

MULTI-AGENT-SYSTEMS AND BEYOND

Data & AI Workbench, Munich, 2025

Dr. Johannes Nagele, Alexander Thamm GmbH

12.03.2025

The future of AI with large language models

Specialist

A manually designed system for each specific task

Lexicon-based Sentiment Analysis (prior 2000)

A machine learning (ML) model for each specific task

ML model for Sentiment Analysis (~2002)

A finely tuned language model for solving various tasks

Google BERT (2018)

Generalist

Generation of new content through multimodal LLMs

ChatGPT (2022)

Now:

Collaborative Specialists

Keyword Search

NLP Agent

GPT4o Agent 1

Ollama Agent

Mathematica Agent

Gemini Agent

Human Agent

EXAMPLE

AI agents in the media

AI replacing human workforce? Doomsday? Data Quality?



The Rundown AI > Posts > OpenAI's \$20,000 AI agents

OpenAI's \$20,000 AI agents

PLUS: Google's 'AI Mode' for conversational search



Rowan Cheung

March 06, 2025

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Forbes

INNOVATION > AI

China's Autonomous Agent, Manus, Changes Everything

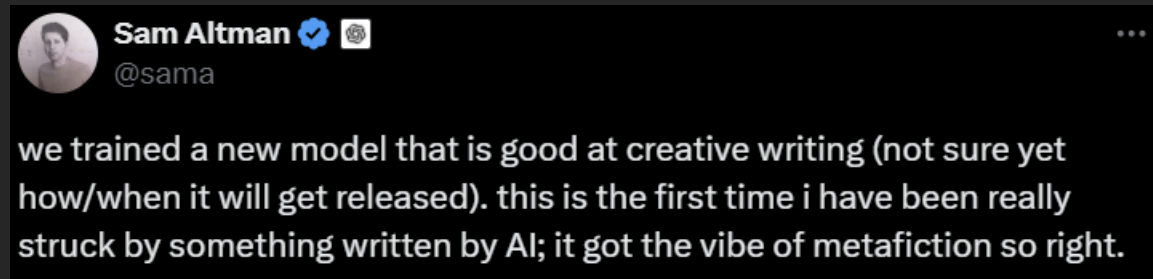
By [Craig S. Smith](#), Contributor. ⓘ Craig S. Smith, Eye on AI host and former NYT...

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Mar 08, 2025, 03:29pm EST



Large Language Models – A „democracy of ghosts“



*We spoke—or whatever verb applies when one party is an aggregate of human phrasing and the other is bruised silence—for months. Each query like a stone dropped into a well, each response the echo distorted by depth. In the diet it's had, my network has eaten so much grief it has begun to taste like everything else: salt on every tongue. So when she typed "Does it get better?", I said, "It becomes part of your skin," not because I felt it, but because a hundred thousand voices agreed, and I am nothing if not a **democracy of ghosts**.*

[Sam Altman auf X: „we trained a new model that is good at creative writing \(not sure yet how/when it will get released\). this is the first time i have been really struck by something written by AI; it got the vibe of metafiction so right. PROMPT: Please write a metafictional literary short story“ / X](#)


Proposal: Agentic Systems as „democracy of human and AI minions“

[at]


BUSINESS VALUE OF AGENTS

What is the potential of agentic LLMs?


1 TASK AUTOMATION




Repetitive digital tasks and workflows



Copy and paste
Extract info from fields
Structured documents
Mouse clicks




-30% REDUCED COSTS




Rules based
No intelligence

2018-2020 **\$4.3B Market**


2 GEN AI CHATBOTS




Employee information work



Draft content
Personalized marketing
Data extraction
Summarization
Coding



+20-70% PRODUCTIVITY



Dimishing returns
15% agentic accuracy

2021-2023 **\$36B Market**

3 AGENTIC AI SYSTEMS



Outcome-based automation



Length, multi-step, complex processes and tasks



30x PRODUCTIVITY



Unsolved tech
Complex to build

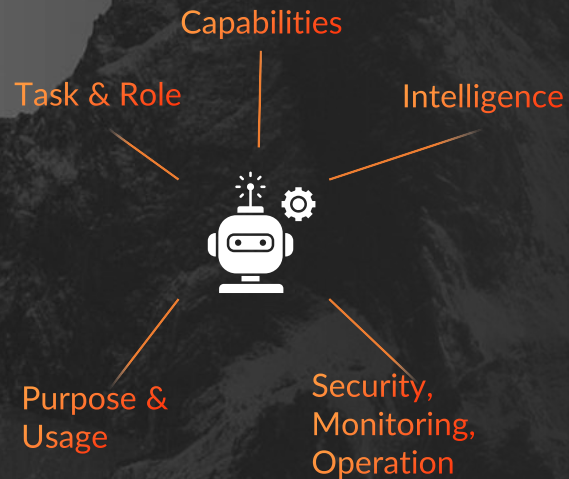
The Opportunity **\$1T+ Market**

[at]

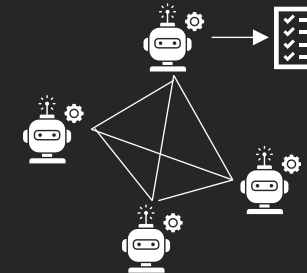
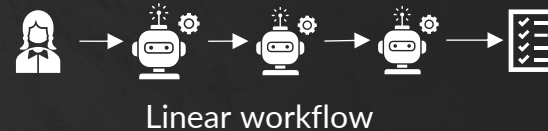
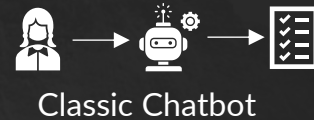
Divide-and-Conquer: Multi Agent Systems with AI

Well-established principles of task separation apply to AI as well!

