AI transformation in the world of mobility and engineering
Agenda

1 **Introduction to Bosch**

A brief overview of Bosch's global presence and impact.

2 **Digital Technologies and AI at Bosch**

How digital technologies and AI are integrated into Bosch's operations.

3 **Application Areas**

Key sectors where Bosch applies AI and digital solutions.

3/I **Built-in AI**

Foundation Models & Neuromorphic Computing

3/II **AI in Product Engineering**

Enhancing product design and development with AI.

3/III **AI in Production**

Leveraging AI for efficiency in manufacturing.

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Who we are
Our company in figures

In 2024*

€

90.3

billion euros
sales revenue

3.1

billion euros EBIT
from operations
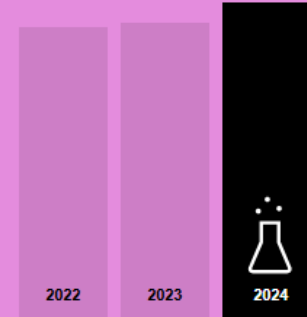
418 000

Bosch associates
worldwide at year-end
(approx.)

490

subsidiaries and regional
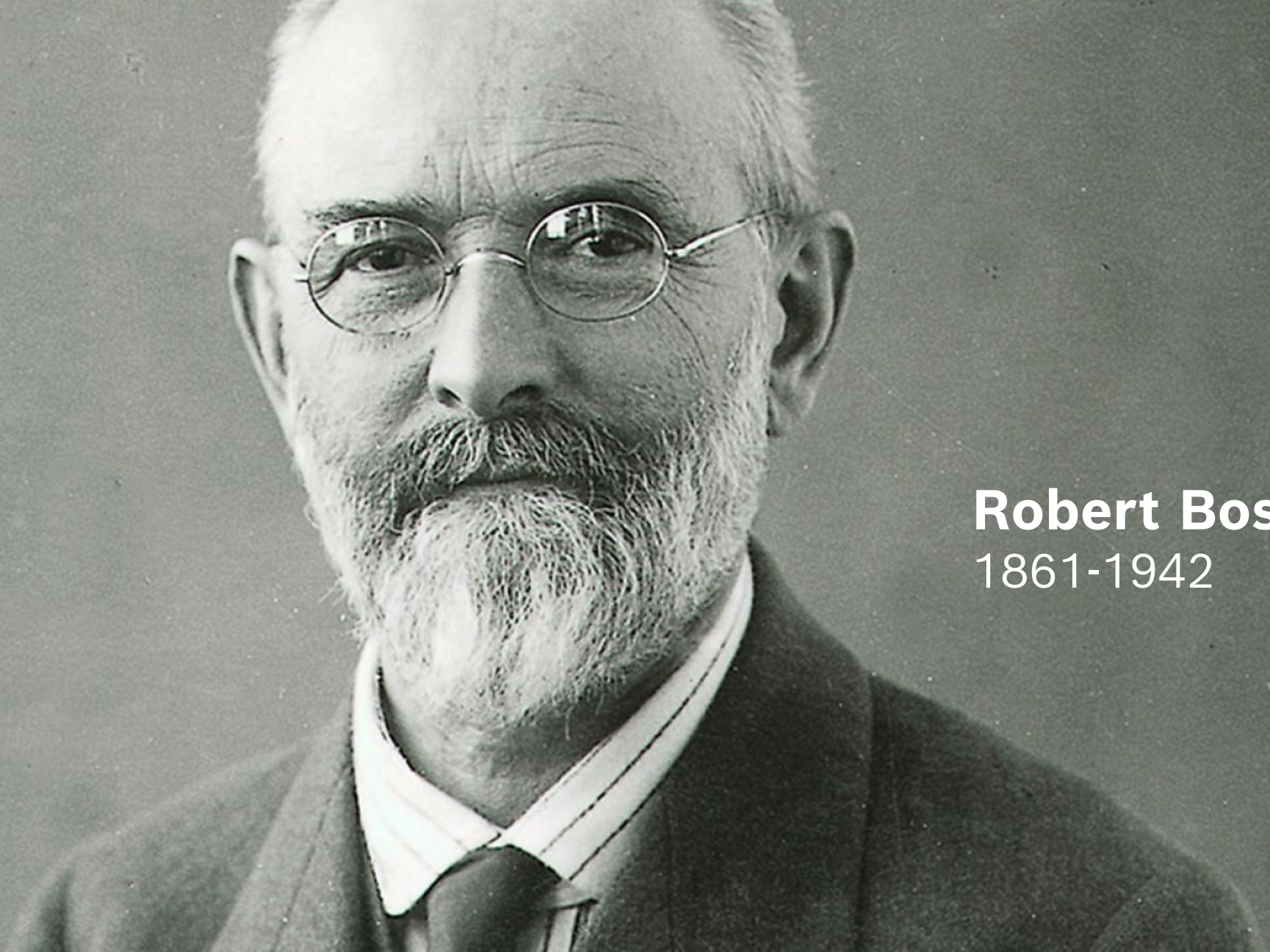companies (approx.) in
more than **60** countries

