

UNIVERSITY OF OSLO

AASTU Seminar 19Feb2025

Local Language Models in distributed Environments - the growth-market for Ethiopia?

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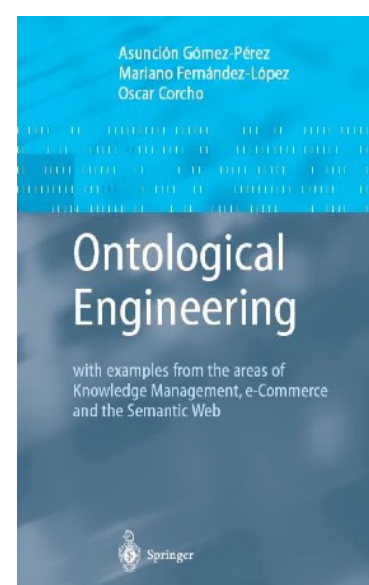
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Why Semantics?

→ Syntax vs. Semantics

Arab



الهندسة فعلم التطور : الاسم
أسنسيون غومز بيرز : المؤلفون
السعر: \$74.95
الكتاب : المنتج

<الاسم>الهندسة فعلم التطور </الاسم>
<>المؤلفون>أسنسيون غومز بيرز </المؤلفون>
<السعر>\$74.95</السعر>
<>الكتاب>المنتج </الكتاب>

English



Title: Ontological Engineering
Authors: Asunción Gómez-Pérez...
Price: \$74.95
Product: Book

<Title>Ontological Engineering</Title>
<Author>Asunción Gómez-Pérez...</Author>
<Price>\$74.95</Price>
<Product>Book</Product>

What do the tags **mean** for the machine?

Source: Juan Miguel Gomez, University Carlos III de Madrid

Why Semantics?

→ Conceptual Level



lunch (.no)



lunch (.es)

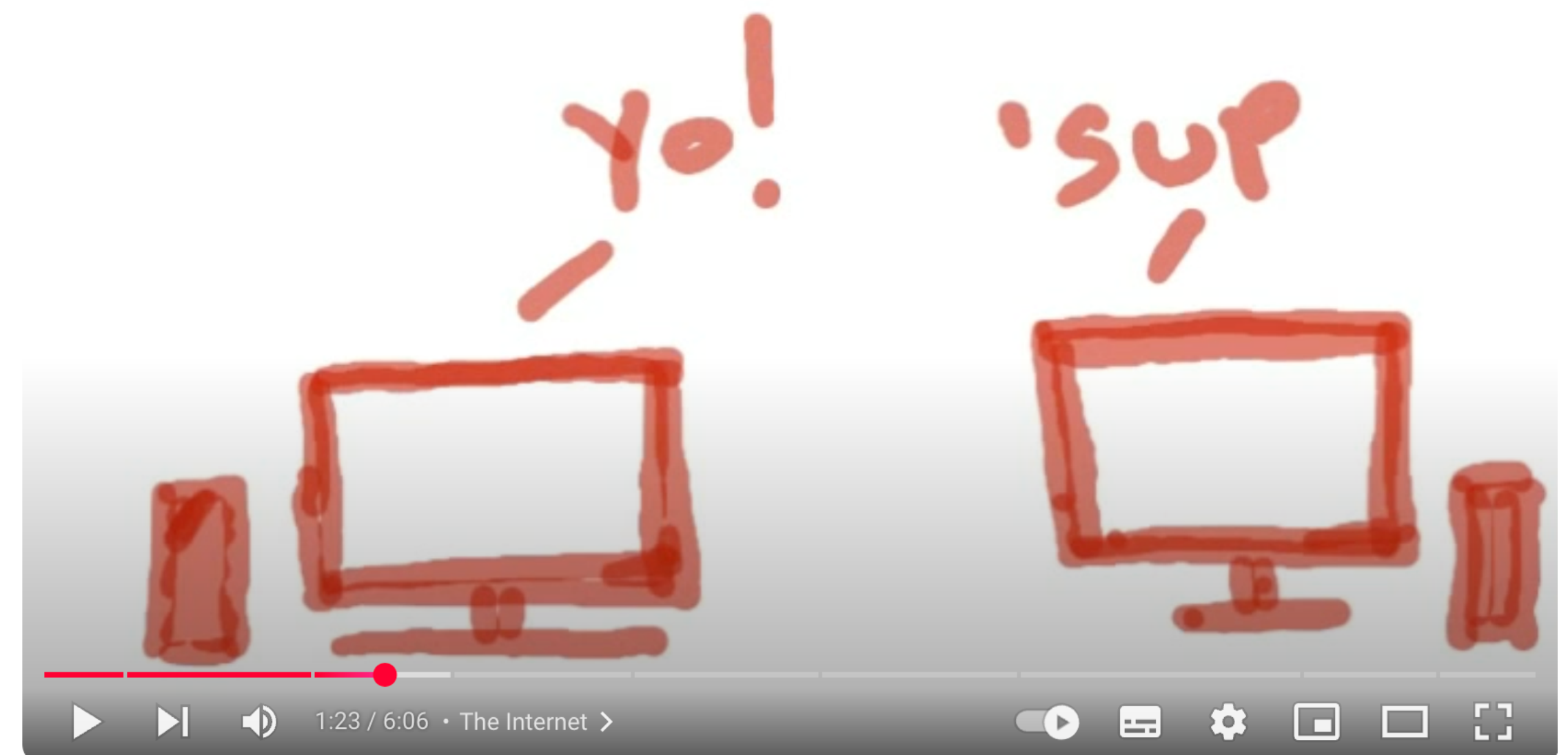
Source: Juan Miguel Gomez, University Carlos III de Madrid