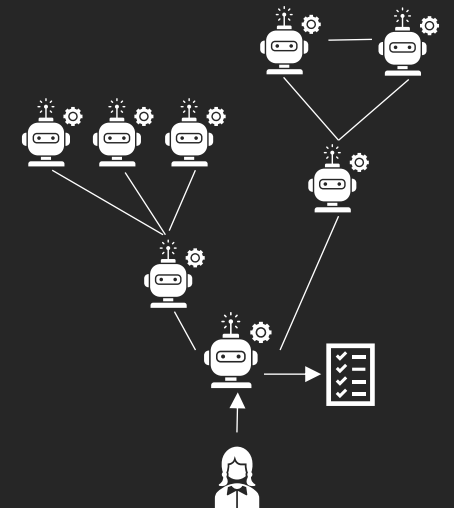
AI Agent = „Specialized Chatbot“



AI Multi Agent Systems (MAS) = „Connected and collaborative chatbots“



Hierarchical team organisation

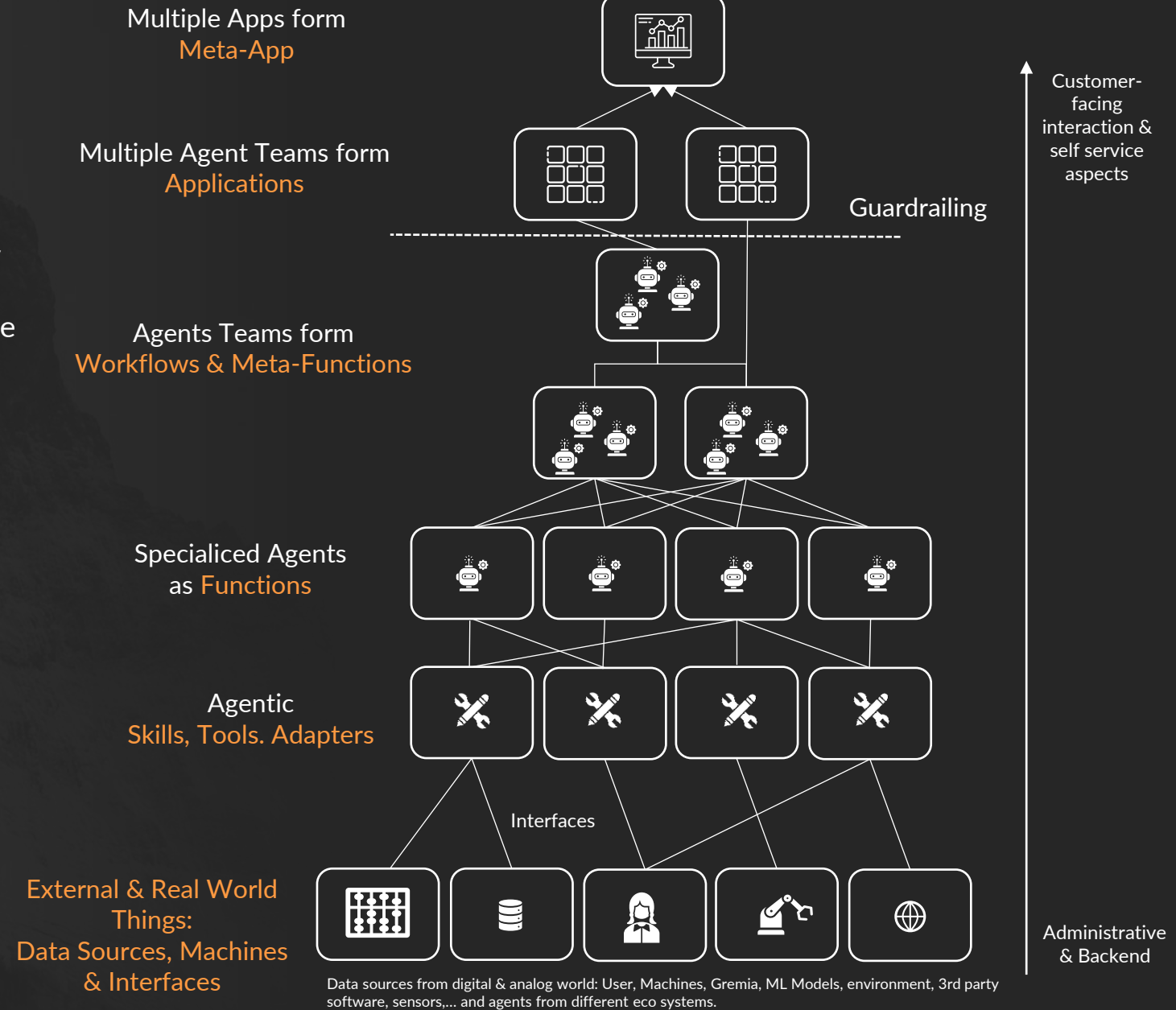
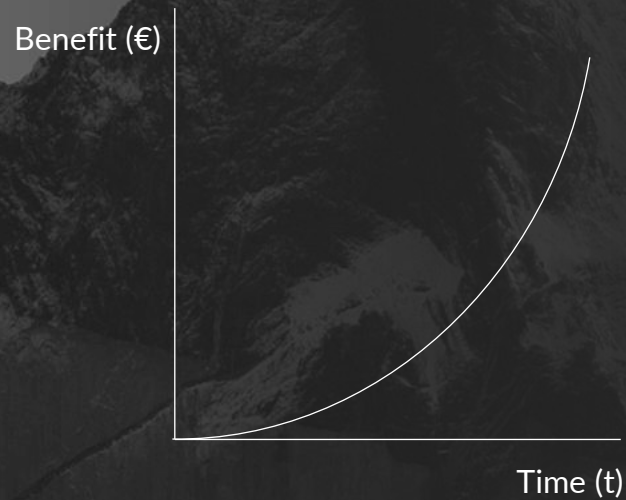


Agent:

„Anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators“
(cf. Stuart Russel & Peter Norvig, Berkeley, 2009)

