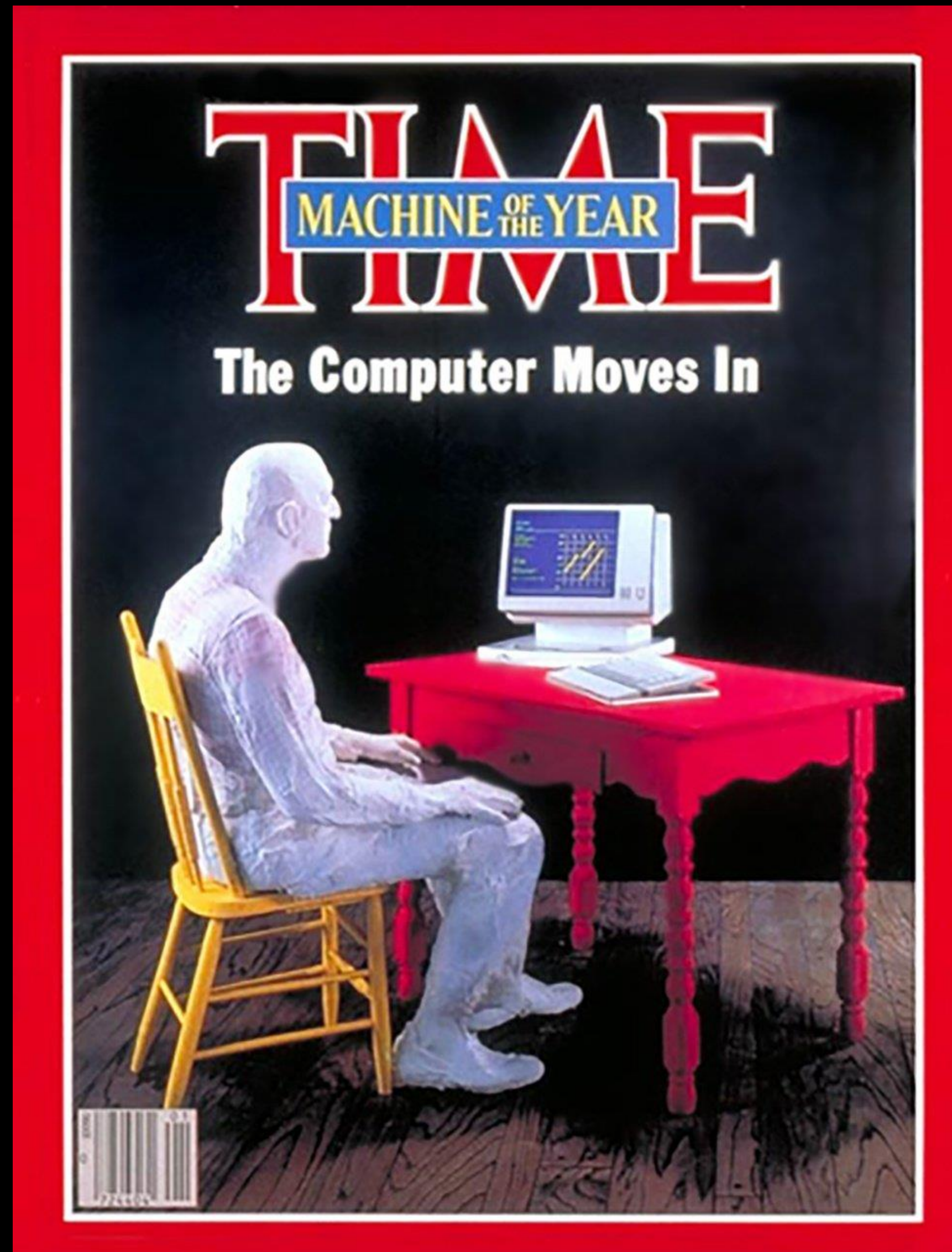# Converging technologies from the IT perspective

