AI Factory Austria AI:AT

AI in Manufacturing

From Hype to Reality

Dr. Daniel Lehner
Expert AI Knowledge Transfer @ AI Factory Austria AI:AT

21.10.2026

Dr. Daniel Lehner



Expert AI Knowledge Transfer @ AI Factory Austria AI:AT
- https://ai-at.eu/trainings/

AI in **manufacturing** (through digital twins)
- IT Consultant and Trainer
- Business Informatics Researcher (441 citations) [1]

AI for **general public**
- University lectures AI for law/business administration
- VHS courses AI for general public [2]
- Certified AI Manager trainings [3]

[1] https://scholar.google.com/citations?user=TGGaQ_0AAAAJ

[2] https://vhskurs.linz.at/index.php?kathaupt=18&suchesetzen=false&kfs_dozentid=139372

[3] https://tecnovy.com/de/tecnovy/certified-ai-manager

Business Model Digitalization



New Markets
50 % reduced costs



-50 tons of CO2
until 2030

https://www.zeit.de/digital/2024-02/klimawandel-co2-sparen-digitalisierung-bitkom-studie

Business Model Digitalization

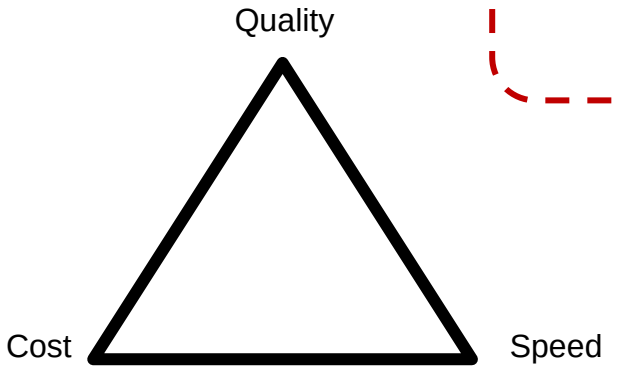


New Markets
50 % reduced costs



-50 tons of CO2
until 2030

Quality is not enough any more



Picture sources: https://madewithbluemchen.at/wp-content/uploads/2016/12/Fragezeichen-17.png;
https://www.iberdrola.com/innovation/smart-farming-precision-agriculture
geralt from pixabay.com, MR-Panda from pixabay.com

AI and IoT an Booster of Digitalizaiton



Quantified Me



Smart Farming



Industry 4.0

Picture sources:https://www.mikkoikola.com/blog/2014/7/5/quantified-self-and-biohacking
https://woboton.com/5-key-benefits-of-industry-40-for-factories/
https://www.iberdrola.com/innovation/smart-farming-precision-agriculture https://vcloudtech.com/solutions/digital-enterprise

Artificial Intelligence (AI)

- *Makes predictions based on data*
- *Detects issues that are not found by humans (or require a lot of experience)*
- *Finds solutions very fast that take a lot of time for humans*

Anomaly Detection



Predictive Maintenance



Live Planning









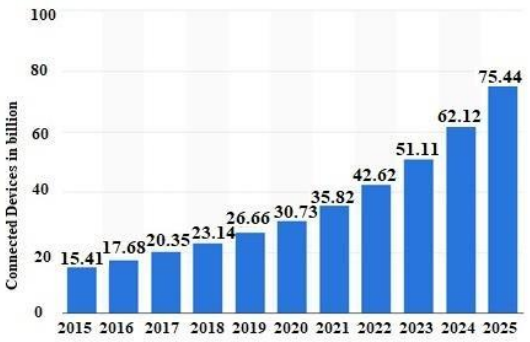


Industry 4.0

- *Delivers data for AI*
- *Realizes AI results in „real“ world*

18 % net value added

- Comparable to annual value creation of Vienna + Styria
- https://msftstories.thesourcemediaassets.com/sites/48/2024/08/20240722_KI-und-Produktivitat_EcG.pdf



Source: https://www.researchgate.net/figure/nternet-of-Things-IoT-connected-devices-from-2015-to-2025-in-billions_fig1_325645304

Picture Sources: European Parliament Research Service; plumber-repair-man-repairman-35611 created by Clker-Free-Vector-Images on pixabay.com; PDCA by Eko Purnomo from Noun Project; Anomaly Detection by Muhammad Rofian from Noun Project

Image by StarShopping from Pixabay; Image by Jens P. Raak from Pixabay

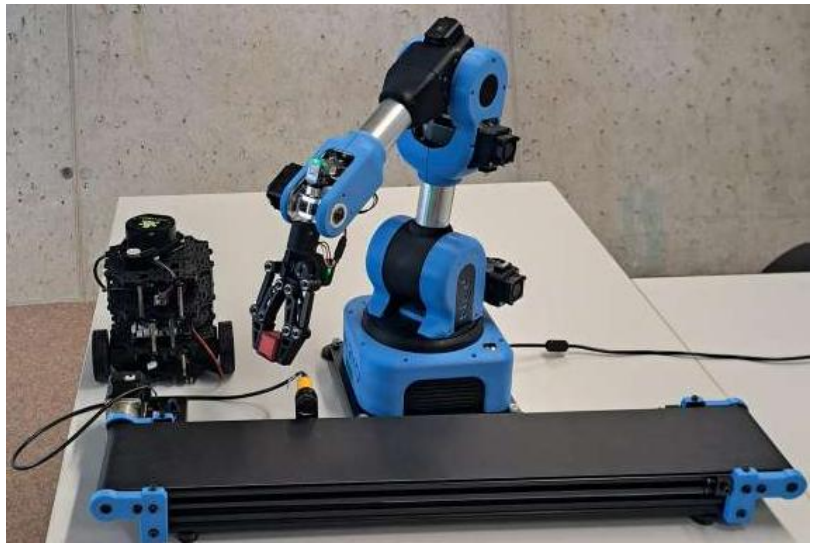
What‘s our Goal?

Predictive Maintenance



Anomaly Detection





Continuous Optimization



Live Planning



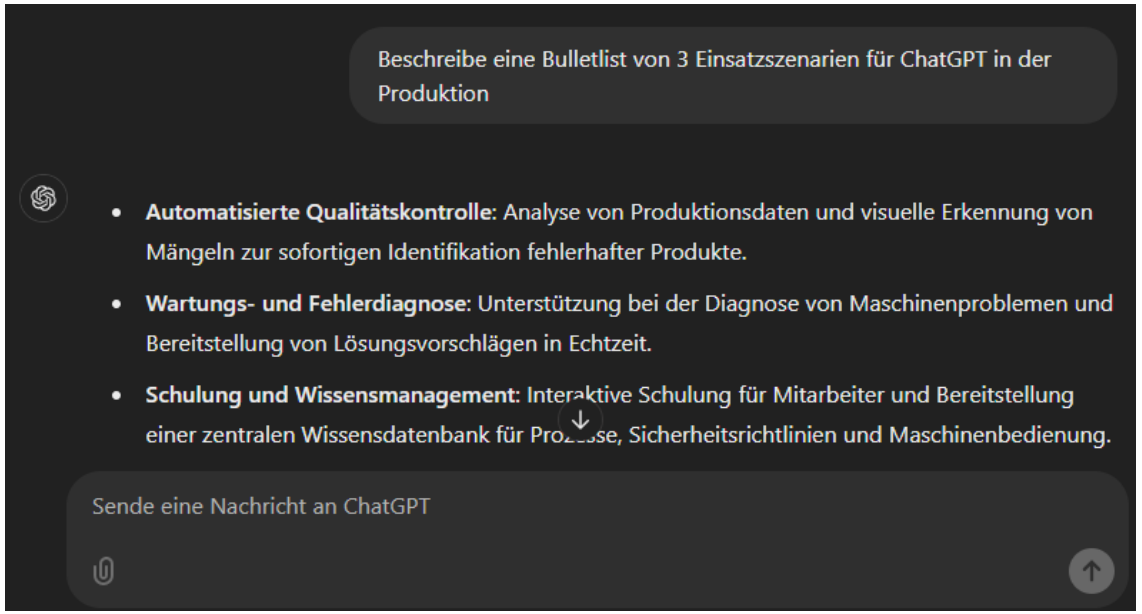
Circular Economy



Innovation through Digitalization

Picture Sources: European Parliament Research Service; plumber-repair-man-repairman-35611 created by Clker-Free-Ve… Images on pixabay.com; PDCA by Eko Purnomo from Noun Project; Anomaly Detection by Muhammad Rofian from Noun P…

ChatGPT



Underlying AI concept

Deep Learning

Transformers

…

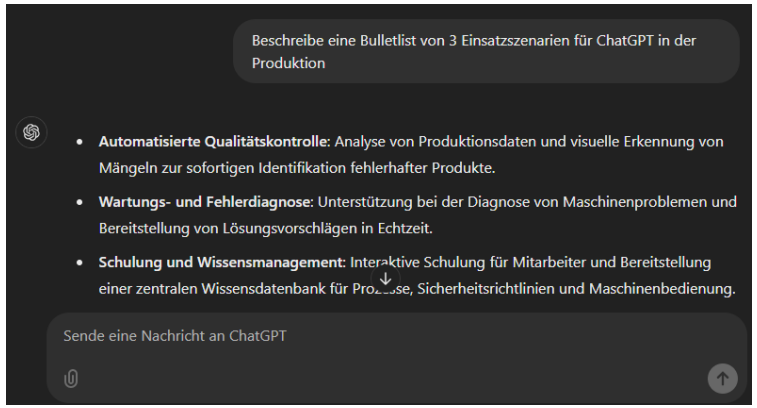
Large Language Model (LLM)

+ information retrieval

Retrieval-Augmented Generation
(RAG)

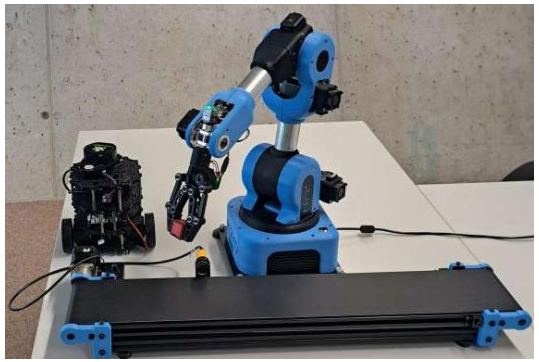
https://chatgpt.com/

Example: Analysis of Live Data









https://chatgpt.com/

What‘s our Goal?

?

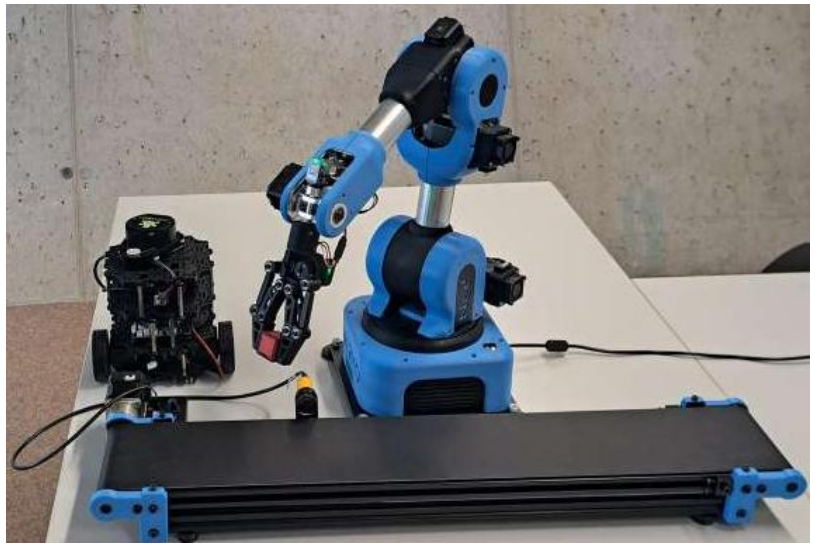
Predictive Maintenance



?