History:

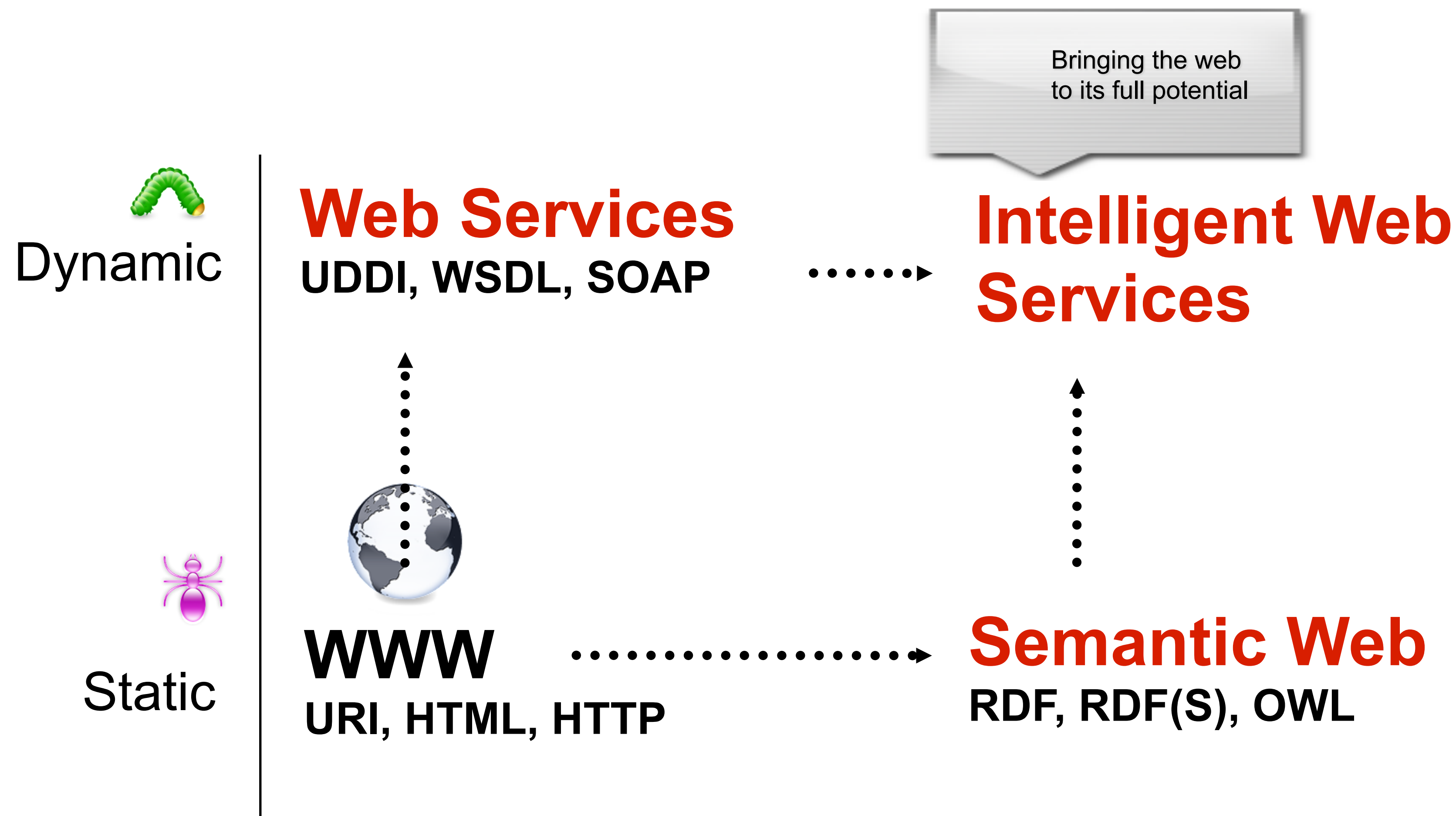
Let computers understand each other

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

The Internet



