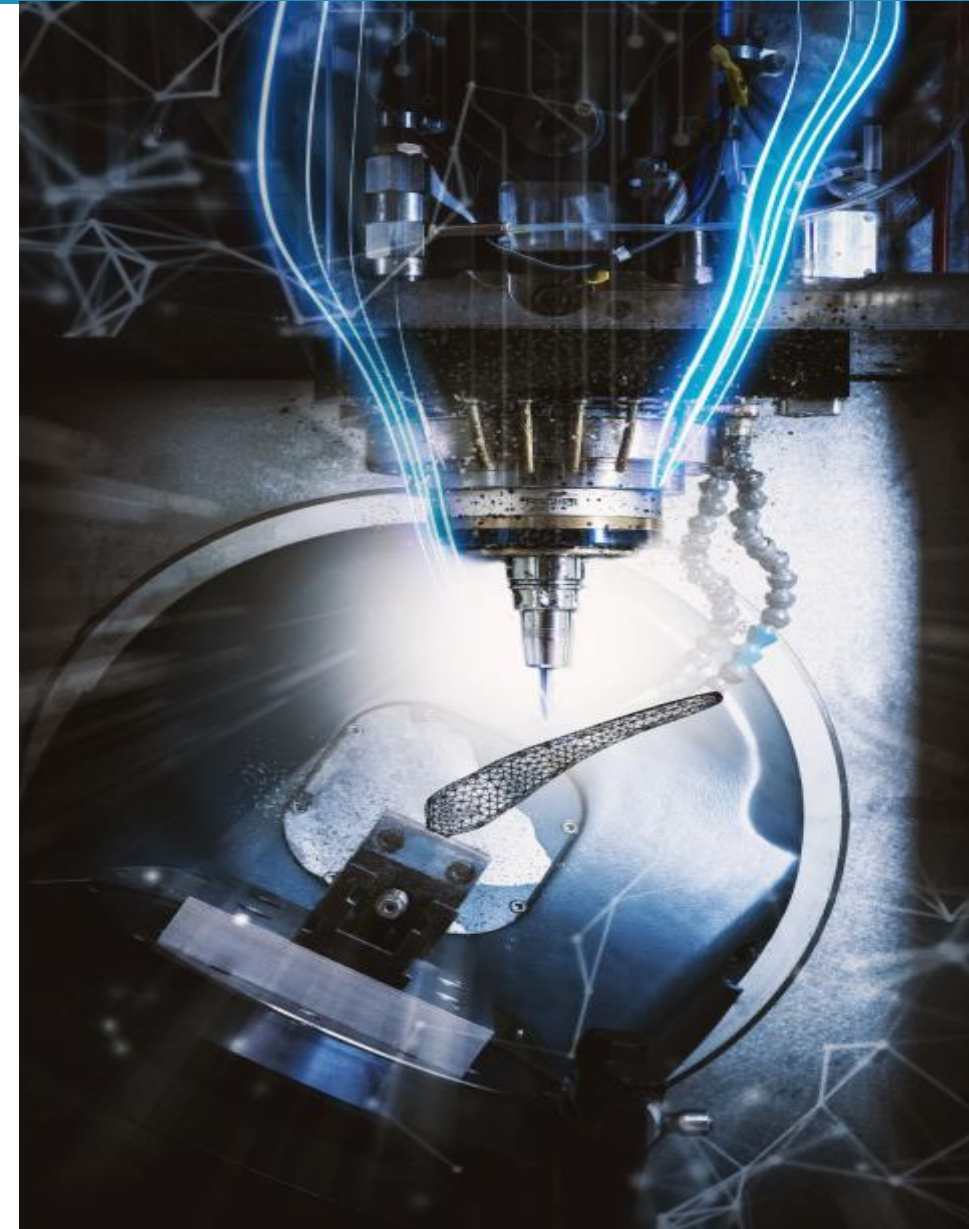
AI is considered as an **important key technology** for production

- ca. **60 %** see added value for their products and services\*
- ca. **55 %** of companies expect opportunities for new business models\*

... however, only **8 %** of companies apply AI solutions\*\*

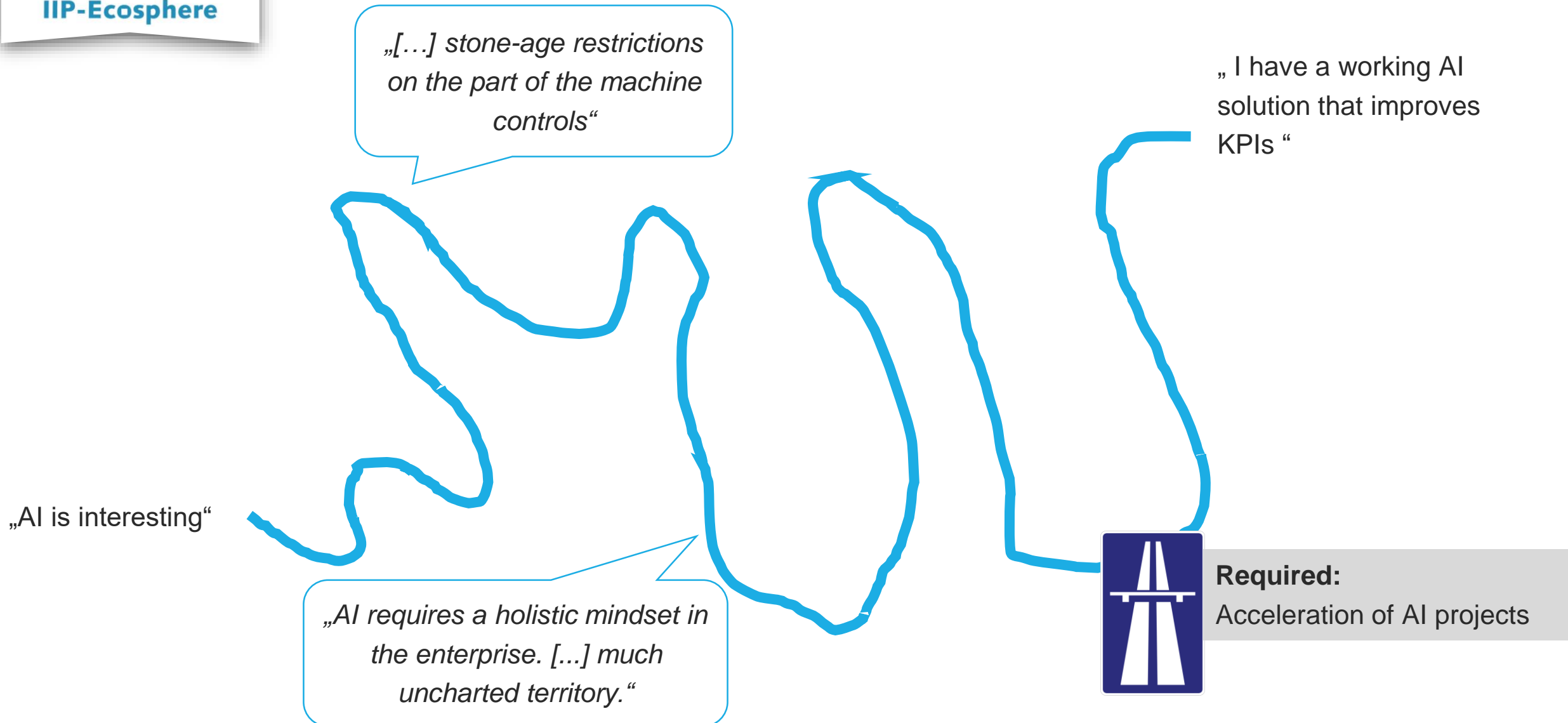
\*IIP-Ecosphere survey of 75 companies in cooperation with VDW

\*\*Bitkom survey on AI





# A long way







IIP-Ecosphere

# Implementation – At a glance!

## Innovation Core

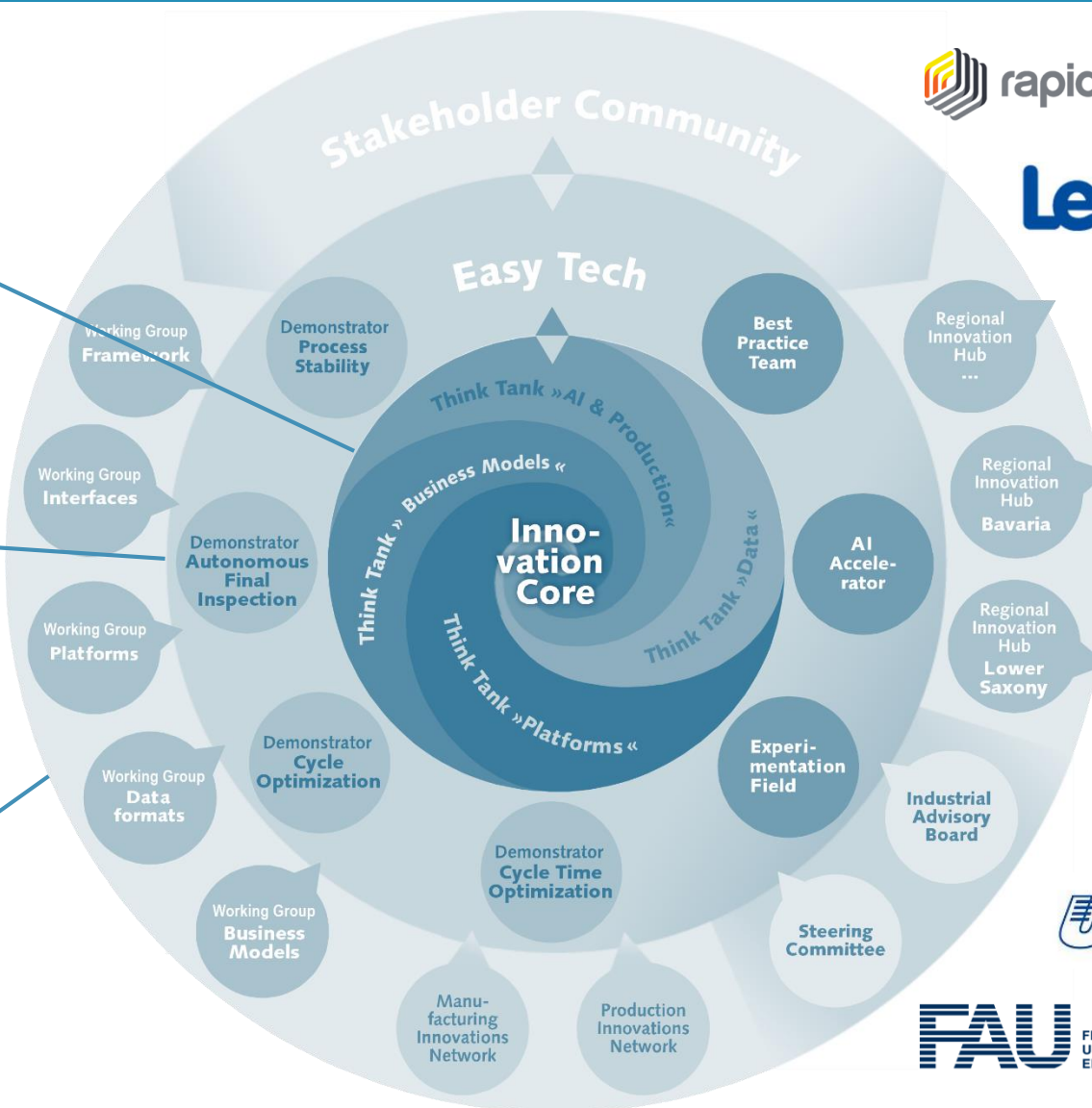
Application-driven research of AI-methods