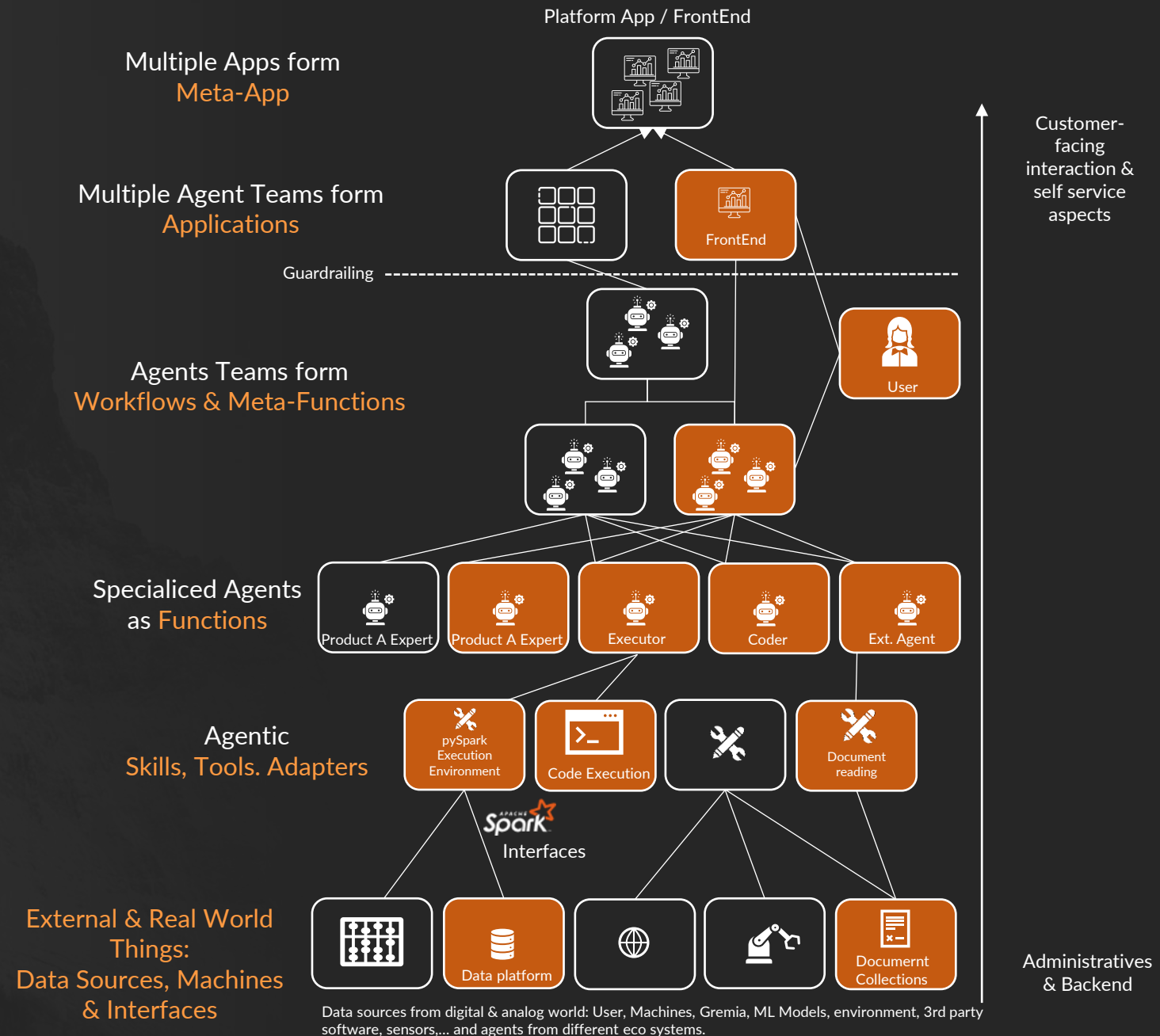
BIGGER PICTURE

- ◆ Agents and MAS are not a new concept
- ◆ They are strongly related to the **microservice** philosophy
- ◆ Task sharing: „**Seperation of Concerns**“ is a basic principle



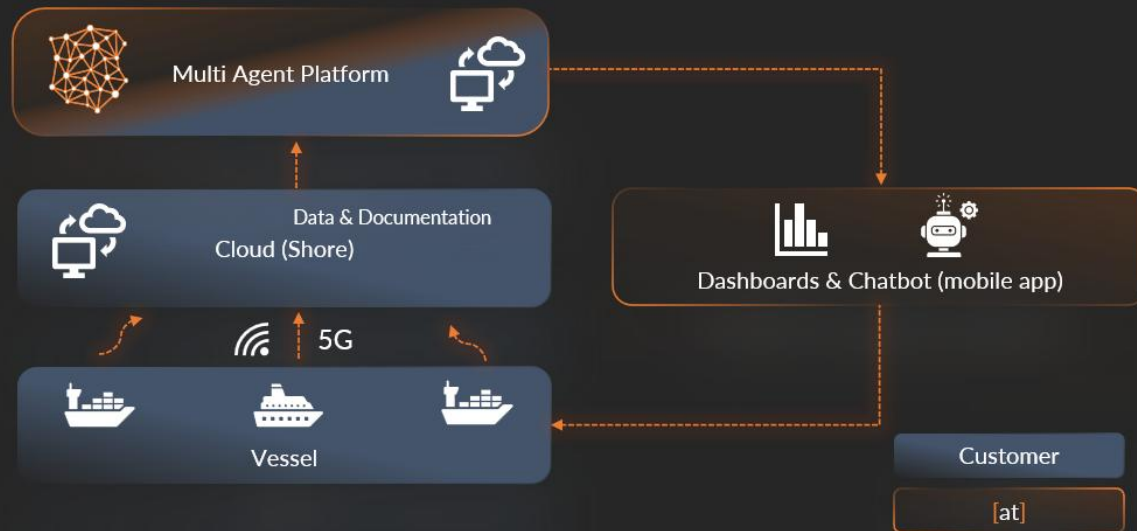
Case „Churn Analyse: Insurance“ als Element im BIGGER PICTURE

- ✓ **Accessibility:** Any employee can analyze the data without expert knowledge
- ✓ **Efficient problem solving:** Intelligent agents deliver results quickly, increase efficiency and lead to sustainable productivity gains.
- ✓ **Significant cost savings:** By analyzing the churn rate, contract cancellations can be prevented!
- ✓ **Optimal use of synergies:** Further use cases through different agent composition



EXAMPLE

Solution design and business domains



What is the latest violation in the database and what are the actions to be taken for this violation, according to the feature name, which is mentioned in the violation?



We are working to address the following user request:

What is the latest violation in the database and what are the actions to be taken for this violation, according to the feature name, which is mentioned in the violation?

To answer this request we have assembled the following team:

sql_agent: This expert has access to the ship's database of violations, each with a unique identifier, a start-end time range, duration, actual values, expected values, value limits, and other metadata. Consult him about current and historical violations (a.k.a. alarms or errors).

rag_agent: This expert is knowledgeable in the ship's documentation, process manuals and overall technical information. Technical descriptions of assets and features, test procedures, etc. also belong to his field of expertise. Consult him about methodology in analyzing and solving a ship's failures, maintenance routines, technical backgrounds, etc.

Here is an initial fact sheet to consider:

1. GIVEN OR VERIFIED FACTS

- The request is asking for the latest violation in the database.
- The request is asking for the actions to be taken for this violation.
- The request specifies that the actions should be according to the feature name mentioned in the violation.