Semantic Web Services



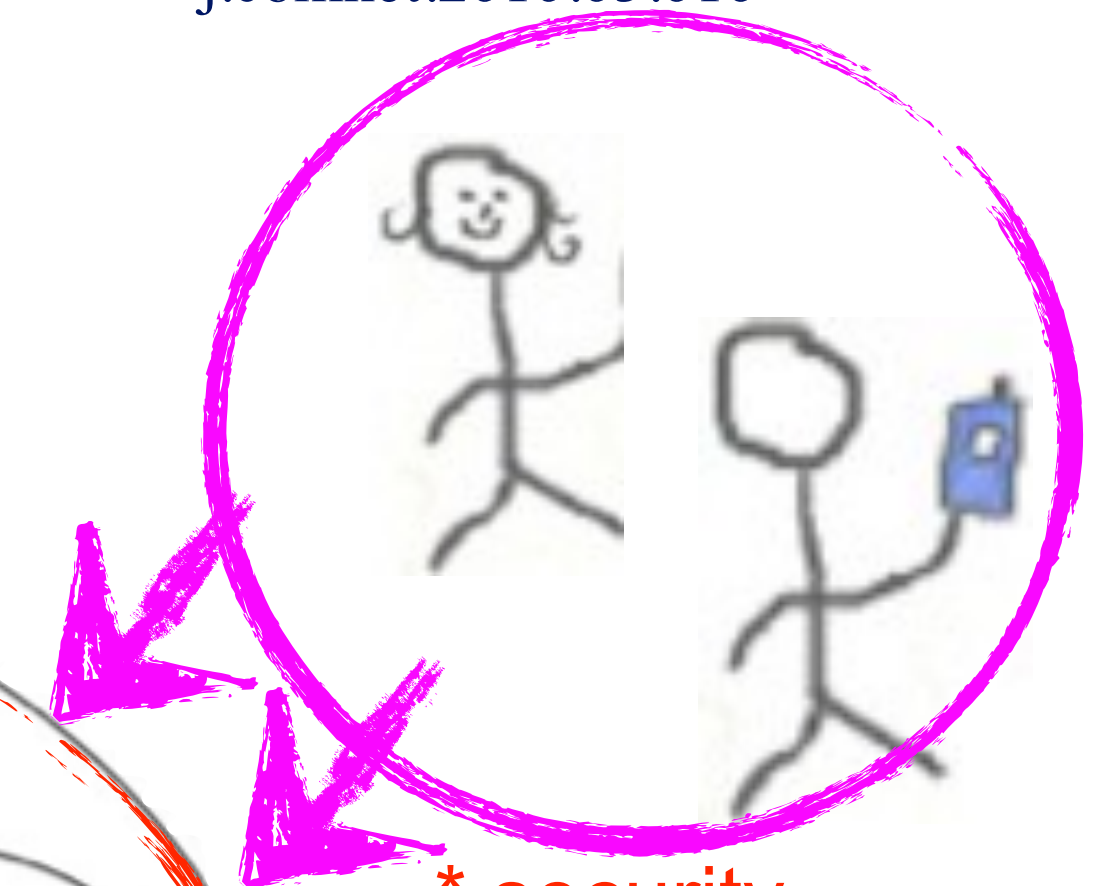
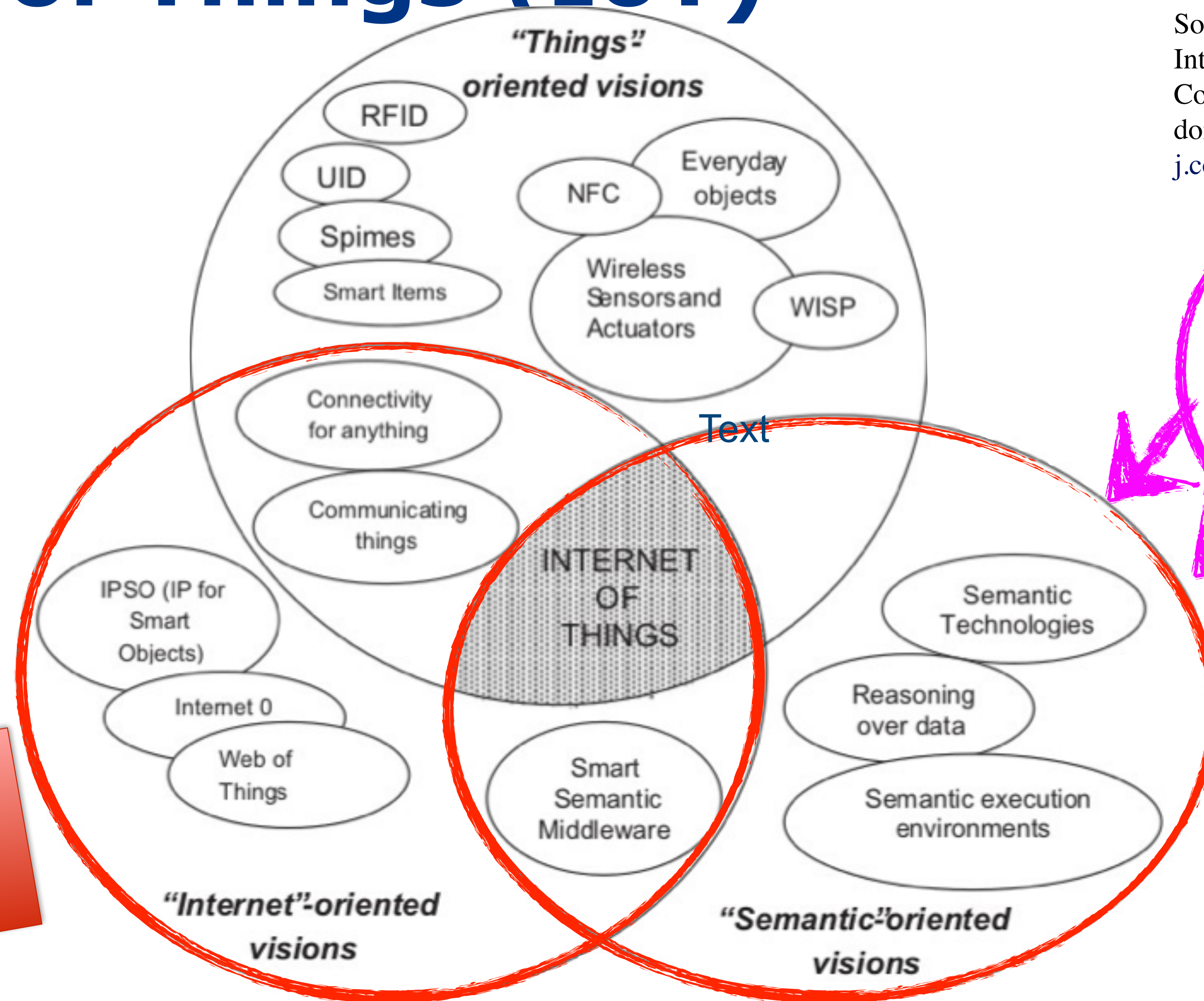
Source: Juan Miguel Gomez, University Carlos III de Madrid