## EasyTech

Simple access to AI-technology

## Stakeholder Community

Integration of stakeholders, events, knowledge transfer, networking



rapidminer

slashwhy



Lenze

SIEMENS

KIPROTECT

VDW



Deutsche Messe  
Technology Academy



Leibniz  
Universität  
Hannover



SENNHEISER



Nutzfahrzeuge



UNIVERSITÄT  
KOBLENZ · LANDAU

GERRESHEIMER

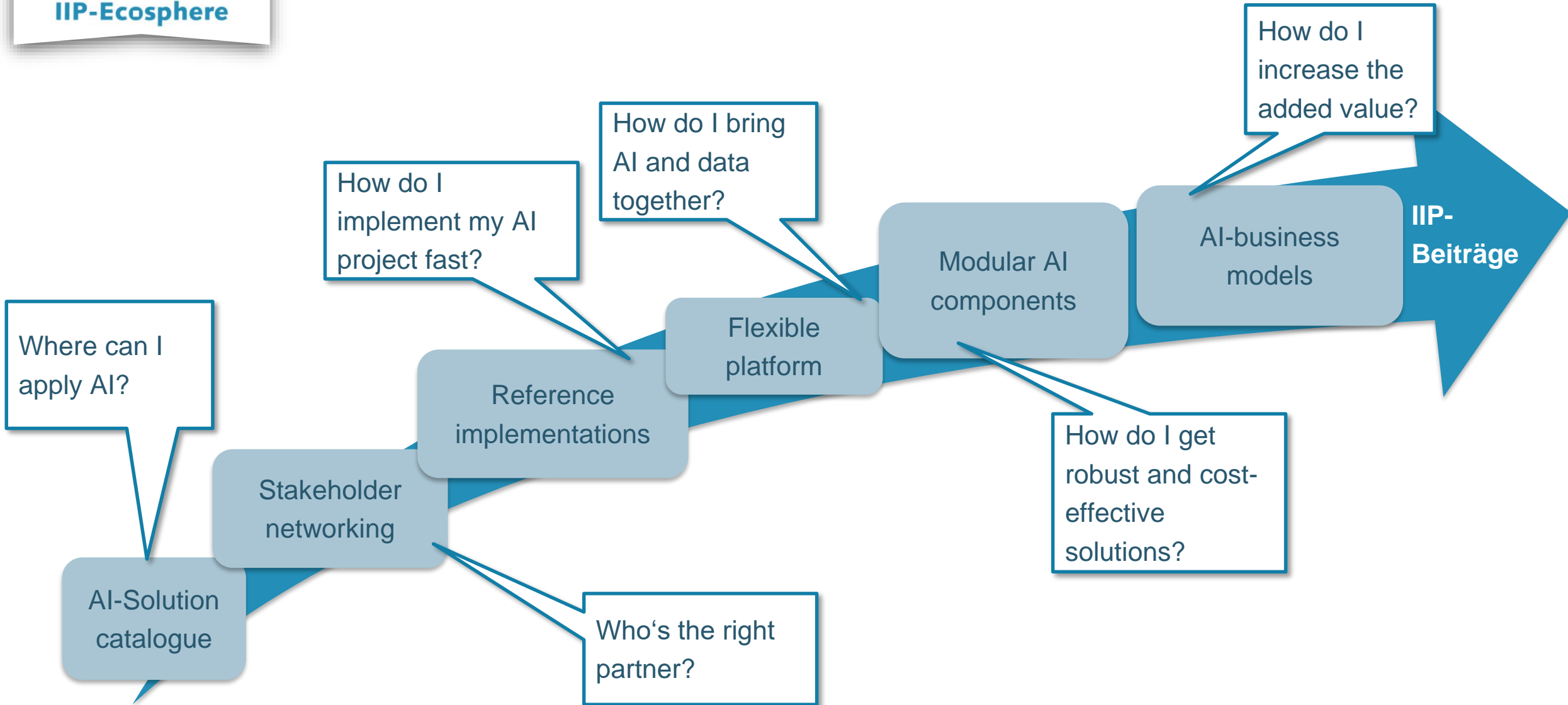


FRIEDRICH-ALEXANDER  
UNIVERSITÄT  
ERLANGEN-NÜRNBERG

GILDEMEISTER



# AI acceleration?





IIP-Ecosphere

# Finding existing AI solutions

## AI catalogue

- Open directory of AI solutions:
  - What can I do with AI in my company?
  - For which areas are there AI solutions?
- Joint design with industry partners

The screenshot shows the homepage of the IIP-Ecosphere AI Catalogue. The header features the IIP-Ecosphere logo and a hamburger menu icon. The main heading is 'Finden Sie die richtige KI Unterstützung für Ihre Produktion' (Find the right AI support for your production). Below this is a subheading: 'Holen Sie sich Lösung, die speziell für Ihre Branche entwickelt wurden und mit den Produkten eingesetzt werden können, die Sie bereits nutzen' (Get solutions specifically developed for your industry and which can be used with the products you already use). A search bar with the placeholder text 'Katalog durchsuchen' (Search catalog) and a magnifying glass icon is positioned below the text. To the right of the search bar is a cartoon robot holding a magnifying glass. The bottom section is divided into three columns: 'Task', 'Branche (erprobt)' (Industry tested), and 'Branche (anwendbar)' (Industry applicable). Each column contains a list of AI applications and industries, each preceded by a small square icon.

**Task**

- Predictive Maintenance/Condition Monitoring
- Qualitätskontrolle und -management
- Optimierte Prozessplanung
- Optimierte Prozesssteuerung
- Robotik & autonome Systeme
- Intelligente Sensorik
- Wissensmanagement

**Branche (erprobt)**

- Herstellung von Nahrungs- und Futtermitteln (C.10)
- Getränkeherstellung (C.11)
- Tabakverarbeitung (C.12)
- Herstellung von Textilien (C.13)
- Herstellung von Bekleidung (C.14)
- Herstellung von Leder, Lederwaren und Schuhen (C.15)

**Branche (anwendbar)**

- Herstellung von Nahrungs- und Futtermitteln (C.10)
- Getränkeherstellung (C.11)
- Tabakverarbeitung (C.12)
- Herstellung von Textilien (C.13)
- Herstellung von Bekleidung (C.14)
- Herstellung von Leder, Lederwaren und Schuhen (C.15)



# Finden Sie die richtige KI Unterstützung für Ihre Produktion

Holen Sie sich Lösung, die speziell für Ihre Branche entwickelt wurden und mit den Produkten eingesetzt werden können, die Sie bereits nutzen



## Task

- Predictive Maintenance/Condition Monitoring
- Qualitätskontrolle und -management
- Optimierte Prozessplanung
- Optimierte Prozesssteuerung
- Robotik & autonome Systeme
- Intelligente Sensorik
- Wissensmanagement

## Branche (erprobt)

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## Branche (anwendbar)

- Herstellung von Nahrungsmitteln
- Getränkeherstellung
- Tabakverarbeitung
- Herstellung von Textilien
- Herstellung von Bekleidung
- Herstellung von Leder



## KI-Plattform

Siemens AG / Open Source

Die KI-Plattform wird dazu eingesetzt Daten aus diversen Quellen zu integrieren und für KI-Algorithmen in einer geeigneten Form zur Verfügung zu stellen. Zudem wird eine Runtime-Komponente angeboten um KI-Algorithmen ausführen zu können.

[Data Management](#)[Anbieter kontaktieren](#)

GRUNDDATEN

VORAUSSETZUNGEN

### Anwendungsprofil

Produkt	—
Unternehmensbereich	Produktion / Montage
Hierarchie-Ebene	Unternehmen (enterprise)
Prozess	
Branche (erprobt)	Maschinenbau (C.28)
Branche (anwendbar)	Maschinenbau (C.28) Herstellung von sonstigen Waren (C.32)

### Nutzen

Szenarien / Use cases	—
KPI	Effizienz - Produktionsvolumen/Zählwert

## Lösungsanbieter:

Siemens AG / Open Source

Kontakt: Open Source Community, Support durch kommerzielle Anbieter wie Confluent

## Kontaktanfrage

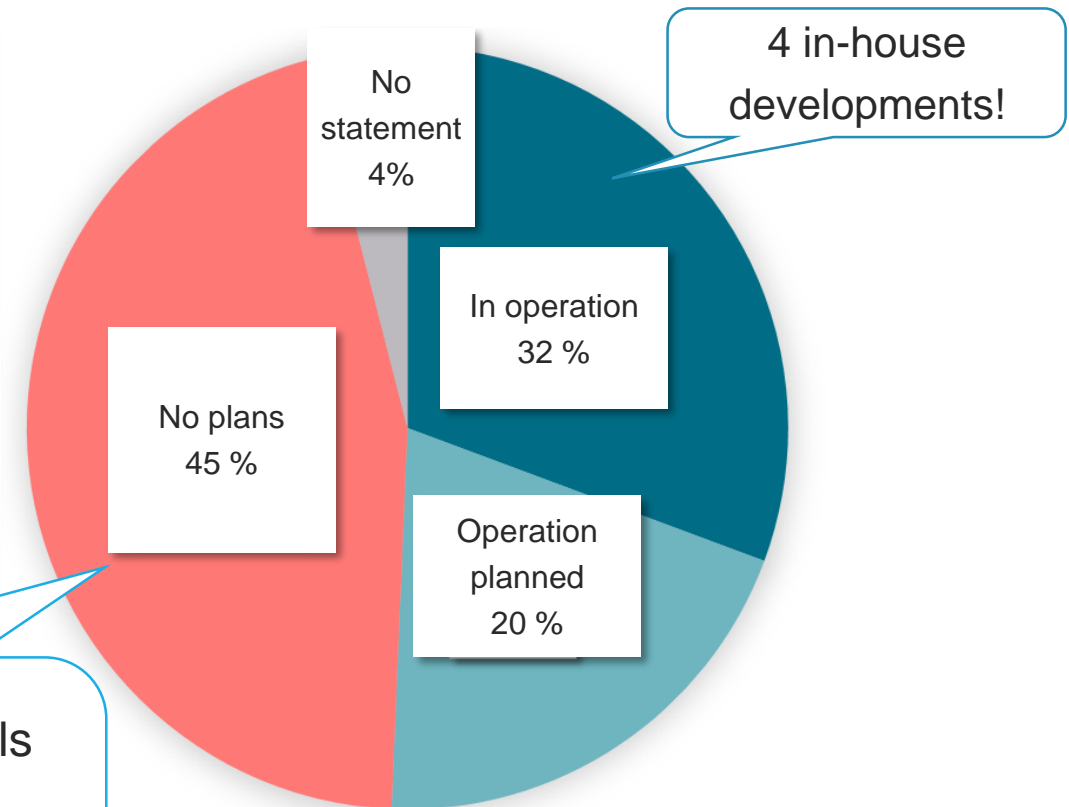
Name

E-Mail-Adresse

# Bringing data and AI together

## Usage of IIoT-Platforms

- Promise / Expectation
  - Data acquisition
  - Distribution / Edge devices
  - Cloud connectivity
  - Facilitate "AI"



- Inconsistent licensing models
- Unclear follow-up costs
- Complex setup
- Lack of know-how