Bruno Siciliano

Department of Electrical Engineering and Information Technology

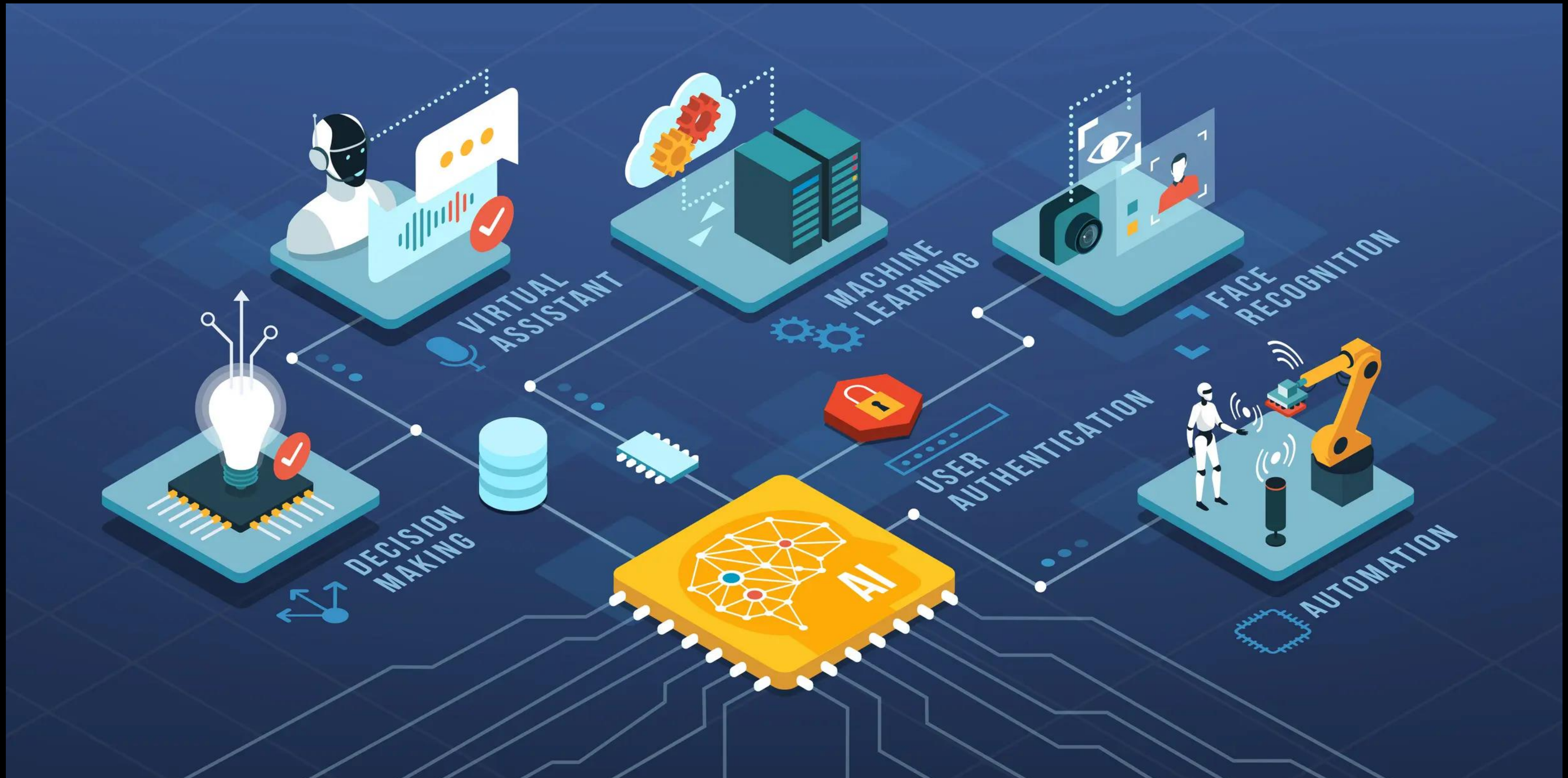*University