The Semantic Dimension of the Internet of Things (IoT)

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



A sensor can't run artificial intelligence (AI)



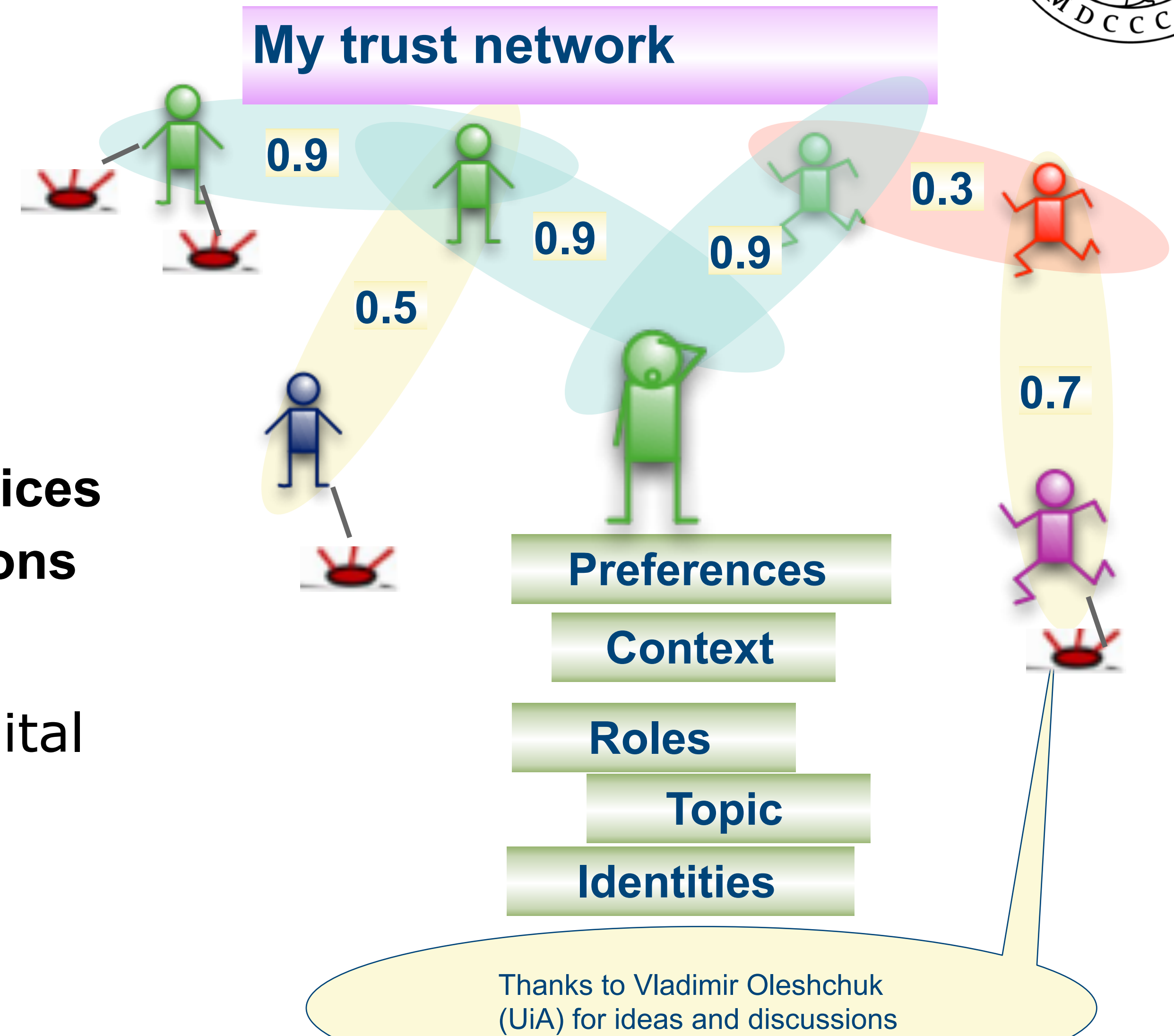
- * security
- * privacy
- * dependability
 - context
 - content
- * personalised

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

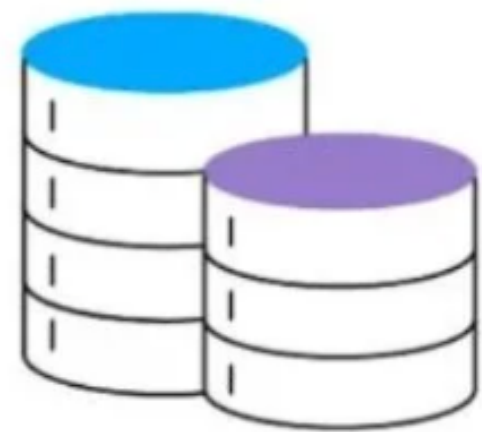
Example

Can a computer trust?

