

# Making emerging technology a lifeline instead of a threat

Vattenfall R&D

Anders Wik

2025-01-22

Energiforsk

# 1980



## Communication

# 2025



## Computer power



# 1980



## Information search



nuclear SMR in operation

## Services/Transactions

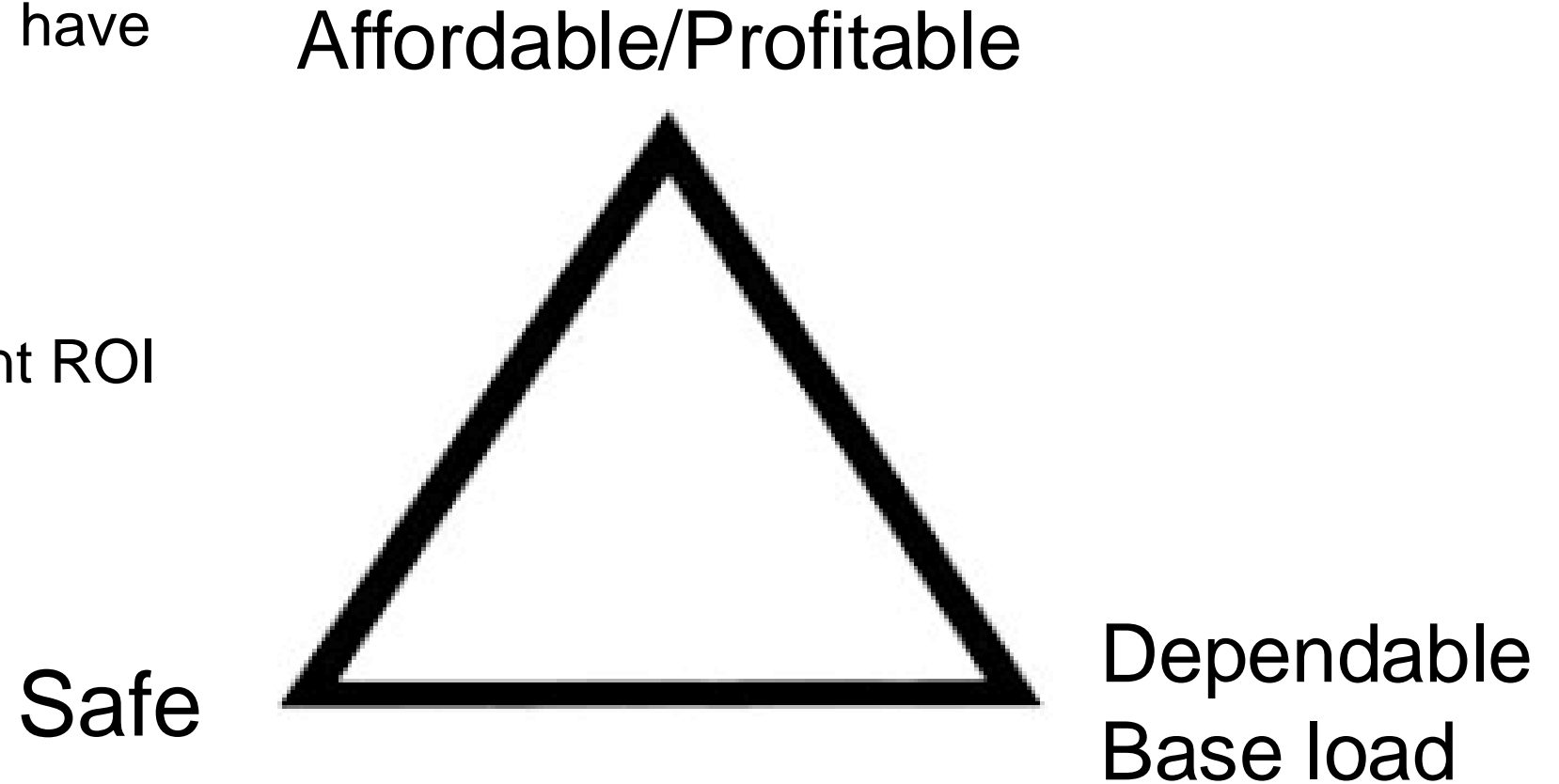
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Skydda ditt BankID.  
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någon som kontaktar dig.

