

UNIVERSITY OF OSLO

African Digital and Innovation Technology
Academy (ADIDA) Seminar 13Jun2025

AI for All: Opportunities and Challenges

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UNIVERSITY
OF OSLO



Will AI be able to
describe?



Norway: 1 Billion NOK for 6 AI centres (100 Million USD = 1.79 USD/inhabitant)

- Artificial Intelligence Centre for the Empowerment of Human Learning
- **The Norwegian Centre for Trustworthy AI**
- **Center for AI & Creativity**
- Norwegian Centre for Embodied AI
- Norwegian Centre for Sustainable, Risk-averse and Ethical AI
- Norwegian Centre on AI for Decisions

UiO is partner in all 6 centres, and leads 2

announced 12Jun2025

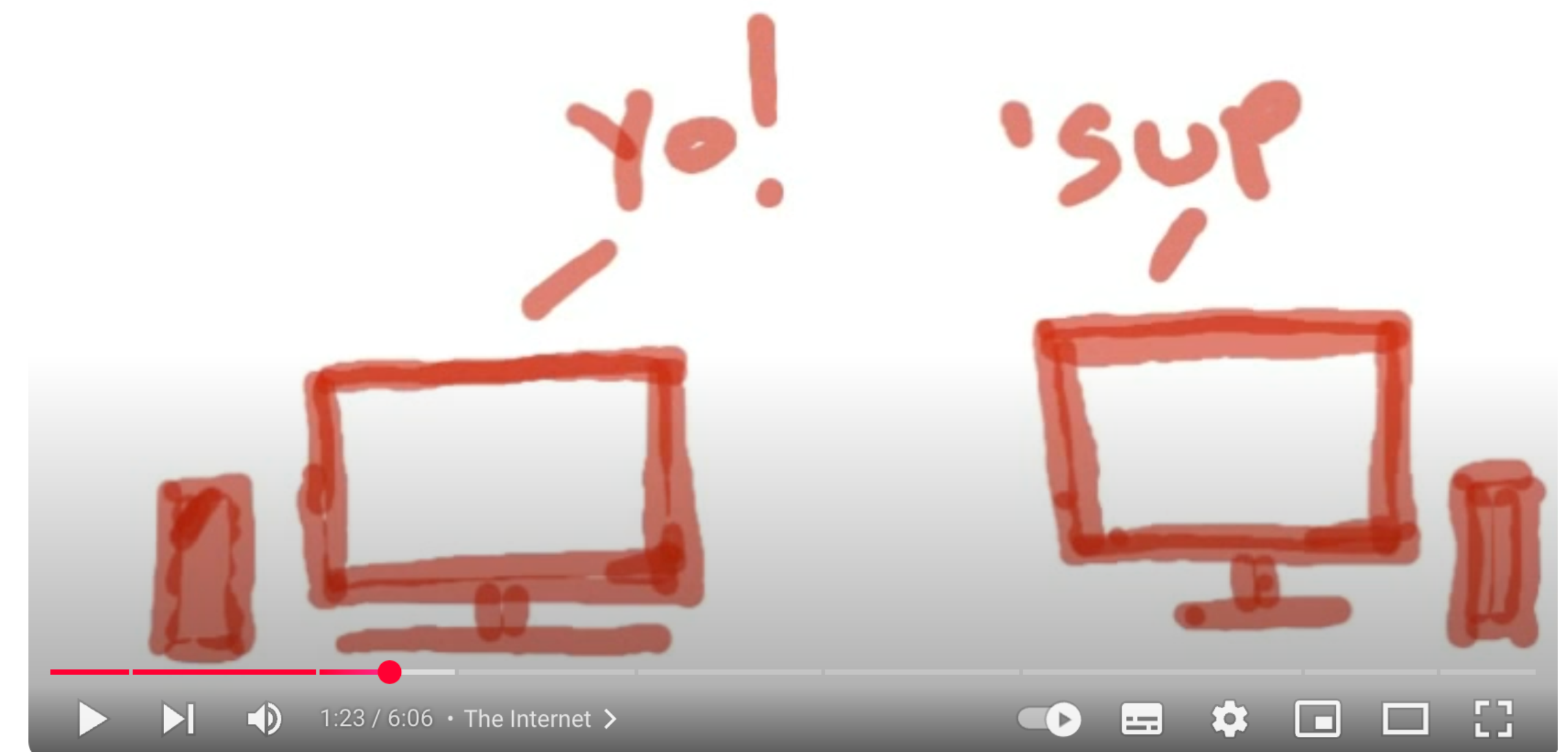
<https://www.forskningsradet.no/nyheter/2025/forskningscentre-kunstig-intelligens/>

AI isn't new!