of Naples Federico II*

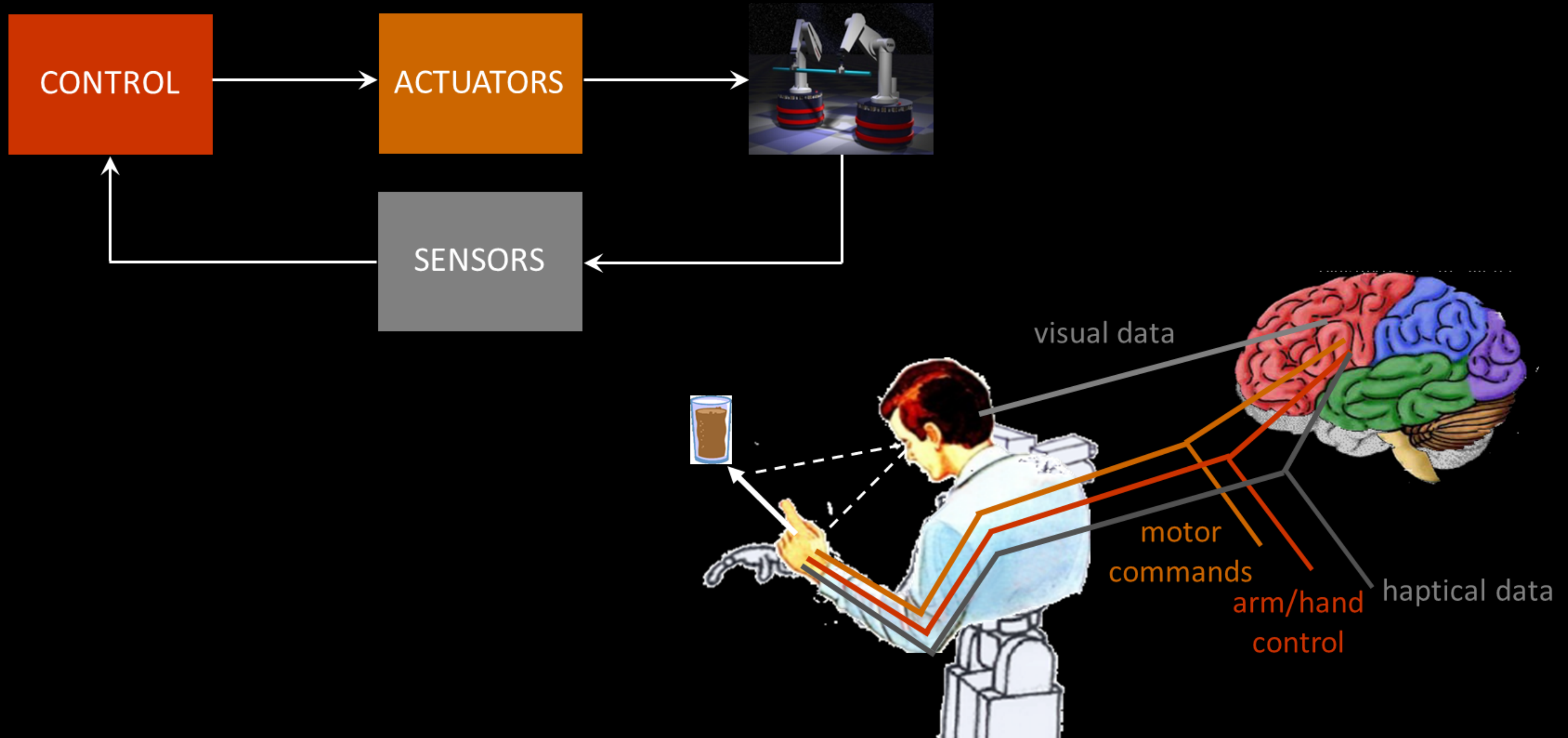# Technology, media & society

1982

2006

Information Technology (IT)