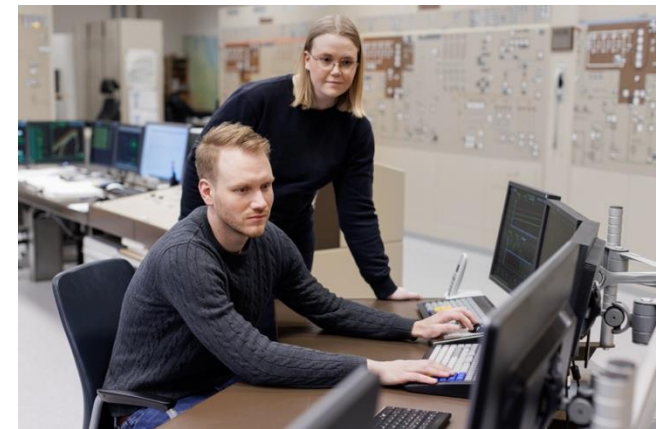
# LTO Trilemma for existing NPP's

- The existing NPP's will have to fulfill the following:
- **Safety** Paramount
- **Profit** Meet requirement ROI
- **Availability** ~85-90%



# Obsolescence and Competence – two important issues for LTO

- **Obsolescence.** Will we find vendors and equipment to support the power plants in keeping them up and running? There will be exchange and modernisation of structures, systems and components (SSC) for the upcoming 20-40 years. May Additive Manufacturing be one answer?
- **Competence.** Perhaps the most complex issue. What competence will we need in the future? Same as today or something else? How to attract students to work with existing NPP when NNB comes around?