History: Let computers understand each other

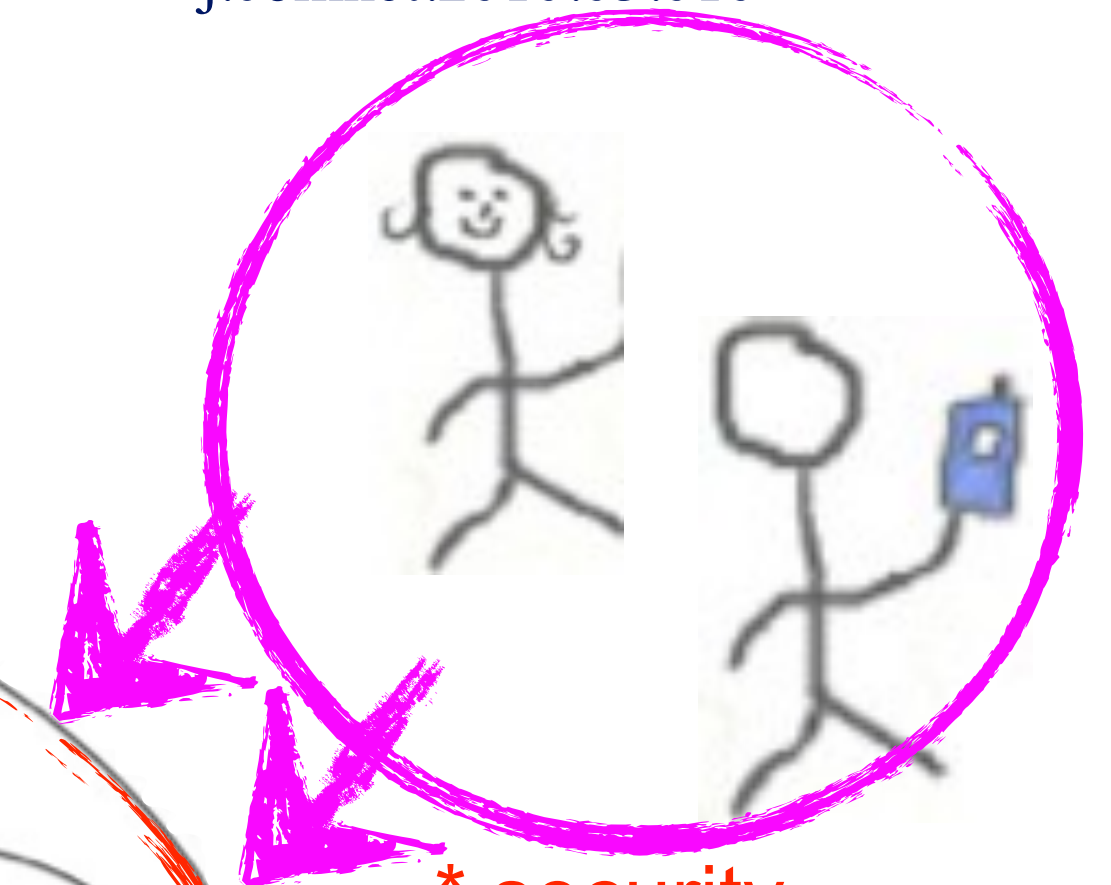
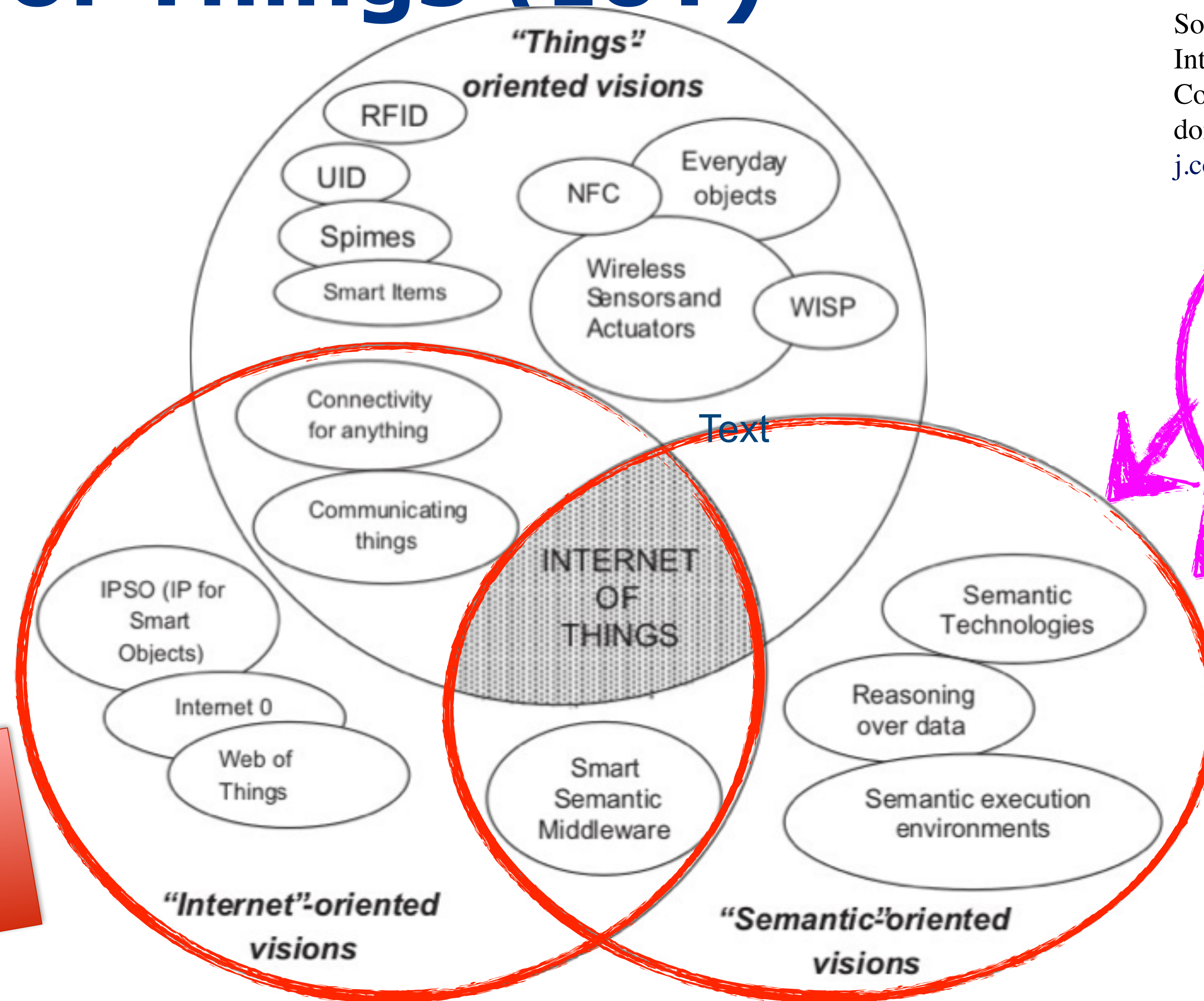
- through Semantics
- The Semantic Web (2007)
 - <https://youtu.be/OGg8A2zfWKg>

The Internet



Source: L. Atzori et al., The Internet of Things: A survey, Comput. Netw. (2010), doi:10.1016/j.comnet.2010.05.010

The Semantic Dimension of the Internet of Things (IoT)



- * security
- * privacy
- * dependability
 - context
 - content
- * personalised

A sensor can't run artificial intelligence (AI)

Fig. 1. "Internet of Things" paradigm as a result of the convergence of different visions.