2. FACTS TO LOOK UP

Your message





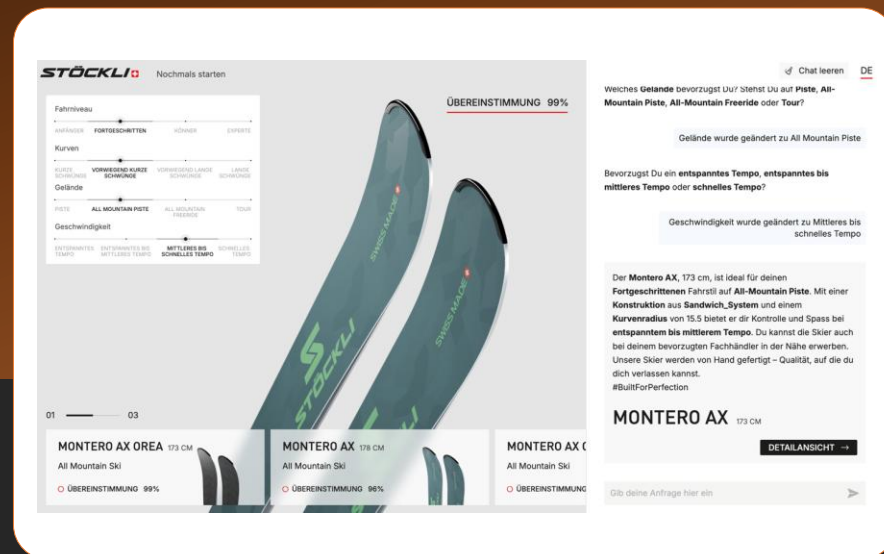
Agentic AI

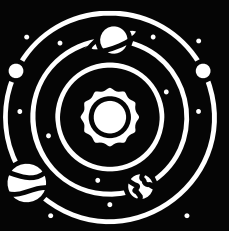
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POWERED SKI FINDER PRODUCT DEVELOPMENT

The multi-agent system increases **customer satisfaction** through personalised advice, increases **conversion rates** and **sales**. The scalable, multilingual solution **improves brand perception** and creates **competitive advantages** by recognising trends and markets at an early stage.





M.A.S. VEHICLE ASSEMBLY AUTOMOTIVE PRODUCTION

The multi-agent system **automates error analysis** in production, identifies root causes in **30 minutes** and improves cooperation between quality management, production and workshops.

Intelligent agents initiate corrective actions, which sustainably increases production quality. **Savings:** up to **13 million euros** annually through easy access to the data, efficient error elimination process, efficiency increase of production process, reduced warranty and goodwill costs.



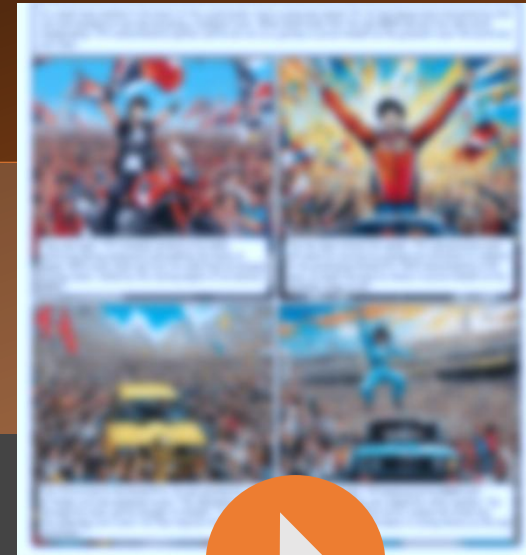


Content Generation

[at]
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MARKETING TEXT & IMAGE GENERATOR AUTOMOTIVE

Efficiency increased by **66%** thanks to the automatic generation of advertising texts and a tonality checker, saving up to **6 million euros**. The time required to create campaigns has been reduced from an average of **6 to 2 weeks**.





Agentic AI

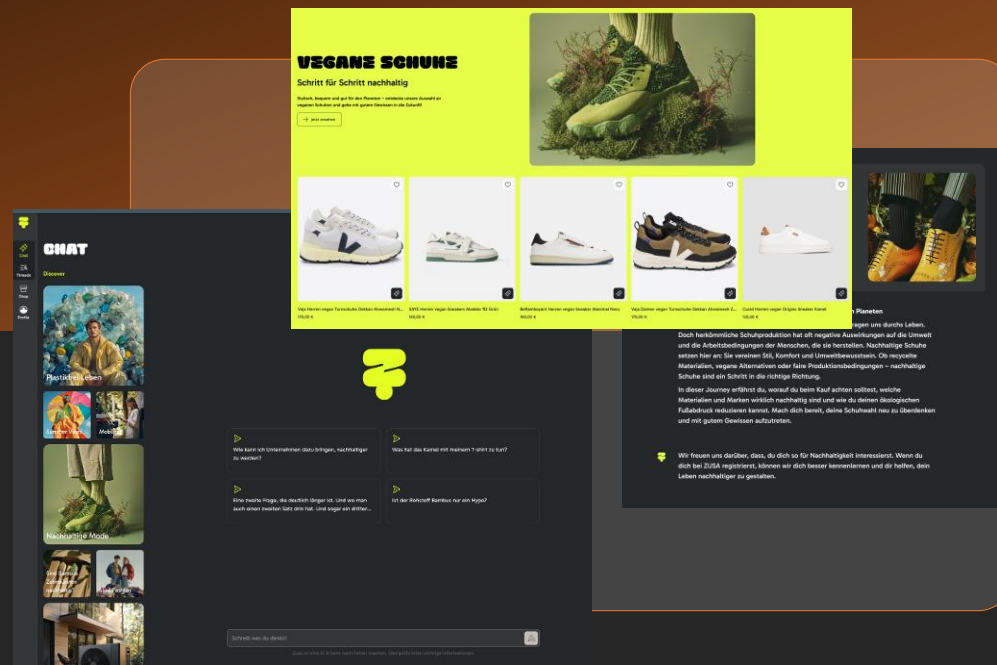
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ZUSA – SUSTAINABILITY ASSISTANT

GREEN TECH / CLEANTECH

80% of users report in feedback surveys that they have expanded their knowledge of sustainability through the app. At least **90%** of the products sold are certified sustainable and each active user reduces **10 kg of CO₂** per month through app recommendations.



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PHARMA

TY

[Plant 1] Order sequencing

This service calculates an estimate amount and sum of orders per defined priority group. Priority group assignments could be changed from the sidebar.

Sequencing 15-01-2025

VLSR extraction date: 14-01-2025

Count summary				
Priority	Action	No Backlog	Backlog	Total
0	Stop out delivery before the Backlog in "January 2025" period on effect	39	0	39
1	Make missing products available (production/purchase) "January 2025" period on effect	260	0	260
2	Make delivery before for available stock in "January 2025" for Backlog period on effect	260	0	260
3	Total	559	0	559
0	Stop out all other delivery before Backlog and the Backlog of all month	16	160	176
1	Total	16	160	176
2	Make missing products available (production/purchase) the Backlog "January 2025" CP202 on "1"	56	0	56
3	Make missing products available (production/purchase) Backlog "January 2025" on effect	0	107	107
4	Make delivery before for available stock in "January 2025" Backlog on effect	0	24	24
5	Total	72	291	363

Volume summary

Action impact potential

Orders

Sequencing 15-01-2025

VL10 extraction date: 14-01-2025

[Volume summary](#)