Robotics

Intelligent connection of perception to action
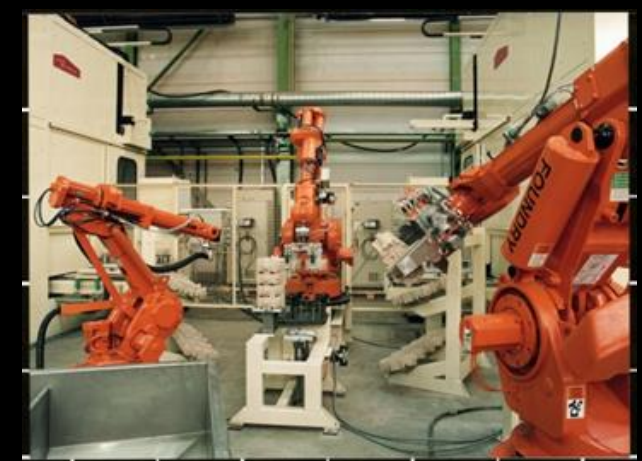
History

SOGNO vs BISOGNO

Humans' DREAM of replicating themselves

NEED for useful machines

Industrial Robotics
1960-1980

Manufacturing Applications

Field Robotics
1980-2000

Spatial Applications

Service Robotics
2000-2020

Medical Applications

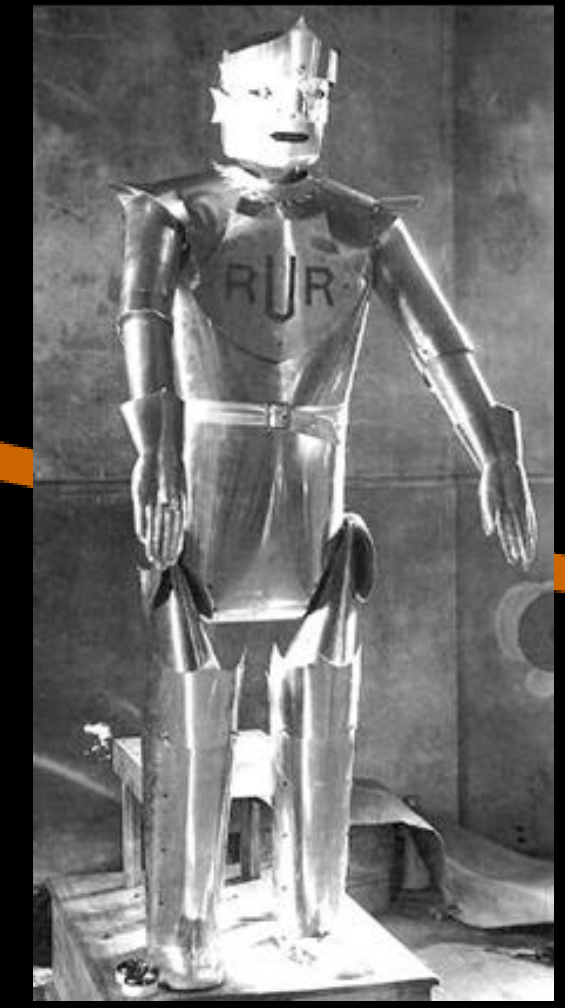Personal Robotics

Humanoid Robotics
?
2020-2040

1200

1500

1550

1750

1920

2005

Artificial Intelligence (AI)

Computers mimicking functions and logics of human mind

Cortical homunculus

AI, Robotics, Asimov & technology

We cannot leave to AI decisions which may have
safety, moral and legal consequences
because we cannot ensure the outcome.
Yet we can have AI in Robotics with proper technology

Moravec paradox — It is relatively easy to make computers perform
comparable to adults in intelligence tests or playing checkers,
but it is impossible to give them the perceptual and motor skills
of a one-year-old