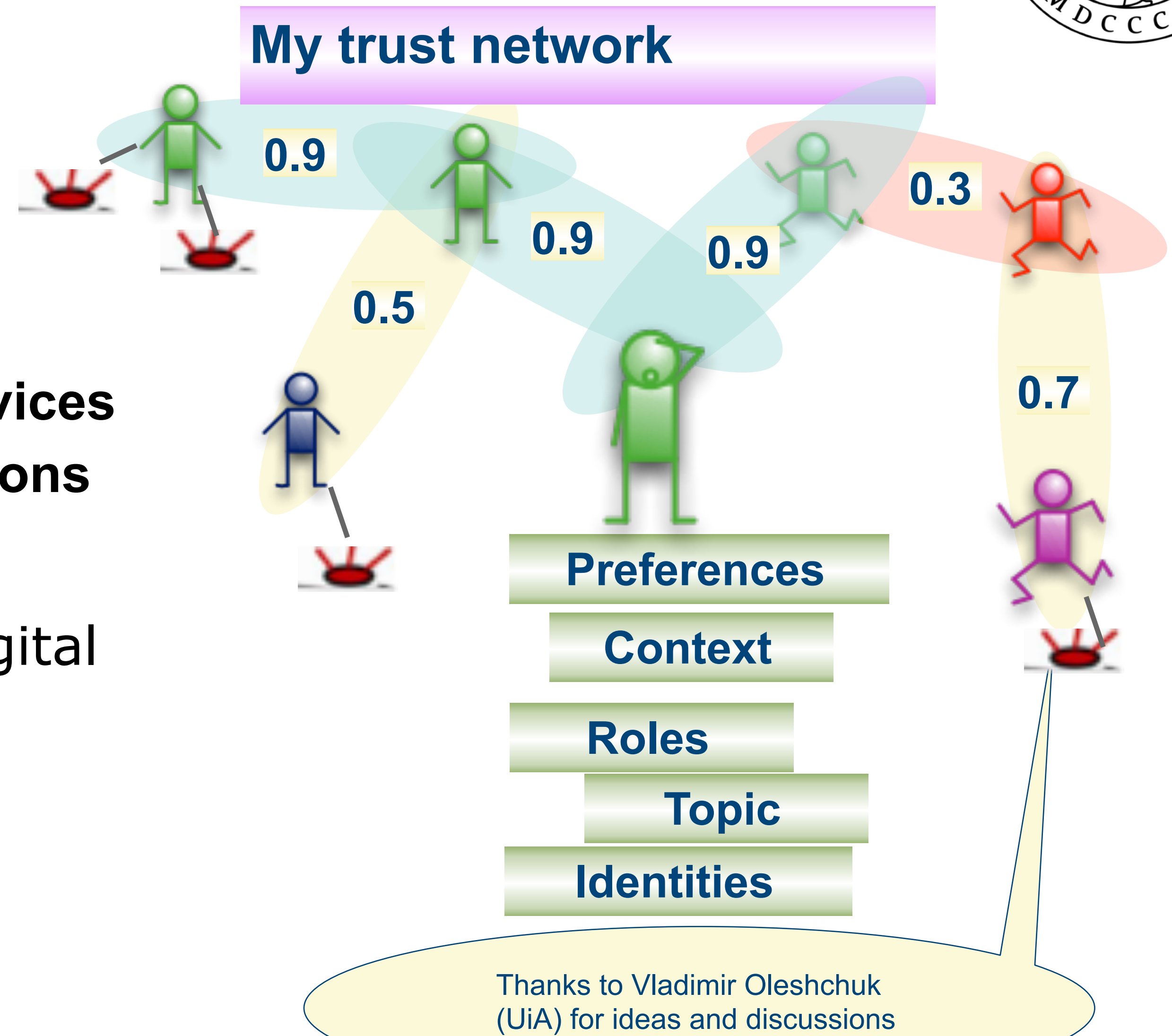
Example

Can a computer trust?

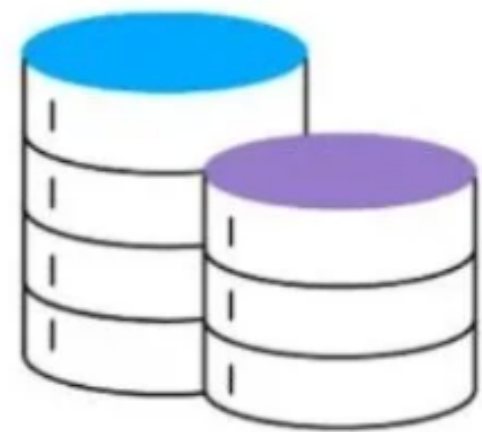
- Trust related privacy
 - > **Representing the user adequately**

- Connecting to **sensors, devices and services**
 - > **Provide privacy and ensure trust relations**

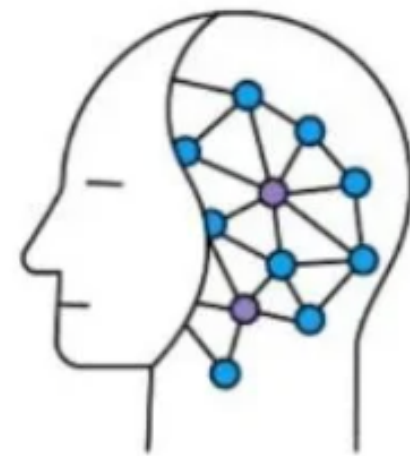
- An ever increasing complexity in the digital environment
 - > **Hiding the complexity from the use**



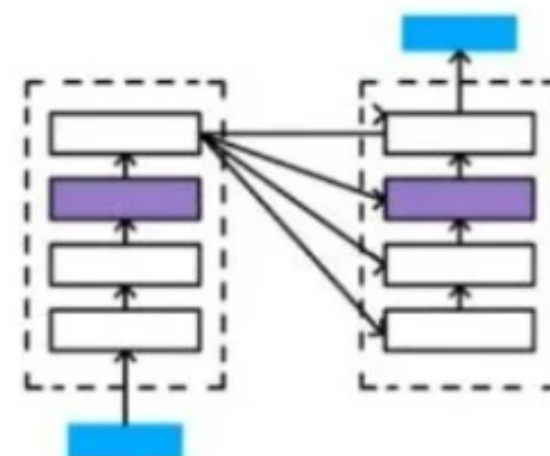
And now we want the computer to answer all questions of the world, in all languages