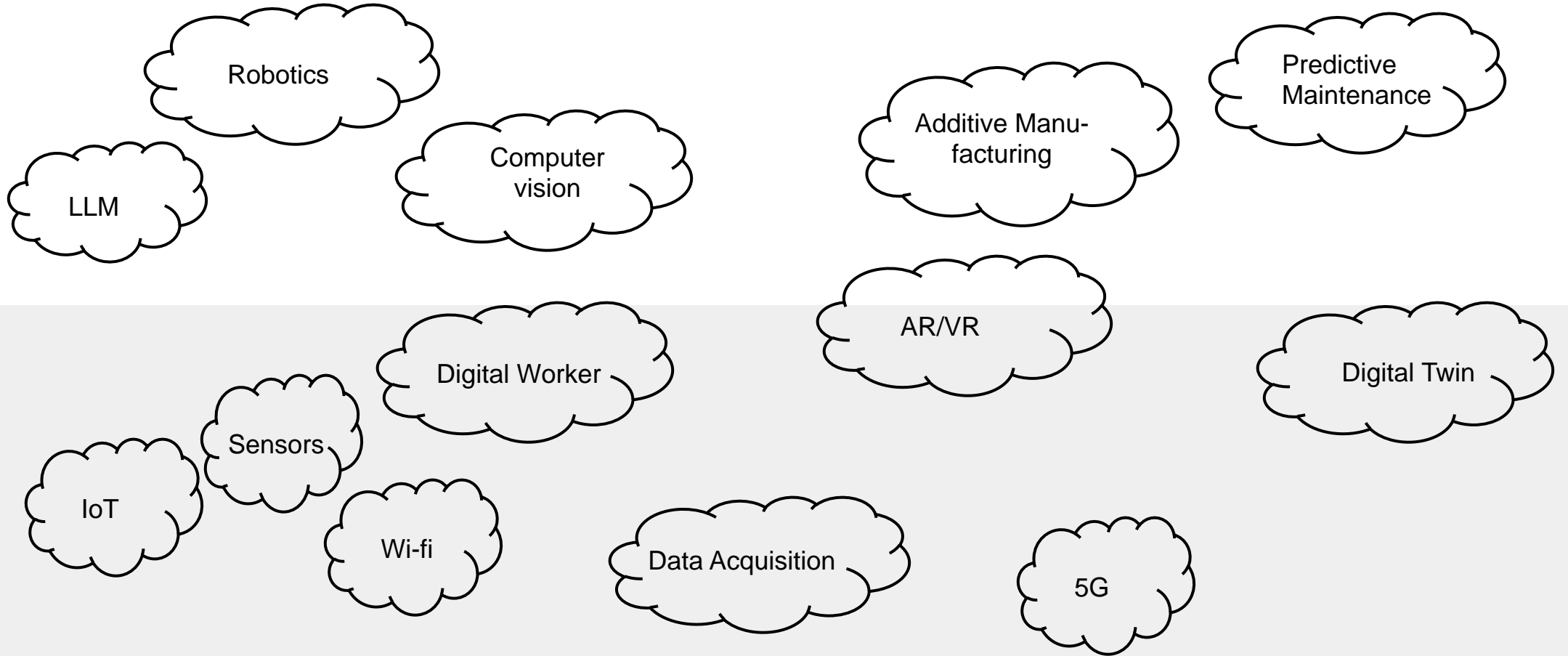
# Hurdles for new technology

- **Regulations.** Uncertainty if we are within the existing regulations.
- **Conservative approach.** Not well proven design, "What if?".
- **Mindset.** "Not for us, we are special".
- **Cyber Security.** Information can leak outside.
- **Time constraints.** Initial increased workload to implement.

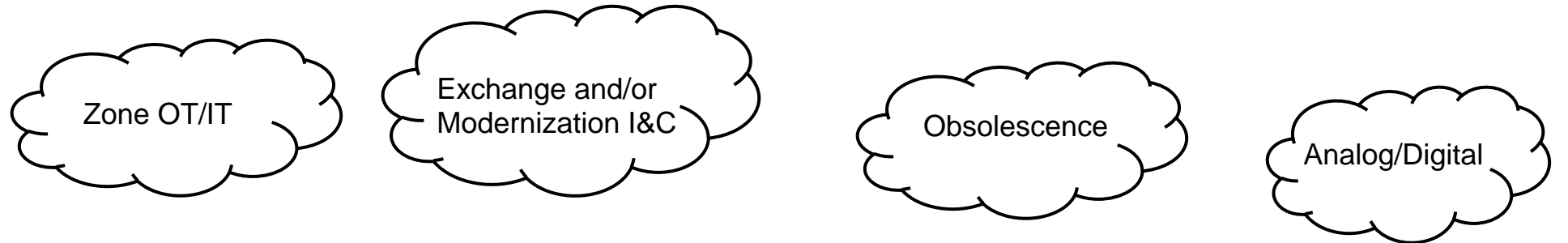


# AI tech

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# OT issues



# The Economist

Fox News. Now what?

Ukraine's game plan

Why civil wars are lasting longer

A special report on the car industry

APRIL 22ND - 28TH 2023



DN DEBATT

*DN Debatt. "Farligt att lagstifta mot en AI-teknik vi knappt förstår"*



Uppdaterad 2023-04-18 Publicerad 2023-04-17



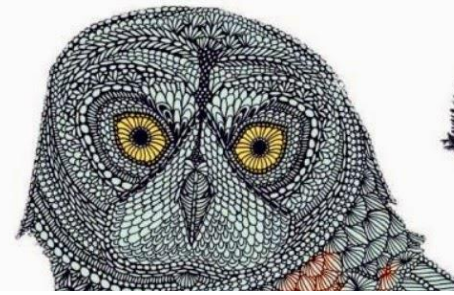
*Elon Musk and Others Call for Pause on A.I., Citing 'Profound Risks to Society'*

More than 1,000 tech leaders, researchers and others signed an open letter urging a moratorium on the development of the most powerful artificial intelligence systems.

**NICK BOSTROM**

## SUPERINTELLIGENCE

Paths, Dangers, Strategies



**"Universitetens nonchalans skrämmer mer än AI"**

## Artificiell intelligens

*I siffror*

### Investeringar i AI\*



**6 500-12 000** miljarder euro/år  
ekonomisk effekt av automatisering av kunskapsarbete, robotar och självkörande fordon år 2025\*\*

\*år 2016 | \*\*beräkning

Källor: Europeiska kommissionen (2019), IPOL (2020)



europarl.eu

**AI bättre än läkare på att upptäcka hudcancer**



# Is AI dangerous? Answer from ChatGPT.

AI can be dangerous if it's developed, used or controlled improperly. Some risks include: loss of jobs, unintended consequences from AI systems, biased AI systems that perpetuate existing inequalities, and the potential for AI systems to be used for malicious purposes, such as cyberattacks or autonomous weapons. However, if developed with proper safety measures and ethical considerations, AI has the potential to greatly benefit society.