€7.8bn

expenditure on research
and development

2022   2023   2024

86,840

researchers and
developers worldwide

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Robert Bosch
1861-1942

Digital Journey of Bosch

1979: Digital journey started – Digitally programable Engine Control

2013: Starting the IoT era of Bosch

2017: Bosch Center for Artificial Intelligence

5000 AI experts

1500 AI Patents

65.000 associates trained

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AI transformation in the world of mobility and engineering

BOSCH VISION FOR AI

By 2025, the aim is for all Bosch products to either contain AI or have been developed or manufactured with its help.
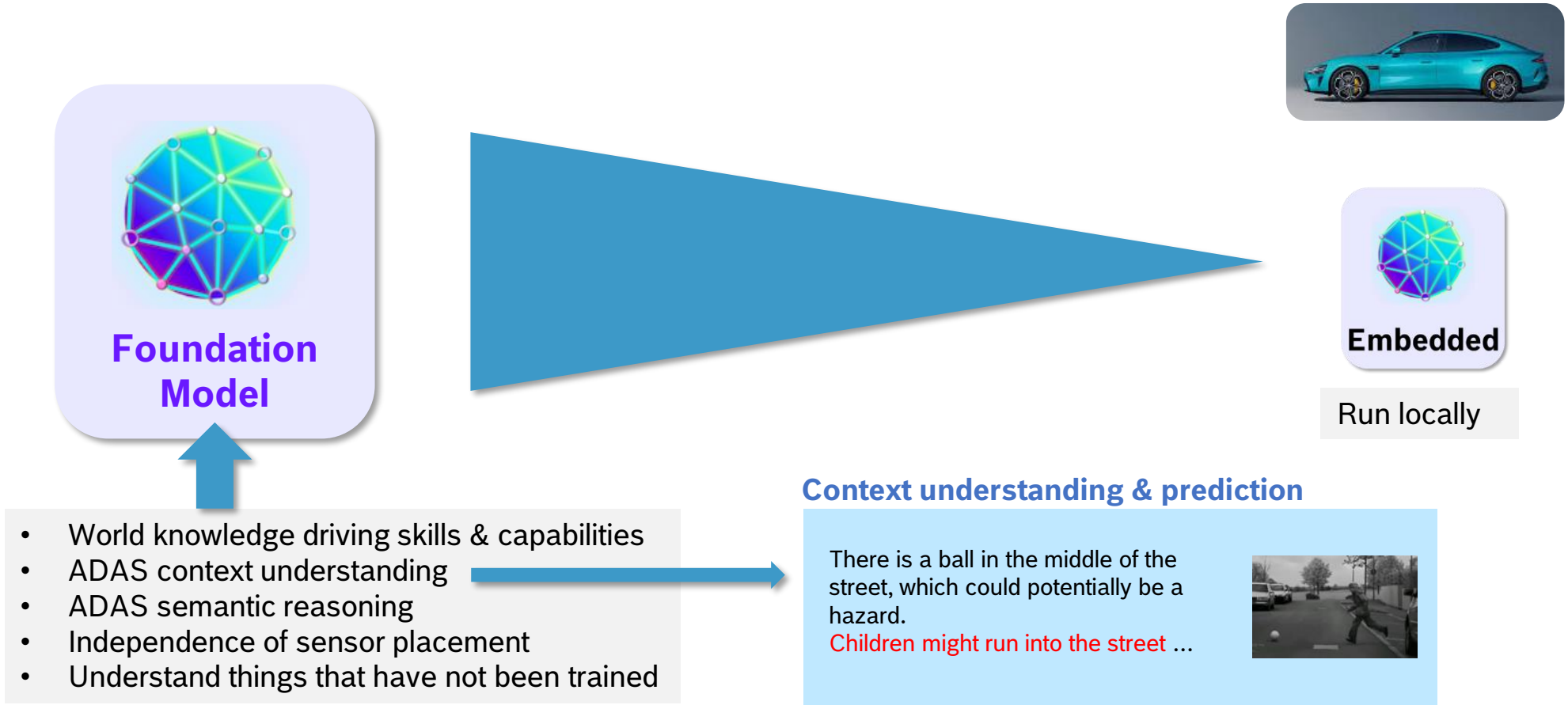
VOLKMAR DENNER