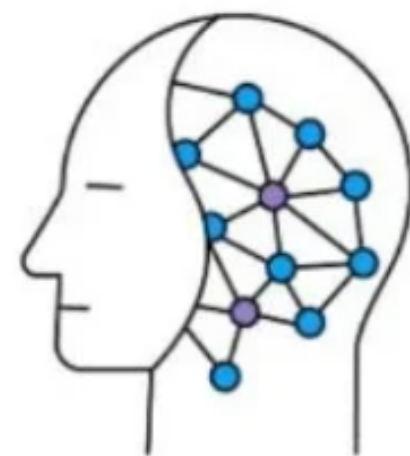
- Trust related privacy
 - > Representing the user adequately
- Connecting to sensors, devices and services
 - > Provide privacy and ensure trust relations
- An ever increasing complexity in the digital environment
 - > Hiding the complexity from the use



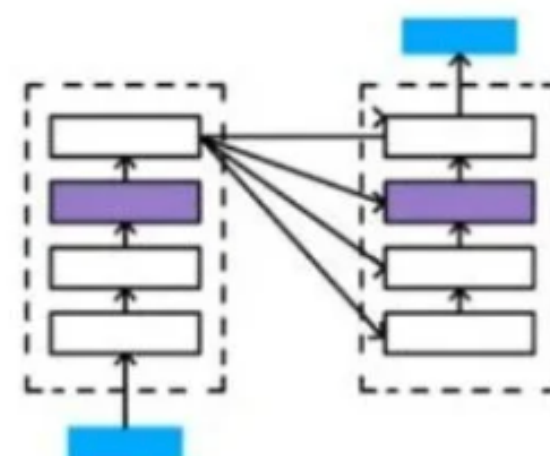
And now we want the computer to answer all questions of the world, in all languages