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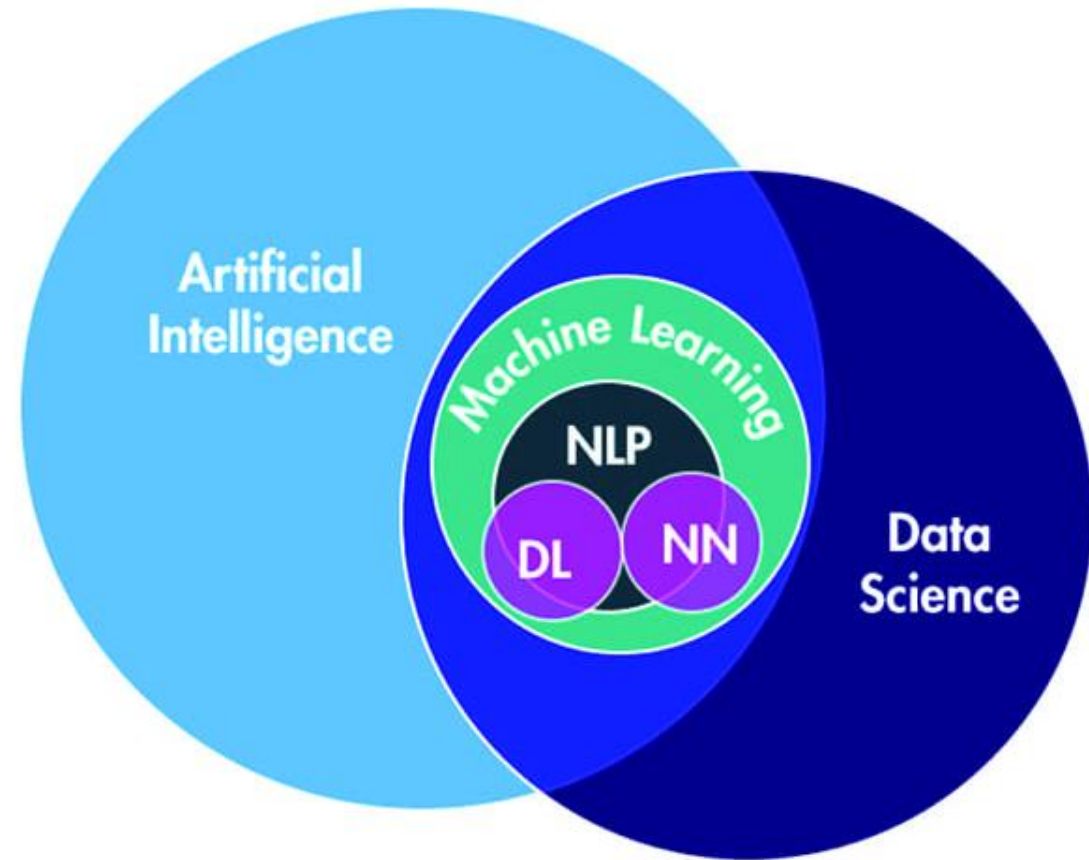
# Where does Predictive Maintenance fits in in the digitalization landscape?

Machine learning can be “supervised” or “unsupervised”. The former is more common and is used by training a system with known data.

Predictive maintenance can be regarded as a subcategory of machine learning.

Predictive maintenance relies on data from various sources in the plant.

It is often a “grey zone” between predictive maintenance and operating support.



