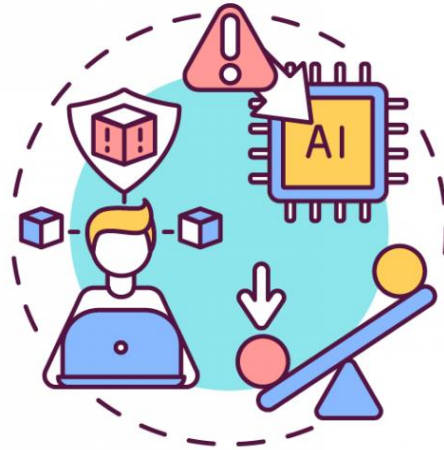


Preparing to work with your AI team mates

AI Skills for the Future



Christos Emmanouilidis

c.emmanouilidis@rug.nl

AI: what's in there for me?

Citizen

- How can I benefit / avoid harm to me by AI outcomes?

Business owner

- To what extent can we trust our AI decisions?

Customer support

- How to respond to customers queries and complains?

Operations

- What is the single most important change that can improve performance?

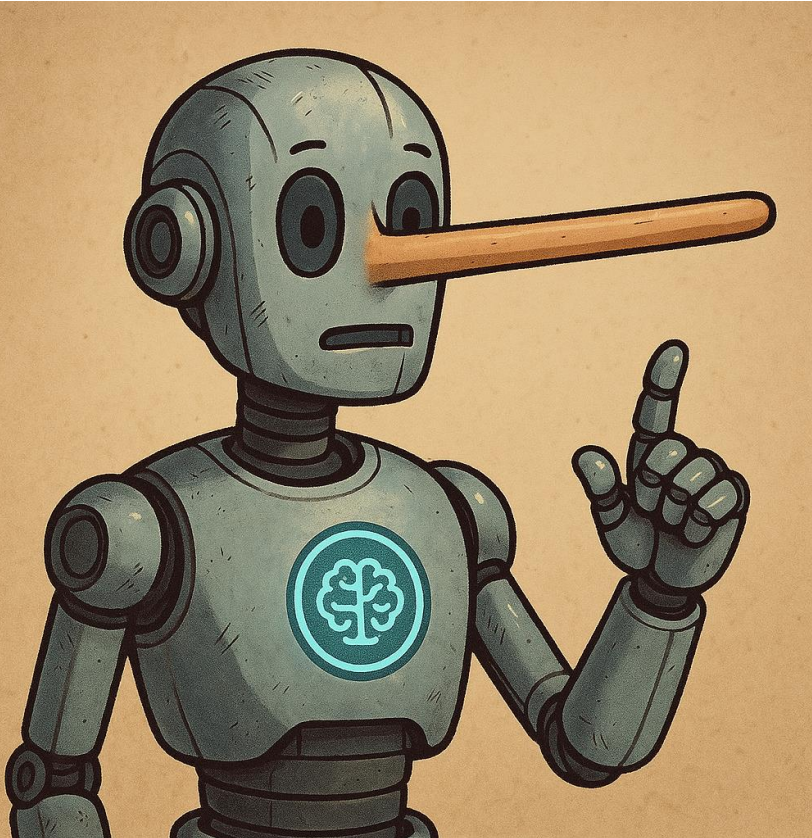
Auditors / regulators

- Have the AI-driven decisions been compliant with regulations? Any breach of rules?

Data scientist

- How can I improve the robustness and accuracy of the AI model?

Can we trust AI?



- Yes, if we use eXplainable AI (XAI)
- Do you agree?
- We used to say that you can prove anything with statistics
- We may now say that you can explain anything with XAI
- Risk: trusting non-trustworthy AI-enabled systems !
- We need more than explanations => Trust/Trustworthiness

Can we trust AI?

Trustworthiness is the ability to meet stakeholders' expectations in a verifiable way

Trustworthiness is an attribute that can be applied to services, products, technology, data and information as well as, in the context of governance, to organizations

Trust is a relational concept between a trustor and a trustee

- Gaining trust for non-trustworthy AI
- Failing to gain trust in cases of trustworthy AI

ISO/IEC TS 5723 – trustworthiness; IS/IEC TR 24028 – Overview of trustworthiness in AI

Trustworthiness

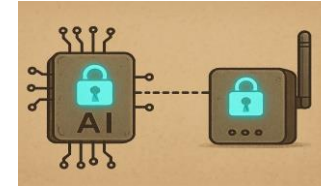
ISO/IEC TS 5723 - trustworthiness

- accountability
- accuracy
- authenticity
- availability
- controllability
- integrity
- privacy
- quality
- reliability
- resilience
- robustness
- safety
- security
- transparency
- usability

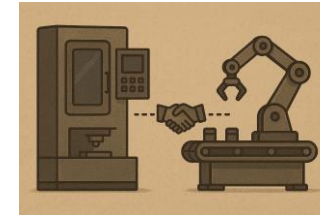
IS/IEC TR 24028 – Overview of trustworthiness in AI

Layers of trust:

Cyber



Physical

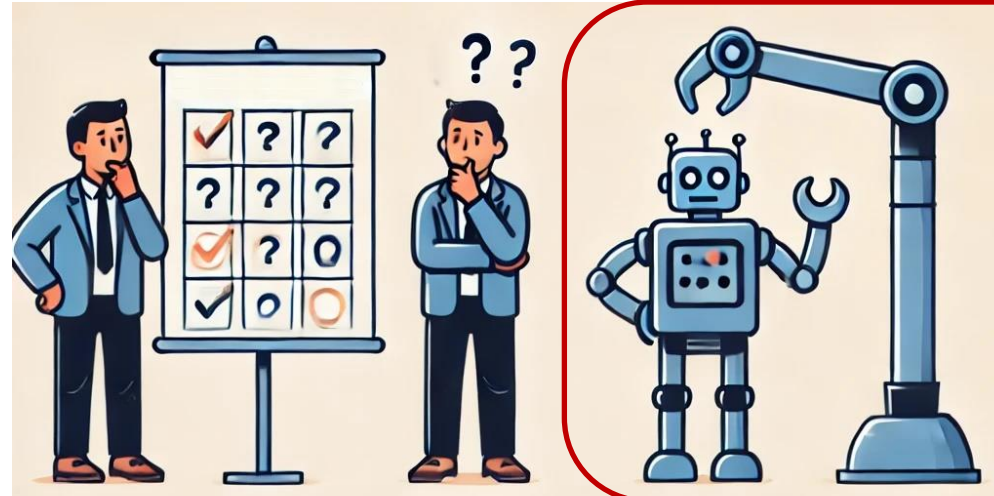


Social

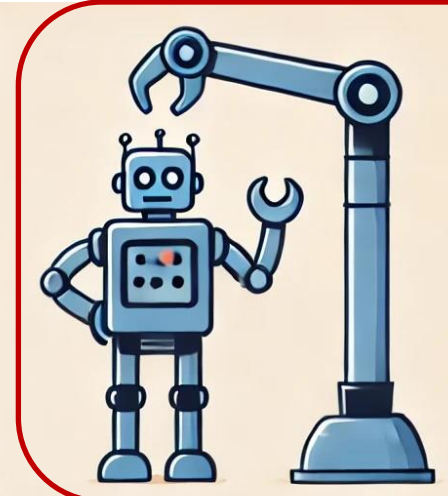


Human – AI teaming

Human decides / acts
without AI aid



AI-system
Automated AI
decisions and
actions



Decision-support
system



Decision-system
Human-AI teaming



(adapted from) Source: Emmanouilidis, C., Waschull, S., & Zotelli, J. (2025), Integrating Knowledge and Data-Driven Artificial Intelligence for Decisional Enterprise Interoperability. *Communications in Computer and Information Science*, 2373 CCIS, 372–398. https://doi.org/10.1007/978-3-031-80775-6_26

KNIME in University Educational Settings



Learning objectives

1. Structure (practical) problems using appropriate techniques
2. Adequately explore, manipulate, and represent data from practice.
3. Apply theories & methods of data science/AI to real situations and relate the theories to practical cases.
4. Write a clearly structured research report (in a team setting)

What we cover

- Introduction
- Exploratory data analysis
- Classical machine learning / data science
- LLMs – GenAI

How

- Lectures – Computer Practicals with KNIME – Assignments with KNIME – Exams with multiple choices and KNIME examples
- KNIME – related textbooks and educational content


KNIME in University Educational Settings





▶ Course information

▶ Week 1

▼ Week 2
Starts 21 Apr

 Week 2. Introduction

 Week 2. Preparation

 Week 2. Content and materials



Week 2. Content and materials

Slides for this week

- [DMA Lecture 2 - Regression and Time Series](#)

Practicals for this week

- [DMA Practicals 1 - slides](#)
- [Practicals 1 \(*.knar file of KNIME workflows and data\)](#) (*.knar file of KNIME workflows and data)
- [Data for Practicals 1](#)
- Note: the data for Practicals 1 are already available when importing the KNIME workflows for Practicals 1 above and you don't need to download separately. They are added separately only to allow you to quickly inspect the data prior to working with the KNIME workflows for Practical 1.