Anomaly Detection





?



Continuous Optimization

Live Planning





Circular Economy

?

?

?

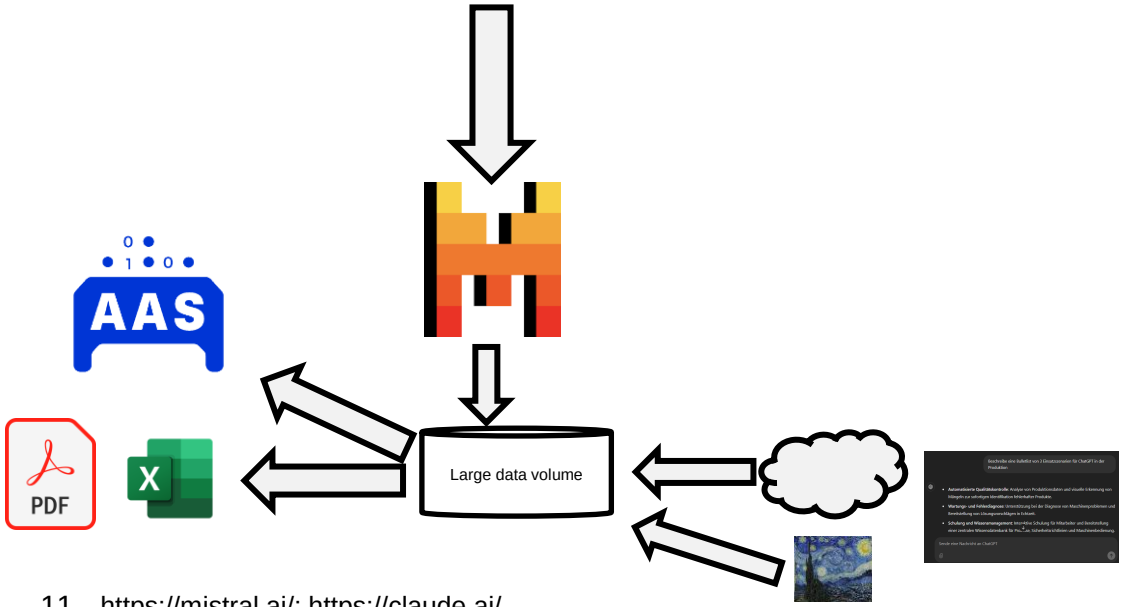
Innovation through Digitalization

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Generative AI in Manufacturing

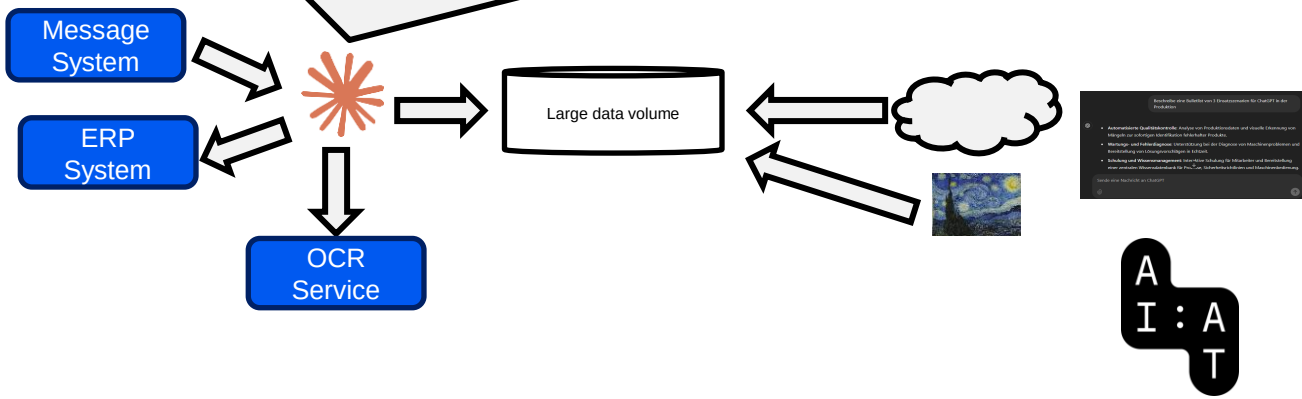
Use Case 1: Machine Chatbot





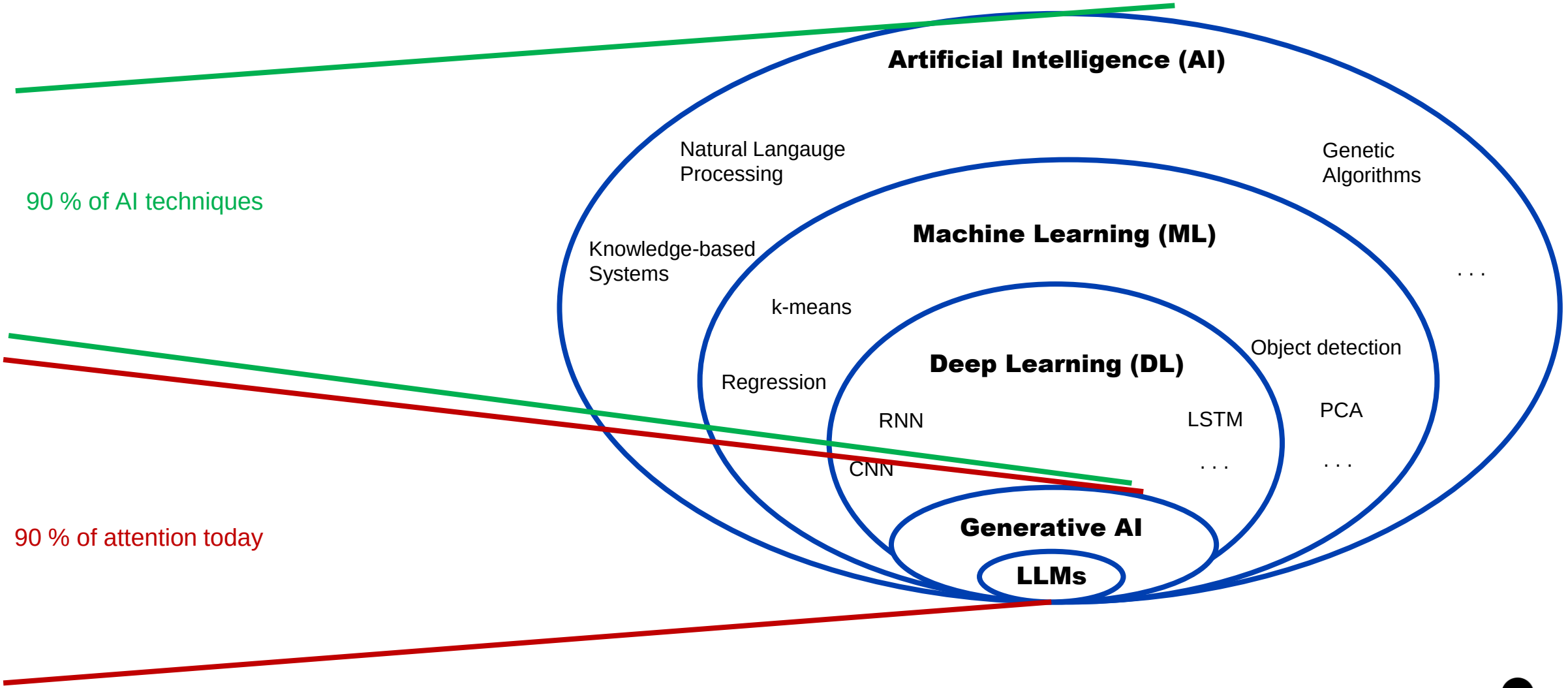
Use Case 2: Invoice Scanning

System Prompt: Use the attached scan of an invoice. Use the Adobe OCR tool to extract the following invoice data:
Then create a new goods receipt in SAP and save the corresponding invoice data.
Confirm that the invoice was created with a short message, including a link to the new goods receipt for review.
User Prompt: Here is the document with the invoice
Permissions
- Own Teams mailbox (read + write)
- SAP goods receipt (write)



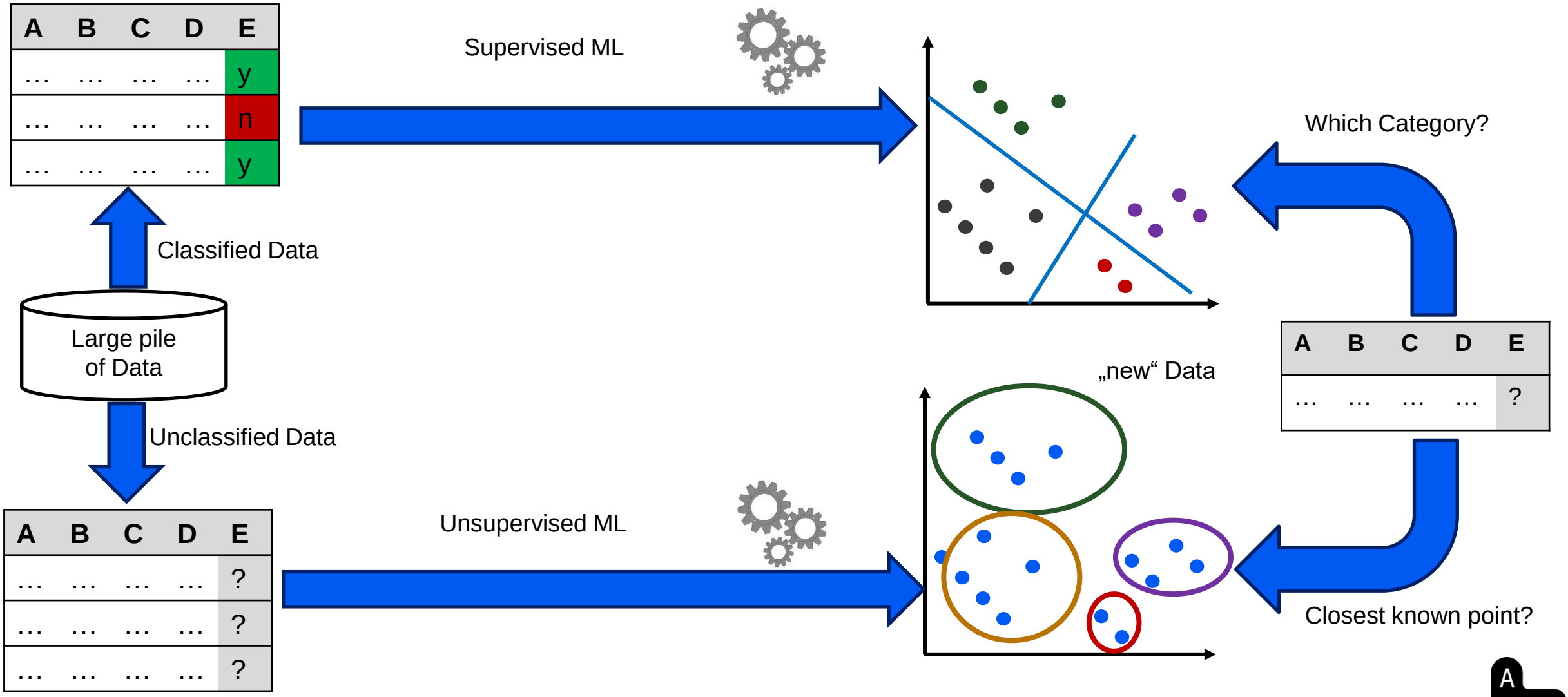
 https://mistral.ai/; https://claude.ai/