NLP: Natural Language Processing  
NN: Neural Networks  
DL: Deep Learning

# Typical approach for Predictive Maintenance

## Questions to ask before starting.

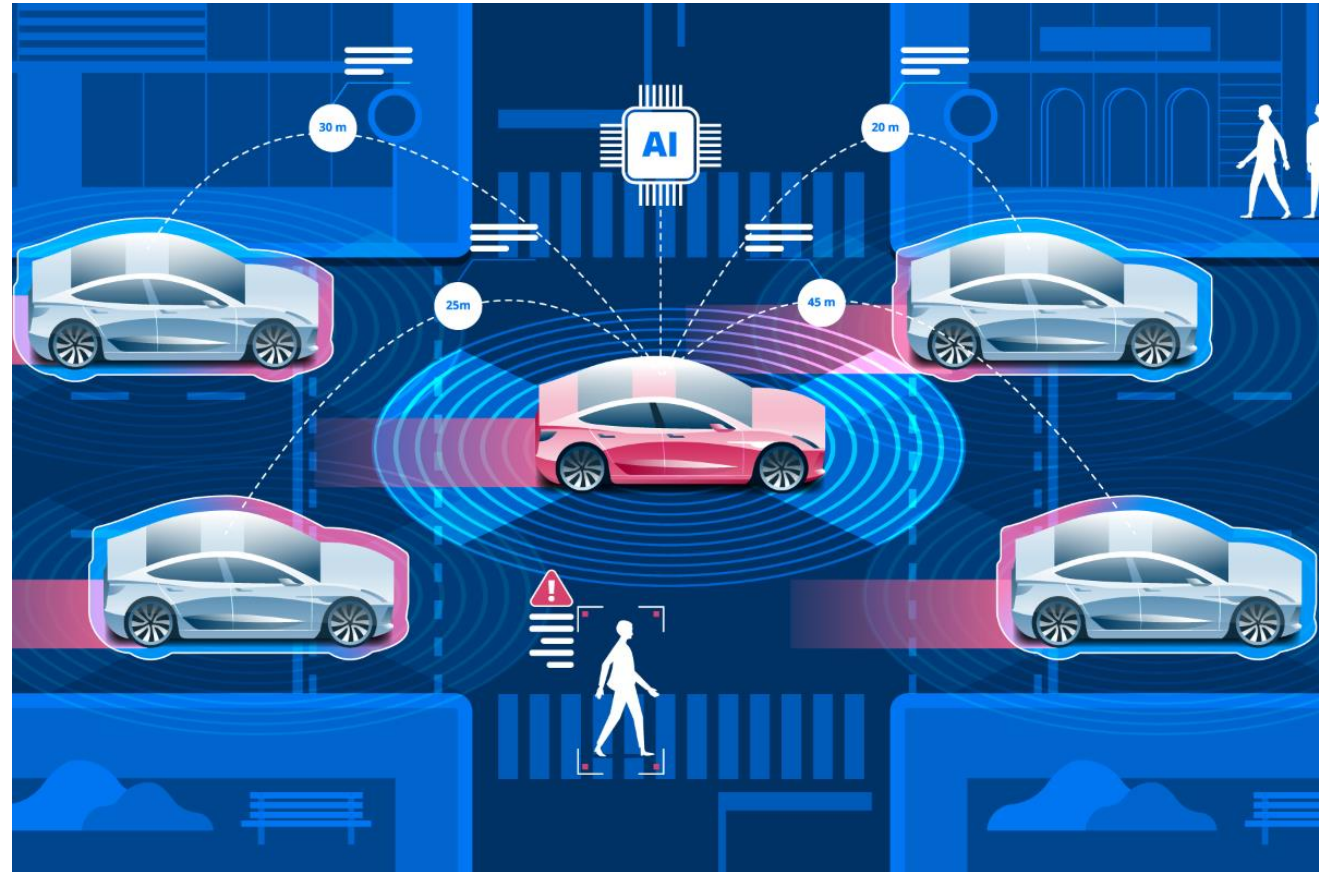
- Is the system or component of great importance for safety or production?
- Is it worth it to go further with predictive maintenance, cost/benefit?
- Do we have enough data to do successful predictive maintenance?
- Is the data reliable?
- Do we have the resources and skills to implement predictive maintenance in our organization?



# Autonomous Cars vs. NPP's.

## What is a more complex environment?

- Self-driving cars have a very complex environment with unpredictable situations, e.g. people, animals, weather etc.
- What about NPP's? Mostly physics and predictable phenomena.