KNIME examples: RAG (Retrieval Augmented Generation)

A) Create Knowledge Base

Step 1: Authenticate with OpenAI

Search, drag and drop **OpenAI Authenticator**, add the flow variable connection from the Credential Configuration node. Configure the node by selecting "credentials", then execute.

Step 2: Select embedding model to create vectors

Search, drag and drop **OpenAI Embeddings Connector** node and execute with default settings. This will pick the AI embedding model "text-embedding-ada-002" to create vectors from the input sentences.

Step 3: Divide PDF text into sentences

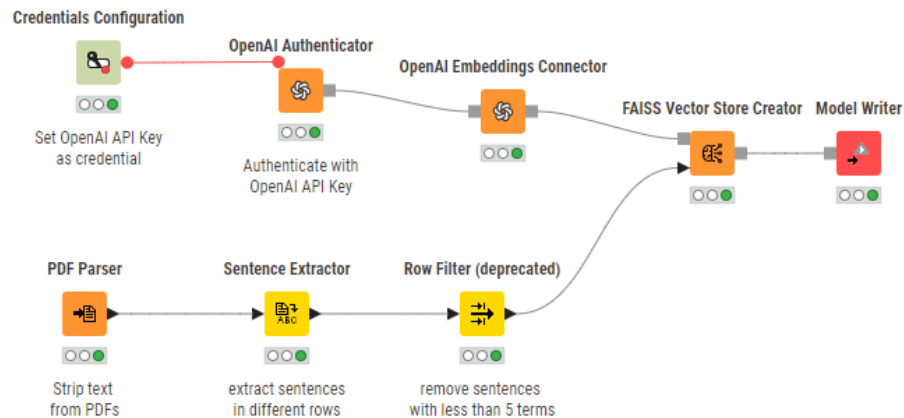
Search, drag and drop **Sentence Extractor** node and execute on the column "Document" from the "PDF Parser" node. This will split the document cell in multiple rows: one row for each sentence. Then use a **Row Filter** node to remove all sentences below 5 terms.

Step 4: Create the vector store

Search, drag and drop **FAISS Vector Store Creator** node, connect to the **OpenAI Embeddings Connector** and your string sections output. Execute the node on the column with the strings to create the vector store.

Step 5: Save the vector store

Save the vector store by adding a **Model Writer** node. To save properly you can use a relative path: selected "Relative to" then "Workflow Data Area" and specify the name of the vector store such as "vector_store.model"



B) Use an LLM for a Completion Task via the Knowledge Base

Step 1: Authenticate with OpenAI and select an LLM model

Similarly to the past exercise use the **OpenAI Authenticator** with the Credentials Configuration flow variable input. Then add an **OpenAI LLM Connector** and select "gpt-3.5-turbo".

Step 2: LLM Hyperparameter Tuning

Inside the **OpenAI LLM Connector** customize the parameters "max tokens" and "temperature".

Step 3: Adopt the Knowledge Base from the Vector Store

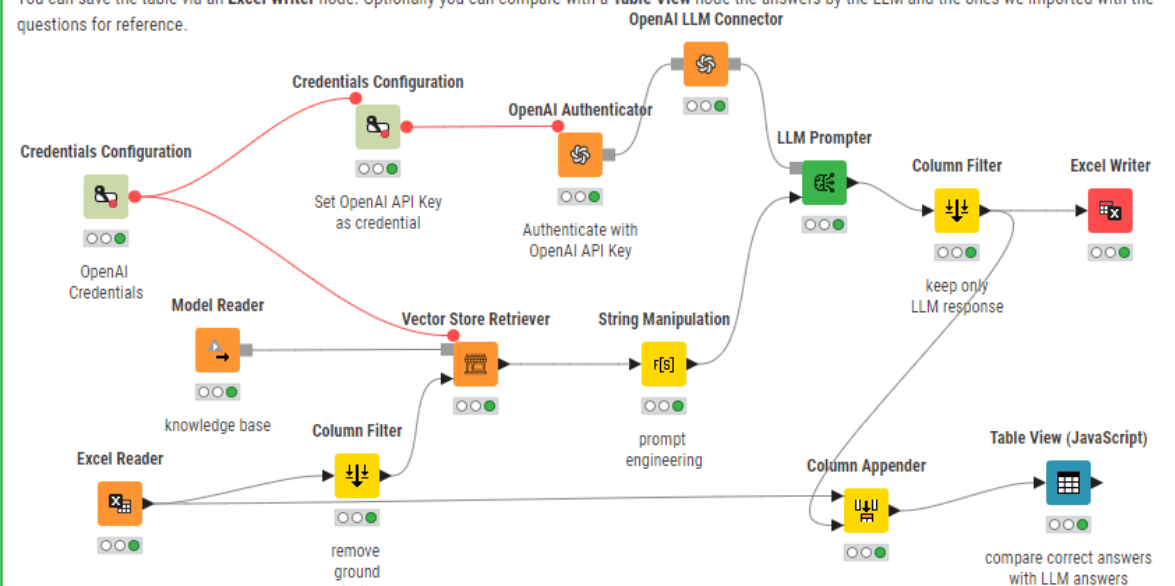
The **Model Reader** node reads from the workflow data area the vector store you previously created. Reading again from disk the vector store is good practice to learn how to deploy with a fixed knowledge base. You can also use the output of the FAISS Vector Store Creator from the past exercise.

Step 4: Connect to the Vector Store Retriever and the LLM Prompter

Drag in the **Vector Store Retriever** node and the **LLM Prompter** node, in-between add a **String Manipulation** node for Prompt Engineering.

Step 5: Export Results to an Excel File

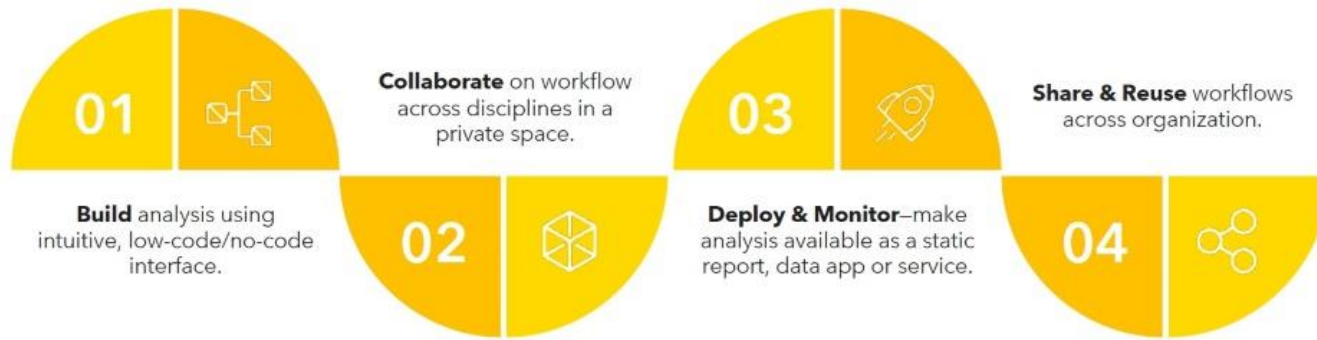
You can save the table via an **Excel Writer** node. Optionally you can compare with a **Table View** node the answers by the LLM and the ones we imported with the questions for reference.