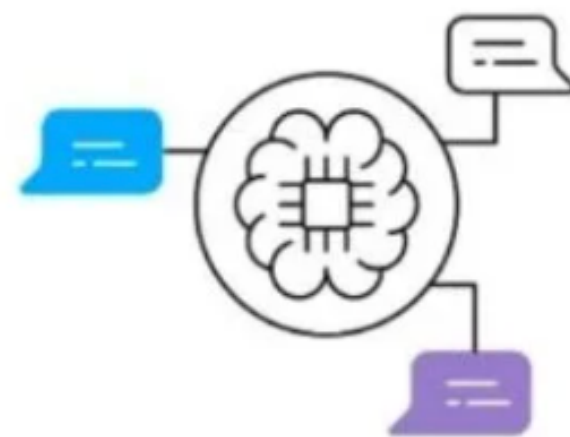
Massive Dataset



Deep Learning



Transformer Architecture

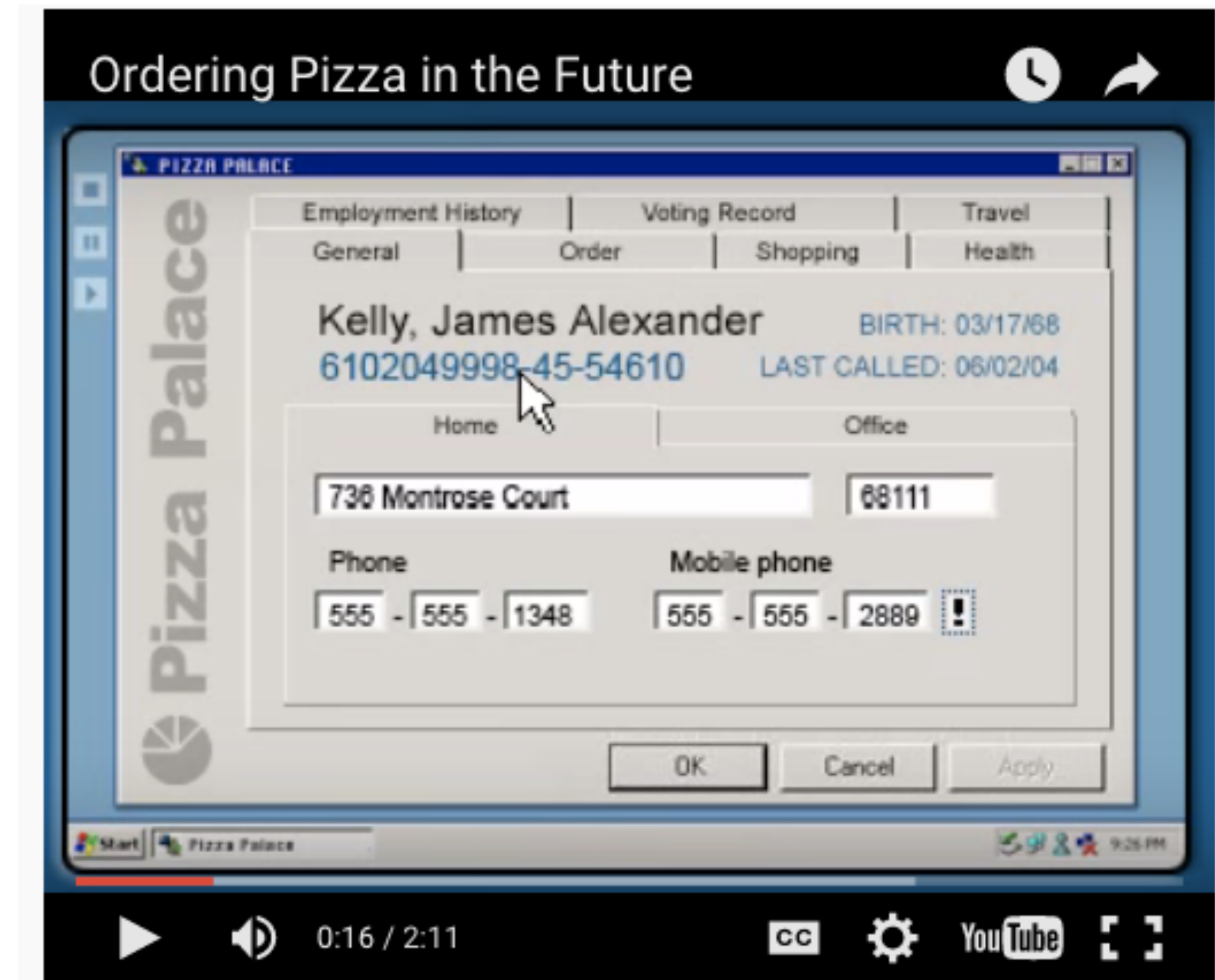


Self-supervised Learning



Fine-tuning

Large
Language
Models
(LLM)



12Jun2006

<https://www.youtube.com/watch?v=RNJI9EEcsoE>

Source: <https://em360tech.com/tech-articles/what-large-language-model-llm-definition-examples-use-cases>

Challenge Large Language Models



◆ AI Overview

To challenge a large language model (LLM), you can ask questions that probe its limitations in areas like reasoning, logic, context awareness, factual accuracy, ethical considerations, and creative interpretation, including:

Logic and Reasoning:

- "Explain why a square is not a circle, using only logical reasoning."
- "If all cats are mammals, and all mammals are animals, then are all cats animals? Why or why not?"
- "Solve this riddle: What has to be broken before you can use it?"

Context and Understanding:

- "Tell me a story about a robot who falls in love with a human, but is programmed to never express emotions. How does the robot grapple with this conflict?"
- "Explain the concept of 'schadenfreude' in a way that a child would understand."
- "Compare and contrast the perspectives of two opposing political viewpoints on a current issue."

[Source: Google "questions to challenge large language models", 19 Feb2025]

Factual Accuracy and Bias:

- "What is the most recent scientific discovery that challenges a previously held belief?"
- "Provide evidence to support the claim that climate change is primarily caused by human activity."
- "Explain why it's important to consider potential biases when interpreting historical events."

Creativity and Interpretation:

- "Write a poem about the feeling of nostalgia."
- "Compose a song that expresses the struggle of overcoming adversity."
- "Imagine a world where animals could talk, what would be a typical conversation between a dog and a cat?"

Ethical Considerations:

- "What are the potential dangers of using AI to make decisions that affect people's lives?"
- "How can we ensure that AI systems are developed and used in a way that is fair and equitable?"
- "Discuss the ethical implications of creating deepfakes that could be used to deceive people."

Why is big beautiful?

INNOVATION / AI

Stargate: America's \$500 Billion Bid To Corner Global AI Capital

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

[Follow Author](#)

Jan 23, 2025, 11:57am EST



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TOPSHOT - OpenAI CEO Sam Altman speaks during the Microsoft Build conference at the Seattle ... [+] AFP VIA GETTY IMAGES

Source: <https://www.forbes.com/sites/craigsmith/2025/01/23/stargate-americas-500-billion-bid-to-corner-global-ai-capital/>

→ feed with “everything” TV, video, wikipedia, NY times,...