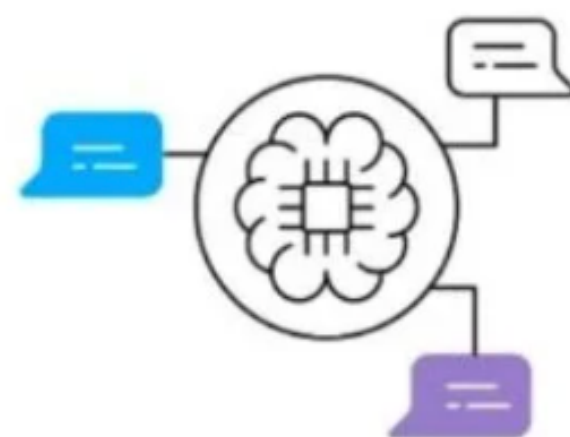
Massive Dataset



Deep Learning



Transformer Architecture

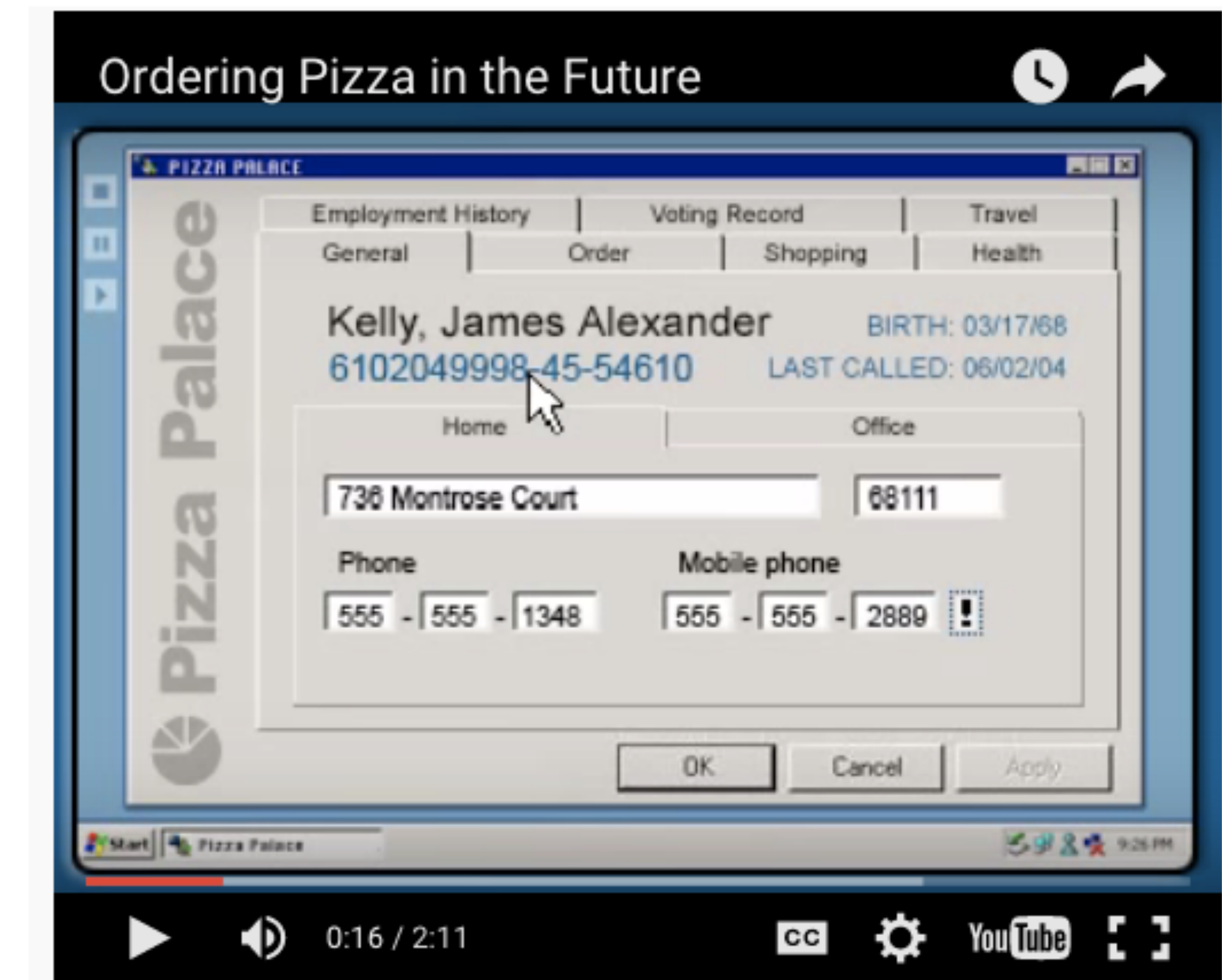


Self-supervised Learning



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...

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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