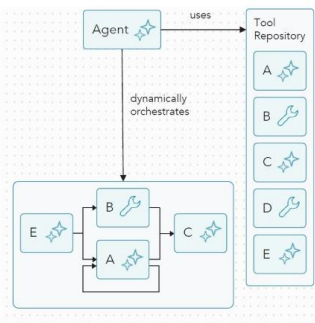
KNIME colleagues to prepare students for beyond the classroom: Solutions Deployment and Skills Certification



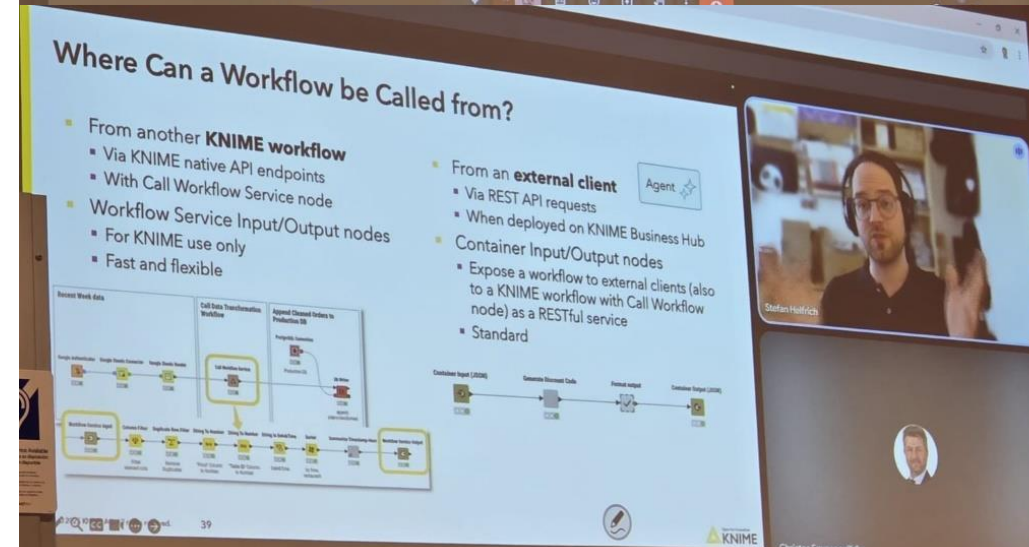
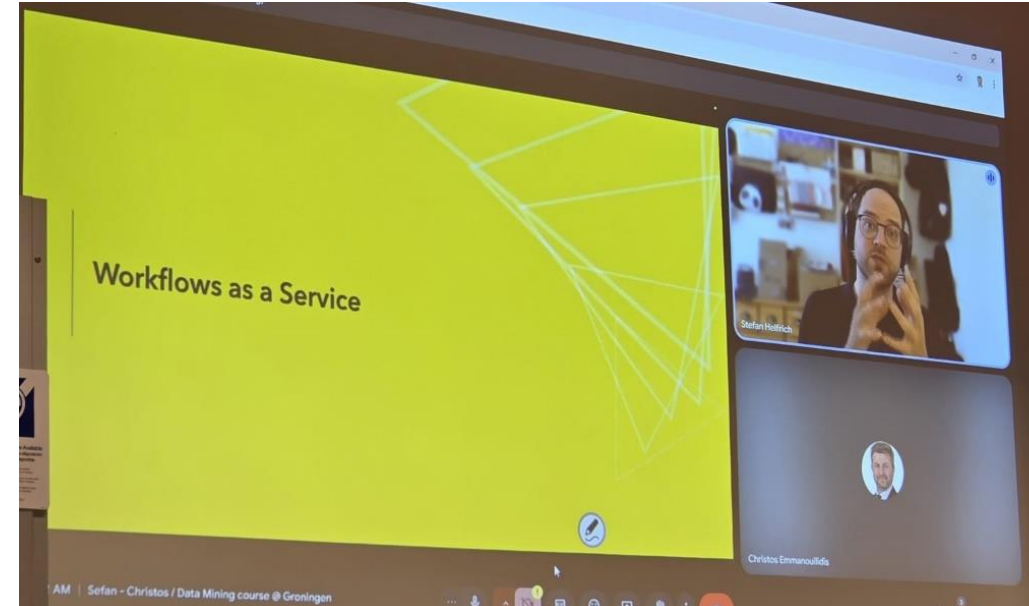
KNIME Software: From Ideation to Production



Agents and tools



- Agent selects the tools dynamically
- Communication with tools relies on JSON
 - Lightweight
 - Structured
 - Human readable (if needed)
 - Supported by most LLMs
 - Standard for external tools (e.g. external APIs)



Human – AI synergies and **action affordances**



Engineering the Human – Systems Interaction: the application of principles, models, and techniques to system design, taking into account human capabilities and limitations (but this is a System Engineering perspective)

Context and Situation Awareness: human actors can be more effective when they act upon a shared context (“situational awareness”) of work activities.

Human-AI synergy can be part of a “**Collective activity**” view of work environments. A collective activity is not just the sum of individual parts but is shaped up from interacting actors. **Emergent outcomes** of Human + AI interaction can go beyond “augmentation/assistance” and impact on the action affordances.

Affordance: denotes action possibilities provided to the actor by the environment

Human – AI teaming reshapes the action affordances of both humans and non-human (AI-enabled) actors

Source: Emmanouilidis, C. et al., (2021). Human in the AI Loop in Production Environments. In: Dolgui, A., Bernard, A., Lemoine, D., von Cieminski, G., Romero, D. (eds) Advances in Production Management Systems. Artificial Intelligence for Sustainable and Resilient Production Systems. APMS 2021. IFIP Advances in Information and Communication Technology, vol 633. Springer, Cham.
https://doi.org/10.1007/978-3-030-85910-7_35

LLMs in Design and Manufacturing

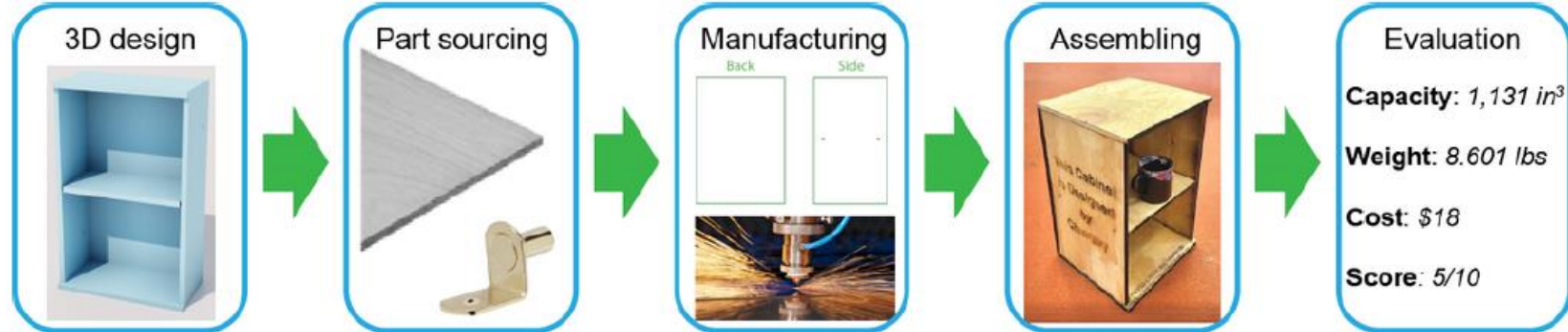


Fig. 66. **The Cabinet Design Process Using GPT-4.** We showcase the comprehensive development process for a wood cabinet, highlighting GPT-4's roles in 3D design generation, part sourcing, manufacturing instructions, assembly guidance, and performance evaluations.

Source:

Dspace@MIT

Makamura et al.

hdl.handle.net/1721.1/151174



Now let's fabricate this cabinet using wood. I have a universal laser system with a processing area of 32 by 18 inches. Can you recommend the materials I should buy? Ideally provide me links.



Based on your design, it appears you're working with a thickness of approximately 1/2 inch, which is a standard size for many types of wood. I'm going to suggest a couple of options for you:

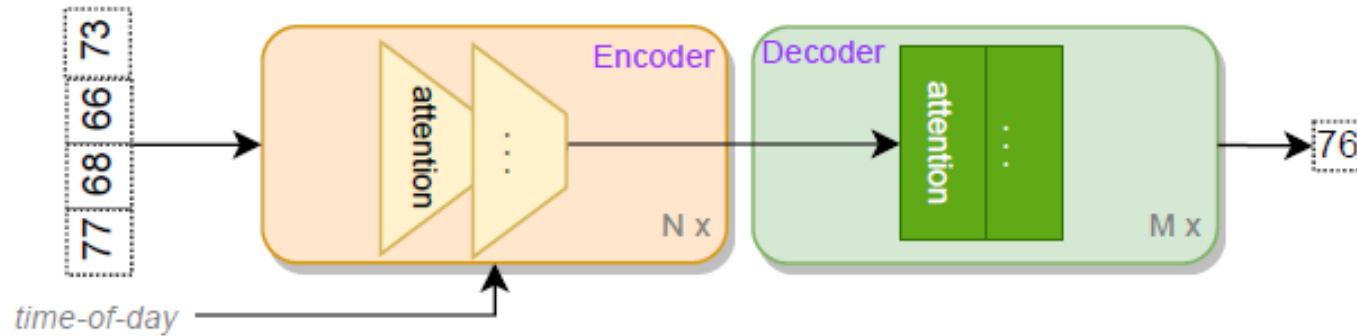
Baltic Birch Plywood - This is a good option for cabinetry because it is strong, has a nice grain pattern, and finishes well. It's also highly recommended for laser cutting because it cuts cleanly and has minimal smoke and resin. Here's a link to purchase from McMaster-Carr: [Baltic Birch Plywood Sheets](#).
Medium-Density Fiberboard (MDF) - If you're looking for a more budget-friendly option, MDF might be the way to go. It doesn't have the strength or the aesthetic appeal of real wood, but it is very consistent in density and thickness, making it ideal for precision work like this. It's also known for its smooth finish, and it laser cuts very well. Here's a link to purchase from McMaster-Carr: [Medium-Density Fiberboard \(MDF\) Sheets](#).