→ all possible combinations

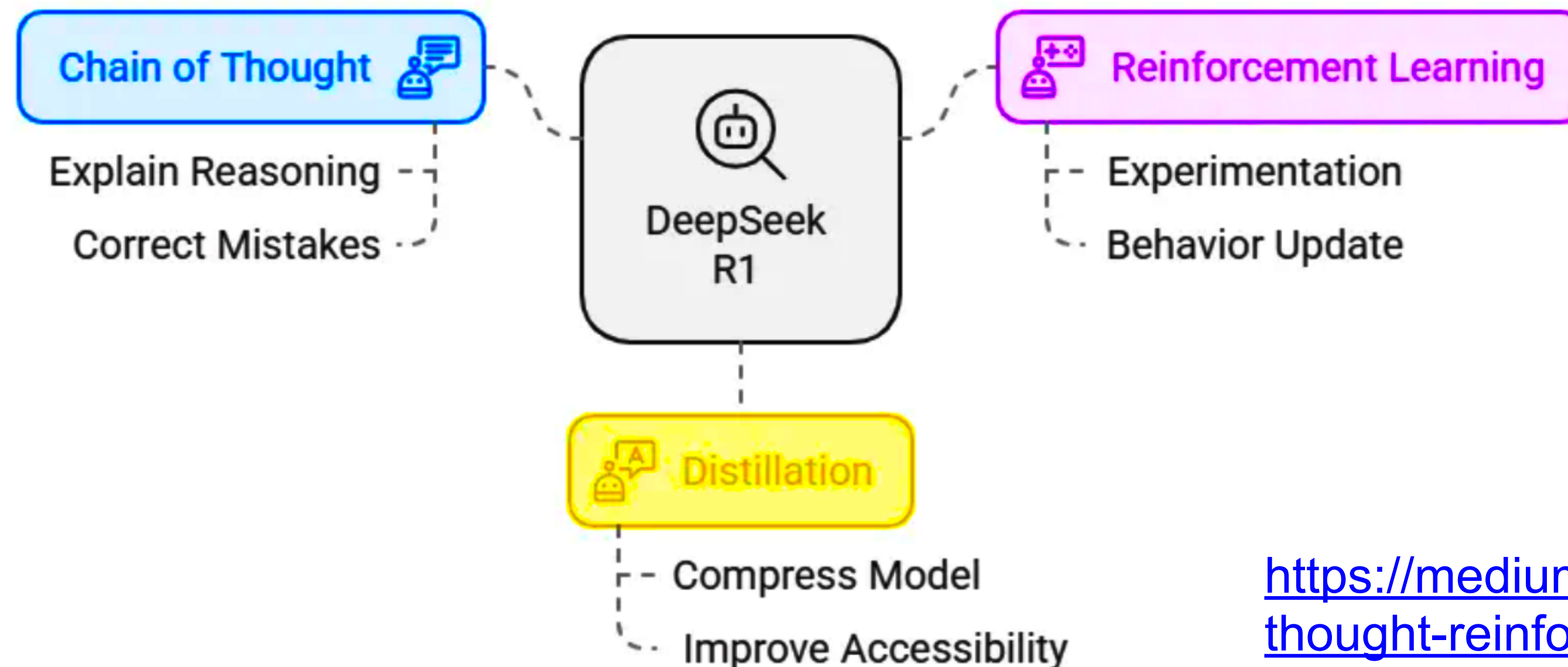


→ the n^2 problem

→ finding plausible answers

The Chinese Way

- ➔ 2022: 440 Universities in China educated AI
 - 50% of world's AI brains
- ➔ Mixture-of-Experts (MoE)



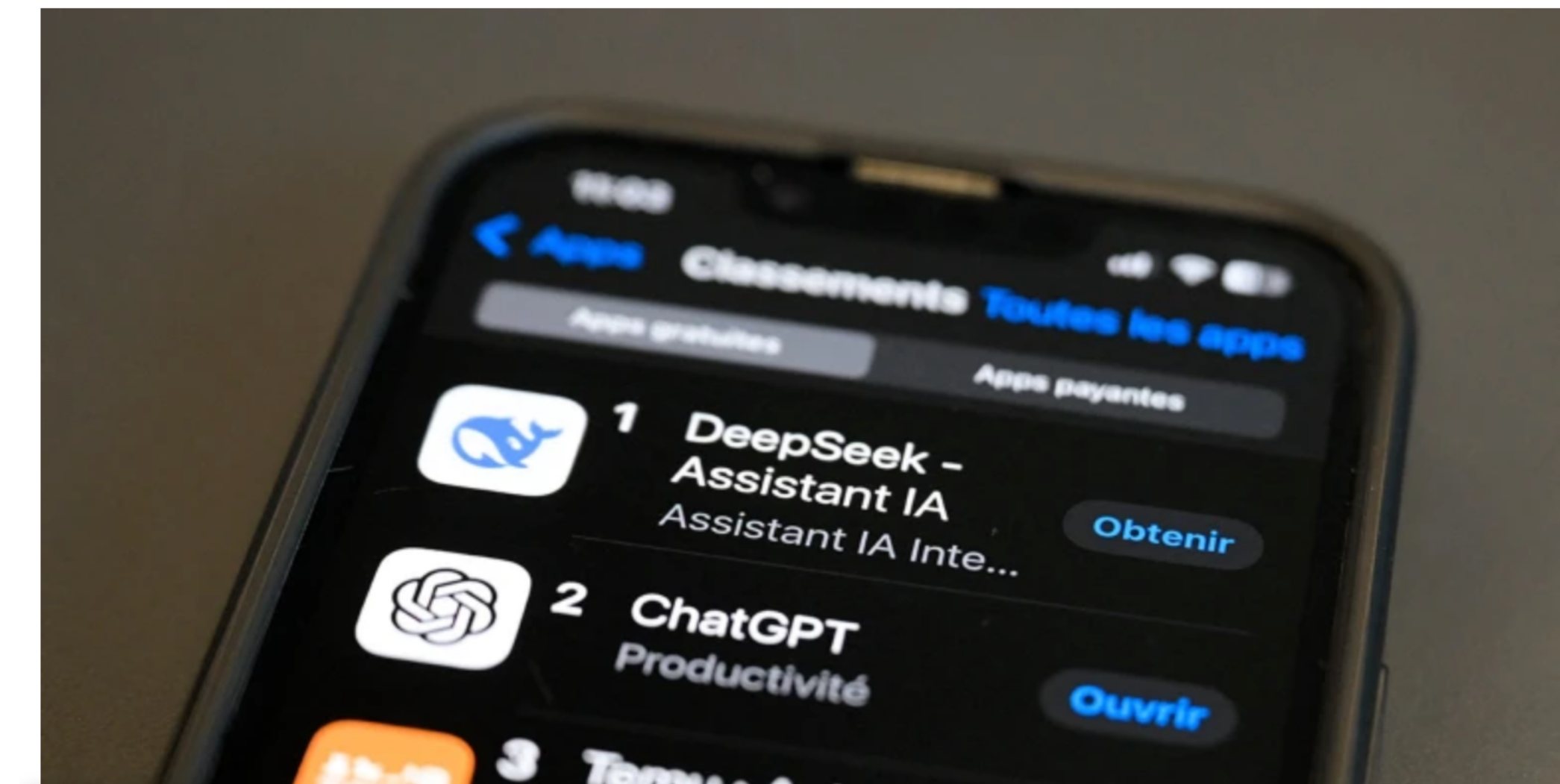
How China created AI model DeepSeek and shocked the world

Government policies, generous funding and a pipeline of AI graduates have helped Chinese firms create advanced LLMs.

By [Gemma Conroy](#) & [Smriti Mallapaty](#)



<https://www.nature.com/articles/d41586-025-00259-0>



<https://medium.com/@tahirbalarabe2/deepseek-r1-explained-chain-of-thought-reinforcement-learning-and-model-distillation-0eb165d928c9>

AI for All

**an inclusive perspective on
opportunities**



Challenges for “always online” the prerequisite for AI usage

- Affordability: Devices, Access, (skills), (value for people)
- Digital Literacy
- Critical mindset
 - “shit in, shit out”
- Funding /international competition
 - monopolism
 - “big is beautiful”
- Learning from cloud deployment
 - is a centralised cloud the solution?