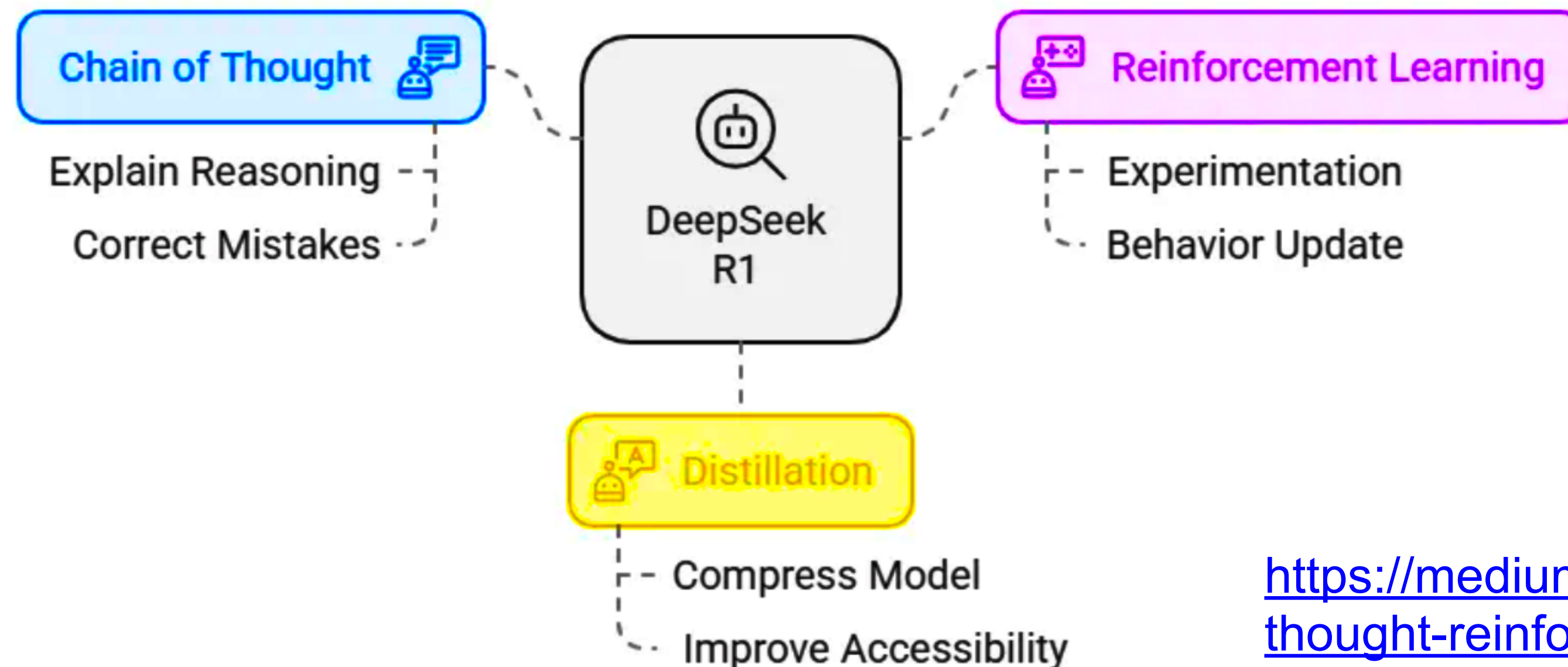


→ the n^2 problem

→ finding plausible answers

The Chinese Way

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



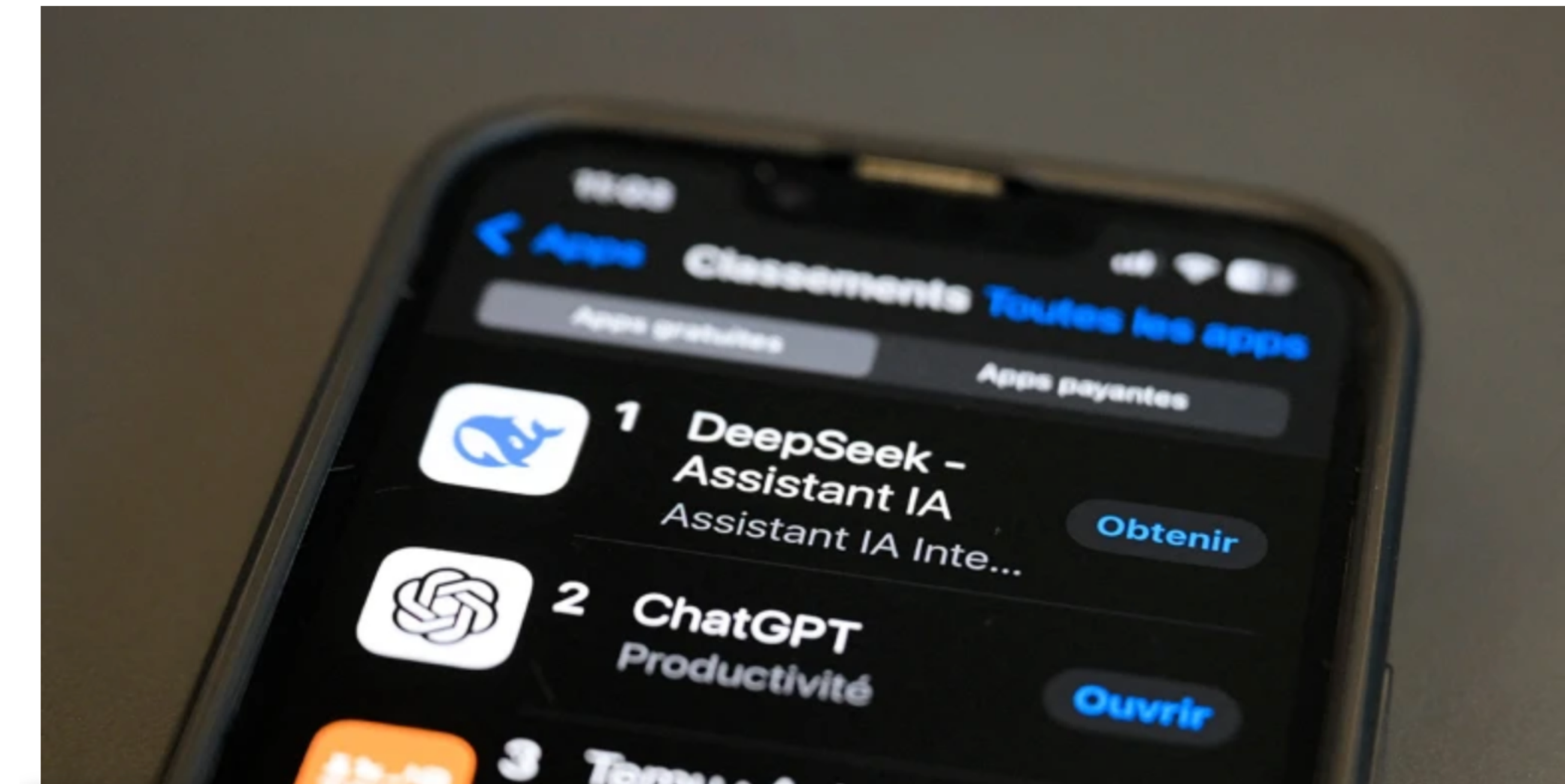
How China created AI model DeepSeek and shocked the world

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>

Quick overview elicit.org

Why don't I a LLM to ask for literature?