„AI Tunnel View“

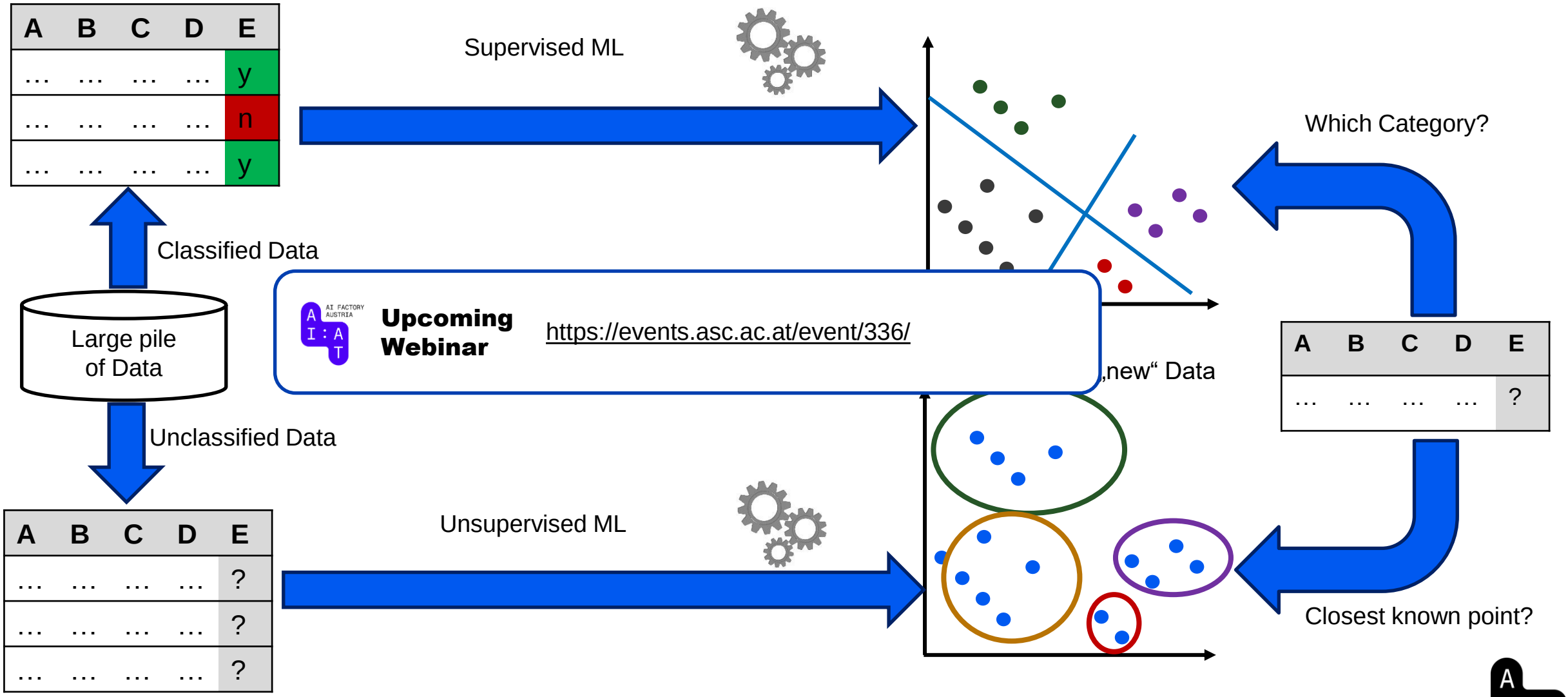


Source: https://www.linkedin.com/posts/jaylatta_llm-tunnel-vision-weve-fallen-into-the-activity-7386990451360387072-y6KI

Machine Learning (ML)



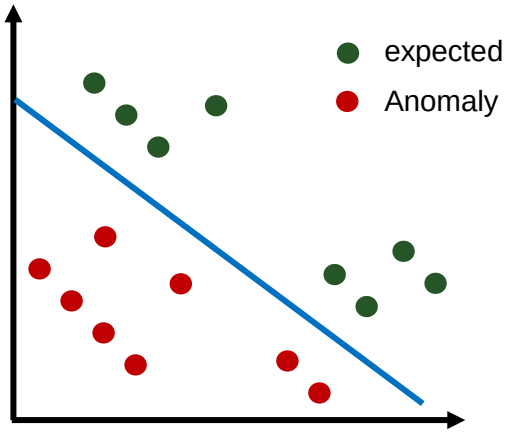
Machine Learning (ML)



Example 1:Anomaly Detection

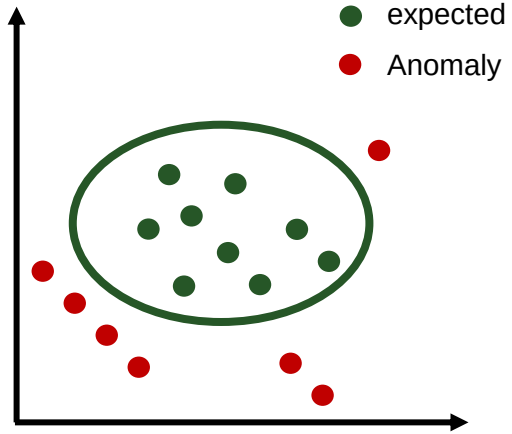


Supervised



Eigene Kategorie für „Anomalie“
+ menschliche Einschätzung
- Bestehende Fehlerdaten nötig
- Unbekannte Szenarien?

Unsupervised



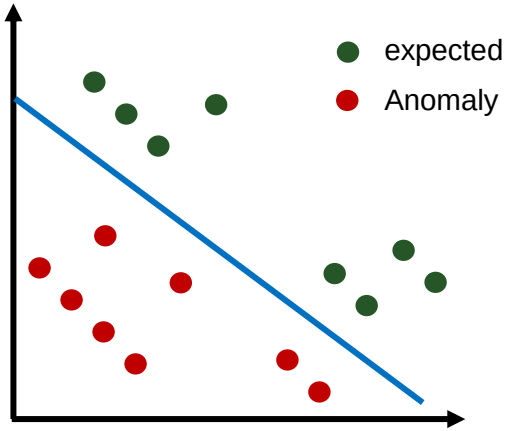
Alles „außerhalb der Norm“ wird als Anomalie klassifiziert
+ kann „live“ passieren
- höhere Fehleranfälligkeit

https://towardsdatascience.com/the-basics-of-anomaly-detection-65aff59949b7

Example 1:Anomaly Detection

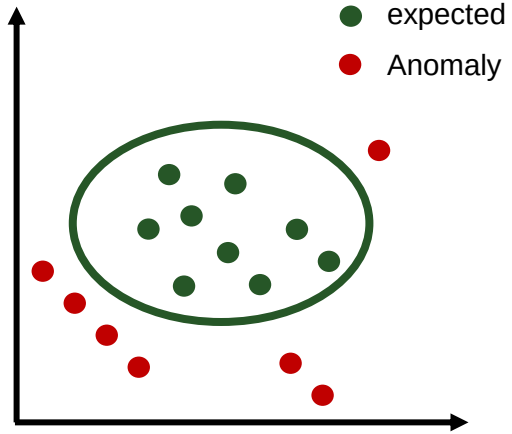


Supervised



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Unsupervised



Alles „außerhalb der Norm“ wird als Anomalie klassifiziert
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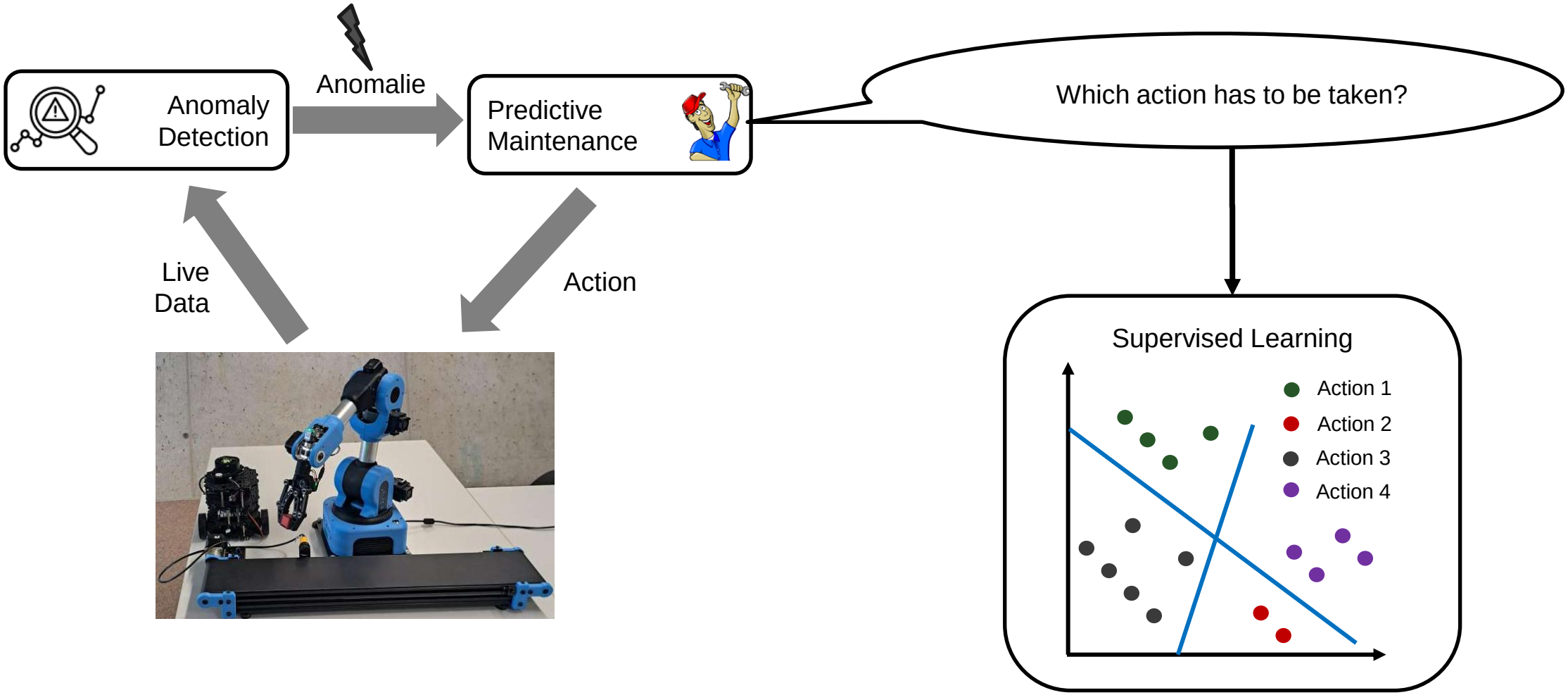
Previous Course: https://training.ai-at.eu/course/section.php?id=63