15%
180m

Africa South of Sahara (SSA)

Coverage gap:

Those who live in an area not covered by a mobile broadband network

59%
680m

Usage gap:

Those who have coverage - but do not use mobile internet services.

25%
290m

Connected:

Those who use mobile internet

AI Opportunities for Africa

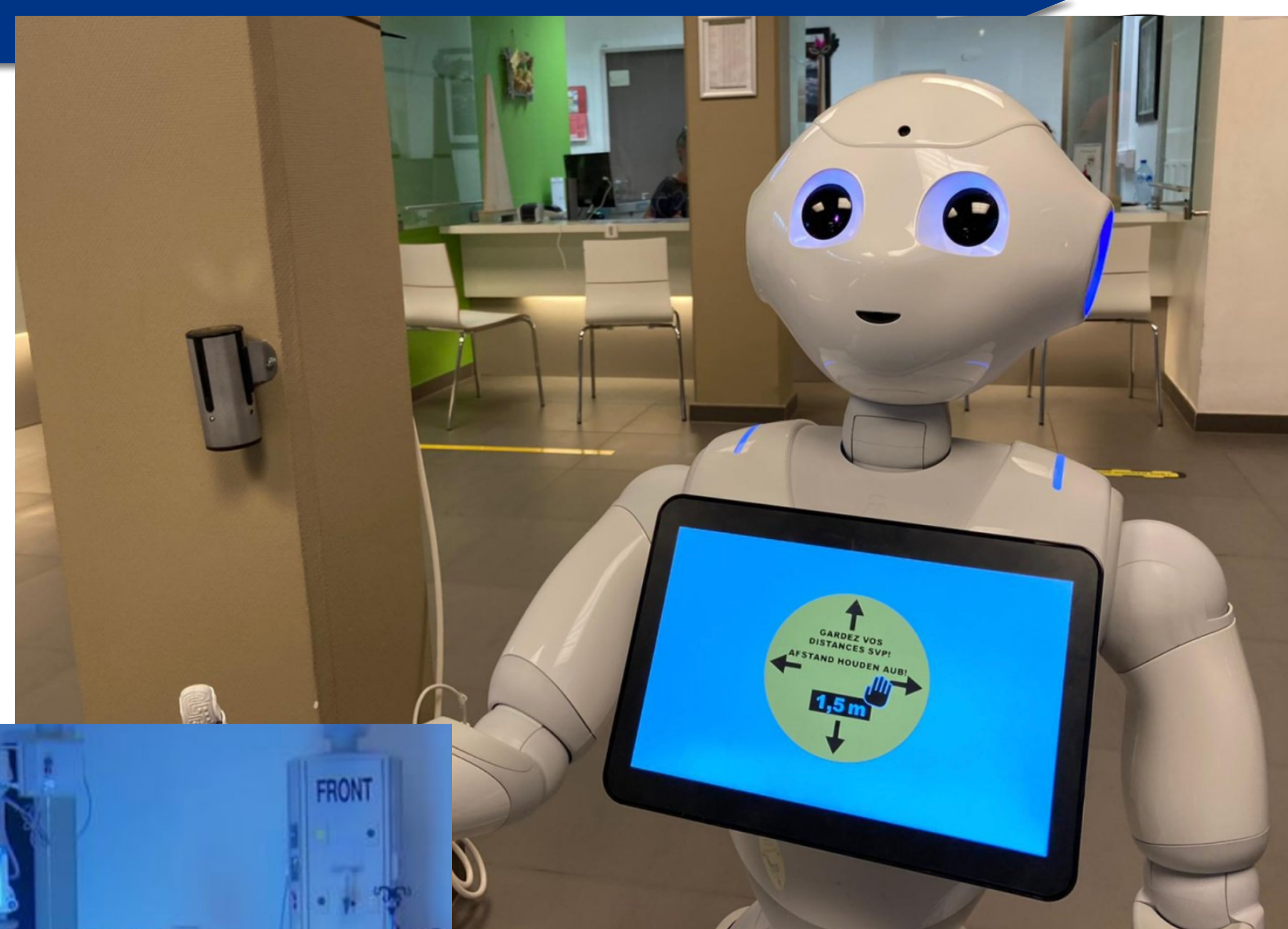
“Think differently: Where to we reach
our people”



Distributed and localised Language Models (D-LM)

- ➔ Reduce: real needs
 - information on health
 - local information
 - language processing
- ➔ Speed
- ➔ Privacy

<https://medicalfuturist.com/8-exciting-medical-robot-facts/>



Source: <https://www.brusselstimes.com/>



Quick overview elicit.org

- Broadband access
- ICT
- Governmental role
- financing
- health
- economic **impact**

It works - research analysis



Local Language Models in Africa

Share

What is the status of local and distributed language models addressing local languages in A..

Summary of top 8 papers

Copy

Recent research highlights efforts to address the underrepresentation of African languages in language models. SERENGETI covers 517 African languages, outperforming other models on various tasks ([Adebara et al., 2022](#)). InkubaLM, a small model, achieves comparable performance to larger models for low-resource African languages ([Tonja et al., 2024](#)). Studies on South African languages show RNNs perform best for low-resource scenarios ([Mesham et al., 2021](#)). However, potential harms of applying large language models (LLMs) in Africa are noted, including exacerbating inequalities ([Baguma et al., 2023](#)). Evaluations of commercial LLMs reveal below-par performance on African languages ([Ojo & Ogueji, 2023](#)), with GPT-4 showing mixed results across tasks ([Ojo et al., 2023](#)). AfroLM, using self-active learning, outperforms existing models on various NLP tasks for 23 African languages ([Dossou et al., 2022](#)). Despite progress, challenges remain in developing effective MT and NLP tools for African languages' unique structures ([Iyamu, 2024](#)).

Distributed Language Model (DLM)

- Raspberry ~~4B~~ 5
- ~~4~~ GB memory - 8 GB
- ~~16~~ GB SD card - 32 GB



- 130 USD - RPI 4B
- 160 USD - RPI 5

How to Run the DeepSeek-R1 AI Model on a Raspberry Pi Locally

Run the DeepSeek-R1 AI model locally on your Raspberry Pi! Learn how to set up Ollama, install the model, and explore AI on affordable hardware. Fun and educational for enthusiasts!



Tim Dodd

28 Jan 2025 • 4 min read

<https://robododd.com/how-to-run-the-deepseek-r1-ai-model-on-a-raspberry-pi-locally/>



Installation on RPI

as part of TEK5530 course

Department of Technology Systems
TEK5530 - Measurable Security for IoT-Based Systems

Local Language Models in Raspberry Pi

- Installed on RPI 5 with 4 GB RAM
 - tinnyllama: 1.1b
 - deepseek-r1:1.5b
 - llama3.2:1b
- Limitations:
 - recommended 8 GB RAM for models
- Next steps
 - training local models

Stian Østgaard, Ulrik Sand



Get up and running with large
language models.