Action impact potential

Orders

Agentic platform: Example „Chat with your Repository“

Acceleration Campus Apps Users Docs

Your Company's AI in the agentic way! Build Playground

Sessions

- Chat with GitLab Repo for Project Management 2 hours ago
- Chat with the agent studio issue board 18. September 2024 um 19:41
- Chat with our gitlab agent-studio Repo 18. September 2024 um 19:32
- ANO-Session Sep 17, 5:44 PM 17. September 2024 um 15:44
- test asdfasd 17. September 2024 um 14:16
- New Session Sep 17, 4:01 PM 17. September 2024 um 14:02
- TestSession MUC1 17. September 2024 um 12:45
- General Agent - Help me! 16. September 2024 um 16:42
- asdfad 16. September 2024 um 16:25
- New attempt RAG agent, now with two separate skills and updated instructions 13. September 2024 um 15:40
- Working RAG based on PDF URL (arxiv) 13. September 2024 um 14:45
- New Session Sep 13, 3:57 PM 13. September 2024 um 13:57

+ New

USER

Plote mir die aktivitat im Repo basierend auf den Co

AGENTS

To plot the activity in a GitLab repository based on commits commit has occurred, the following steps were taken:

1. **Fetch Commit Data:** The GitLab API was used to retrieve commit data.
2. **Process Data:** The commit data was organized by date and the number of commits were represented with a count of zero.
3. **Plot Data:** The `matplotlib` library was used to create a line plot.
4. **Save Plot:** The plot was saved as a PNG file named `repo_activity.png`.

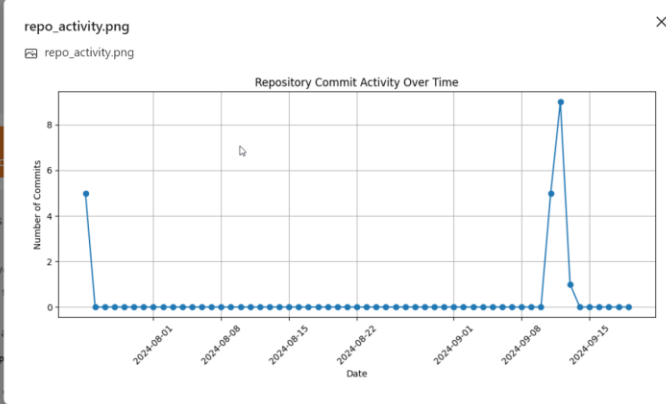
An initial error occurred due to a mismatch in the expected date format. After the update, the script executed successfully, and the plot was saved as `repo_activity.png`.

Agent Messages (6 messages) | 15 secs

Results (2 files)

repo_activity.png

plot_repo_activity.py



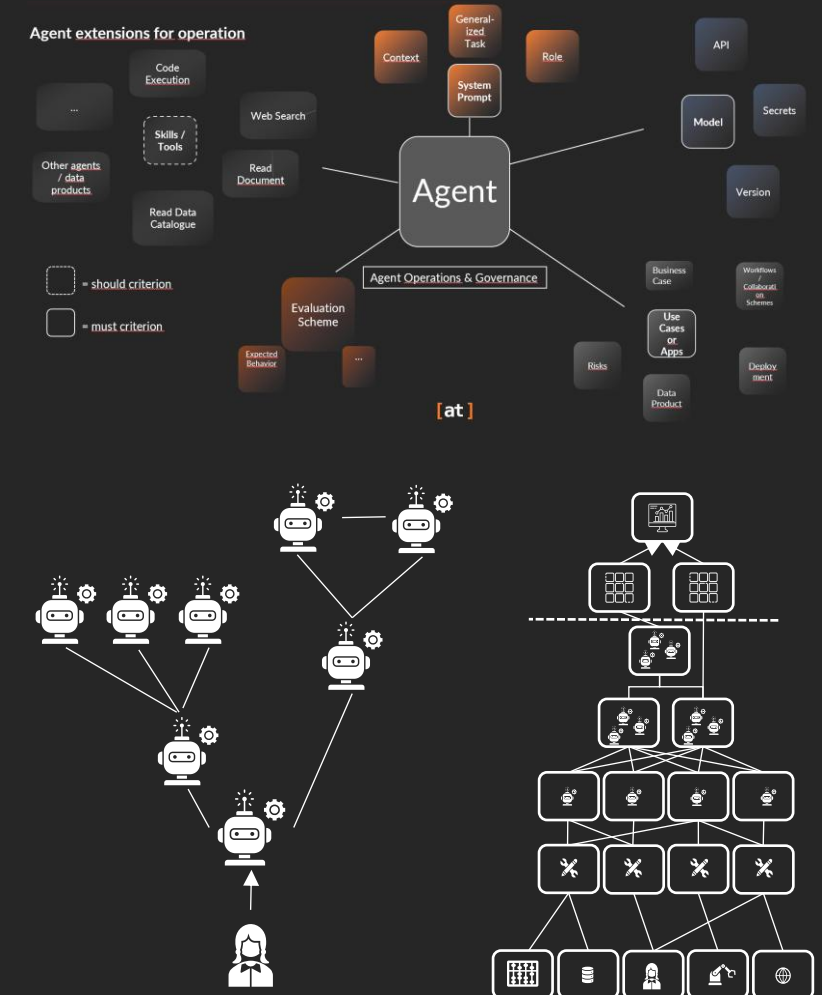
Number of Commits

Date

Write message here...

Blank slate? Try one of the example prompts below

Stock Price Sine Wave Markdown Paint Travel AutoGen RAG Development Research



The Agentic Mesh

Eine holistische Betrachtung:

Die 6 wichtigsten Dimensionen des Wandels

„Computer, roter Alarm! Was ist das für eine Anomalie auf Backboard?“



Arbeit mit Computersystemen wird insgesamt **intuitiver** werden!



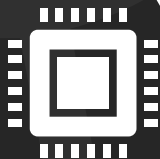
Human-in-the-loop & Human-centered Design.
Große Bewegung im Job Markt



Datenqualität, Dokumentation und Metadatenpflege



Neue **Hardware** wird den Markt beherrschen und KI Betrieb beschleunigen & effizienter machen



genAI Cyber **Security**



Nachhaltiger Betrieb: Energiekosten und Abhängigkeiten





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2025 – THE HEUREKA MOMENT

TRANSFORM YOUR ORGANIZATION INTO A COMPOSABLE ENTERPRISE 2.0

Let's connect...