© Smart Cities World

# Do we want autonomous systems?



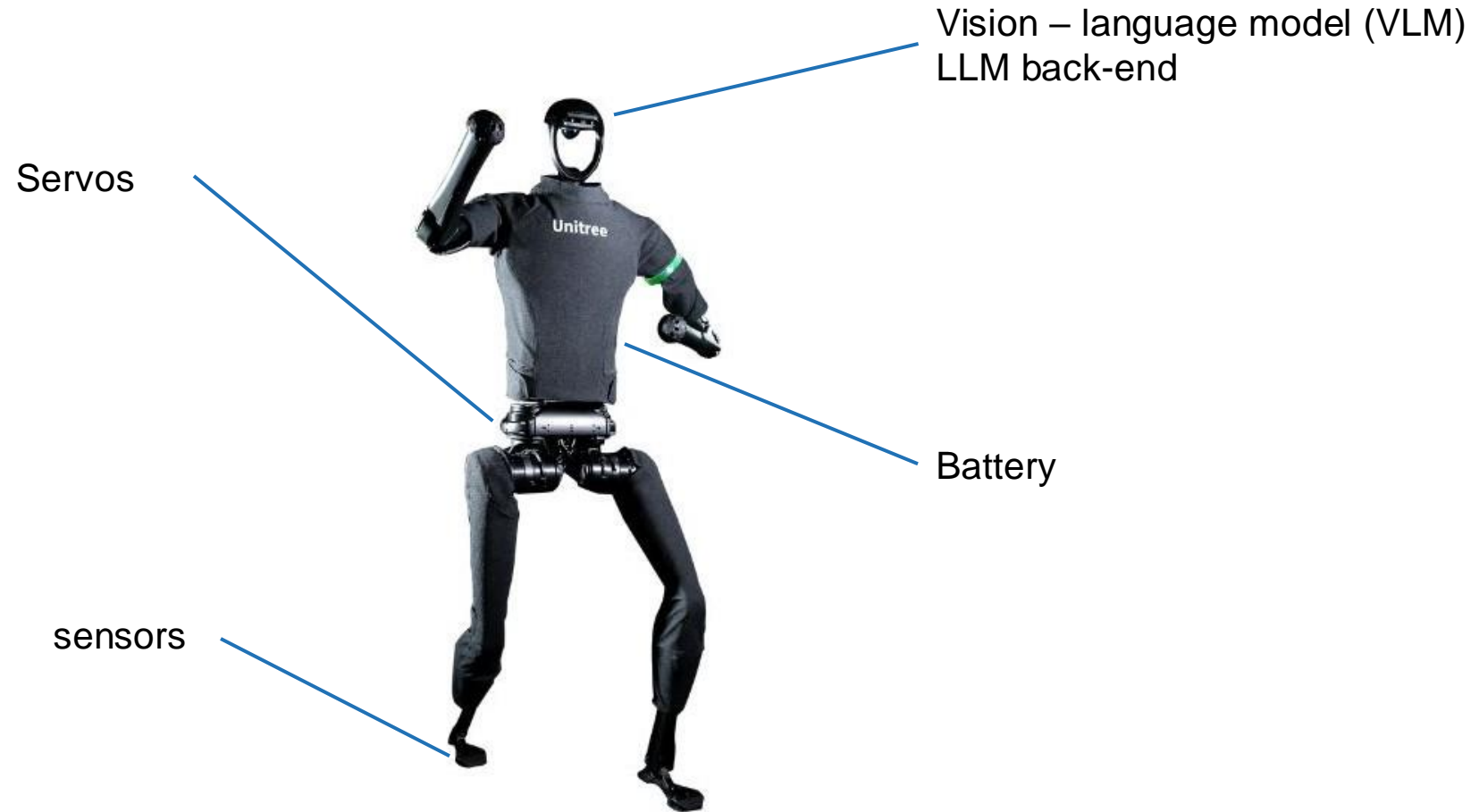
# Ethics and AI/Robotics

## Asimov's Laws of Robotics (1942)

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.