Run [DeepSeek-R1](#), [Qwen 3](#), [Llama 3.3](#), [Qwen 2.5-VL](#),
[Gemma 3](#), and other models, locally.

Download ↓

Available for macOS, Linux,
and Windows

Screenshot from the Ollama website

Distributed Language Models (DLM)

- Ethiopian AI Institute (EAI)
- Amharic
- Afaan Oromo
- Tigrigna
- Somali

Indian startups develop Local Language Models for inclusive AI

📅 March 6, 2024 - 📁 news

<https://aii.et/indian-startups-develop-local-language-models-for-inclusive-ai/>

Indian startups and tech giants are developing Local Language Models (LLMs) such as BharatGPT and Hanooman, capable of understanding and generating content in multiple Indian languages.

In a significant stride towards embracing AI that accommodates India's linguistic diversity, startups and tech giants have embarked on developing Local Language Models (LLMs) like BharatGPT and Hanooman. These models, crafted by Bengaluru-based CoRover and Seetha Mahalaxmi Healthcare in collaboration with IIT Bombay and other premier institutes, demonstrate a concerted effort to tailor AI technologies for India's linguistic richness.

BharatGPT, proficient in over 14 Indian languages, and Hanooman, designed for sectors like healthcare and education with initial support for 11 languages, signify a transformative step in making AI accessible to a broader segment of the Indian population.

Likewise, Ethiopian Artificial Intelligence Institute (EAI) is actively working on the development of indigenous language models for four vernacular languages: Amharic, Afaan Oromo, Tigrigna, and Somali.

“Food for thoughts”

1. Establish an inclusive Digital Public Infrastructure (DPI)
 - from Universities to schools and communities
 - distributed local knowledge
2. Join forces for natural language processing of your languages
3. Establish dedicated LM for health, education, climate change, ...
4. Foster Research on Edge and Fog AI



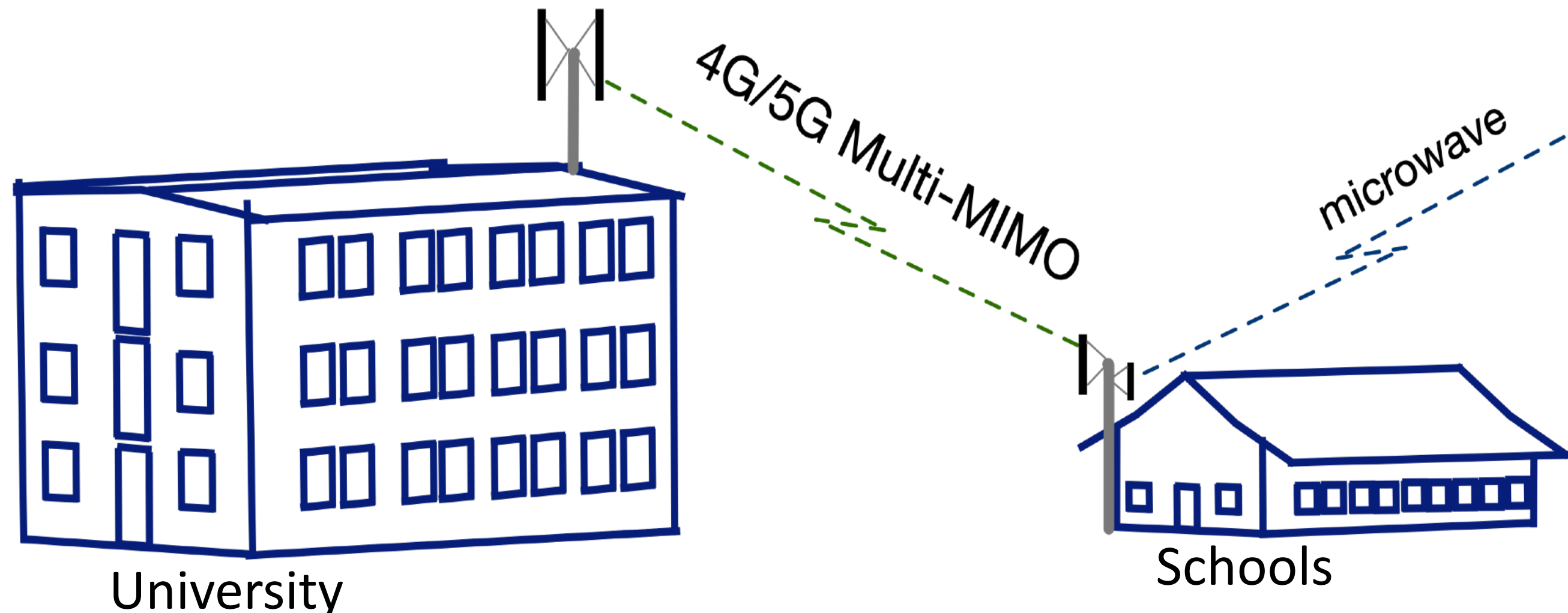
antenna

“we can reach every school and community centre”

Pathway(s) for inclusive DPI with AI



National Research & Education Network (NREN)



1. Strengthen the NRENs
2. Enable Universities to connect
3. Connect all schools
4. Establish CL3 in each community




Get up and running with large language models.
Run [DeepSeek-R1](#), [Qwen 3](#), [Llama 3.3](#), [Qwen 2.5-VL](#), [Gemma 3](#), and other models, locally.



Conclusions

- Large Language Models
 - address high complexity
 - can ask “almost everything”
 - need 5-10 x energy as normal search
 - impossible to compete globally
- Distributed Language Models
 - Quick answer
 - Privacy
 - Addressing real needs
- Inclusive Digital Public Infrastructures (DPIs)

1. Establish an inclusive Digital Public Infrastructure (DPI)
 - from Universities to schools and communities
 - distributed local knowledge
2. Join forces for natural language processing of your languages
3. Establish dedicated LM for health, education, climate change, ...
4. Foster Research on Edge and Fog AI



Get up and running with large language models.

Run [DeepSeek-R1](#), [Qwen 3](#), [Llama 3.3](#), [Qwen 2.5-VL](#), [Gemma 3](#), and other models, locally.



Appendix: Norwegian Centres for AI research

- Artificial Intelligence Centre for the Empowerment of Human Learning**
- The Norwegian Centre for Trustworthy AI**
- Center for AI & Creativity**
- Norwegian Centre for Embodied AI**
- Norwegian Centre for Sustainable, Risk-averse and Ethical AI**
- Norwegian Centre on AI for Decisions**

Artificial Intelligence Centre for the Empowerment of Human Learning

- The centre will develop new models for human-KI interaction and learning and look at "hybrid intelligence", i.e. mutual joint learning for humans and machines.
- Areas of application are education and training in general, through new learning systems for schools, the labour market and society in general.