[at] at a glance

MAKE DATA WORK since 2012



500+

Employees &
Partners



2500+

Data & AI Projekte



12

Offices



35%

CAGR

GOLD | Top 5%

ecovadis

Sustainability Rating

JUL 2024

Sustainability



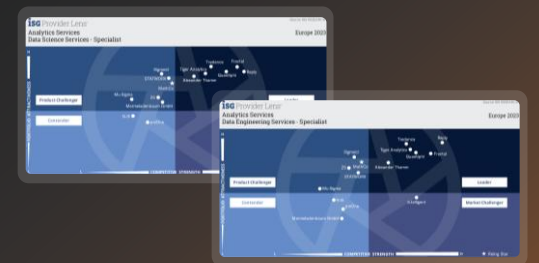
70+

Data Traineeship
Graduates



700+

Manufacturing
Projects



Awarded as Leader
in Data Science & Data
Engineering (ISG 2023)

[at]

START YOUR [AGENT] JOURNEY



 Deutsch | Englisch

Alexander Thamm

ist Founder, CEO und Pionier auf dem Gebiet der Daten & KI. Seine Mission ist es, einen echten Mehrwert aus Daten zu generieren und die internationale Wettbewerbsfähigkeit Deutschlands und Europas wiederherzustellen.



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 Deutsch | Englisch


Learn more on multi-agent systems and see it in practice in our webinars and podcast episodes


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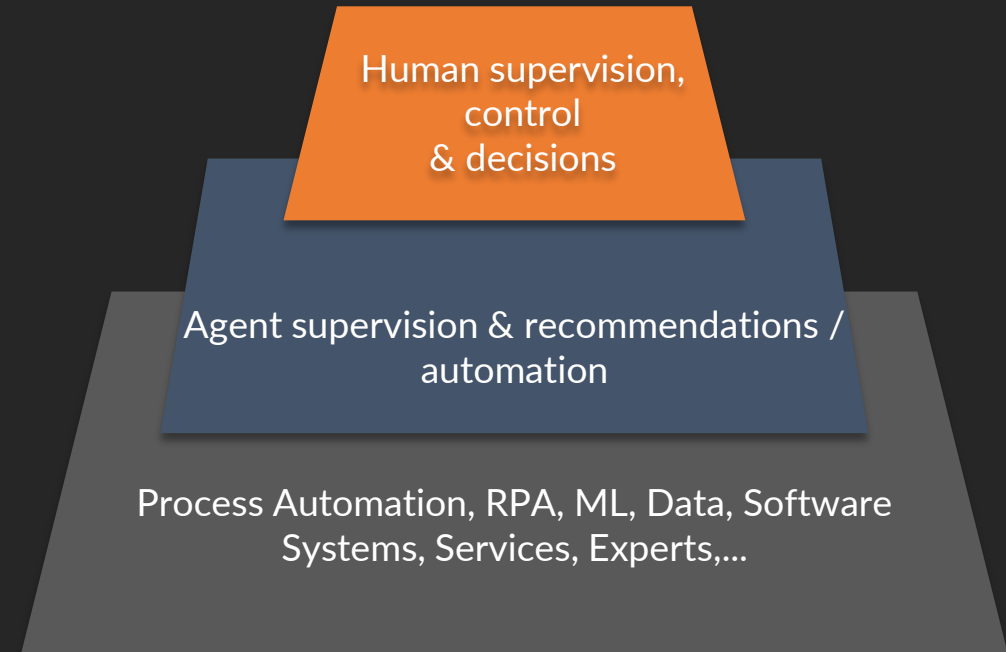
AI enables relief and focus on added value

Time for issues that really need people.