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Built-in AI

Foundation models &
neuromorphic computing

AI transformation in the world of mobility and engineering
Next revolution: Make it small

Foundation Model

Embedded

Run locally

- World knowledge driving skills & capabilities
- ADAS context understanding
- ADAS semantic reasoning
- Independence of sensor placement
- Understand things that have not been trained

Context understanding & prediction

There is a ball in the middle of the street, which could potentially be a hazard.
Children might run into the street ...

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AI transformation in the world of mobility and engineering
Neuromorphic computing − Energy efficient Intelligence

Definition

Hardware systems (and associated software/algorithms) where components **physically model or emulate neurons and synapses** in biological nervous systems.

Architecture Comparison

ANN vs. SNN
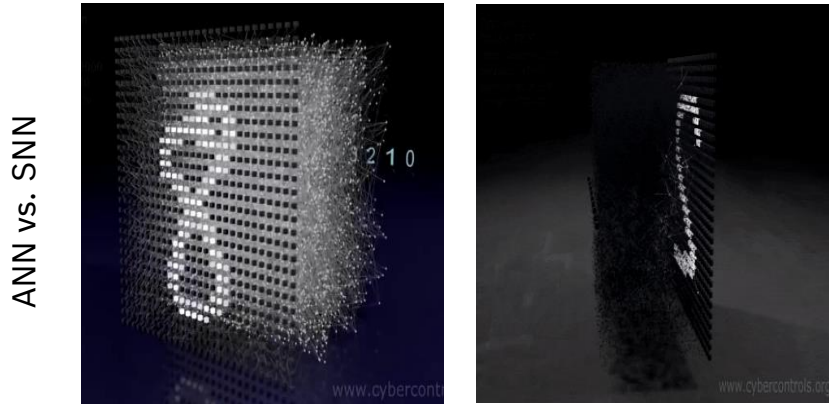
Key Difference:

In the von Neumann architecture, memory and processing are physically separate, while in neuromorphic systems, they're integrated within the same structure, eliminating the data transfer bottleneck.

Project motivation: research for low energy consumption networks

Background: promise to have energy consumption of 10% compared to a classic ANN.

Collaboration: Engineering Center Budapest, ELTE University AI department, Corporate Research & Technology Department in Germany

Goal: customer demo for the technology (compare SNN and ANN)

R&D Process: challenge to find the best use case for the technology

Fig.1: Scheme for Spiking Neural Networks [1]
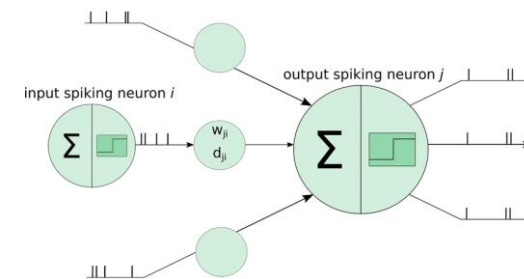
Current project target to initiate a customer collaboration in neuromorphic computing

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AI in Engineering
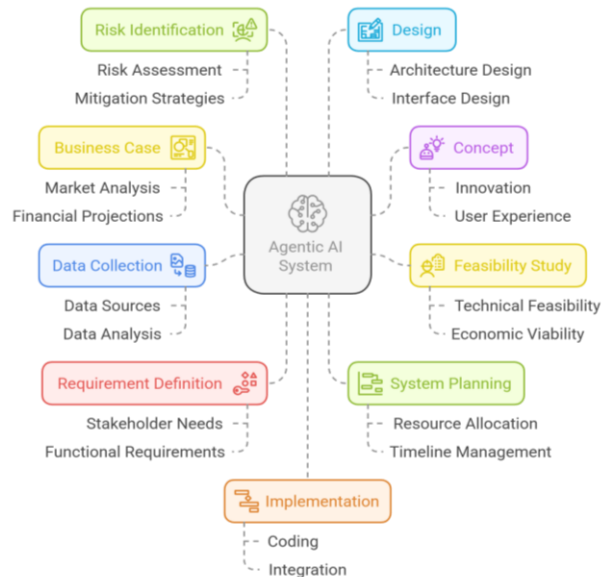
Agentic AI in the field of engineering and scientific domains