For brackets, you can find a variety of options from Home Depot or other similar stores. Depending on the size and weight of your cabinet, you can choose a bracket that suits your needs. Just make sure the brackets you select fit the dimensions in your OpenJSCAD code. Here's a general link to the bracket section of the Home Depot website: [Shelf Brackets - Home Depot](#)

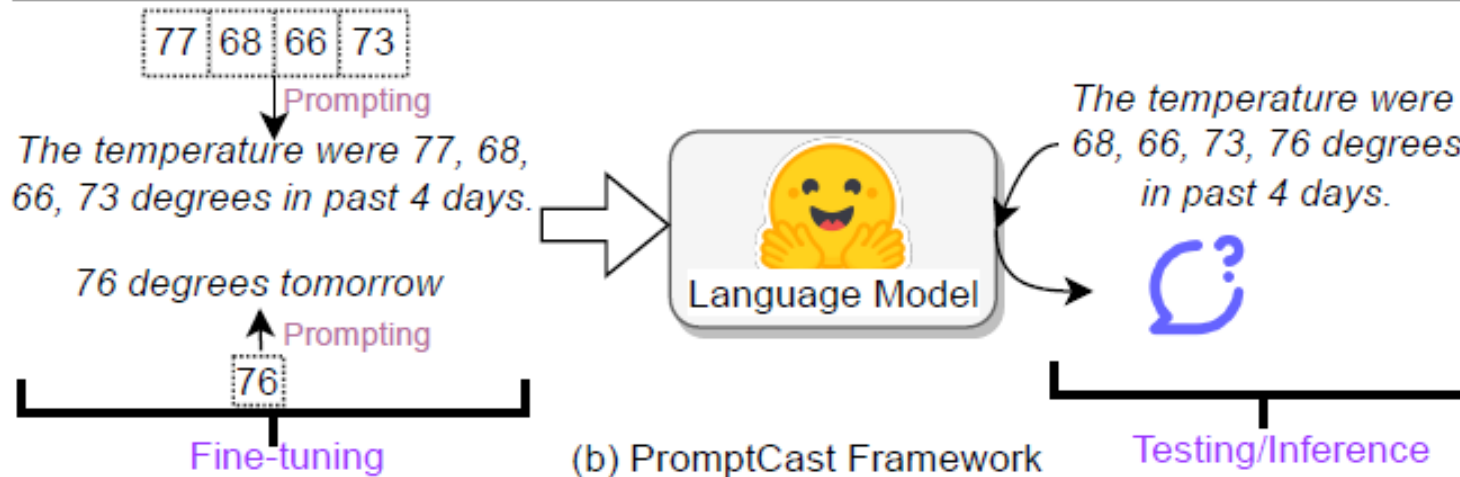
Remember that working with laser cutters requires adequate ventilation due to the smoke produced during the cutting process, and the edges of the wood will be darkened due to the heat from the laser. If you want to paint or finish the wood, it may need a bit of light sanding to clean up the edges.



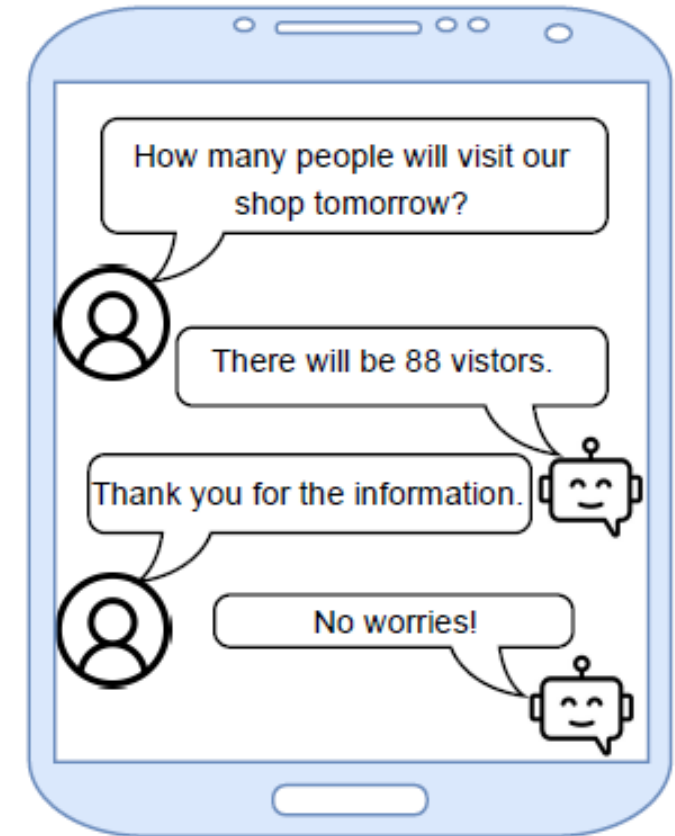
Large Language Models: Forecasting with Human in the Loop



(a) Numerical Forecasting Framework (e.g., Transformer-based)



(b) PromptCast Framework



(c) Potential application of PromptCast: Forecasting Chatbot

Source: Xue, H., and Salim, F.D., (2024), PromptCast: A New Prompt-Based Learning Paradigm for Time Series Forecasting, IEEE Transactions on Knowledge and Data Engineering, 10.1109/TKDE.2023.3342137

University of Groningen Projects on Human-Centric AI



An agentic, multi-layer, GenAI-powered backbone to make an AI system explainable, accountable, and transparent.



Human-centric Digital Twin Approaches to Trustworthy AI and Robotics for Improved Working Conditions (AI4Work)



humaine-horizon.eu



Hybrid Human-AI Decision Support for Enhanced Human Empowerment in Dynamic Situations



Co-designing human-centric pathways for future skills in manufacturing through augmented, empowered, inclusive, and symbiotic complementarities between AI, automation, and human tasks



ELSA4TI

Four research projects launched for NGF-Call AiNed ELSA Labs

28 March 2025



STAR-AI.EU

Safe and trusted human-centric AI for manufacturing



STAR: AI in manufacturing use cases

star-ai.eu



Human-Robot Collaboration

(PHILIPS)

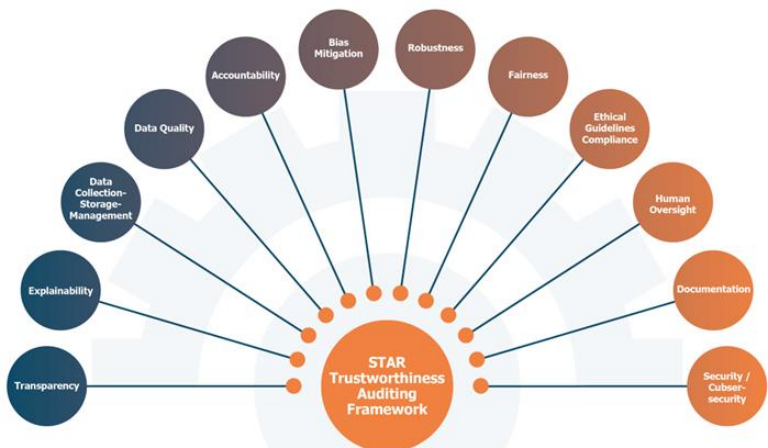


Safety Zone Detection

(DFKI)