https://towardsdatascience.com/the-basics-of-anomaly-detection-65aff59949b7

Anomaly Detection by Muhammad Rofian from Noun Project

Example 2: Predictive Maintenance



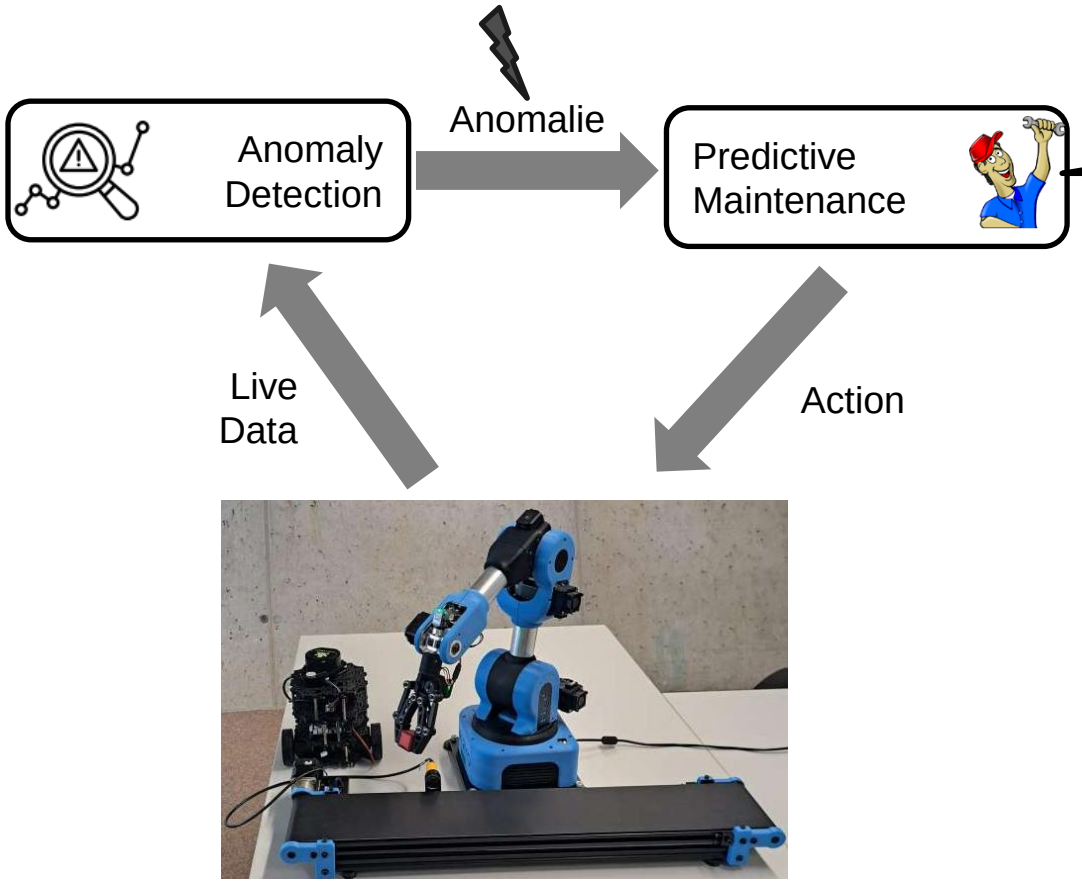


https://towardsdatascience.com/the-basics-of-anomaly-detection-65aff59949b7

plumber-repair-man-repairman-35611 created by Clker-Free-Vector-Images on pixabay.com; Anomaly Detection by Muhammad Rofian from Noun Project

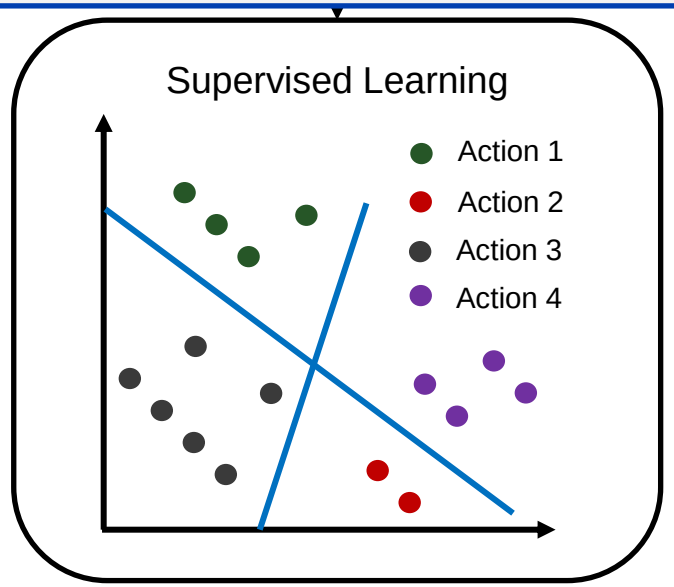
Example 2: Predictive Maintenance





Which action has to be taken?

Hands-On Course : https://events.asc.ac.at/event/349/



https://towardsdatascience.com/the-basics-of-anomaly-detection-65aff59949b7

plumber-repair-man-repairman-35611 created by Clker-Free-Vector-Images on pixabay.com; Anomaly Detection by Muhammad Rofian from Noun Project

Neural Networks in Biology



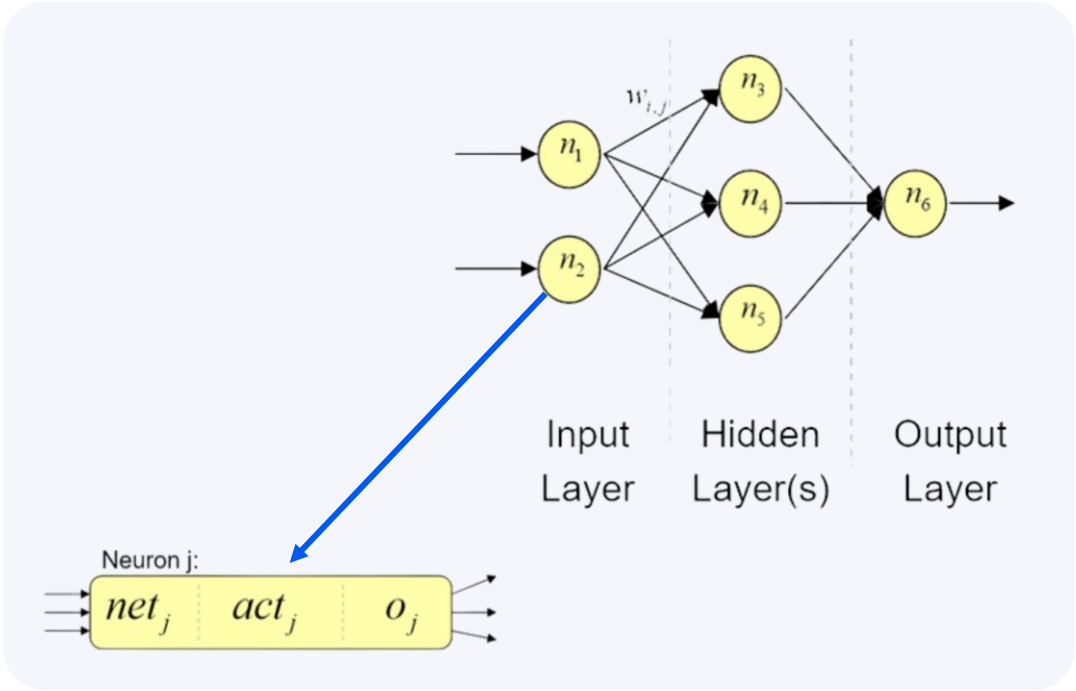
- Brain comprises **~10 Billion** Neurons
- Each Neuron is connected with **10.000** other Neurons
- All inputs are processed in parallel by Neuron

KEY INSIGHT
Learning = change in connections between neurons (=Synapses)

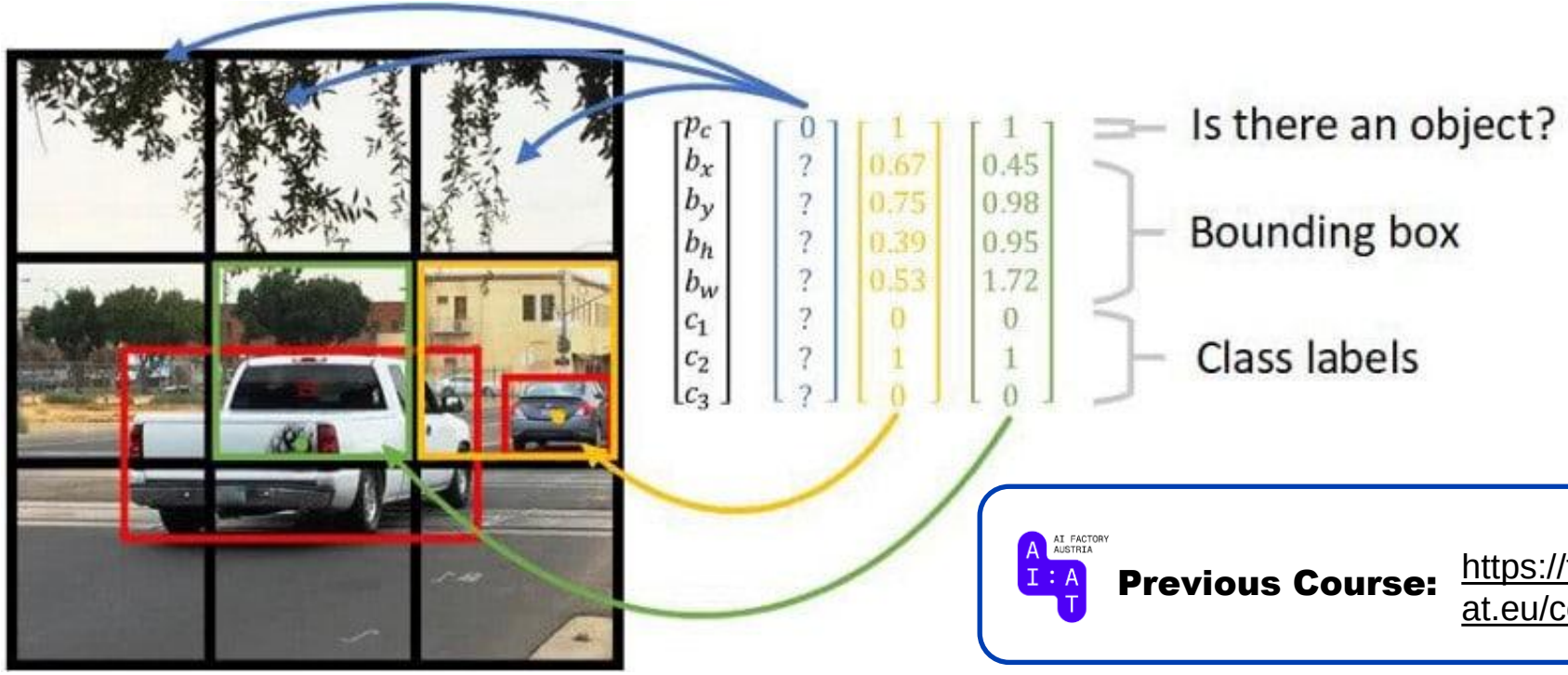
Artificial Neural Networks

Simple Neural Network

- Directed, weighed graph
- Layers of Perceptrons
- Each weighed edge connects two Perceptrons from different layers