Research Partners	Public/Private Partners
UiB, NTNU, UiO, HiØ, Sjøkrigsskolen, USN, Universitetet i Agder, Uflorida.us, Uof.OULU Finland, U.Murcia Spania.	SIKT.no, VESTLAND FK, VESTFOLD FK, KS-Kommunesektorens Organisasjon, Digital Norway, Bergen Brannvesen, Statsforvaltaren i Vestland, Nordland FK, Trondheim Kommune, Trøndelag Nettskole, Nettskolen Troms, LEARNLAB AS, VISMA FLYT AS, LEVATO AS, Midlaier AS, CAPGEMINI, KAHOOT! AS, European Edtech Alliance e.V.
Prosjektleder: Barbara Wasson (UiB)	

The Norwegian Centre for Trustworthy AI

- The centre will research how AI systems can be made more accurate, interpretable, inclusive and fair. The project will contribute to more responsible, reliable and non-discriminatory AI used in areas such as policy development, health and justice.

UiO: Arnaldo Frigessi



Research partners	Public/Private partners
UiO, NR, SINTEF, UiT, UiB, OsloMet, BI, Høgskulen i Volda, UiS, NORCE Statistisk Sentralbyrå, Norsk Utenrikspolitisk Institutt, Politihøgskolen, Norges Geotekniske Institutt, UC Berkeley, Startuplab AS, Transportøkonomisk Institutt, CICERO Senter for klimaforskning, The European Centre of Tort and Insurance Law, University College London, University Of Cambridge, Ahus. Prosjektleder: Arnaldo Frigessi (UiO)	Equinor ASA, Kongsberg Maritime AS, DNV AS, Norsk Hydro ASA, Gjensidige Forsikring ASA, Statkraft AS, Aars AS, Sparebanken Møre, DNB ASA, Aleap AS, Ruter AS, ABB AS, Construction City Cluster As, Statens Vegvesen, Helse Sør-Øst RHF, Skatteetaten, NAV, Oslo Pensjonsforsikring AS, Domstoladministrasjonen, Folkehelseinstituttet, Digitaliseringsdirektoratet, Utlendingsdirektoratet, Politidirektoratet, Øygarden Kommune, Arkivverket, Norsk Nukleær Dekommisjonering, Trondheim Kommune, Standard Norge, Nasjonal Kommunikasjonsmyndighet, med flere.

Center for AI & Creativity

UiO: Alexander
Refsum Jensenius



- The centre will research how AI promotes and challenges creativity, including issues related to copyright and regulation. The research results are relevant to many stakeholders, especially creative industries such as film, music, design and literature, as well as public and private stakeholders in health, education and cultural heritage.

Research Partners	Public/Private partners
UiO, AHO, BI, HIØ, HVL, INN, Kristiania, NB, NILU, NLA, NMH, NORD, NORSUS, NTNU, SimulaMet, Sintef, UiA, UiB, UiT Prosjektleder: Alexander Refsum Jensenius (UiO)	ANNO, Atelier Nord, BEK, Bergen Internasjonale Festival, Borealis, Cultiva, DHKO, Fynd Reality AS, GramArt, GRAMO, Halogen AS, Hamarregionen Utvikling, HelseINN, JM Norway, Kilden Teater og Konserthus, KODE Kunstmuseer og Komponisthjem, Kulturskolerådet, Kulturtanken, Media Cluster Norway AS, Multikjetil AS, Nasjonalmuseet, Nasjonalt senter for kunst og kultur i opplæringen, Notam, NOPA, Norwegian AI Cloud, NRK, Oslo Kreativ AI, Polyfon, PUNKT, Reimagine AS, Sarepta Studio AS, Skapia, Skolene i Innlandet, StoryPhone AS, Teknisk Museum, TEKS, TONO, Ultima, Vest-Agder Museum, VRINN

Norwegian Centre for Embodied AI

→ "Embodied AI refers to AI integrated into a physical "body" - typically a robot, and together the partners will look at how to build robotic systems with embedded AI that are generalisable across robotic platforms. There are many areas of application, such as defence, the maritime sector, transport and health.

Research partners	Public/Private Partners
NTNU, UiO, OSLOMET, UiTø, SINTEF, FFI, NORCE. Prosjektleder: Kostas Alexis (NTNU)	Statens vegvesen, Hovedredningssentralen, Kongsberg D&A, Maritime Robotics AS, SKARV TEC, EELUME, AUTOAGRI, NORBIT, WATER LINKED, SCOUTDI, UBIQ AEROSPACE

Norwegian Centre on AI for Decisions

→ The centre will conduct research on how to develop AI that responds to sustainability goals on energy consumption, security and responsibility, e.g. by looking at the environmental impact, ethics, risk and robustness of AI models. Areas of application are finance/economics, renewable energy, climate and hardware.

Research Partners	Public/Private Partners
NTNU, SINTEF, SINTEF ENERGI AS, NORCE, NR, SINTEF OCEAN AS, NMBU, SimulaMET, UiO, Meteorologisk Institutt, IFE, TØI, SINTEF MANUFACTURING AS. Prosjektleder: Sebastian Gros (NTNU) og Signe Riemer-Sørensen (SINTEF)	St. Olavs Hospital HF, Statnett SF, Statens Vegvesen, KS-Kommunesektorens Organisasjon, SYKEHUSPARTNER HF, STATSBYGG, TRONDHEIM KOMMUNE, STATKRAFT AS, ANEO AS, KONGSBERG MARITIME AS, AKER BP ASA, DNV AS, ELKEM ASA, GLITRE NETT AS, HYDRO ALUMINIUM AS, Avinor, BAMA, Haste, ITS Norway, ATB AS, EQUINOR ENERGY AS, Mesta, SKAGERAK KRAFT AS, Å ENERGI AS, Nordpool, Properate, HOUSE OF KNOWLEDGE AS, House of Knowledge, KPMG, Oslo Kommune, TENSIO AS, Benteler Automotive Raufoss AS, Solution Seeker, Gassco, IC Techn, KONGSBERG DISCOVERY AS, Autronica Fire & Security AS, NYE VEIER AS, VEIDEKKE ENTREPRENØR AS

Norwegian Centre for Sustainable, Risk-averse and Ethical AI

- The centre will combine different AI techniques to interpret sensor data from physical processes in industry and critical infrastructure, and will explore how AI can be used for decision support where confidence in decisions is maintained. Areas of application are AI-based decision-making systems for better decisions in sectors such as energy, health, logistics and process industry.

Research Partners	Public/Private Partners
Simula, BI, UiO, NTNU, UiT, CICERO, IFE, ISF, SINTEF. Prosjektleder: Baltasar Beferull-Lozano (Simula)	Norges Bank, Dolphin, Rystad Energi, Scalamem AS, Finance Innovation, Refinitiv Norge AS.