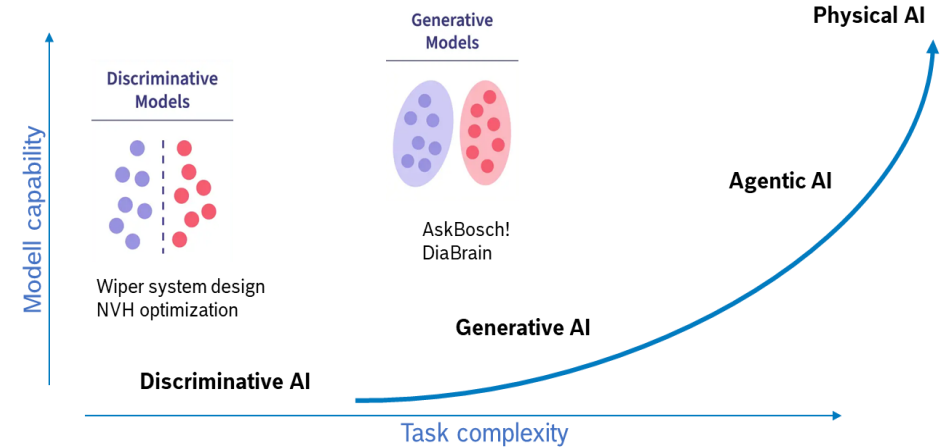# AI transformation in the world of mobility and engineering
AI capability: Evolution meets business need

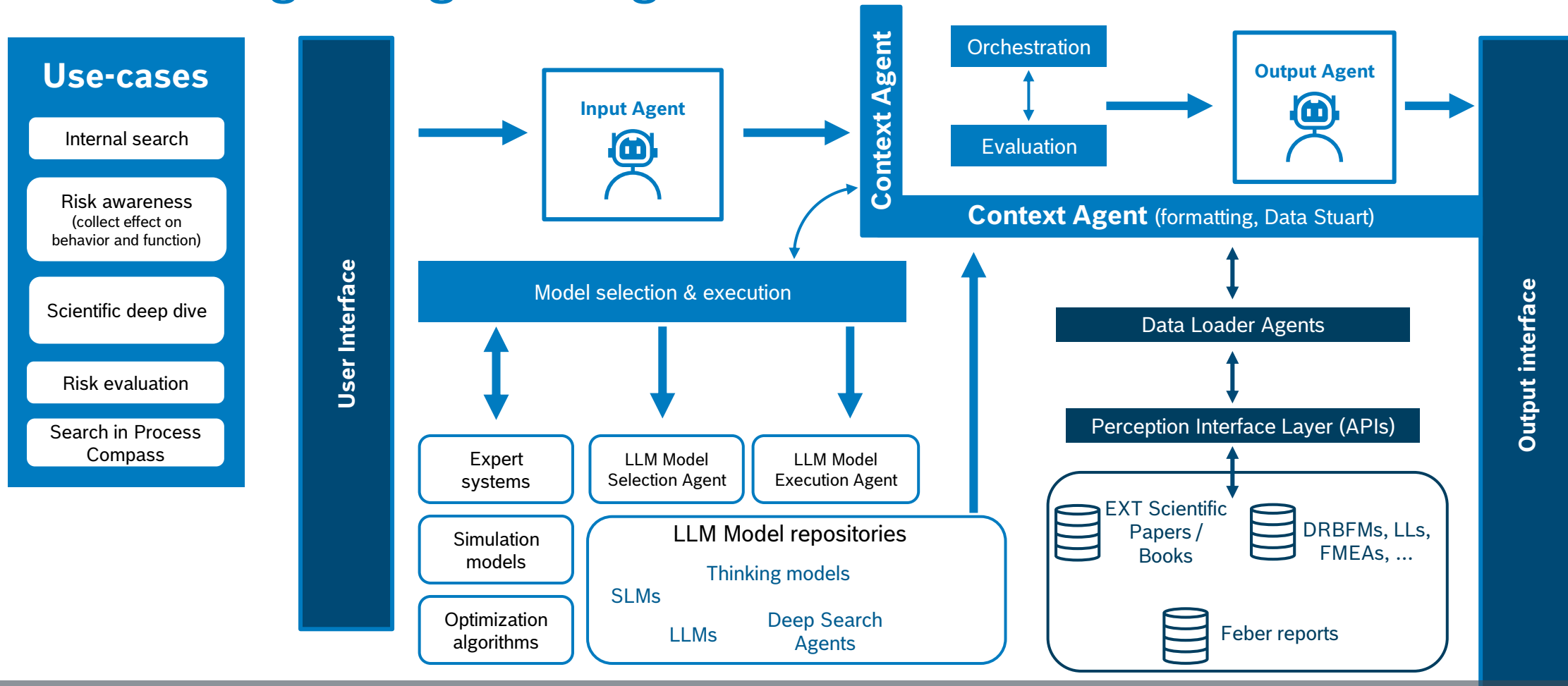Engineers spend 20-40% of their time on tasks unrelated to creative problem solving.