School Connectivity and Rural Development

Q The impact of school connectivity on rural development

Summary of top 8 papers

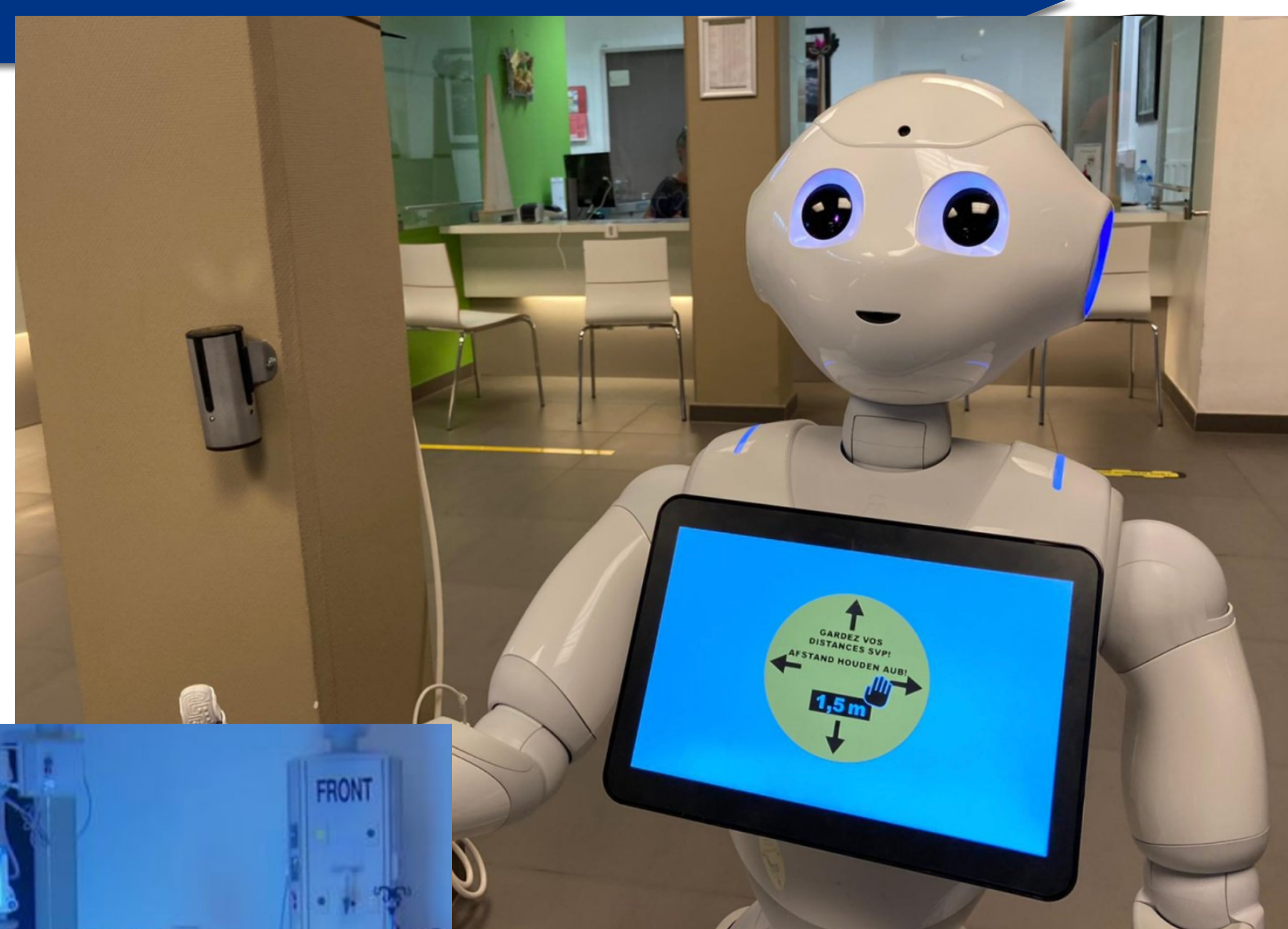
Copy

Research suggests that internet connectivity and broadband access can have significant positive impacts on rural development, particularly in education and economic outcomes. School connectivity can benefit entire communities by aggregating demand and improving service delivery (Wells & O'Riordan, 2021). Rural areas often face lower broadband availability and adoption rates compared to urban areas ([Mack et al., 2023](#)), but increased connectivity has been shown to improve child health outcomes, including vaccination rates and prenatal care uptake ([Majid, 2013](#)). Internet access can enhance educational opportunities in rural schools ([Khan & Hadi, 2013](#)) and contribute to economic development through increased business activity, productivity, and job creation ([Mack et al., 2023](#)). However, sustainable rural connectivity requires government commitment and innovative funding approaches (Wells & O'Riordan, 2021). While some studies have found mixed results in policy impact evaluations ([Mack et al., 2023](#)), overall, the literature points towards sizeable economic impacts of internet connectivity in many rural settings ([Hjort & Tian, 2021](#)).

Local Language Models (local LLM)

- ➔ 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/>

Local Language Models (local LLM)

- ➔ Raspberry 4B
 - 4 GB memory
 - 16 GB SD card



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

Raspberry Pi

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/>



Local Raspberry Pi

- Rachel-Pi = education package
- Dalai Llama = AI package

<https://www.linkedin.com/pulse/bringing-ai-education-world-rachel-pi-dalai-llama-hugo-albarrac%C3%ADn/>



<https://www.reddit.com/r/midjourney/>

Bringing AI Education to the World with RACHEL-Pi and Dalai Llama



Hugo Albarracin

Data Coordinator | Business Intelligence & Data Engineering
Expert | Advancing in Artificial Intelligence & Machine...



April 2, 2023

In today's digital world, access to information and education is critical. However, not everyone has access to the internet, especially in remote areas or developing countries. That's where RACHEL-Pi comes in. RACHEL (Remote Area Community Hotspot for Education and Learning) is a portable, battery-powered device that contains copies of educational websites in offline format. With RACHEL-Pi, this device becomes even more affordable and accessible to communities in need.

Local Language Models

- 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.

Conclusions

- Large Language Models
 - address high complexity
 - can ask “almost everything”
 - need 5-10 x energy as normal search
 - impossible to compete globally
- Local Language Models
 - Quick answer
 - Privacy
 - Addressing real needs
- Ethiopia: Every school/community with an RPI?