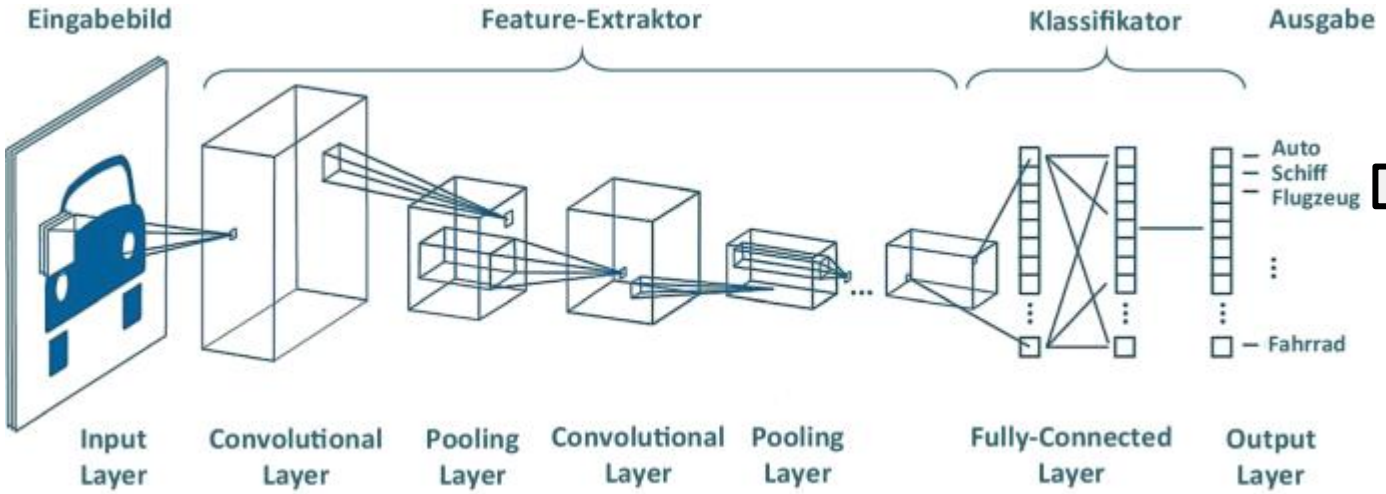
Example 3: Image Detection

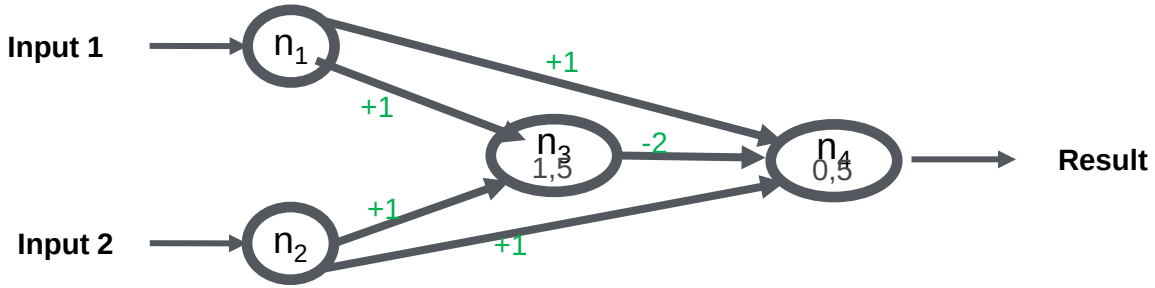


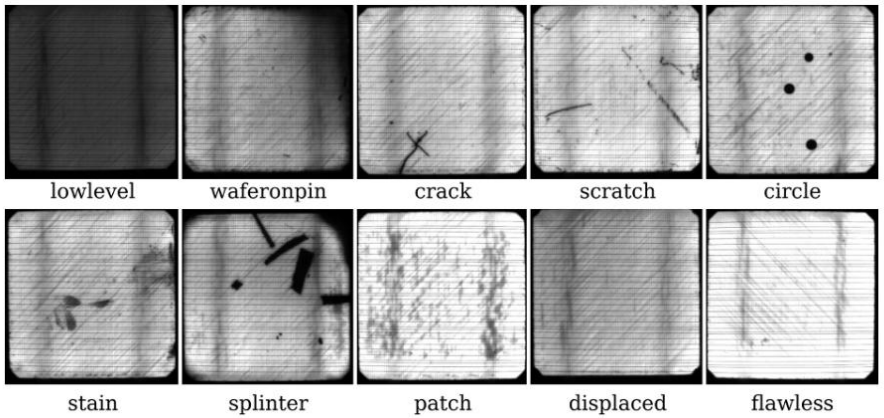
Previous Course: https://training.ai-at.eu/course/section.php?id=150

Source: https://datasolut.com/einfuehrung-in-maschinelles-sehen/

Example 4: Anomaly Detection in Manufacturing







Source: https://link.springer.com/article/10.1365/s40702-020-00641-8

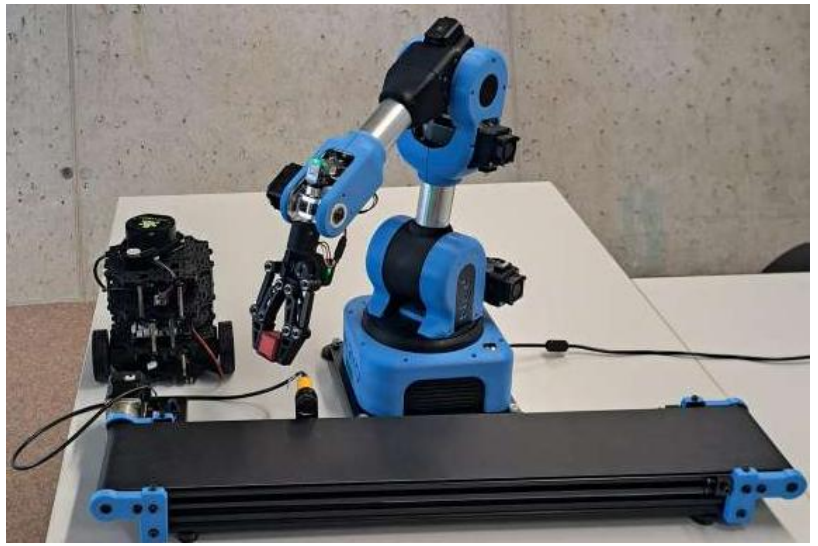
What‘s our Goal?

Predictive Maintenance



Anomaly Detection





Continuous Optimization



Live Planning



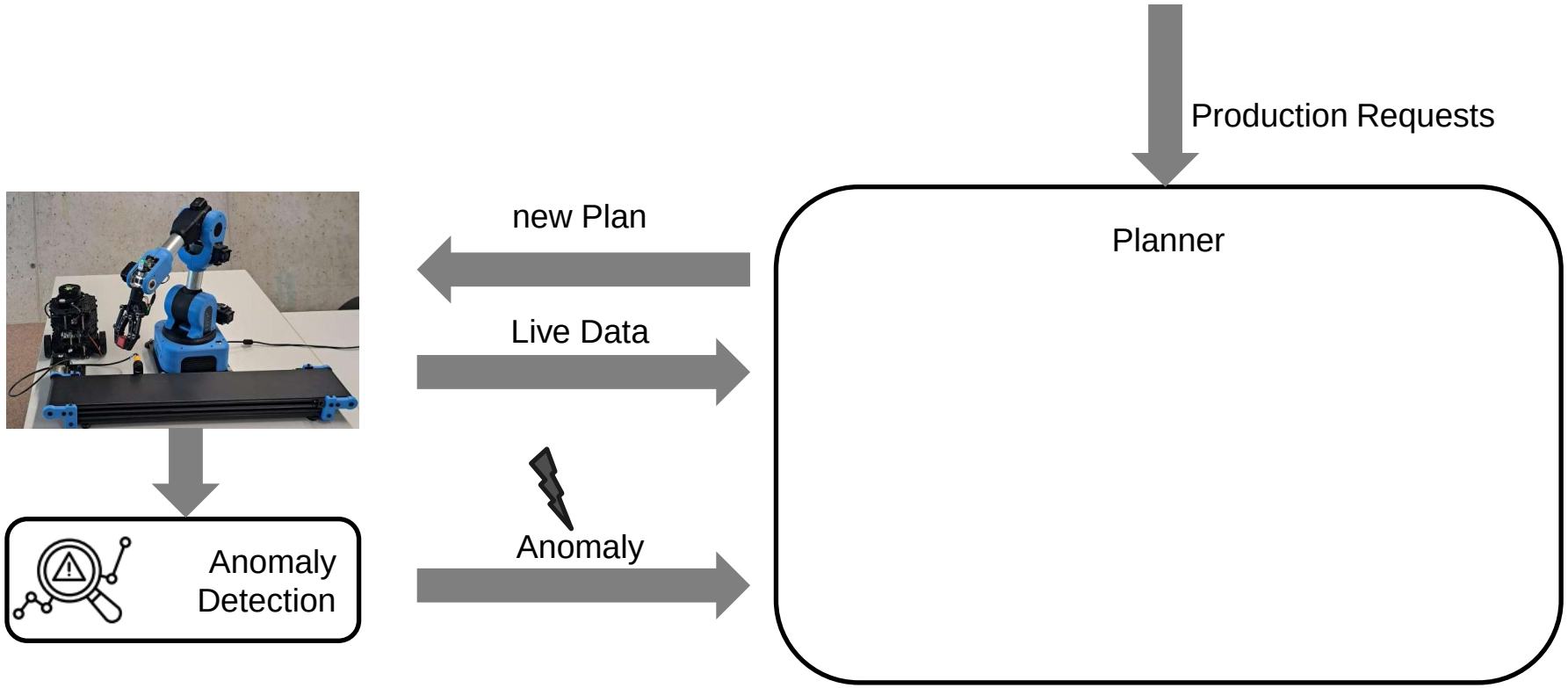
Circular Economy



Innovation through Digitalization

Picture Sources: European Parliament Research Service; plumber-repair-man-repairman-35611 created by Clker-Free-Vector-Images on pixabay.com; PDCA by Eko Purnomo from Noun Project; Anomaly Detection by Muhammad Rofian from Noun P