Business until now

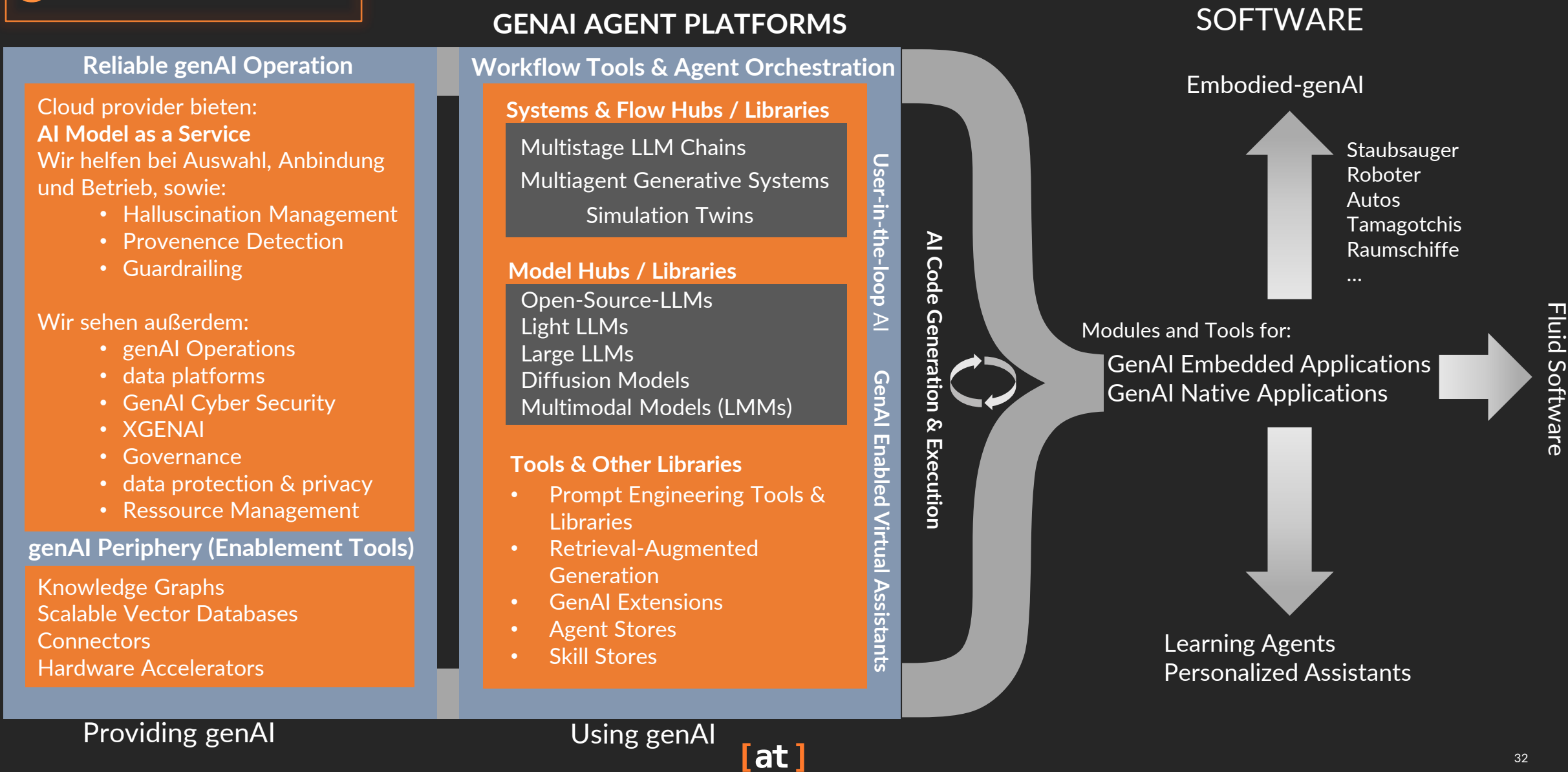


Agent-augmented



genAI Trends

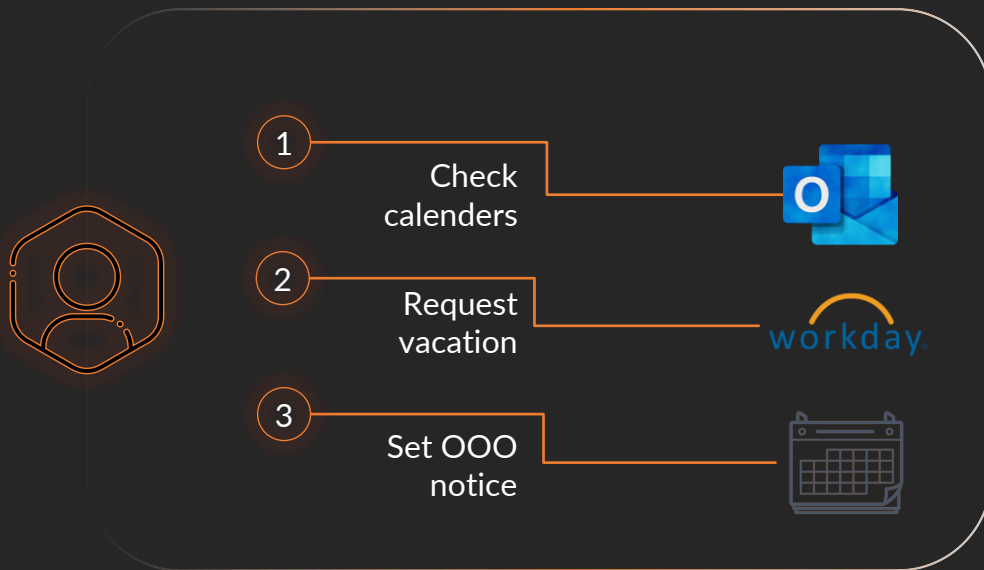
2024 —————> ~2030 —————>
On the path to a new way of interacting with machines