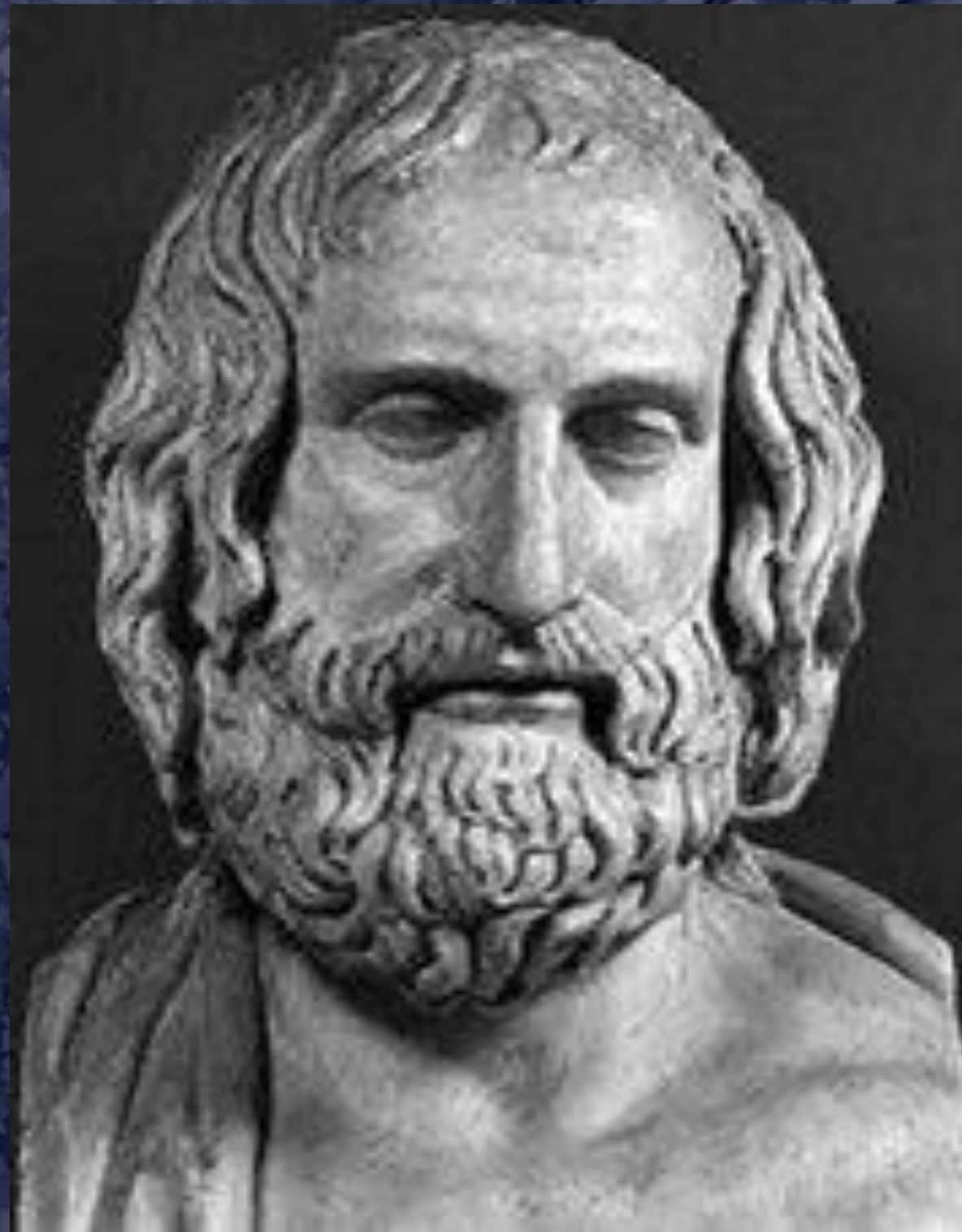The big challenge