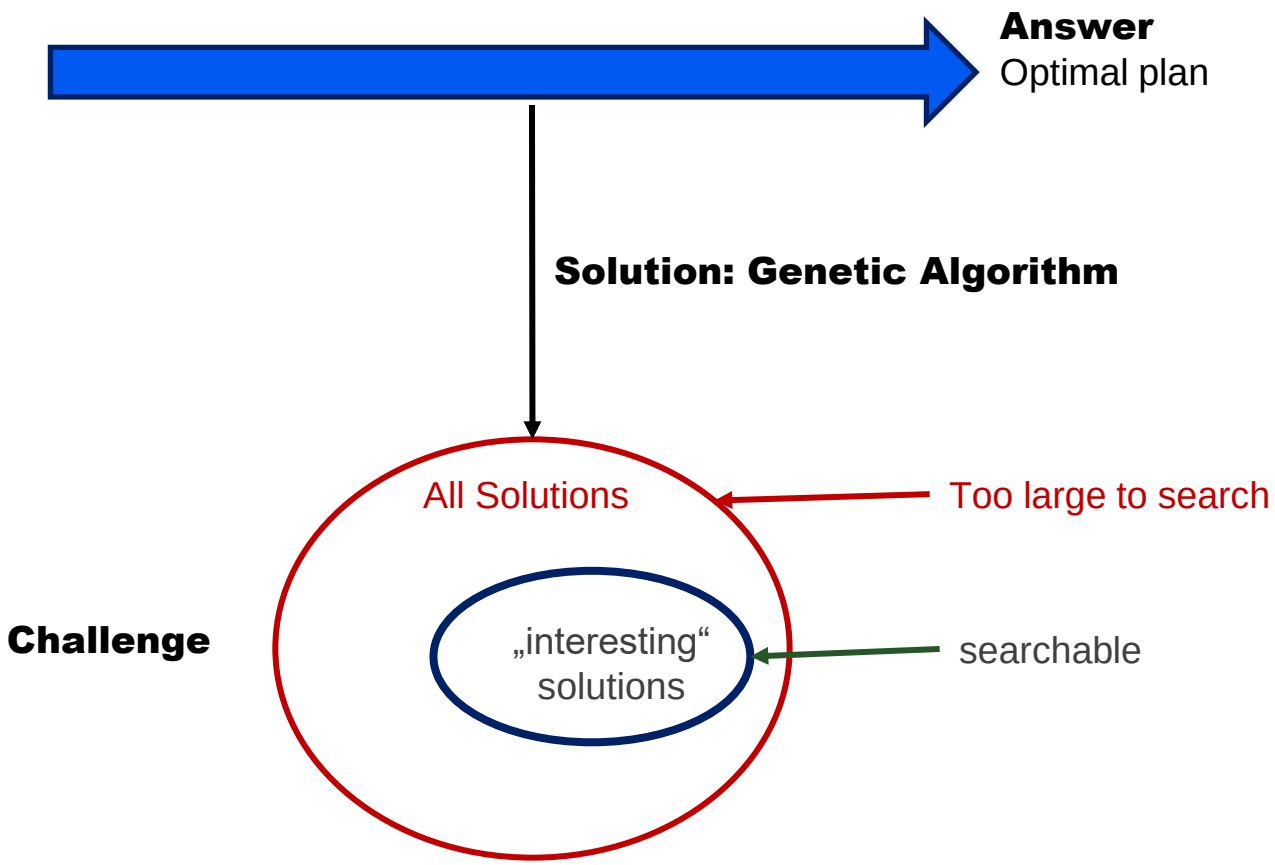
Example 5: Live Planning



Anomaly Detection by Muhammad Rofian from Noun Project

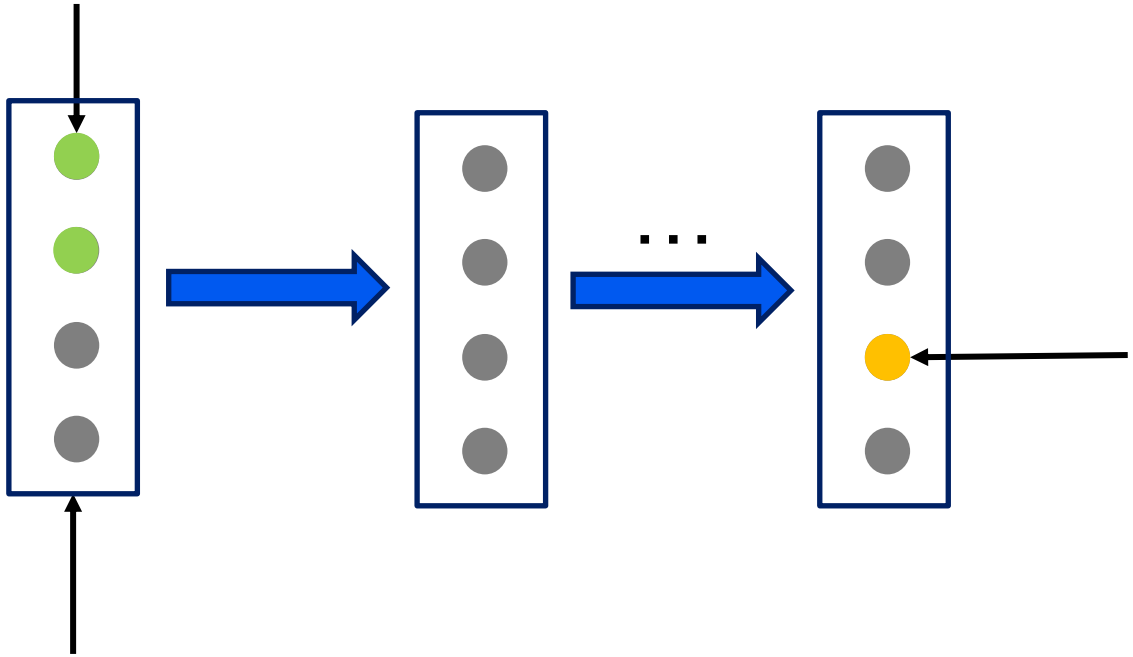
Genetic Algorithms - Overview

Problem statement
„What‘s the optimal plan?“



Live planning with genetic algorithms

Individual = one possible solution
- **Properties** = what makes this individual unique?
- **Fitness** = how well is goal satisfied by individual (based on properties)?



Generation
- Number of Individuals

Step 1: calculate „fittest“ Individuals

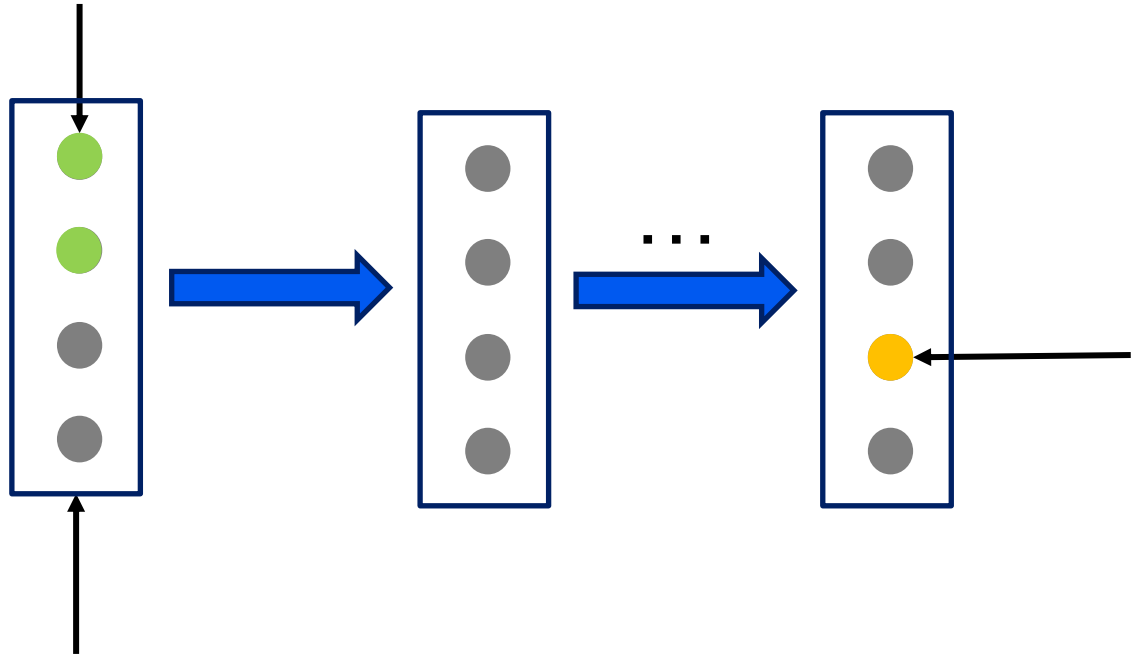
Step 2: Generate next Generation
- Combination of fittest individuals

Step 3: Repeat until stop criteria met

Result: Best performing individual in last generation

Live planning with genetic algorithms

Individual = Plan
- **Properties** = actions to be executed
- **Fitness** = required time to reach goal



Generation
- Number of potential plans

Step 1: calculate „fittest“ Individuals

Step 2: Generate next Generation
- Combination of fittest individuals

Step 3: Repeat until stop criteria met

Result: Plan with min time in last generation

What‘s our Goal?