# Humanoid robots - explained





# World simulation

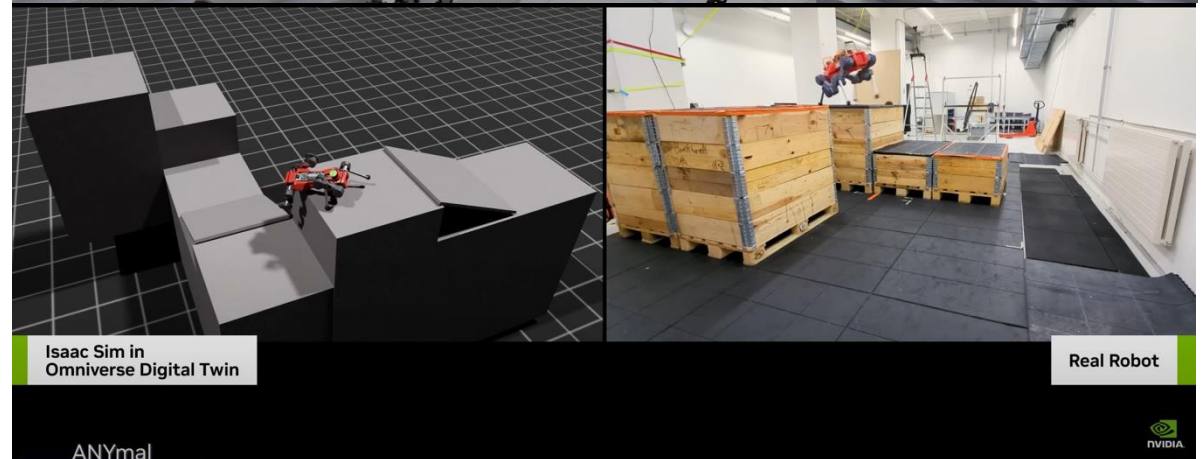
Robots are trained in virtual environments to be able to perform tasks in the real world