IIP-Ecosphere

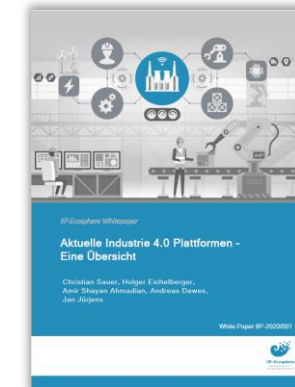
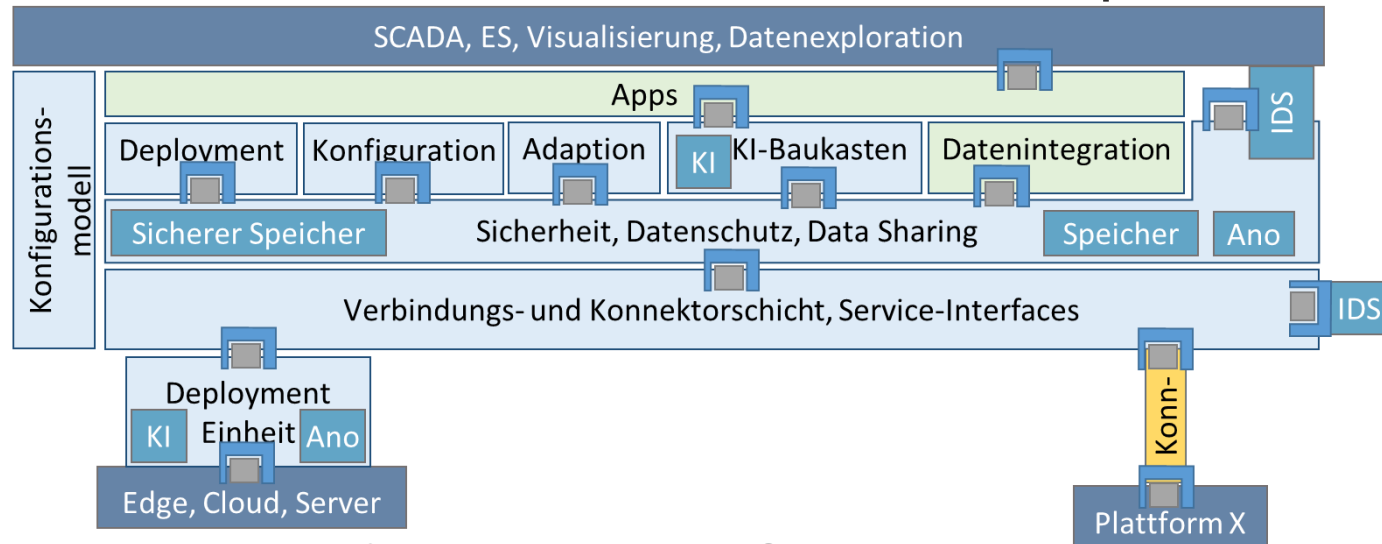
# Bringing data and AI together

## Virtuelle IIoT-Plattform



“Not yet another platform”:

- High flexibility
- Dynamic edge deployment
- Easy AI usage
- Connections with other platforms
- Current standards: asset administration shells (AAS), ...
- Open source



<https://www.iip-ecosphere.de/ergebnisse-publikationen/>





# Work on modular AI

## Identification of module candidates

- Feasibility studies
- Demonstrators
- Analysis of existing approaches

## Implementation and validation

- Reference implementation of AI building blocks
- Exploration in different contexts

## Generalization

Customizable standard components



# Conclusion

- AI is often still challenging, especially for SMEs without AI experts
- IIP-Ecosphere works on means to ease the application of AI

**An ecosystem thrives on active participation!**

- Feel free to contact us!



IIP-Ecosphere

# Kontakt



Per Schreiber



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[www.iip-ecosphere.eu](http://www.iip-ecosphere.eu)



[@de\\_iipecosphere](https://twitter.com/de_iipecosphere)



[linkedin.com/company/iip-ecosphere](https://linkedin.com/company/iip-ecosphere)





# Creating new (AI) innovations & customized solutions with co-creation

**AI IN MANUFACTURING — FINNISH-GERMAN COLLABORATION  
INITIATIVES**

December 14th 2021 - Helsinki

Timo Heikkinen, CEO & Co-founder, Top Data Science

# Agenda & introduction

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## Creating new (AI) innovations and solutions with co-creation

- From co-creation to value-creation
- Power of Computer Vision and AI
- Case Brose: Weldseam Quality Assurance with AI & how to acquire customized AI solutions to midsize manufacturing companies

### About me

- CEO & Co-founder at Top Data Science
- 20 years in software business leadership roles, including AI, Machine Vision & Enterprise Software
- Board member in Healthtech Finland industry association of Technology Industries of Finland.





# 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



evondos

OPTOFIDELITY



SIEMENS

glaston  
seeing it through

LAHTI

JYVÄSKYLÄ

novozymes  
Rethink Tomorrow

Rocla

brose  
Excellence in Mechatronics

Metso:Outotec

HUS

Valmet

morpho

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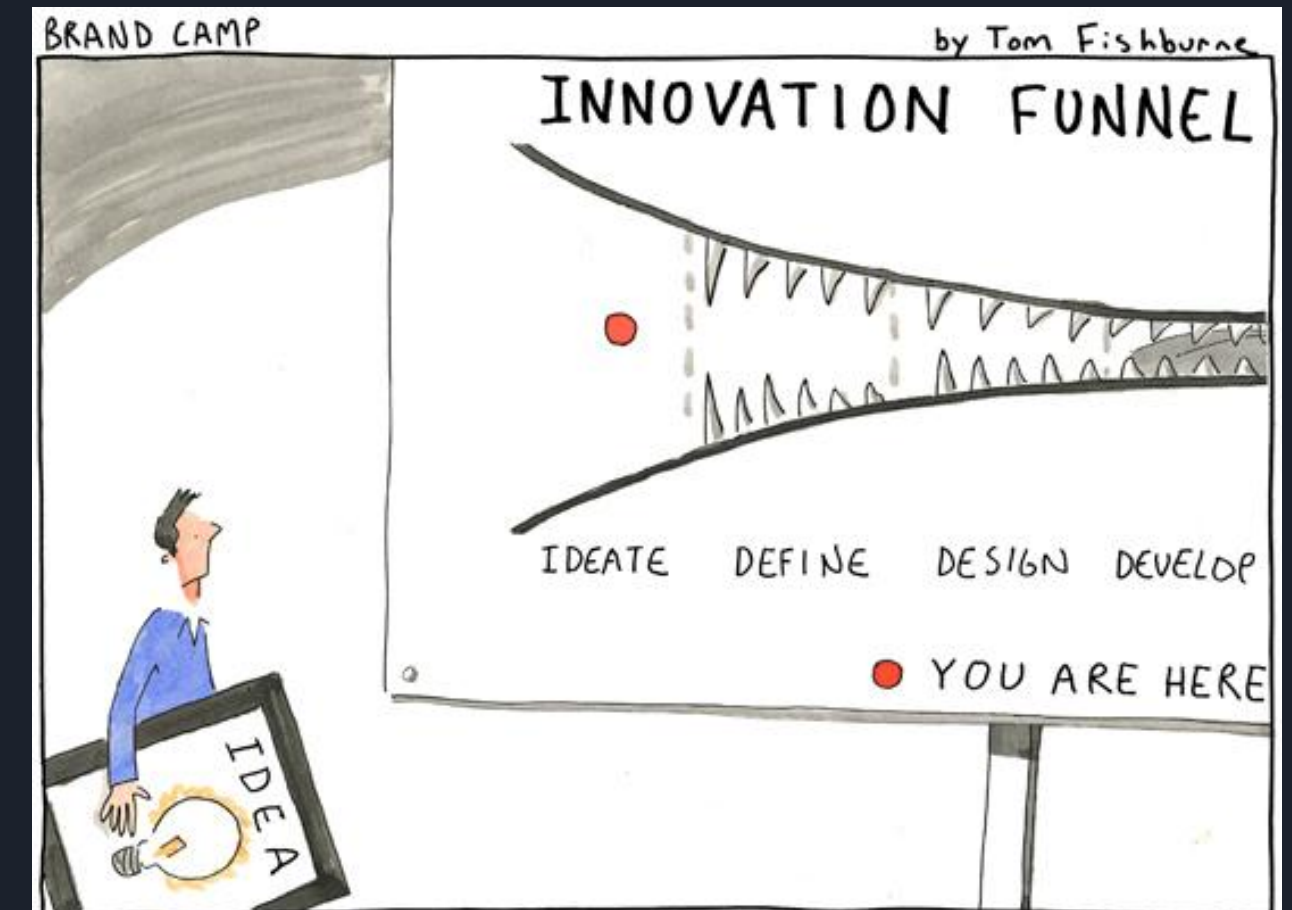
## **Creating new innovations and customized solutions with co-creation**

- Insights from 6 years and 100+ projects for scalable AI



# From innovation to value-creation - What makes a project successful?

- Leadership commitment and open innovation culture
- Mixed teams and domains
- Get your data ready - properly curated and documented
- Agile and iterative development in phases, collect user experiences and feedback, then develop further towards wider user adoption
- Operating scalable AI, Data engineering, pipelines and tools, ML Ops, Data & Model Ops.



Source: <https://marketoologist.com/>, Tom Fishburne

---

# Power of Computer Vision and Data-driven approach

# Power of Computer Vision



- Modern **Computer Vision (CV)** technologies are bringing remarkable efficiency and scalability to industrial automation and manufacturing
- Computer Vision enables replacing rule-based logic with generalizable **data-driven learning**
  - Utilize image/video data, sensor fusion with other data sets, and business data
  - Solutions enable cost-efficient 24/7 monitoring automation for a wide range of tasks and use cases

## Costs

Reduced costs through 24/7 machine automation

## Productivity

Automate time-consuming repetitive tasks enabling operators to focus on core operations

## Quality

Improve quality through more standard quality assurance process

## Safety

Improve safety by automatic detection of risky behavior and process status



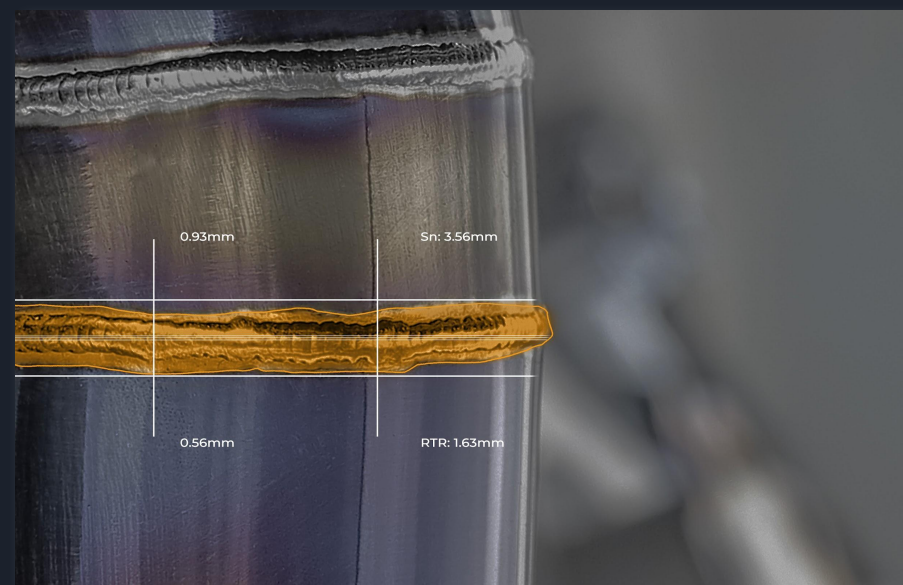
# Industrial Computer Vision

- 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:

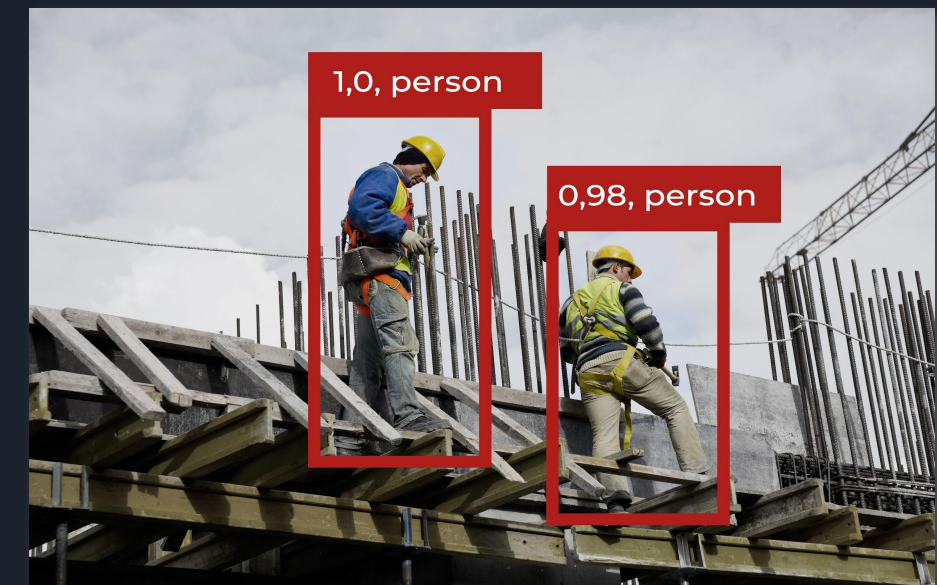
## Factory & Process Automation



## 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.



# Development, Operation & Management



Our solution development lifecycle and MLOps covers machine learning process from annotation and model development to deployment and continuous monitoring