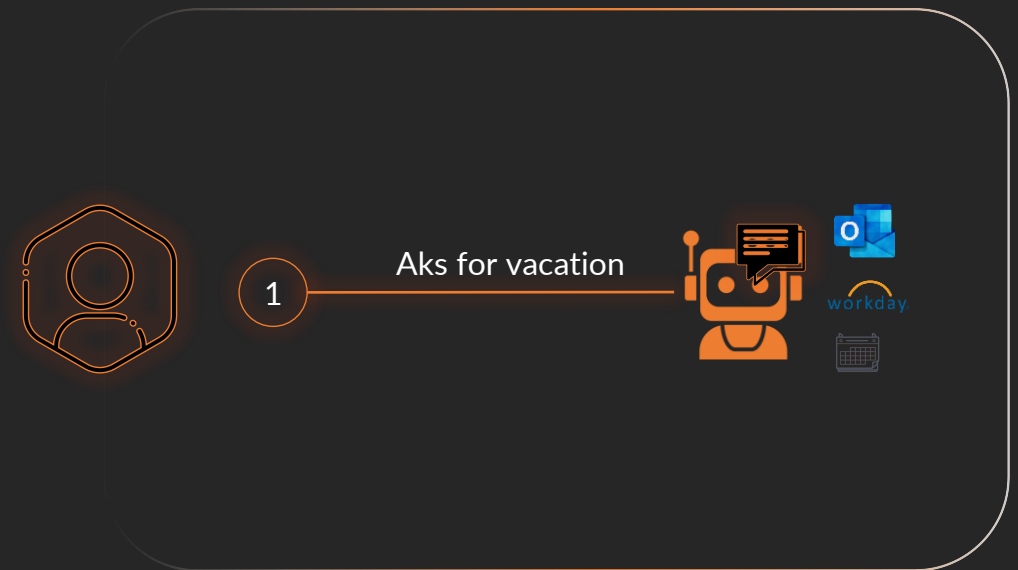
AI-supported working world

AI permeates almost all processes within a company

Today - Manual processes

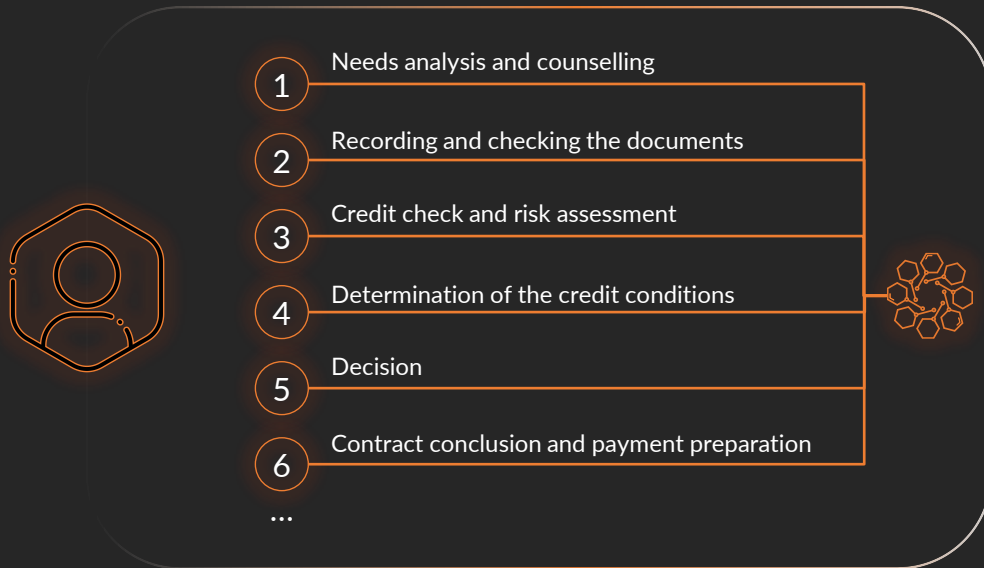


Future - AI based

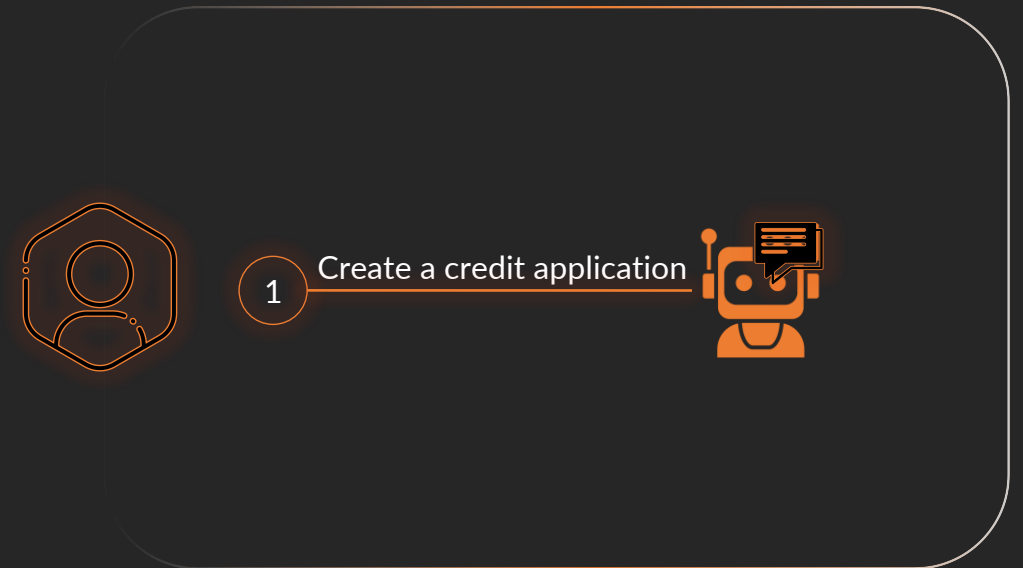


AI-support even for complex processes

Today – credit application



Credit application with AI



Ways into the future

Tooling AI-centered completely new build or agents work with existing systems

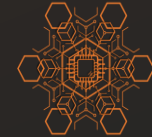
Many systems work together



2 Optionen

1

New,
AI-centered
Tools



2

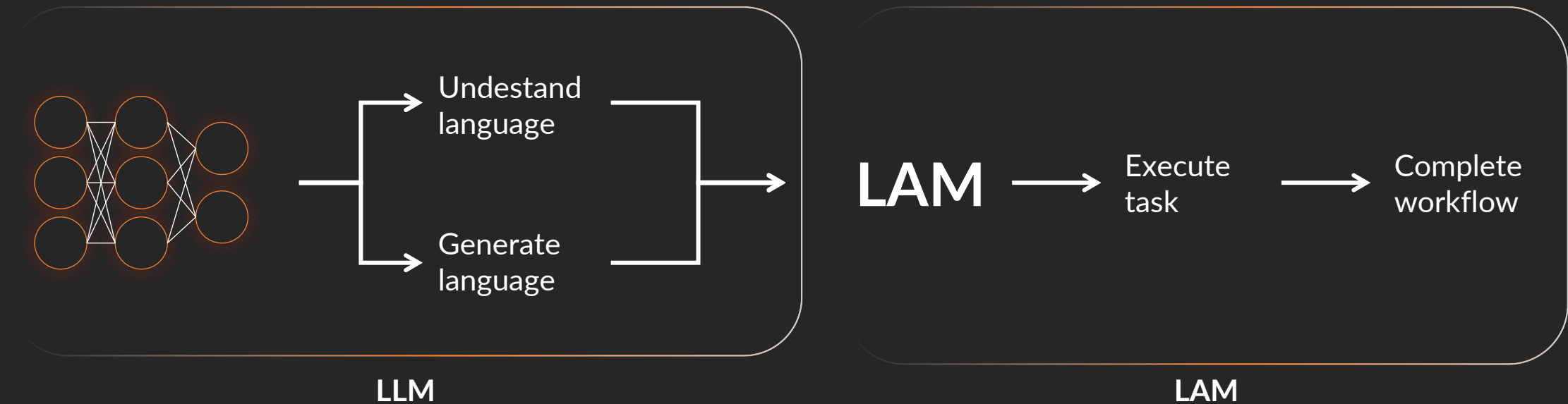
Agents
managed
processes



[at]

From LLMs to LAMs

Large action models are the next logical step in letting AI solving real-world problems



Key features

LAMs improve reasoning capabilities for better planning of workflows

Transformer-Architecture

LAMs also rely on LLMs at their core

Transformers excel at identifying patterns in natural language, code, sensor data, and others

Self-evaluation

LAMs evaluate their actions and correct errors

Models compare results with expected results to improve responses

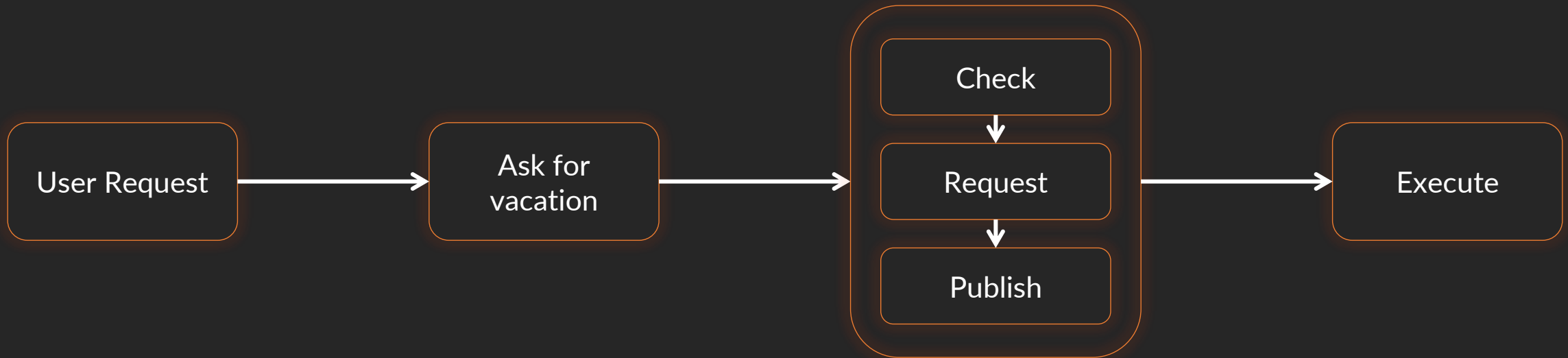
Symbolic AI

Some LAMs combine symbolic AI with the transformer architecture

Symbolic AI improves reasoning and planning capabilities

Neurosymbolic AI

Symbolic AI plans workflows, LLM understands the task and leads the execution



LLM

Symbolic AI

LLM

[at]

Claude Computer Use

Takes full control of a system, navigating on the screen and executing programs

Setup

Running in a VM

Uses tools via Function Calling

„Agent Loop“ to evaluate intermediate results

API or UI to interact with the agent loop

Demo

Please:

- Search Amazon for 3 wireless earbuds:
 - Find price
 - Rating
 - Brand name
- Make a simple Excel file 'earbuds.xlsx':
 - Put the information in a basic table
 - Add colors to the headers
 - Sort by price
- Show me the results