✓ Predictive Maintenance

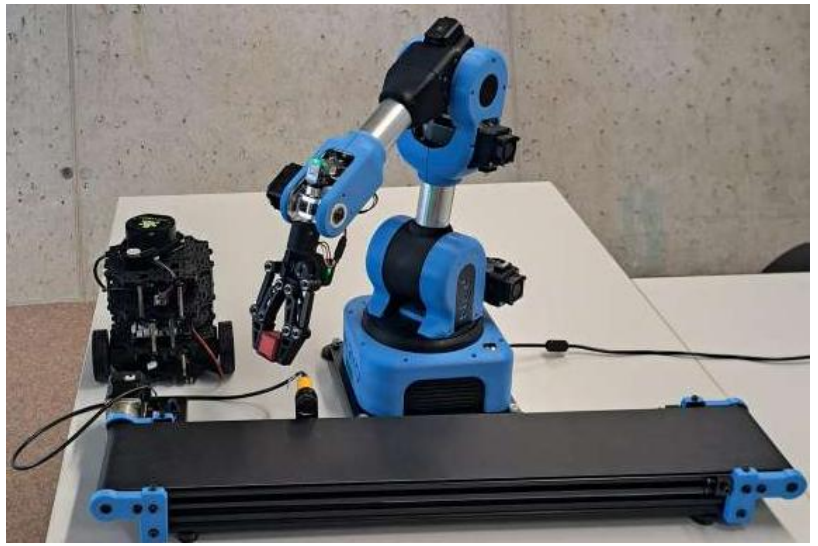


✓ Anomaly Detection



✓ Live Planning







Continuous Optimization



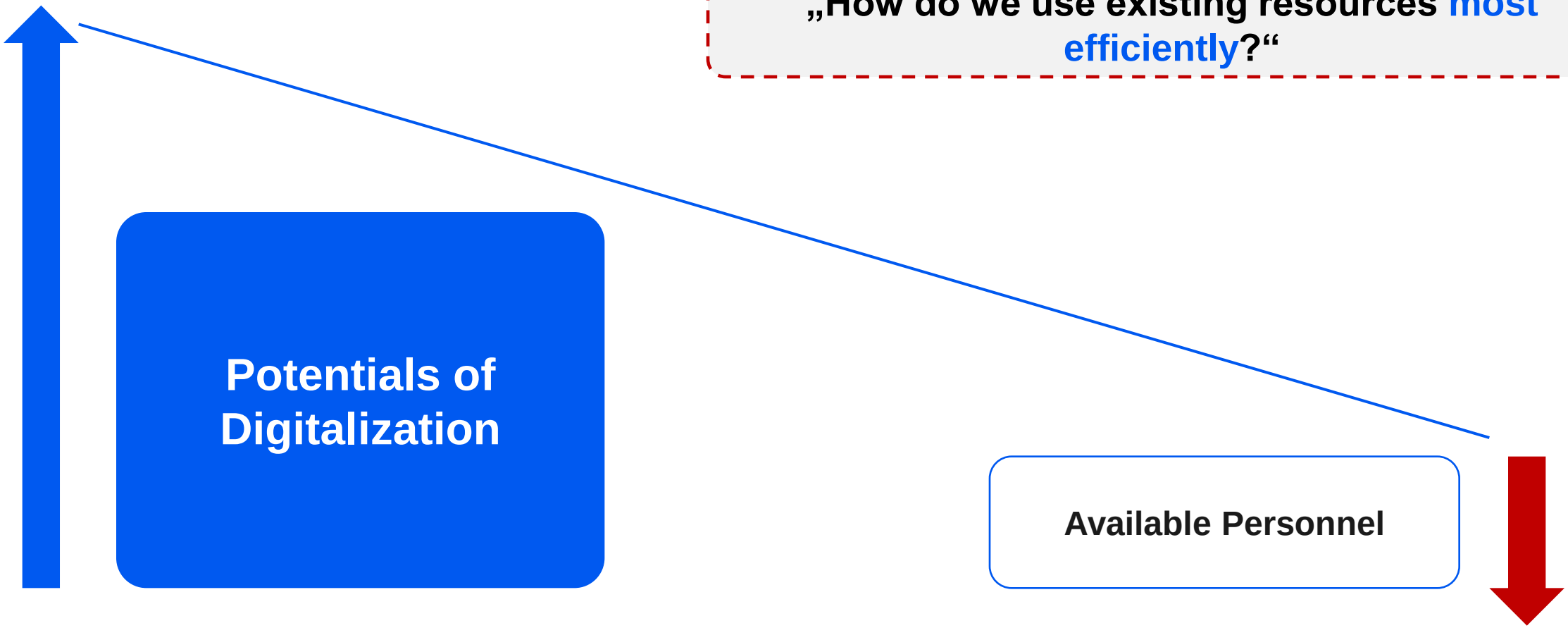
Circular Economy

Innovation through Digitalization

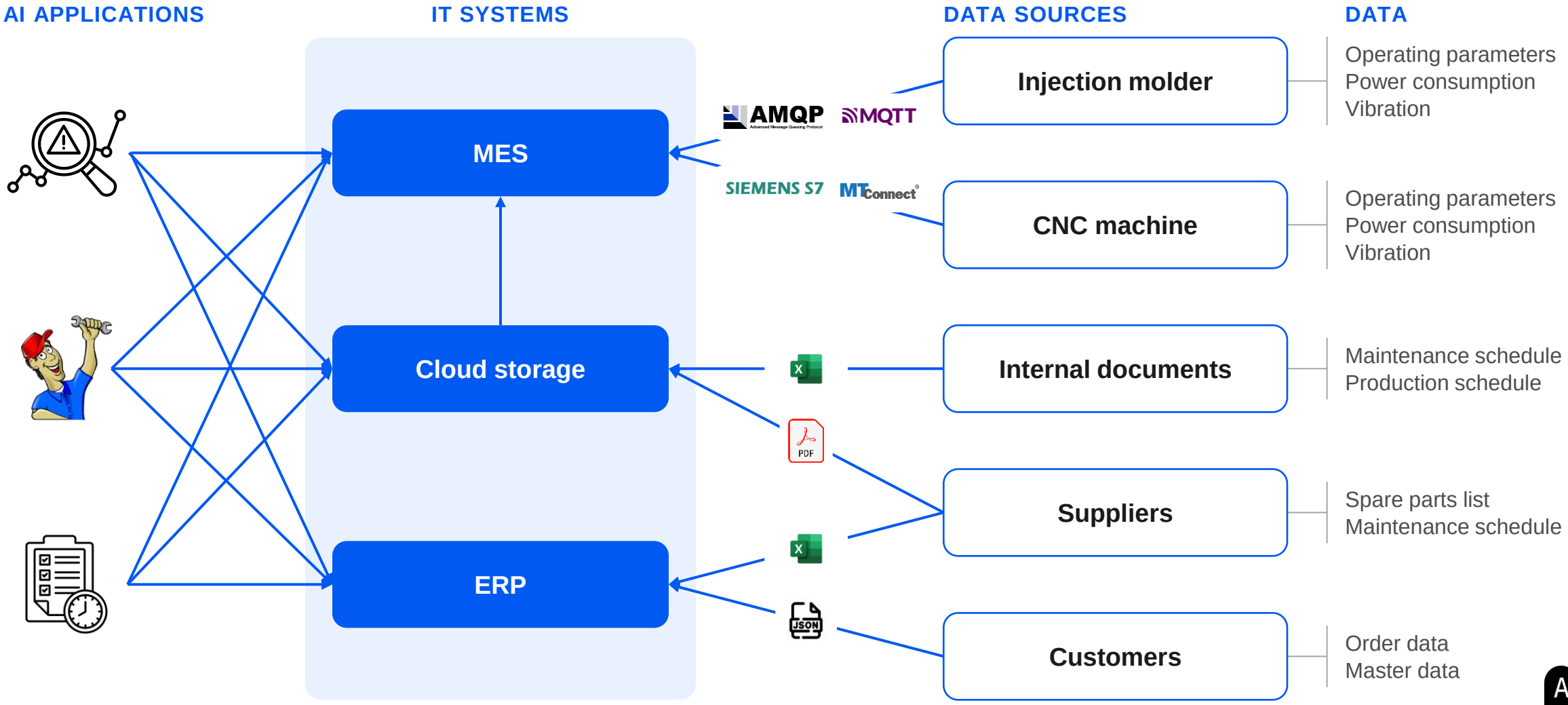
Picture Sources: European Parliament Research Service; plumber-repair-man-repairman-35611 created by Clker-Free-Vector-Images on pixabay.com; PDCA by Eko Purnomo from Noun Project; Anomaly Detection by Muhammad Rofian from Noun P

#1 Challenge of Digitalization

„How do we use existing resources most efficiently?“

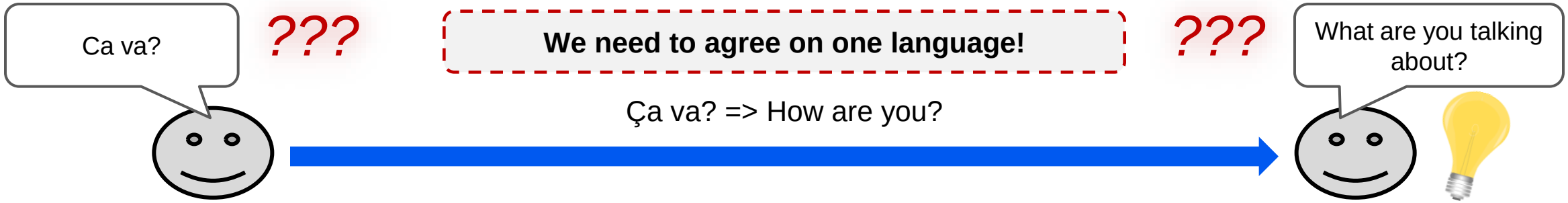


Where do we stand today?



plumber-repair-man-repairman-35611 by Clker-Free-Vector-Images on pixabay.com; PDCA by Eko Purnomo, Noun Project; Anomaly Detection by Muhammad Rofian, Noun Project

Why standardized digital twins?



Uniform data exchange

Cross-company



Within the company



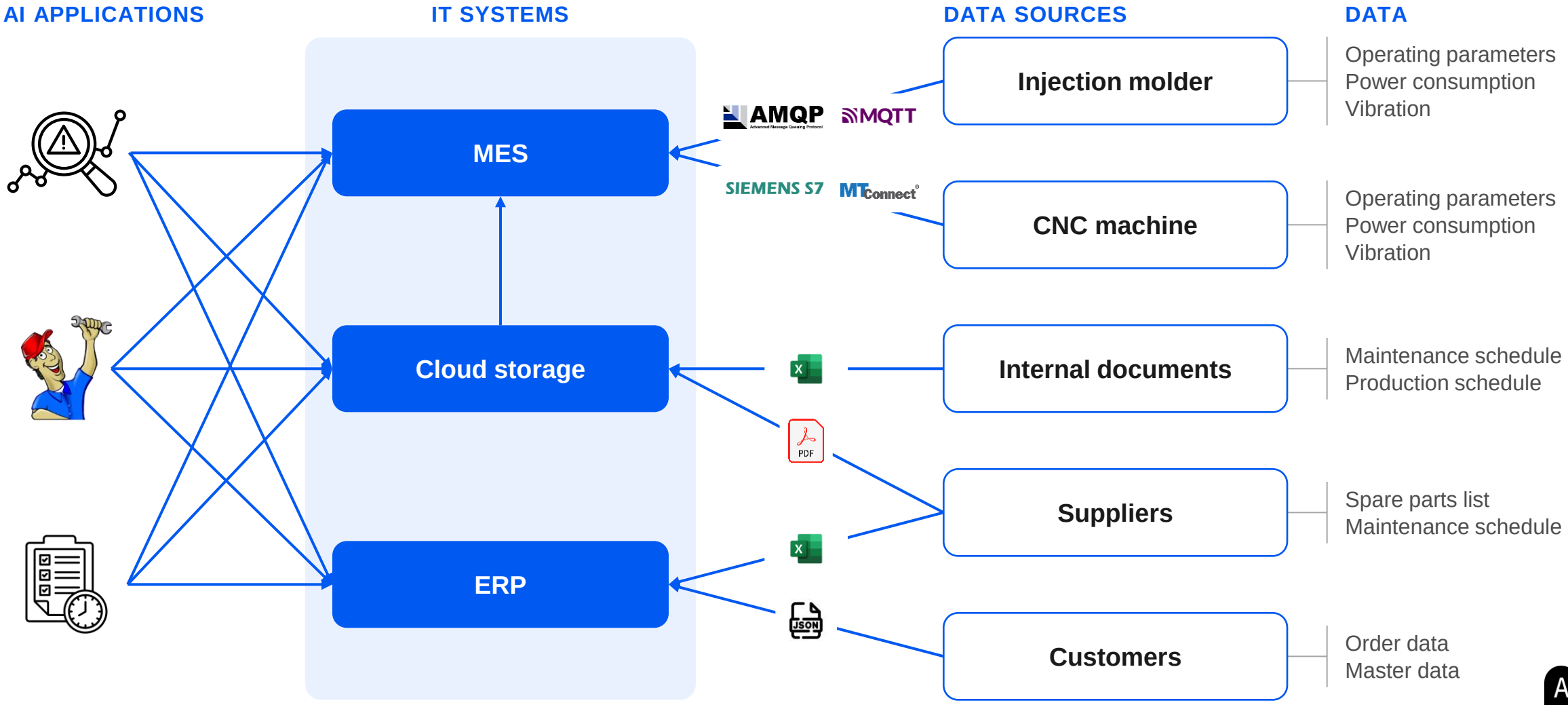
AAS — Asset Administration Shell (AAS) as a potential industry standard