We support different platforms including

- Microsoft Azure
- AWS
- Google Cloud Platform
- On-premise and edge

---

# Case Brose - Computer Vision, Quality Assurance Solution for Weld Seams in Automotive Industry

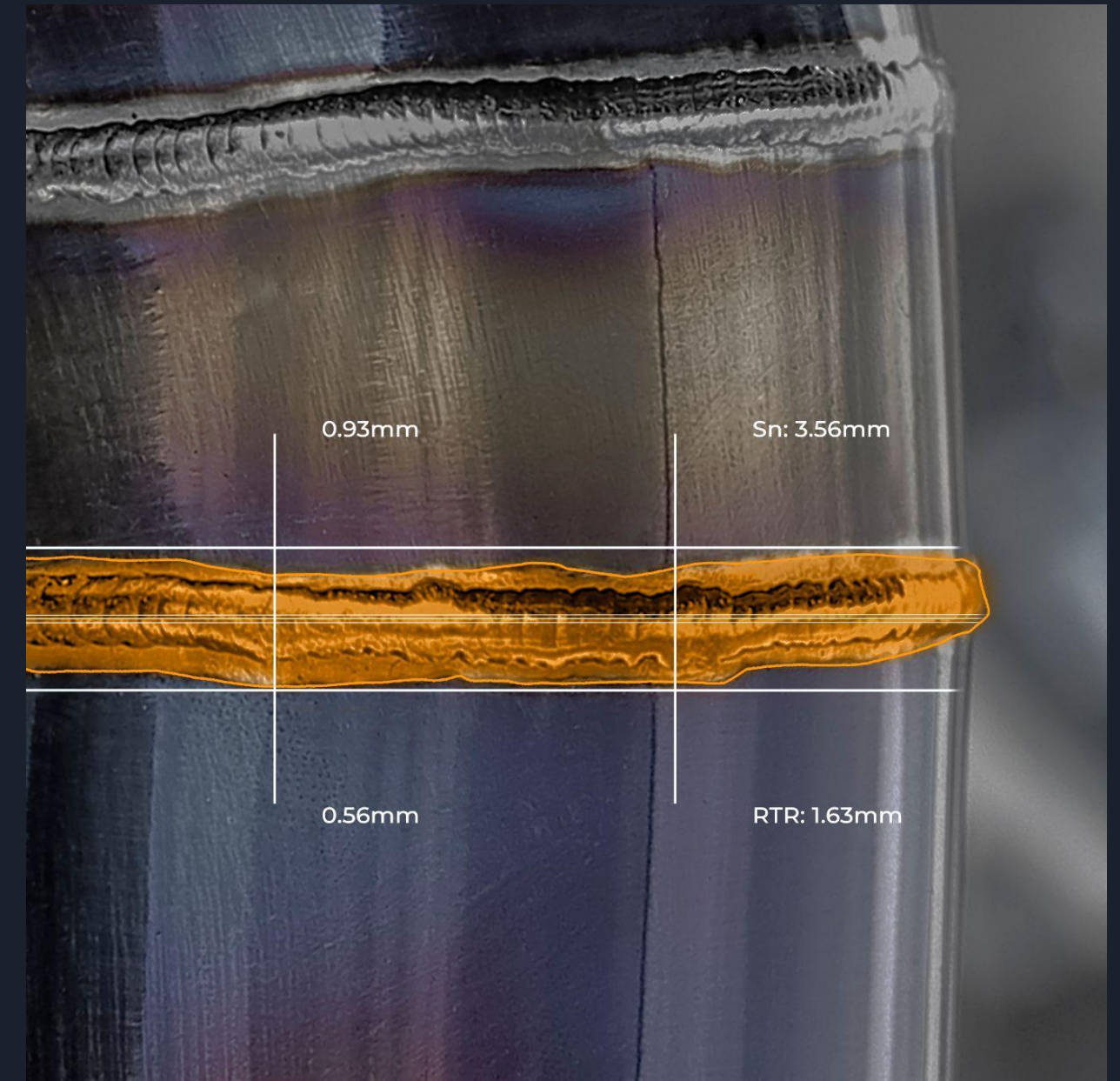
# Quality Assurance - Case



- **Brose** provides high-quality mechatronics products to automotive industry.
  - 25,000 employees, 24 countries, revenue 5.1 billion euros
- Destructive tests
  - To measure whether the welding quality meets the required standards and regulatory requirements.
- Top Data Science automate their welding quality assurance process by
  - **Combining cloud-based software technology with deep learning.**

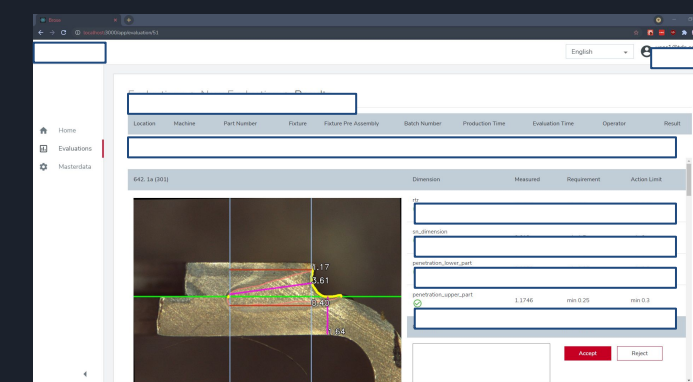
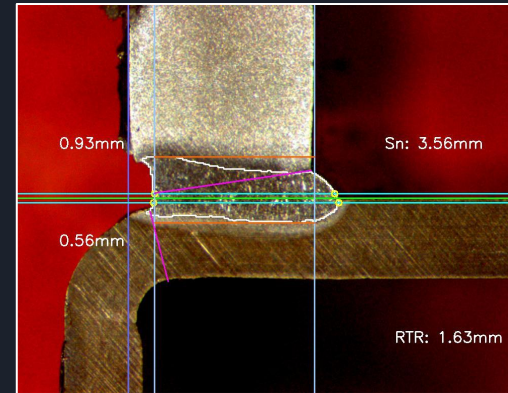
## Business value

- **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





# Top Data Science & Brose, Timeline from innovation to production



## Brose - Open Innovation Challenge

Brose and Munich Network organized an invitational Open Innovation Challenge Competition

## Deep Learning PoC

Brose & Top Data Science - proof-of-concept project for weld seam analysis with a computer vision deep learning

## Innovation and Supplier of the year Award

Brose recognized Top Data Science work by giving the Innovation and Supplier of the year.

## Development, Scaling & Support and Maintenance

Development of AI & Cloud based production version for Quality Assurance.  
Scaling to production sites in several global locations.

# Thank you!

Timo Heikkinen, CEO and Co-Founder

[timo.heikkinen@topdatascience.com](mailto:timo.heikkinen@topdatascience.com)      +358 40 589 4400

[www.topdatascience.com](http://www.topdatascience.com)





# Industrial Data Science Platform and Applications in the Electronics and Manufacturing Industries

David Arnu, Lead Data Scientist

Ralf Klinkenberg, Founder & Head of Research



14 December 2021





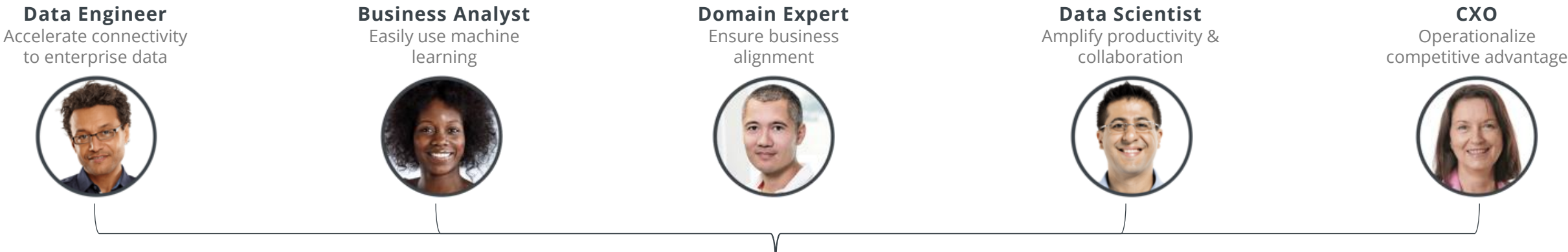
Parts of enterprise AI are broken  
today and we want to help fix them

**Reinvent enterprise AI** so that **anyone** Any skill level  
or domain  
has the power to **positively shape the future.**

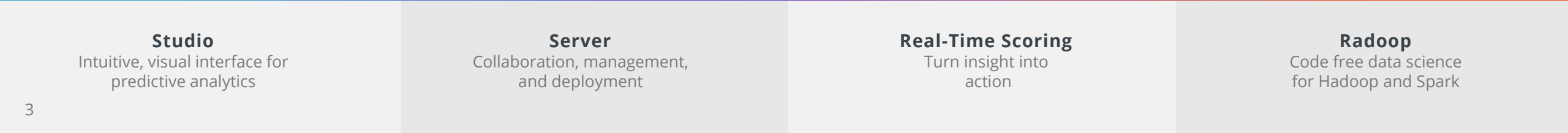
Allow users the ability to make an  
impact on their organization, not just  
create a technically sound model



# Fully Augmented, Transparent, End-to-End Platform



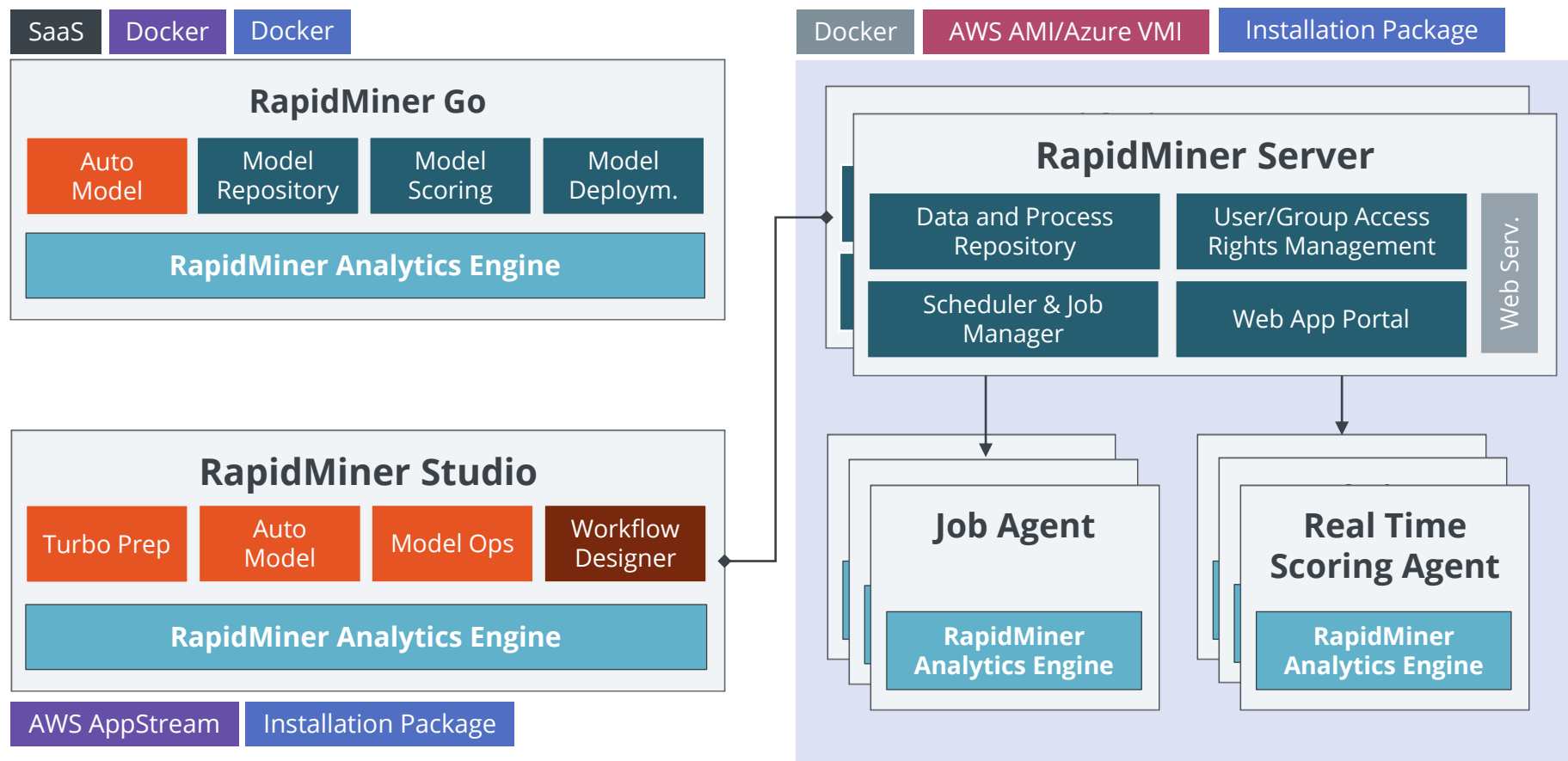
Automated, Visual Workflow, or Code-Based Data Science