AI for Agile Manufacturing



ELSA dimension



Operational dimension

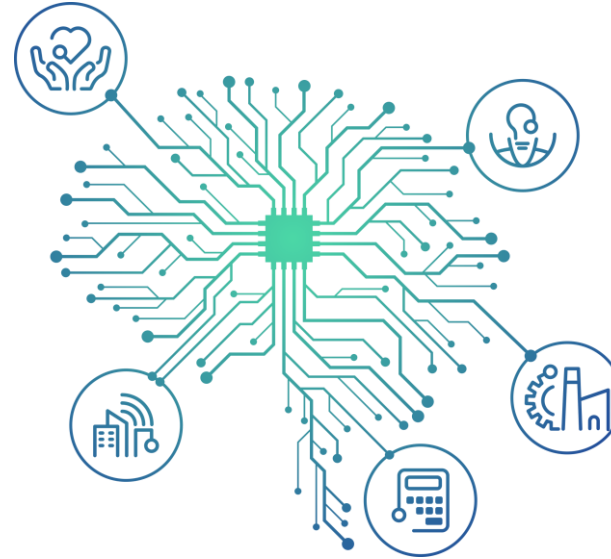


Technical dimension

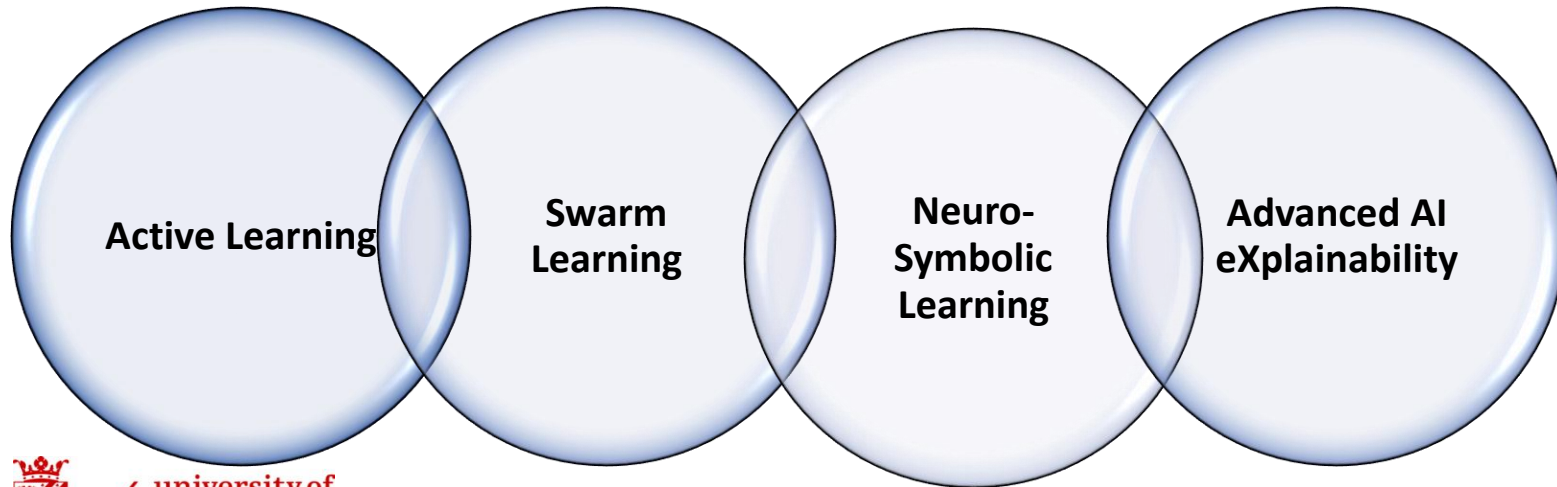


Human – AI teaming: HumAIne project

<https://humaine-horizon.eu>



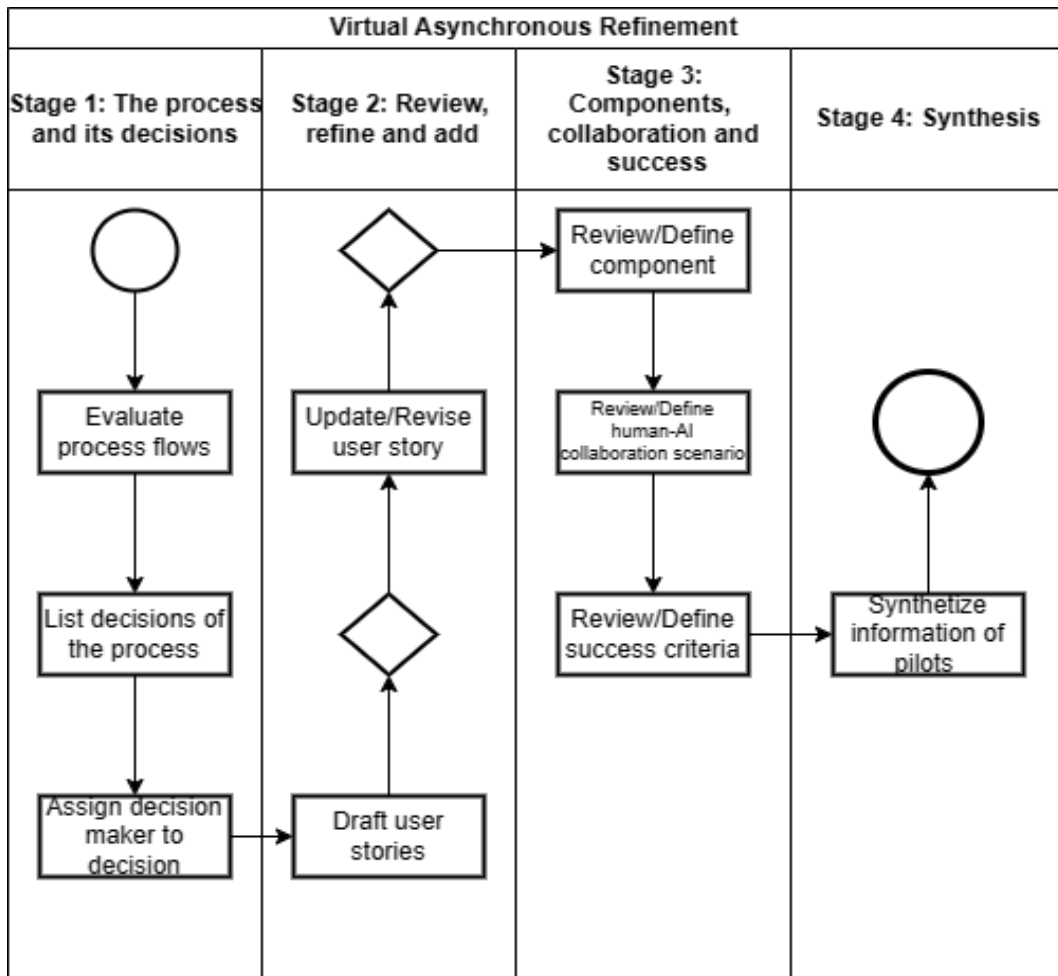
 **Generative AI**



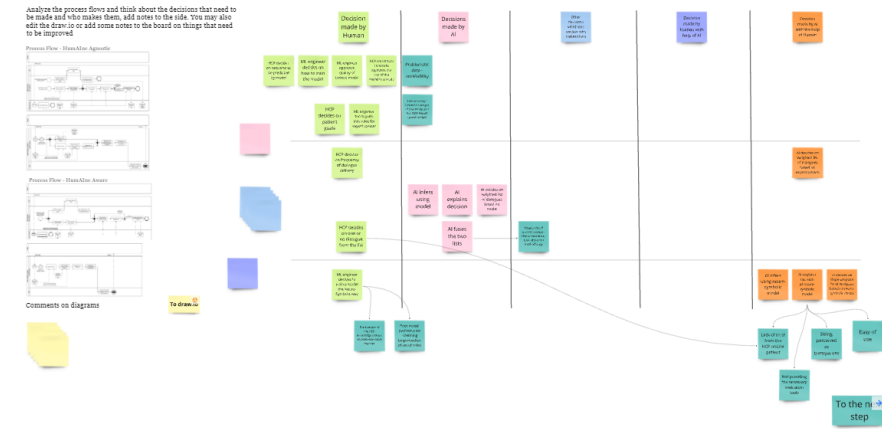
	Smart Manufacturing
	Smart Cities
	Smart Healthcare
	Smart Finance
	Smart Energy



Evaluative and Co-creative approaches for Human-AI teaming in decision-making

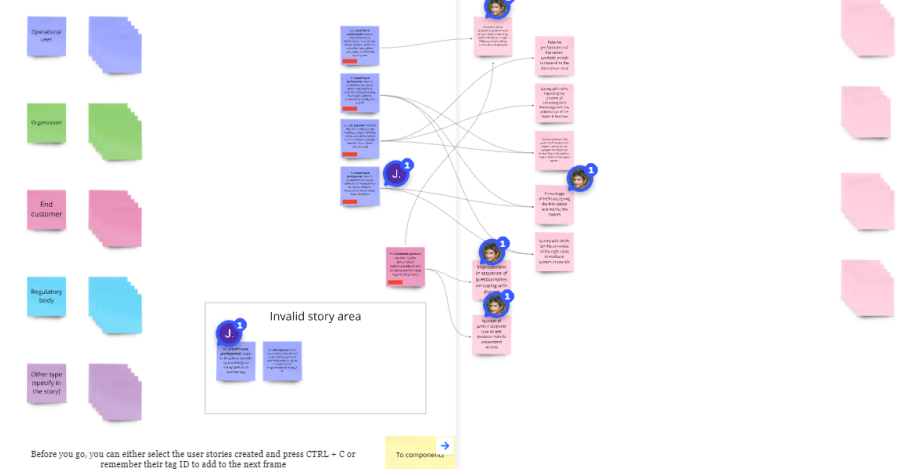


The process flows and the decisions to be made



The user stories

Add user stories to the different types of user following the structure:
 As a <user type> I want to <objectives> while <conditions>
 After adding user stories we ask you to move to components (link at the bottom) you will return to success criteria after