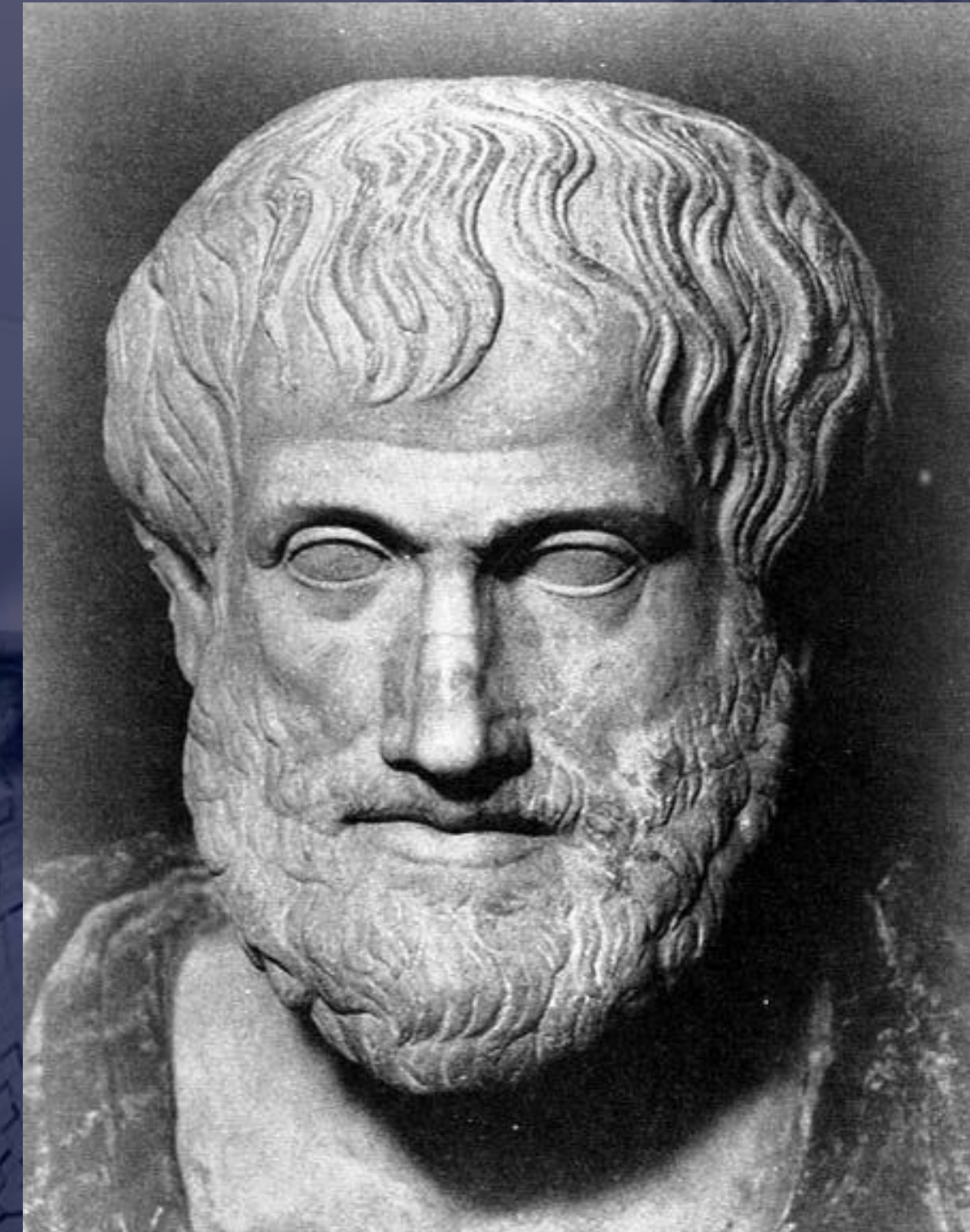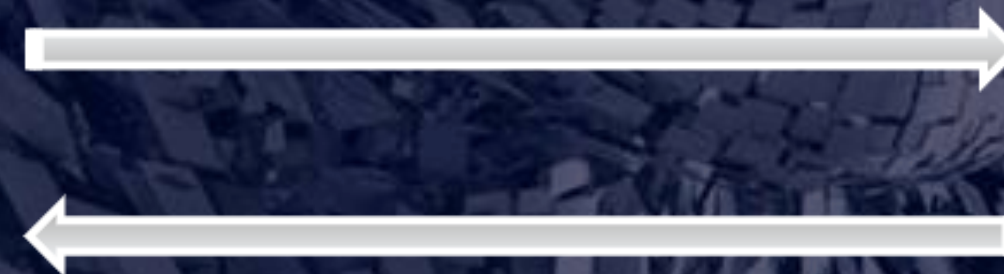
Manipulation