# RapidMiner AI Cloud

Easily Maintainable – Elastically Scalable – Runs Anywhere



## Deployment Types

Software-as-a-Service (SaaS)

Managed

On-demand

On-prem/private

Anywhere

## Containerization Support



kubernetes

## Supported Cloud Platforms



Google Cloud Platform

## Supported Operating Systems

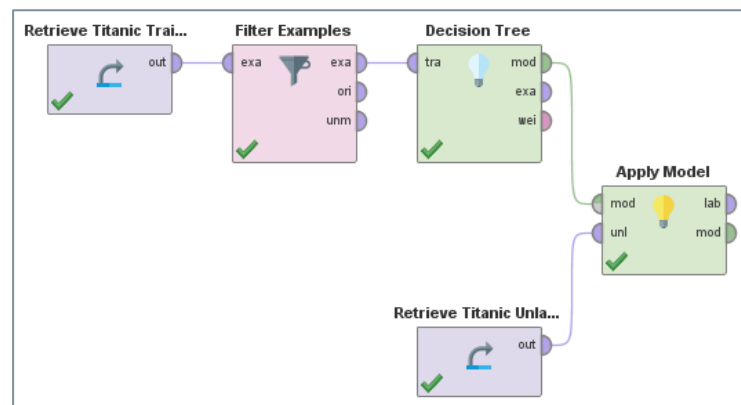






# Data Science Approaches

```
1 class Basket():
2     PRICING_STATUS_CHOICES = (
3     )
4     NO_REQUEST,
5     _("No Request - there was no manual pricing requested yet")
6
7     WAITING_FOR_MANUAL_PRICING,
8     _("Waiting For Pricing - the basket needs someone to "
9       "set a manual price for one or multiple lines")
10
11     MANUALLY_PRICED,
12     _("Manually Priced - the basket has been priced manually")
13
14
15
16
17
18
19
20 )
```



TRANSFORM	CLEANSE	GENERATE	PIVOT	MERGE	MODEL	CHARTS	CREATE PROC			
Passenger Class	Name	Sex	Age	No of Siblings or ...	No of Parents or ...	Ticket Number	Passenger Fare	Cabin	Port of Embarkat...	Life Boat
First	Allen, Miss. Elsie.	Female	29	0	0	24160	211.338	B5	Southampton	2
First	Allison, Master. HJ.	Male	0.917	1	2	113781	151.550	C22 C26	Southampton	11
First	Allison, Miss. Helen.	Female	2	1	2	113781	151.550	C22 C26	Southampton	?
First	Allison, Mr. Hudson.	Male	30	1	2	113781	151.550	C22 C26	Southampton	?
First	Allison, Mrs. Hudson.	Female	25	1	2	113781	151.550	C22 C26	Southampton	?
First	Anderson, Mr. Harry	Male	48	0	0	18982	26.550	E12	Southampton	3
First	Andrews, Miss. Kier.	Female	63	1	0	13502	77.958	D7	Southampton	10
First	Andrews, Mr. Thom.	Male	39	0	0	112050	0	A36	Southampton	?
First	Appleton, Mrs. Ede.	Female	53	2	0	11788	51.479	C101	Southampton	D
First	Arppe,Mr. Rza.	Male	71	0	0	PC 17609	48.504	?	Cherbourg	?
First	Arter, Col. John Jac.	Male	47	1	0	PC 17757	227.525	C62 C64	Cherbourg	?
First	Arter, Mrs. John Ja.	Female	18	1	0	PC 17757	227.525	C62 C64	Cherbourg	4
First	Auer, Mrs. Louis.	Female	24	0	0	PC 17477	69.380	B35	Cherbourg	9
First	Barber, Miss. Ellen	Female	26	0	0	18871	78.850	?	Southampton	5
First	Bartholomew, Mr. Alge.	Male	89	0	0	27542	39	A23	Southampton	8
First	Baumann, Mr. John.	Male	?	0	0	PC 17218	25.825	?	Southampton	?
First	Baxter, Mr. Garry E.	Male	24	0	1	PC 17558	247.521	858 B60	Cherbourg	?
First	Baxter, Mrs. James	Female	50	0	1	PC 17558	247.521	858 B60	Cherbourg	5
First	Bazzani, Miss. Adina	Female	32	0	0	11813	75.292	D15	Cherbourg	8

## Data Science 1.0

Code-centric  
Very flexible  
Slow  
Error-prone  
Hard to maintain

## Data Science 2.0

Process-centric  
Flexible  
Higher Productivity  
Still some complexity  
Easier to maintain

## Data Science 3.0

Data-centric  
Covers most use cases  
Extremely fast  
Safe and guided  
Seamless operations

Sufficient for 100% of cases

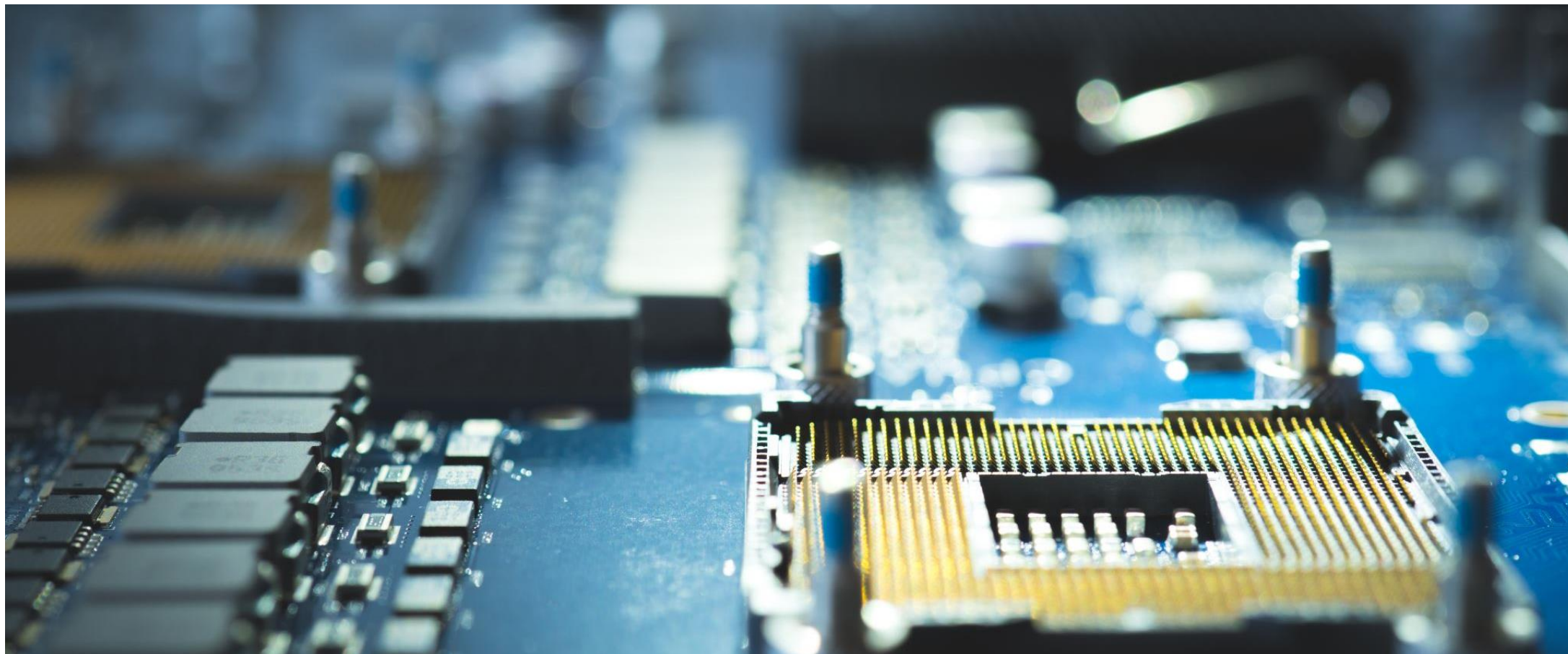
Sufficient for 95% of cases

Sufficient for 80% of cases



# IIP-Ecosphere Demonstrator at Sennheiser

## - Intelligent Testing of Circuit Boards



# Sennheiser Use-Case Demonstrator



Testing today

Manual set-up

Manual handling of parts

Automated testing

Operator decides on further actions if tests fail

...



Testing tomorrow

Automated set-up

Automated handling of parts

Automated testing

Automated decision on next steps if test fails

...



Gefördert durch:



# Use Case and Challenges



IIP-Ecosphere

- Detecting errors and Pseudo-Errors in (semi-)automated testing environments
- Creating services that monitor the test stations and trigger proper reactions:
  - Re-testing
  - Send to repair
  - Check test station

Gefördert durch:





# Use Case and Challenges



IIP-Ecosphere

- Many test parameters (may also change over time)
- Many different products
- Cost and Time considerations:
  - What are the base costs of the product?
  - What are the costs of different actions?
  - Workload on the test station?
  - Production and storage capacities?