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Product Engieering Multi Agent

Use-cases
- Internal search
- Risk awareness (collect effect on behavior and function)
- Scientific deep dive
- Risk evaluation
- Search in Process Compass

User Interface

Input Agent

Context Agent

Orchestration ↕ Evaluation

Output Agent

Context Agent (formatting, Data Stuart)

Model selection & execution

Expert systems

LLM Model Selection Agent

LLM Model Execution Agent

Simulation models

Optimization algorithms

LLM Model repositories
Thinking models
SLMs
LLMs
Deep Search Agents

Data Loader Agents

Perception Interface Layer (APIs)

EXT Scientific Papers / Books

DRBFMs, LLs, FMEAs, …

Feber reports

Output interface

Optimized way to deep search Bosch and external data assets
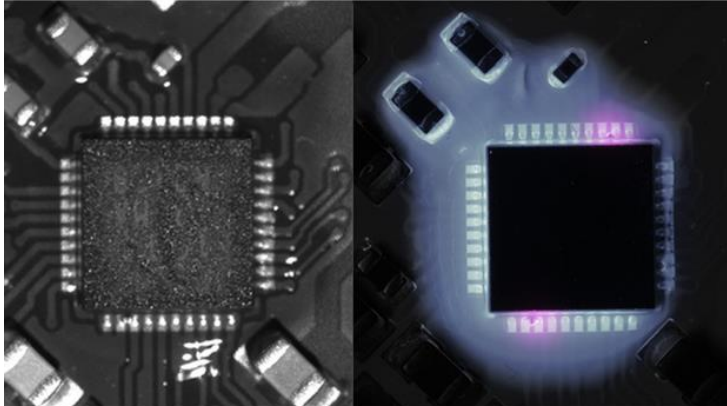
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AI in Production

Leveraging AI for efficiency in manufacturing
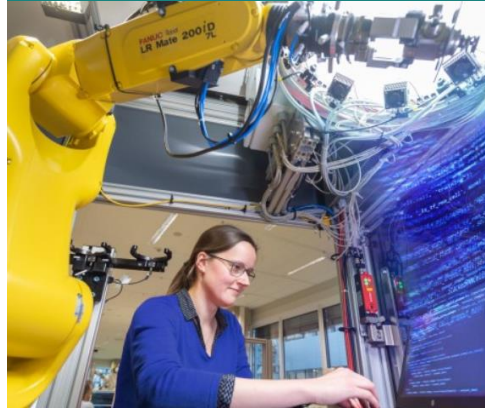
AI in Production

Optical inspection

Industrial Robotics

Production Scheduling

Pattern & Anomaly Detection

Root Cause Analytics

..and numerous other applications

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AI transformation in the world of mobility and engineering
Automated unpacking machine

Motivation: AI supported productivity increasing, scalable solution

Background: relevant for Bosch plants and external market

Collaboration: since 2022 w. Bosch plant Hatvan/ Engineering Center

Budapest and ELTE University AI department, Central Logistic Department

Germany

Goal: machine for the series production (using AI/robotics/3-D vision)

R&D Process: learn from own logistic and integrate solution into an

industrial environment w. availability of 99.8%

Main functions of the Automated Unpacking Machine:
- box cutting
- recognize box content
- grab/remove content from boxes
- grab/remove filling material (separation paper from plastic)
- exception handling
- tracking/register incoming goods

Project currently after the last study phase before the kick-off of the industrialization phase

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Thank you for your attention!

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