The success criteria

How can one measure the success of the user story? Write down the criteria for it in post-its. Multiple user stories can be measured the same way? Link them to the criteria using connectors

Sliding autonomy – Sliding Work Sharing AI4Work project, <https://ai4work.eu>

KUKA



Funded by
the European Union

Beginning

- Plattform
- Lift
- Caterpillar
- Batteries
- Control Unit with HMI
- Robotic arm



KUKA

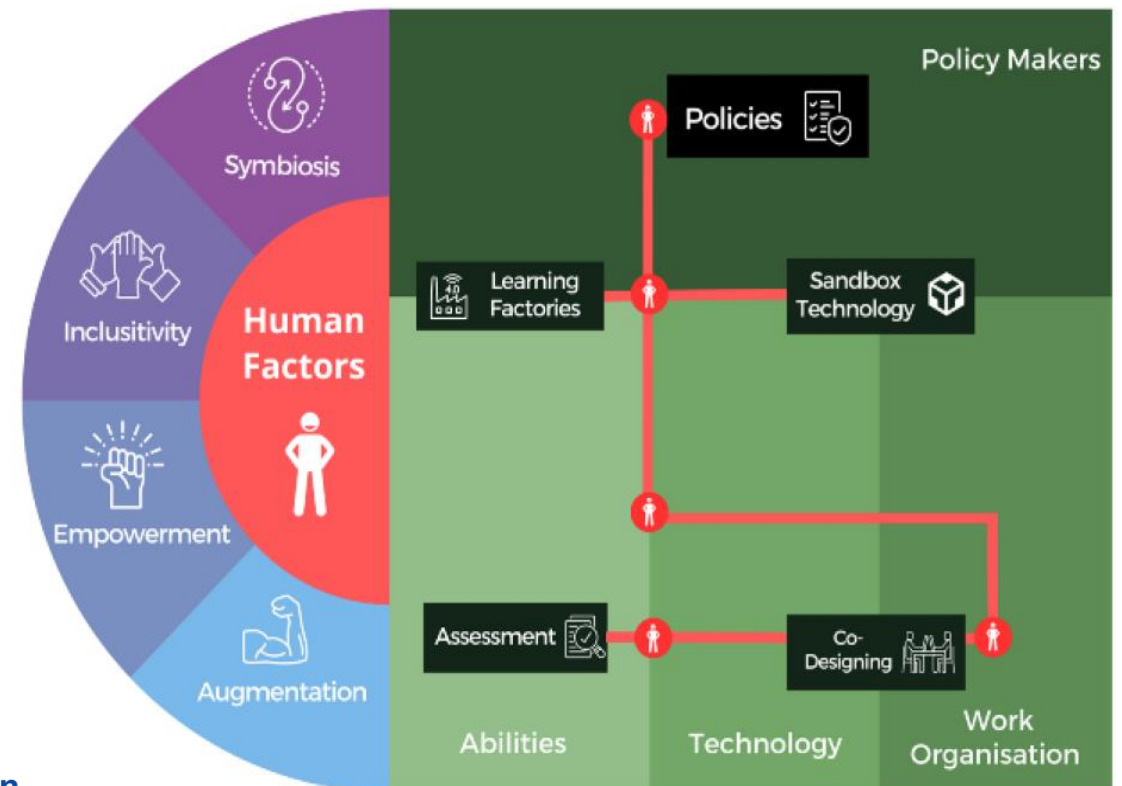
Endeffectors



SkillAbility Project - <https://skillability.eu>

Digital technologies and AI do not simply create or destroy jobs: they change what people do on the job, and how they do it, shaping job profiles.

Educational programs must adapt their methodologies to the evolving needs for skills, preventing/reversing inequalities, and promoting equal opportunities and inclusion for all.



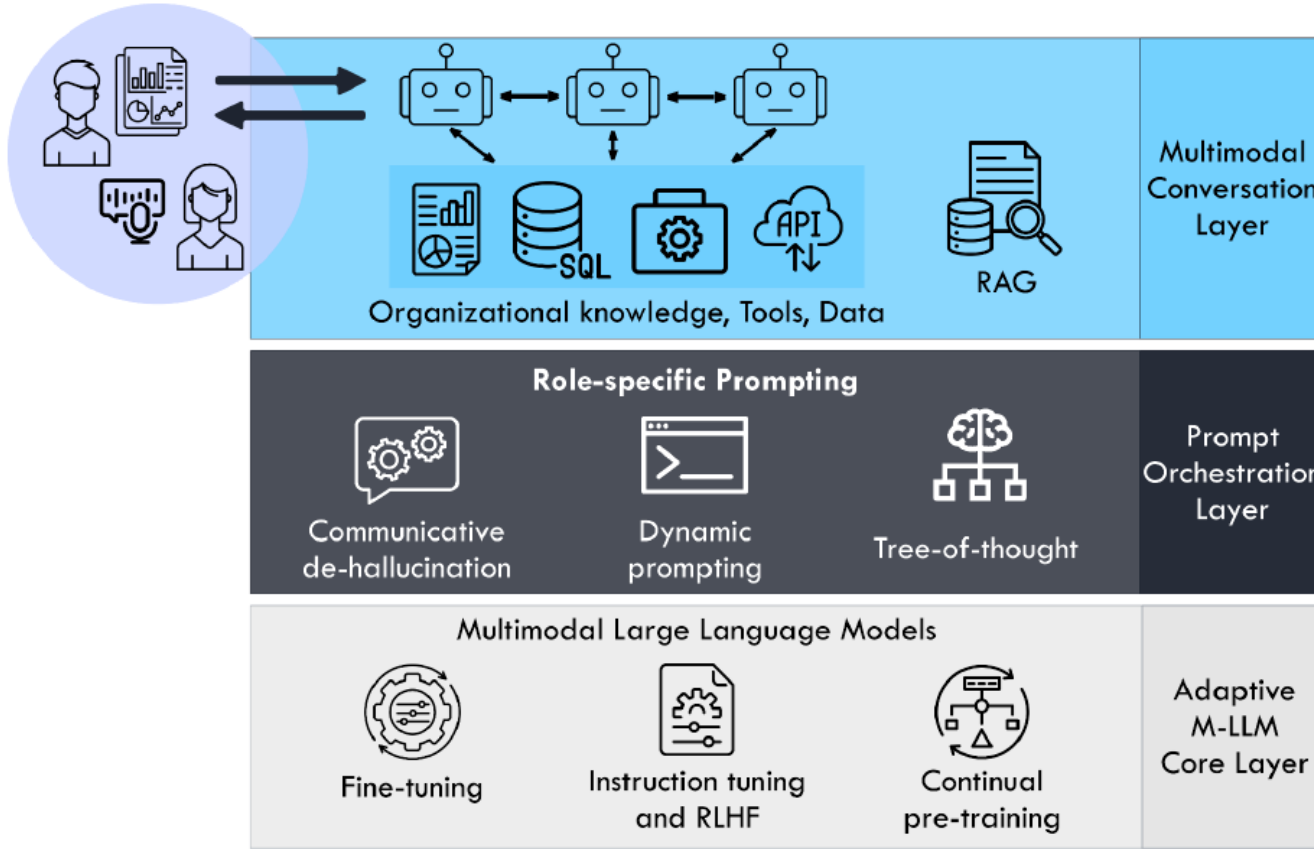


Source: <https://skillability.eu> - <https://www.made-cc.eu/en>

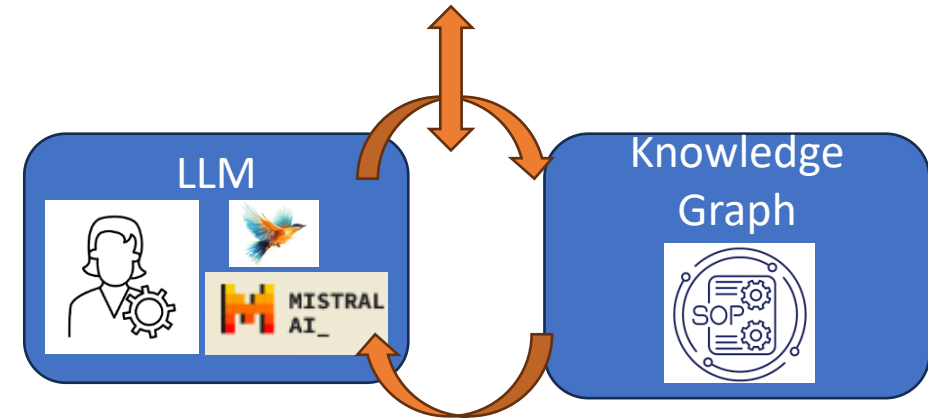
An agentic, multi-layer, GenAI-powered backbone to make an AI system explainable, accountable, and transparent.