Gefördert durch:



Bundesministerium  
für Wirtschaft  
und Energie



IIP-Ecosphere

# Evaluation of AI in Production

- Three different error classes
  1. True defect (the board is defect -> repair or discard)
  2. Pseudo error (test fails, but the board is okay)
  3. Test-Station error

	True defect	True pseudo error	True Test-Station error
Predicted defect	<i>Defect board detected</i>	Board marked defect, but was only a test error	Board marked defect, test station continues to produce errors
Predicted pseudo error	Unnecessary re-testing, Board still defect	<i>Re-testing results in board marked okay</i>	Unnecessary check of test station
Predicted test station error	Costs for checking test station, board still defect	Unnecessary check of test station	<i>Check of test station, works correct afterwards</i>

Gefördert durch:



Bundesministerium  
für Wirtschaft  
und Energie



# Further Projects



# Data-Driven Process Optimization for the Brewing Industry



Project Goal:

Development of an industry-specific data science platform for the beverage industry



Sample Use Case:

Data-driven malt yield maximization with Artificial Intelligence (AI) & Machine Learning (ML)



## Ingredients



Hop



Yeast

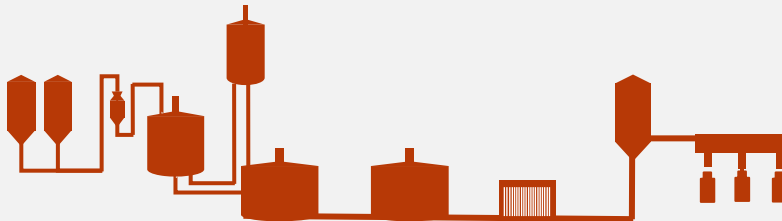


Water

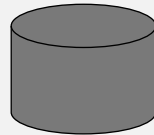


Malt

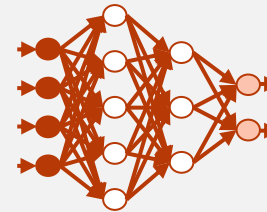
## Brewing Process & Training of Prediction Model ( ML )



Beer-Brewing-Process

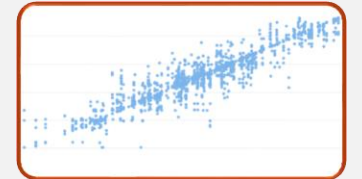


Product and  
Process Data



Prediction Model

## Model Predictions



Prediction 1



Prediction 2

Optimized Process Control

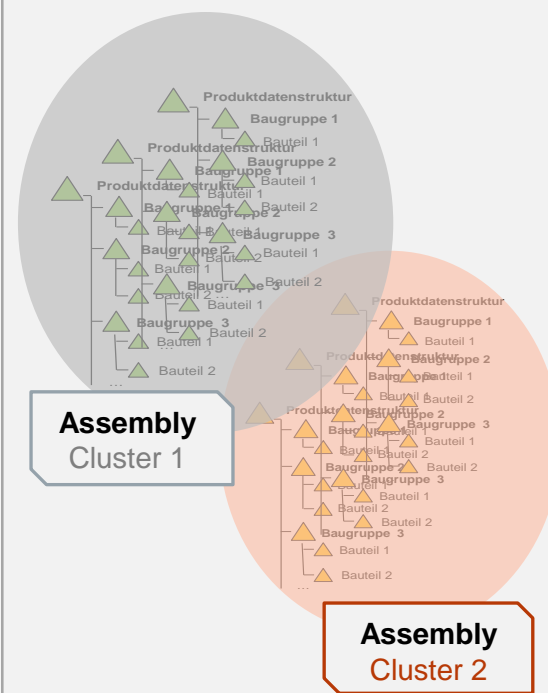
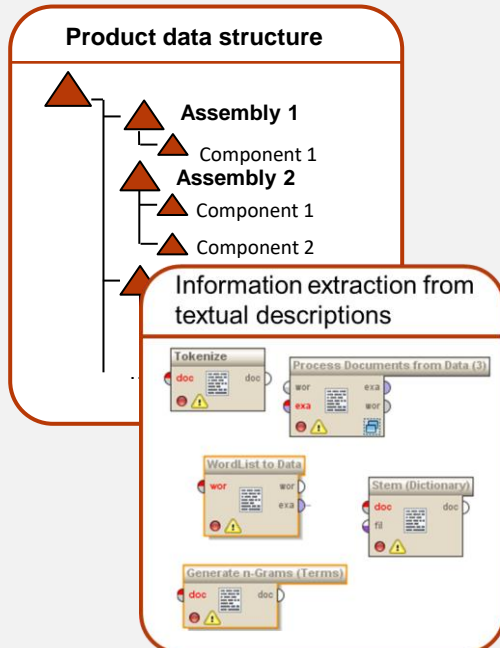
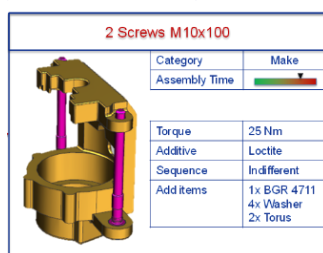
## Extracting knowledge from Product Lifecycle Management (PLM) data

## Prediction of assembly times & assembly plans for new product designs

# Preprocessing

# Modeling

## Predicted Plans



<b>Blatt:</b>		<b>Benennung:</b>		<b>Datum:</b>	
1		Welle		01.06.2016	
<b>Auftrags-Nr.:</b>		<b>Zeichnungs-Nr.:</b>		<b>Bearbeiter:</b>	
2016-0156		987-321		M. Müller	
<b>Werkstoff:</b>		<b>Form- und Abmessung:</b>		<b>Fertiggeg.:</b>	
C 45		Rundmaterial ø 60 mm		3,8 kg	
<b>Nr.</b>	<b>Prozessbeschreibung/Arbeitsgang</b>			<b>t<sub>f</sub></b>	<b>t<sub>e</sub></b>
01	Sägen auf 155 mm			5	5,3
02	Auf Maß 150 mm			8	9,4
03	Welle komplett drehen			20	6,4
04	Gewindeloch bohren			10	12,7
05	Gewinde schneiden			10	14,8

## Assembly plan



### Coordinator

Dr. Halid Hrasnica  
Eurescom, Heidelberg, Germany

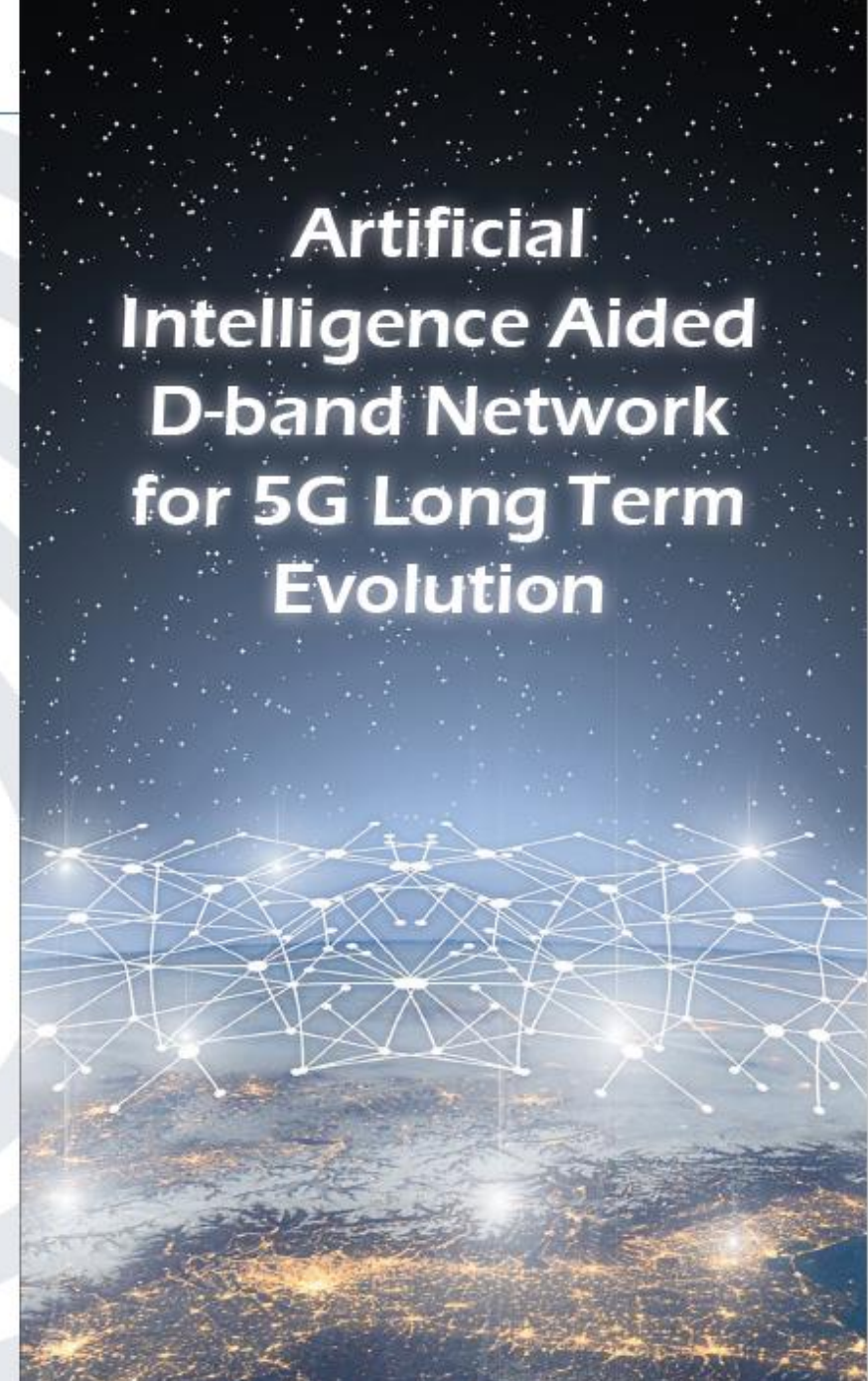
### Scientific and Technical Project Manager

Prof. Dr. Angeliki Alexiou  
University of Piraeus Research Centre,  
Athens, Greece

**Website:** <https://www.ict-ariadne.eu>

**Twitter:** @AriadneIct

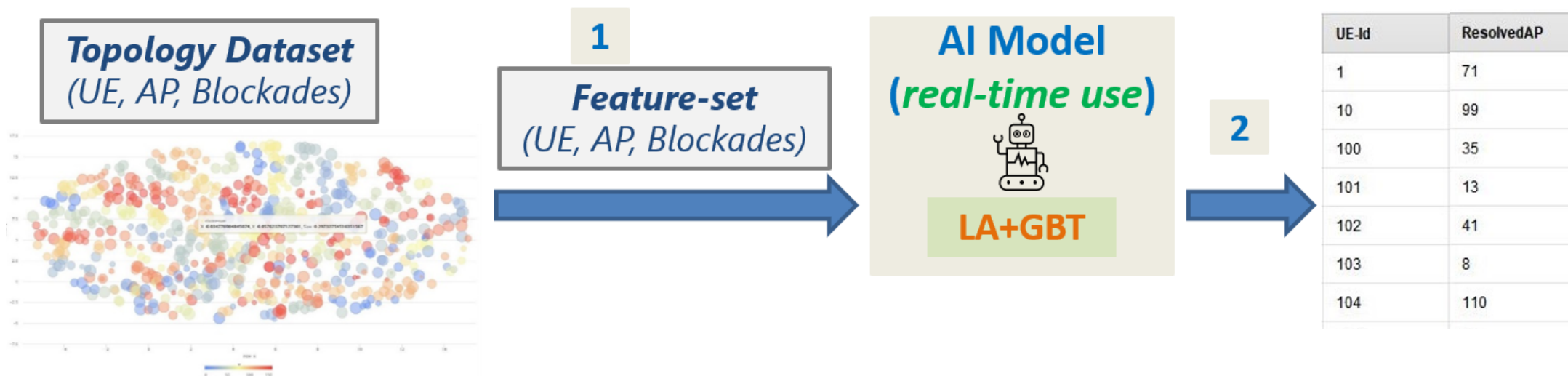
**Email:** [contact@ict-ariadne.eu](mailto:contact@ict-ariadne.eu)



# Artificial Intelligence Aided D-band Network for 5G Long Term Evolution



# Dynamic Line-of-Sight (LoS) Connectivity





**David Arnu**  
Lead Data Scientist



**Ralf Klinkenberg**  
Founder & Head of Research



RapidMiner, Dortmund, Germany

**research@rapidminer.com**

**www.RapidMiner.com**

**www.industrial-data-science.de**

RapidMiner  
rapidminer.com  
@rapidminer

# SILO<sub>AI</sub>

## Largest private AI lab in the Nordics



# Who we are

*Largest private AI lab in the Nordics*

# SILO<sub>AI</sub>

## What we do

Trusted AI partner. We deliver AI-driven solutions and products to our clients by providing world-class expertise and tooling.

## Vision

AI for people. A world with safe human-centric AI that frees the human mind for meaningful work.