Foundation model for robotics

➔ Understand the environment

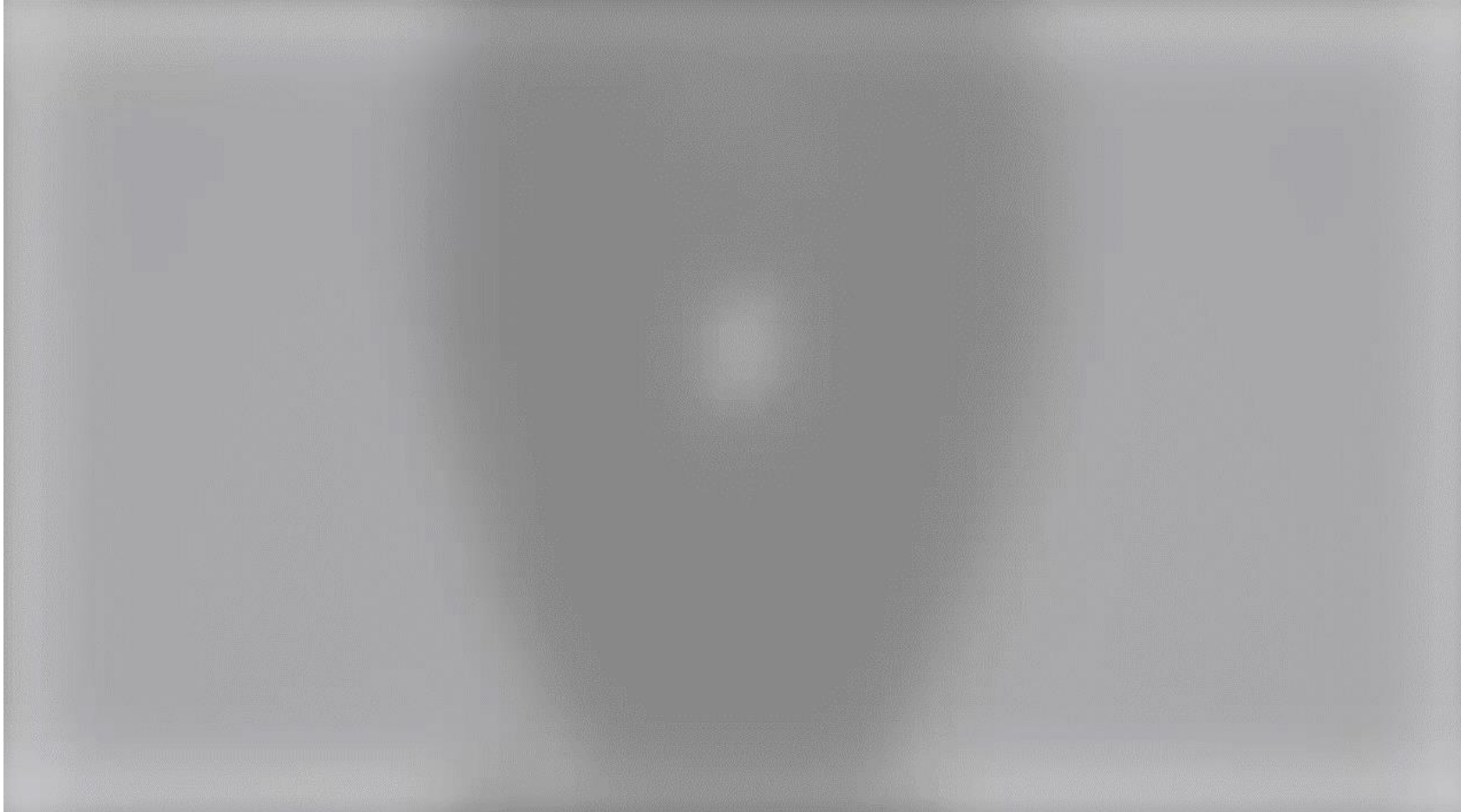
Ai agents

➔ Decision on what to do



# General purpose robotic platform

We add all things together



# Status as we speak

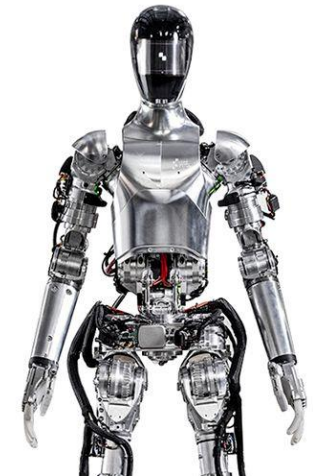
Tesla – Optimus robot

FigureAI – Figure robot

Agility Robotics – Digit

1X – Neo (Norway)

Unitree Robotics – G1 (China...)



# Your future workmate?

**Is this just a question of *When* rather than *If*?**

I think this will happen in the future but I also believe that the humans will still be around.

**So, AI in all its beauty, we humans still have a role in our existing NPP's!**



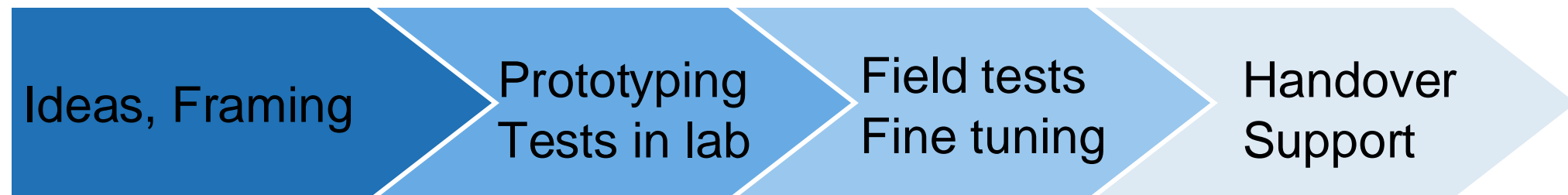
Picture: Business Insider

# Thank You for Your Attention

# Extra

# Workflow R&D towards deployment

- Ideas are framed and goes through a screening process for Go/No Go
- Prototypes are produced and tested in lab environment
- Field tests are conducted to see robustness and user friendliness
- Finally product/service is handed over to BA/BU for deployment. Support function remains for a certain time period by R&D



The colours indicate the involvement of R&D. The darker, the more involvement from R&D personnel and laboratory resources.