OPC UA — OPC-UA for pure machine data

ECLASS — ECLASS for semantics

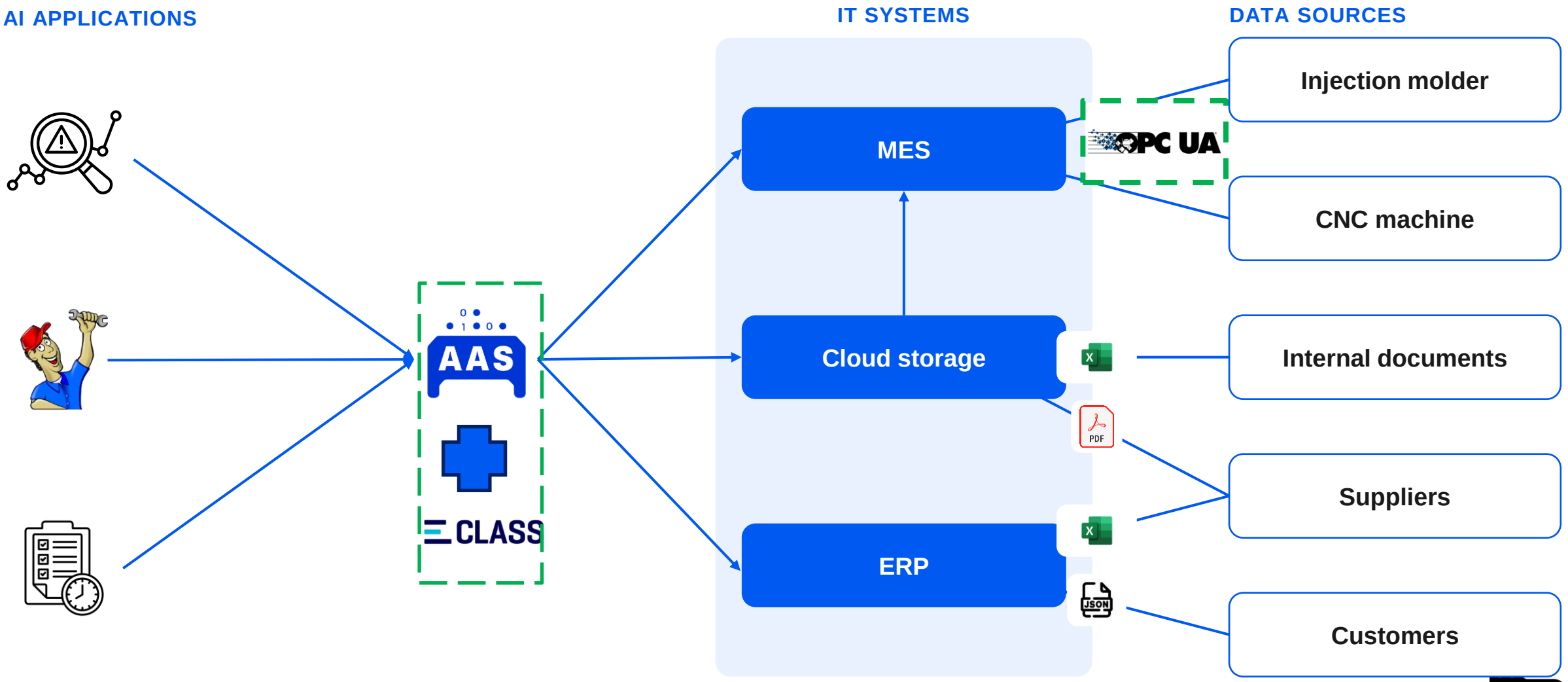
Factory by Lin Qiye, Noun Project (CC BY 3.0); retail-7377943 by gravisio, Noun Project (CC BY 3.0)

Where do we stand today?



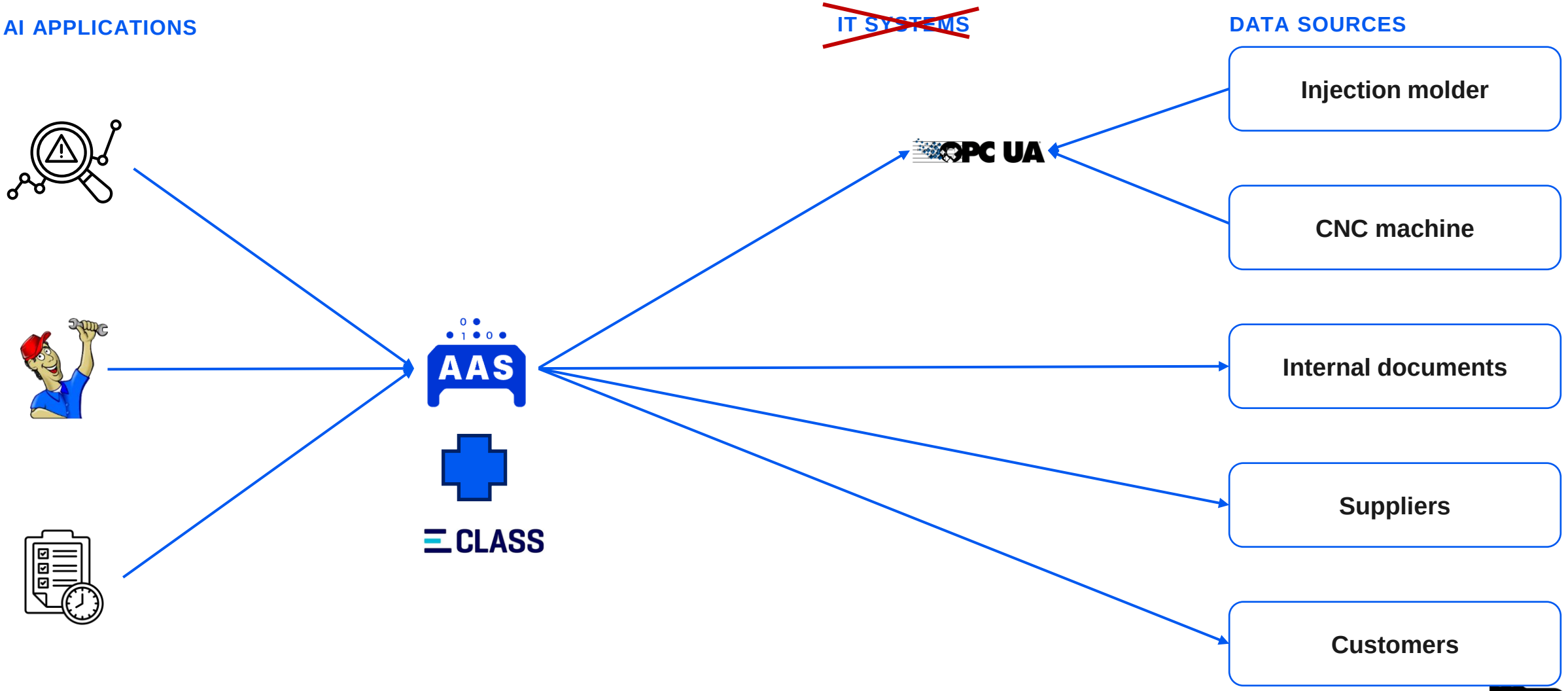
plumber-repair-man-repairman-35611 by Clker-Free-Vector-Images on pixabay.com; PDCA by Eko Purnomo, Noun Project; Anomaly Detection by Muhammad Rofian, Noun Project

With standardized digital twins



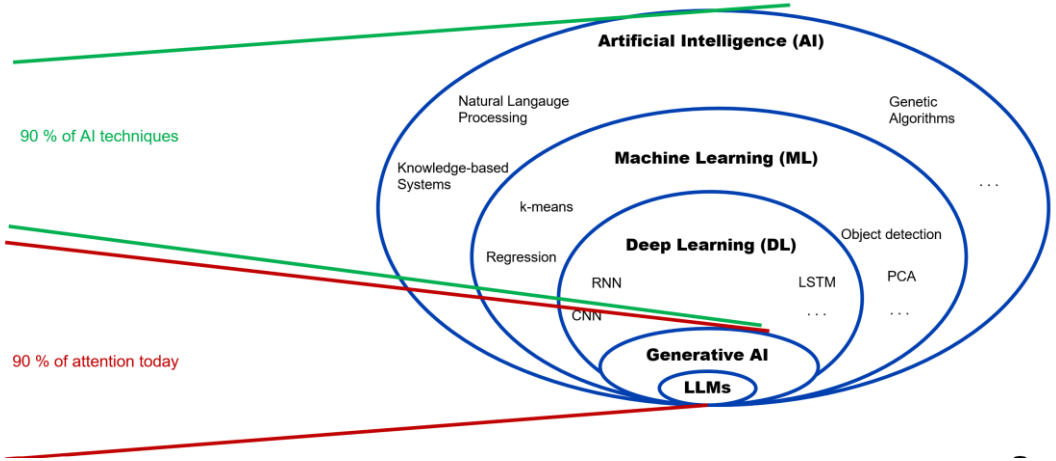
plumber-repair-man-repairman-35611 by Clker-Free-Vector-Images on pixabay.com; PDCA by Eko Purnomo, Noun Project; Anomaly Detection by Muhammad Rofian, Noun Project

Future scenario



plumber-repair-man-repairman-35611 by Clker-Free-Vector-Images on pixabay.com; PDCA by Eko Purnomo, Noun Project; Anomaly Detection by Muhammad Rofian, Noun Project

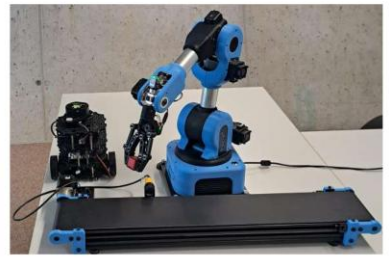
Key Takeaways



Predictive Maintenance

Anomaly Detection

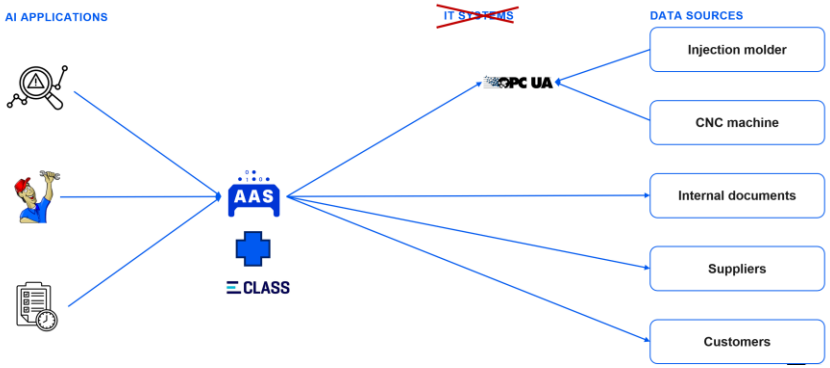
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Picture Sources: European Parliament Research Service; plumber-repair-man-repairman-35611 created by Clker-Free-Vector-Images on pixabay.com; PDCA by Eko Purnomo from Noun Project; Anomaly Detection by Muhammad Rofian from Noun Project

Contact



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