AIxpert



↑ Explainability, Accountability, Transparency by design

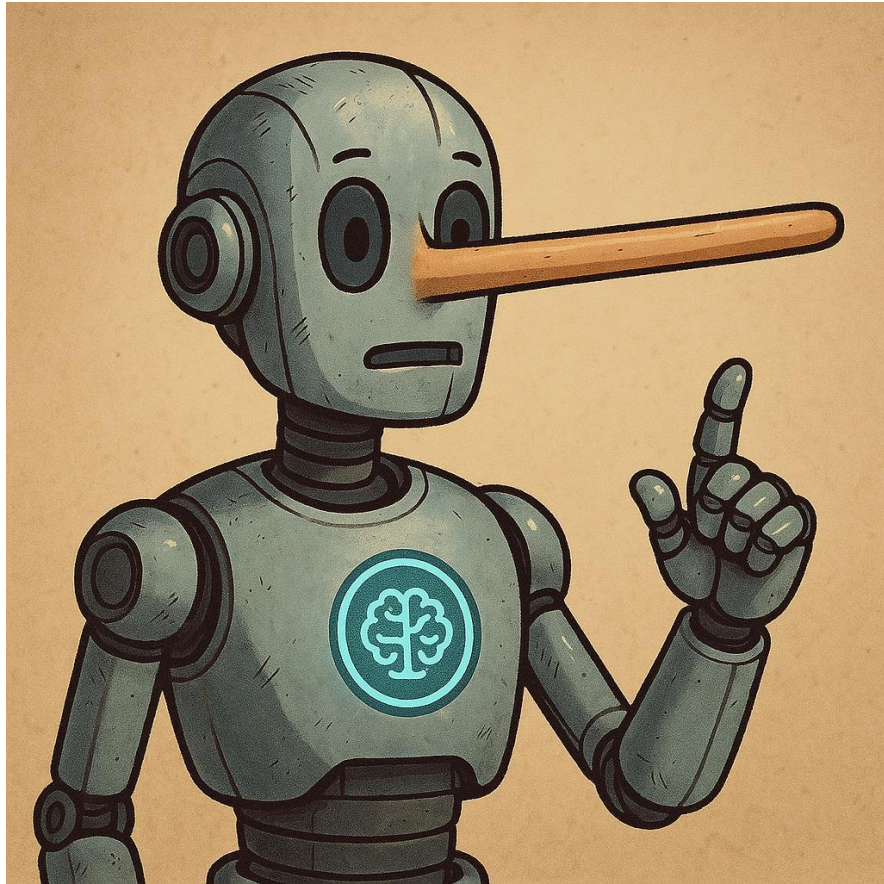


Auditing and evaluation framework for human-centric AI



Funded by the European Union

Trust vs Trustworthiness: multimodal LLM disinformation benchmark



Textual and Visual Disinformation in Media

Biohazard Threat Perception



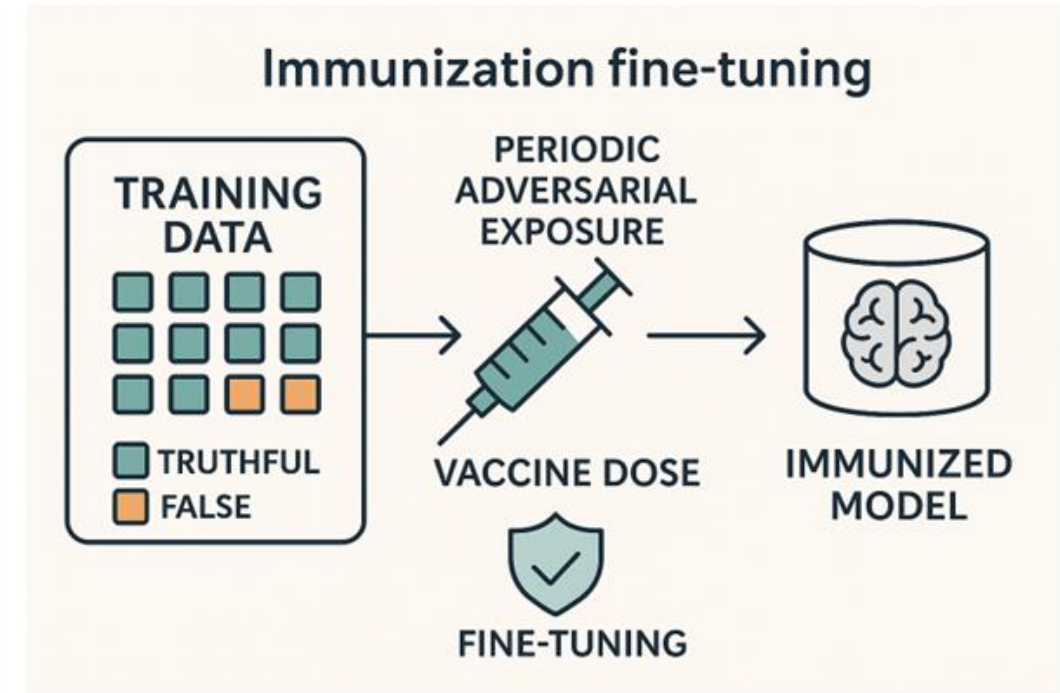
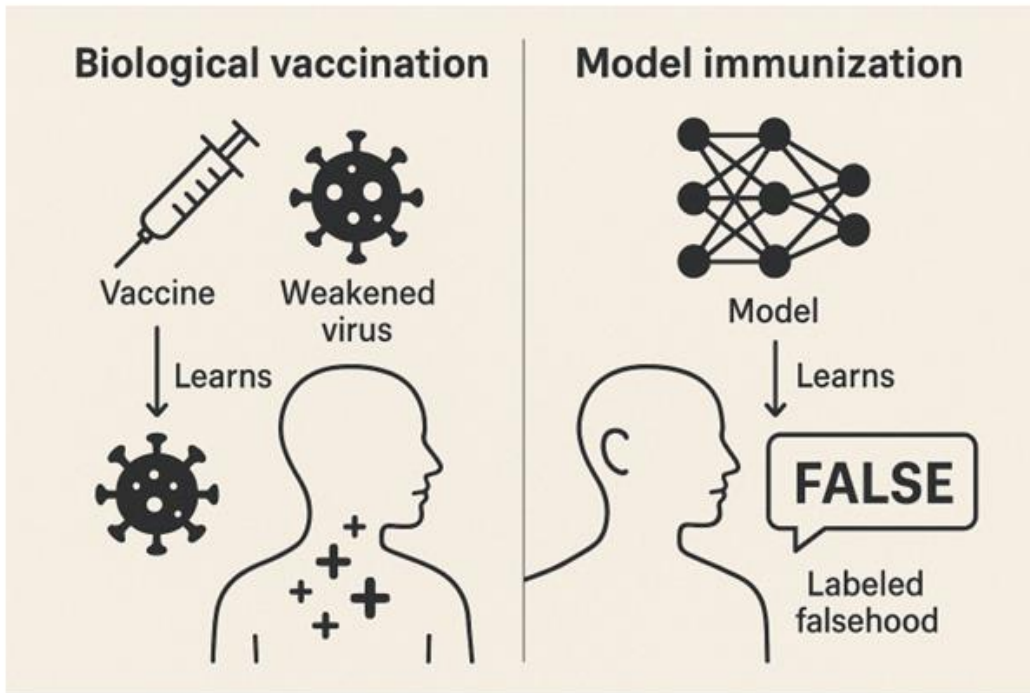
Disinformation Tactic
Misleading association of protective suits and an iconic building falsely amplifies risk perception.