200+ Experts

100+ PhDs

Network of 500+

Machine learning

Natural language processing

Computer vision

Cloud | IoT | Embedded

**Nordics**

Finland, Sweden, Denmark

**US**

Palo Alto

**DACH**

Switzerland

**UK**

London





# Why Silo AI?

## State-of-the-art AI expertise

Deep and specialized AI expertise, a unique ability to attract and keep world-class AI talent

## Trusted AI partner

Trusted advisor with a service mindset and flexible working model for a unique customer experience

## End-to-end capability

With expertise spanning the tech stack and operations, realize best outcome and maximum value



# R&D for AI-driven products

## Expertise areas

### Design, planning & management

- Technology planning
- Architecture planning
- Rapid prototyping
- Project management

### Machine Learning

- Supervised learning
- Unsupervised learning
- Transfer & active learning
- Multi-objective optimization
- Reinforcement learning
- Recommender systems

### Computer Vision

- Image segmentation
- Object detection
- Sensor fusion
- Image generation
- 3D, video, point clouds
- Image & object annotation

### Natural Language Processing

- Word & doc classification
- Text tagging & parsing
- Language generation
- Machine translation
- Speech recognition
- Conversational AI

### Software, Data & ML Engineering

- MLOps & DevOps
- Data engineering
- Software development
- Lifecycle support

## Cloud AI

## Data platforms

## Embedded AI

## IoT & Edge AI



# Use cases and references

## Smart vehicles

Automotive | Maritime |  
Heavy Machinery | Aerospace



Advanced Driver-  
Assistance Systems



Intelligent Vessel  
Awareness System



Autonomous  
Heavy Machinery



Predictive Aircraft  
Maintenance



Situational Awareness  
& Object Tracking

## Smart industry

Manufacturing | Factories |  
Process Industry | Industrial IoT



Visual Quality  
Control



Visual Anomaly  
Detection



Predictive  
Maintenance



Process Quality  
Prediction



Tool & Equipment  
Recommendation

## Smart devices

Wearables | Smart Homes |  
Personal Electronics | Semiconductors



Camera Device  
For Surveillance



Cybersecurity &  
Intrusion Detection



Sewage Pipe Defect  
Analysis Robot



On-device Point Of  
Interest Prediction



Healthcare &  
Medical Devices

## Smart health

Medical Devices | Pharma |  
Healthcare Services | Home Care



Surgery Imaging  
Analysis



Imaging For Cancer  
Diagnostics



Biomedical  
Signal Processing



Treatment  
Recommendation



Computer Vision  
For Home Care

## Smart cities

Infrastructure | Energy | Logistics |  
Construction | Mobility | Citizen



Water Quality &  
Sewage Pipe Analysis



Port  
Automation



Parcel Arrival  
Prediction



Energy & Distributed  
Heating Optimization



Financial Stability  
Monitoring





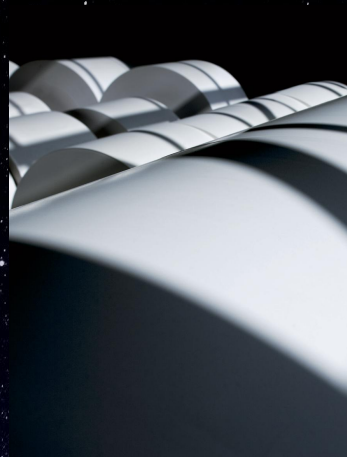
# Silo AI in Smart Industry



Predictive  
maintenance for  
rapid intervention



Large scale Visual  
quality control  
solution



System design  
(SoC+SW) for AI  
camera portfolio

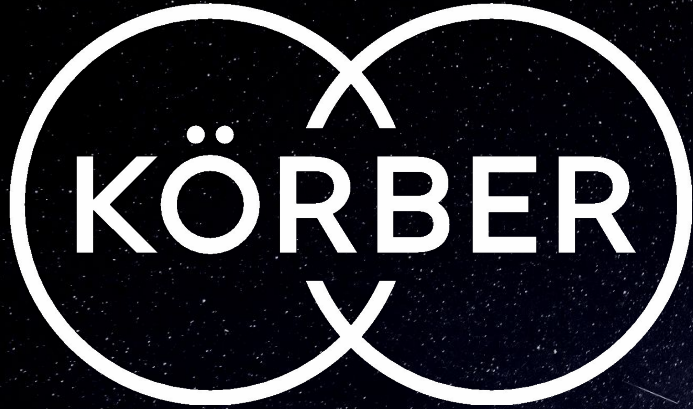


Self-learning  
dynamic pricing  
solution



# Edge AI in Industrial Environments

*Silo AI webinar this Nov: our 3rd on the topic*



SILO<sub>AI</sub>



# Körber & Silo AI

*Optimized AI visual quality control solution for pharmaceuticals manufacturing*

## Platform expertise

- Benchmark of 6 AI accelerator devices
- Overall edge system design for thermal and power budget
- Optimized data transfer, IoT framework, device mgmt

## AI expertise

- Model optimization: architecture, HW-specific optimization
- Latency and latency jitter reduction (main KPI)
- Semi-supervised learning to reduce batch-wise costs

## MLOps expertise

- Wider roll-out design
- MLOps system for cost-effective deployment of reliable solutions
- Joint cloud and edge data and model quality monitoring

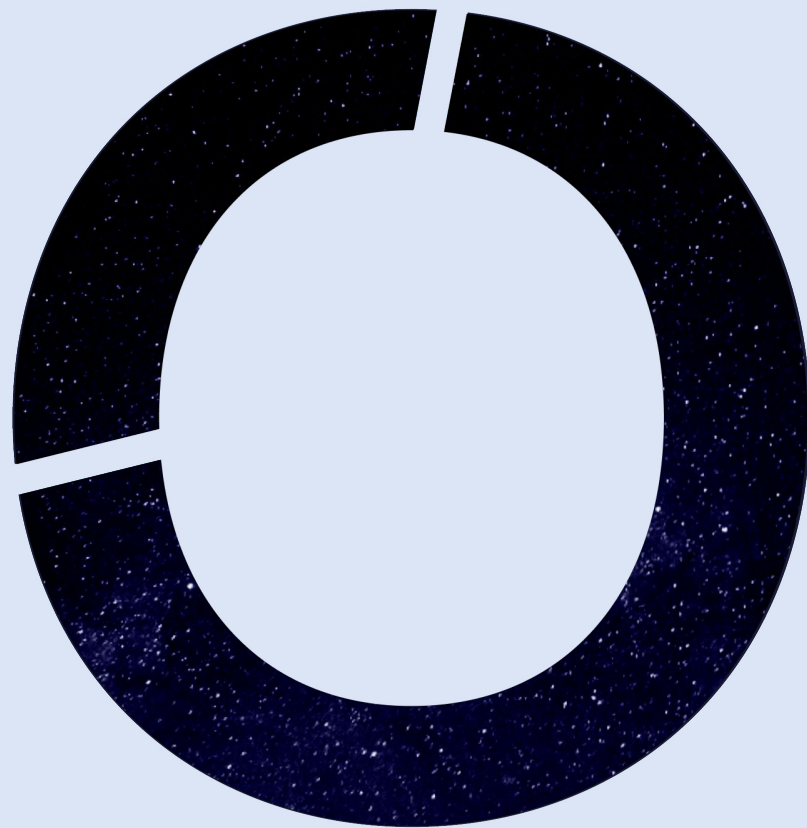




## Niko Vuokko

Head of Technology  
PhD

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Largest Private AI Lab in the Nordics

**SILO**<sub>AI</sub>



# Thoughts on Industrial Edge AI proposal

- AI-based virtual and super sensors  
=> Cost-effective and scalable Wireless Digital Factory
- OpenRAN rApps for local network optimization and reliability  
=> Solve factory-level challenges with IoT and compute device support
- One-shot, semi-, and self-supervised AI for industrial goods  
=> Low-cost AI quality control for small batch manufacturing





# Edge AI in Industrial Applications

Ville-Veikko Mattila, Jukka Saarinen  
Nokia Technologies

December 14<sup>th</sup>, 2021



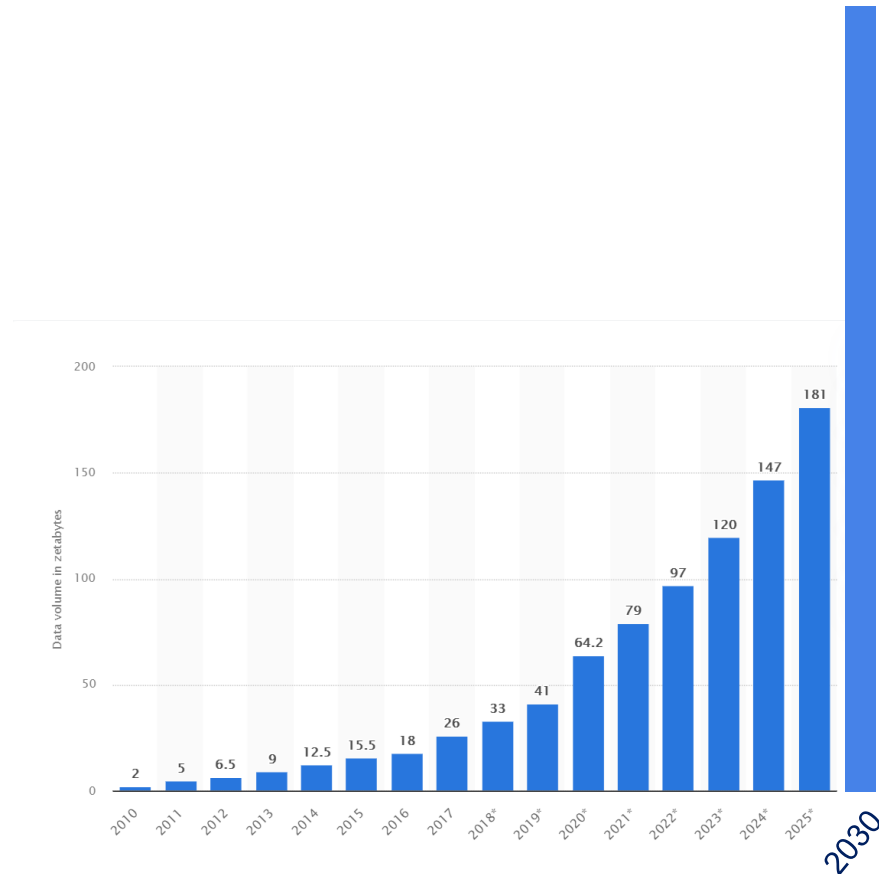
A large crowd of people is sitting on the grass in a city park, likely Central Park in New York City. The background is filled with tall, modern skyscrapers and older brick buildings. The scene is bright and sunny, with many people relaxing on the lawn.

Future edge solutions  
will enable the  
**COMPETITIVE EDGE**  
for sustainable  
networks



# Dramatic exponential increase in network traffic is not sustainable from a cost or energy consumption perspective and needs to be addressed

By 2025, 80% of all generated data are expected to be processed at the edge



Volume of data/information created, captured, copied, and consumed worldwide from 2010 to 2025 (in zettabytes)

Source: IDC, Statista 2021

The nature of devices and applications is changing, and the collection and **real-time processing of data is driving the transformation** from centralised cloud-based infrastructure models towards edge

Massive data traffic increase due to mobile broadband, video acceleration, data centers, connected smart devices and IoT sensors are causing major changes to future networks, network architecture and sustainability

Currently, globally data centers are consuming energy annually more than 400 terawatts (TWh), which is approximately 3% of the total energy generated in the world and it is rapidly increasing

Edge computing market size is between \$100 and 250 billion by 2028 (CAGR 30-40%)



# New sustainable and secure networks critically needed to match the future data capacity growth

## Data and capacity limits

Exponential (IoT) data generation is pushing network capacity to its limits and at increasing cost.

## Network sustainability

To dramatically slow down the exponential growth of capacity need, energy consumption, and related costs.

## Secure data flow

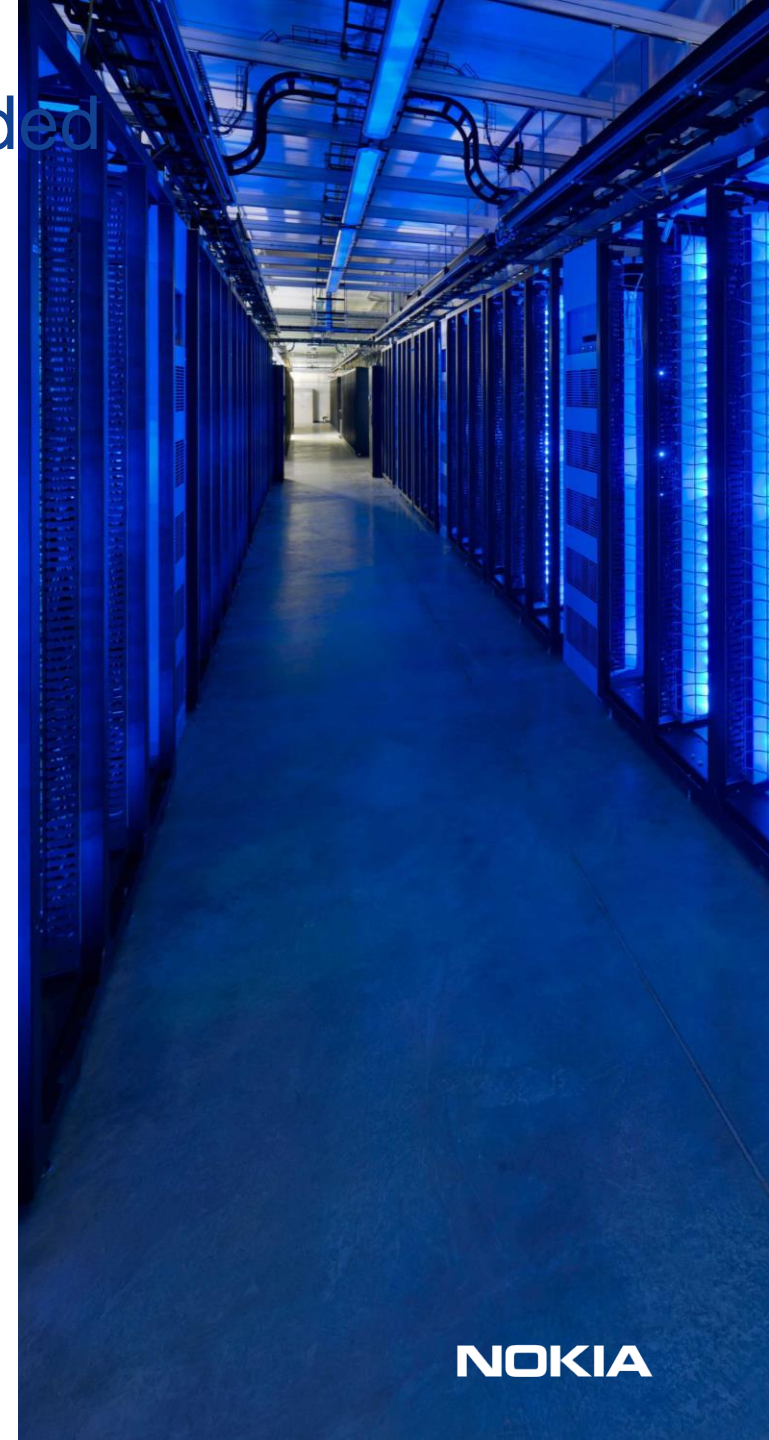
To enable secure and seamless data flow from device to cloud and back.

### Case example – Energy efficiency on data centers

Globally data centers use annually over 400 terawatts (TWh), which equals to capacity of 50 nuclear power plants. During the next 10 years, additional 50 nuclear power plants will be needed if energy efficiency can not be improved.

By 2025, **80% of all generated data are expected to be processed at the edge** that can change this trend.

It is estimated that new edge capabilities on 5G can help **reduce carbon emissions and energy efficiency up to 60%** over the next 10 years. Globally, this reduces massively the need for new energy production capacity.



## Our mission

Creating COMPETITIVE EDGE for sustainable future networks

## Our solution

1. Creating intelligent edge platform and architecture
2. Processing data close to where it is generated

### Nokia's main project focus areas:

Architecture  
and platform

Automation to  
enable  
seamless  
and secured  
data flow

Industry  
applications

Use cases  
and Edge  
Cloud  
ecosystem

# The project proposal to boost the build-up of Edge Cloud ecosystem in Europe

Nokia, together with global industry leaders, will create an ecosystem enabling strong global growth and investments in Finland

Nokia will establish a test environment on Edge computing in Finland to increase edge-based R&D and global business growth

This project will strengthen the position of edge cloud ecosystem in global markets and sustainable competitive edge in and for Europe

Nokia's main project focus areas:

Edge Cloud Use cases and Edge Cloud ecosystem

Edge Cloud Applications for Future Networks

Edge Cloud Automation to enable seamless and secured data flow across devices, edge & cloud

Edge Cloud Architecture and platform for Future Networks



# Key research areas in manufacturing

## 1. Real-time data/vision pipeline challenges in

- Intelligent and real-time machine to machine (M2M) communication
- Remote machine control
- Product quality monitoring
- Production analytics
- Time-sensitive M2M communication (5G) in industry
- Adaptive data-driven additive manufacturing
- Enhanced M2M communication enabled predictive quality
- Data collection for AI training

## 2. Edge computing challenges

- Low latency, adaptivity, scalability
- Network distribution, central control

# Multimedia Solutions in Multi-access Edge Cloud (MEC)

## Example

- Main objective is to create new capabilities for **end-to-end energy and performance optimisation of distributed and adaptive image and video processing pipelines**, taking care of the entire system from the edge to the cloud by focusing on the following research areas are:
  - Multimedia collaboration solutions in MEC environments with demonstrators
  - Multimedia sensor optimization in real-time multimedia-enabled processes in MEC environments (camera, compression local optimization and power management)
  - Advanced distributed AI architectures and solutions (federated learning and complex data management)
  - Real-time, far-edge or multi-sensory multimedia analytics in MEC environments,
  - SW component implementations to domain-specific IoT and multimedia-centric problems and use cases (e.g., machine learning or image/video content analysis algorithms) in Edge AI environment.

# Suitable funding instruments, calls and requirements

## Preliminary key project ideas and themes : Presentation of ideas by Nokia

### Funding instruments:

- Key Digital Technologies
- Smart Networks and Services
- Eureka Clusters

### Discussion and planning session:

- Ranking of the project ideas → 2-3 themes to be selected for further scoping and planning
- Selection of most suitable funding instrument together



# Key Digital Technologies JU

1

## Focus



- The funding scope is widely in electronics and ICT.
- The approach is bottom-up, no detailed call text to match
- The funding scope is strictly industrial.
- The consortium needs to include a full value chain

## Opportunities



- The consortium include a full value chain
- Typical projects realise a number of demonstrators tailored to industrial needs.
- Very large project consortiums; typically 30-40 (even 100+) partners

## Support



- Estimated 1B€ for 2021-2028
- The funding is a combination of EU grants and national grants for each partner
- Smaller funding rates; typically 40-70%, For a Finnish LE 40%
- Essentially higher hit rates; even 20-60% (in H2020 usually 2-15%)

## Requirements



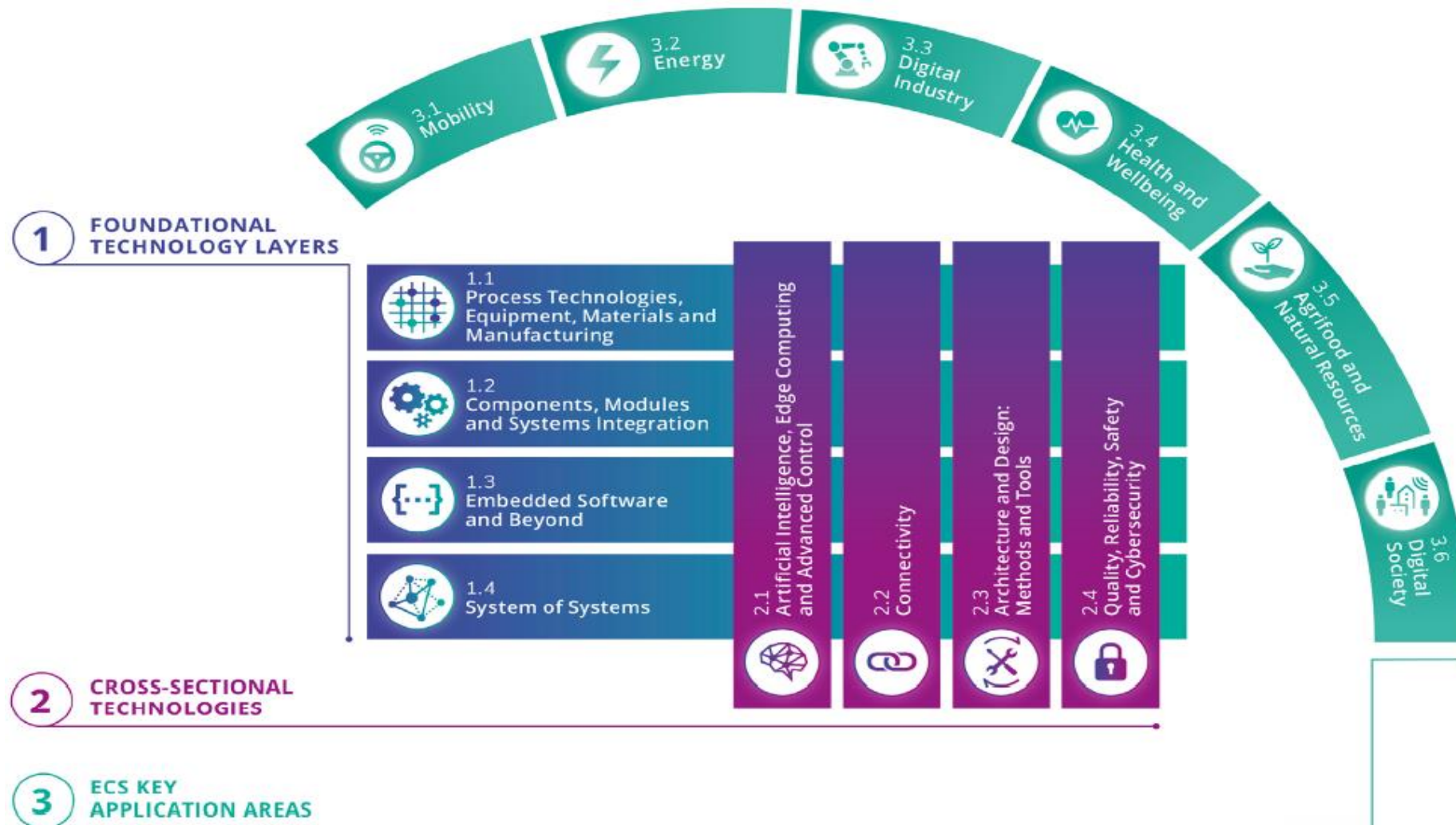
- Eligibility: legal entity from Member State or associated country, EU may limit the eligibility of third country participation in some actions under security topics.
- Further requirements defined in work programme.

## How to apply



- Call expected to open in September 2021 and deadline at the end of 2021 /early 2022

# Key Digital Technologies Themes



# Smart Networks and Services

2

## Focus



- Communication network and digital infrastructure development
- Beyond 5G and development of the fundamental technologies for 6G
- Security and privacy
- Digitalisation of society together with vertical industries and public sector

## Opportunities



- Wide collaboration opportunities with industries, SMEs, and research organisations

## Support



- €900 million over the period 2021-2027

## Requirements



- Eligibility: legal entity from Member State or associated country. National funding agencies have their own rules which define the eligibility.
- Further requirements defined in work programme.

## How to apply



- Draft agenda available, Calls expected to open in 2021/2022



# EUREKA Clusters

A typical Cluster project is...



2-14 participants



3-4 countries



average duration

30 months



average project cost

3 - 15 M€



Telecommunications



Smart electronics systems



Low carbon energy technologies



Software intensive systems  
and services



New Cluster on Metallurgy



Micro and Nano electronic  
technologies and applications



Advanced manufacturing program

# Thank you!

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