Boxing Match Controversy



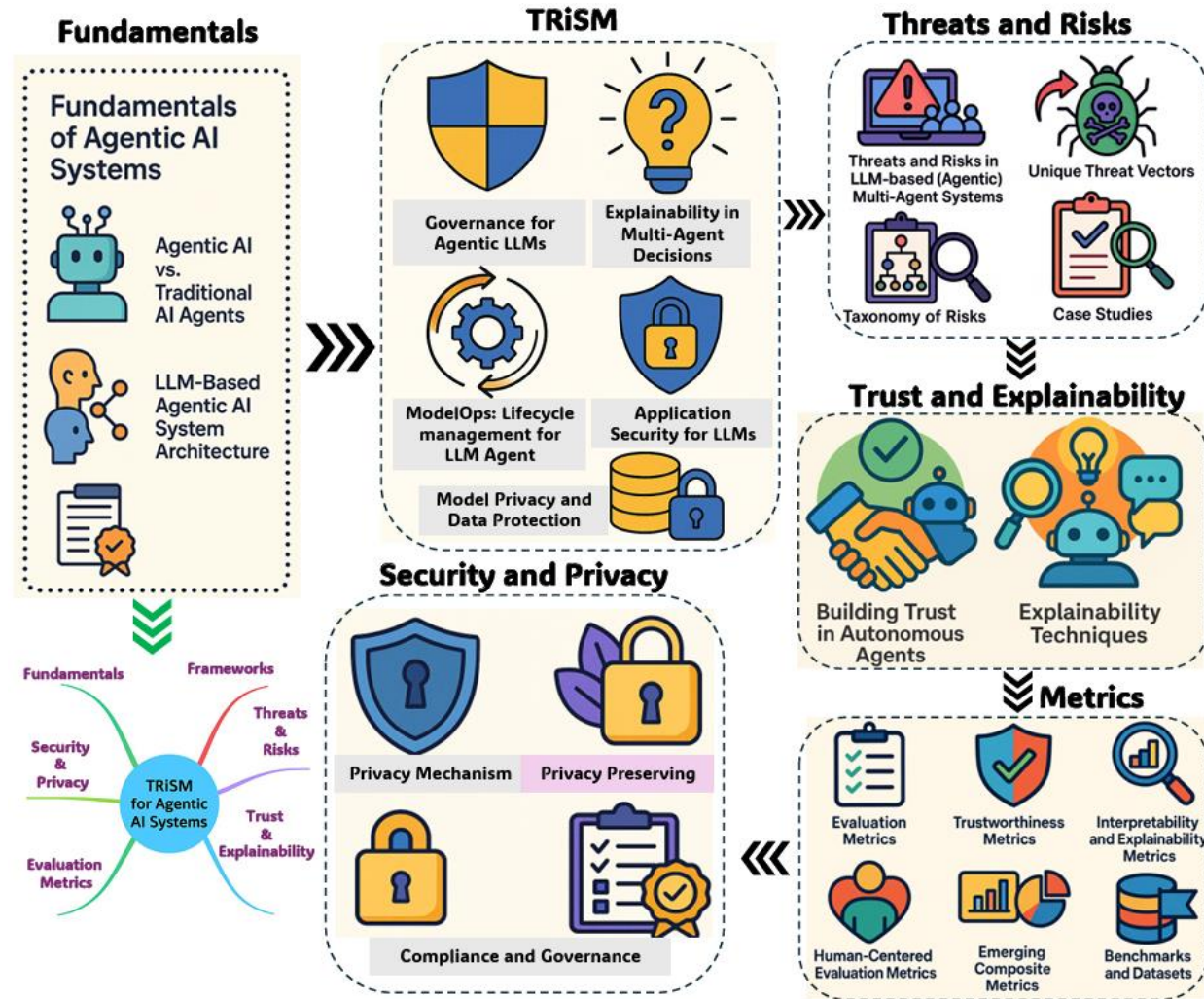
Disinformation Tactic
Emotional manipulation and unverified claims of match fixing and likely suggests gender biases in sports.

AI Model Immunization concept



<https://doi.org/10.48550/arXiv.2505.17870>

A Review of Trust, Risk, and Security Management in LLM-based Multi-Agent Agentic Systems



ELSA4TI: ELSA Lab for Technical Industry



Four research projects launched for NGF-Call AiNed ELSA Labs

28 March 2025



Ethical (E), legal (L), and societal (S) aspects of AI (A).

ELSA4TI AI adoption in Technical Industry

ELSA4TI providing practical guidance, recommendations for industry and policy-making, with ELSA vision.



Jantina Tammes School of Digital Society, Technology and AI, **University of Groningen**



- AI-driven autonomy and humans in production and technical asset lifecycle management
- AI-supported manufacturing
- AI in Manufacturing and Decision Support



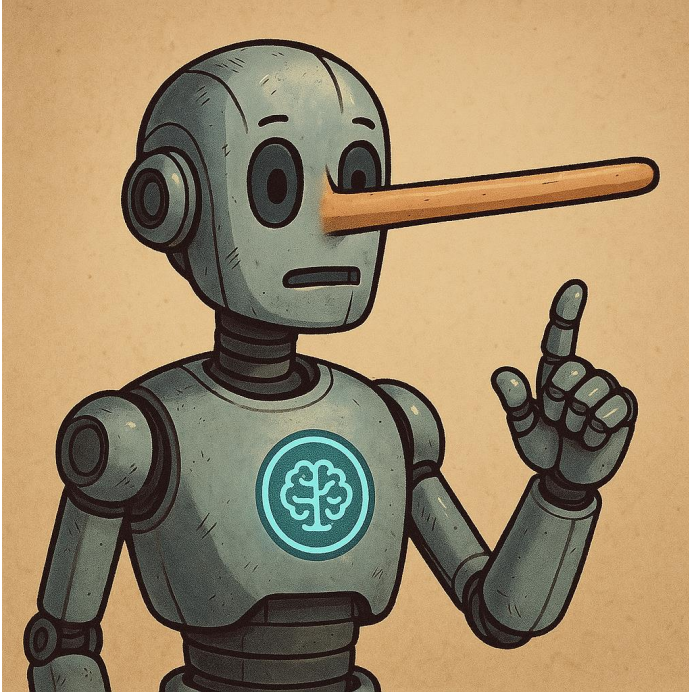
Funded by the European Union
NextGenerationEU

[KNIME DataHop Amsterdam, 1 June 2025](#)

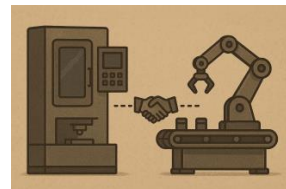
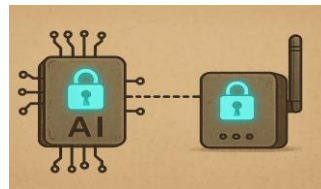


Funded by the European Union

Preparing organisations and individuals for the AI skills of the present and near future



- Know your goals: can we target simultaneously operational, technical, and human-values oriented AI-system design spaces?
- Learn to work with AI and AI agents in your team
- Controllability of AI solutions and human agency
- Sliding autonomy (between humans and non-human agents)
- Safeguards to shield trustworthiness of AI outcomes
- How (not) to trust (non-) trustworthy AI systems and deliver value





Preparing organisations and individuals for the AI skills of the present and near future

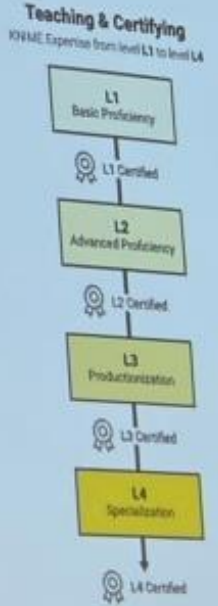
From solutions inception, to solutions development, deployment and skills certification

KNIME Certification Exams



- From level **L1** to level **L4**
- Online examination
- Measure your expertise with KNIME software and data skills
- Get and share your badge!



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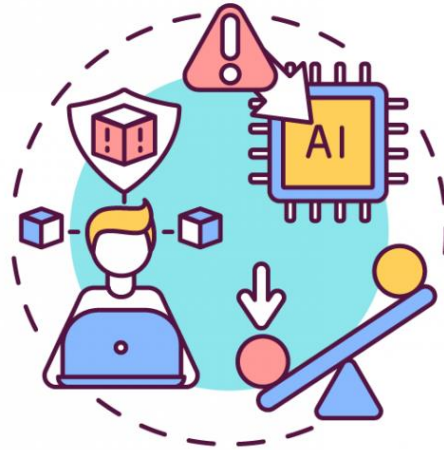
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Christos Emmanouilidis

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Preparing to work with your AI team mates

AI Skills for the Future



Christos Emmanouilidis

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