Cognition

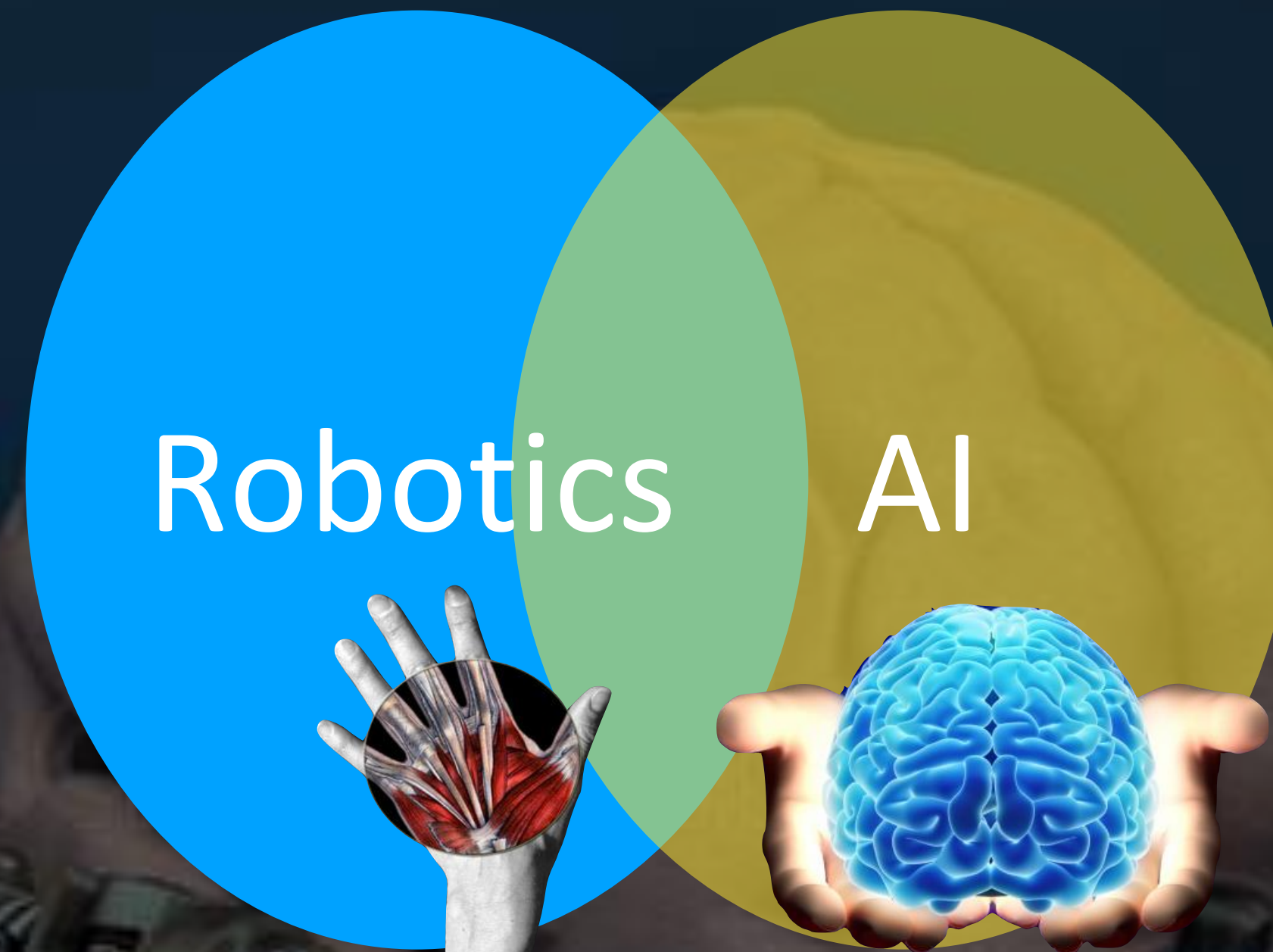Body vs mind

Anaxagoras   Aristotle

Embodiment

Converging technologies

The big challenge is found at the *intersection of Robotics and AI*

Physical AI is MUCH harder (Moravec paradox)

AI is not deterministic and "blind" use in Robotics can be potentially dangerous
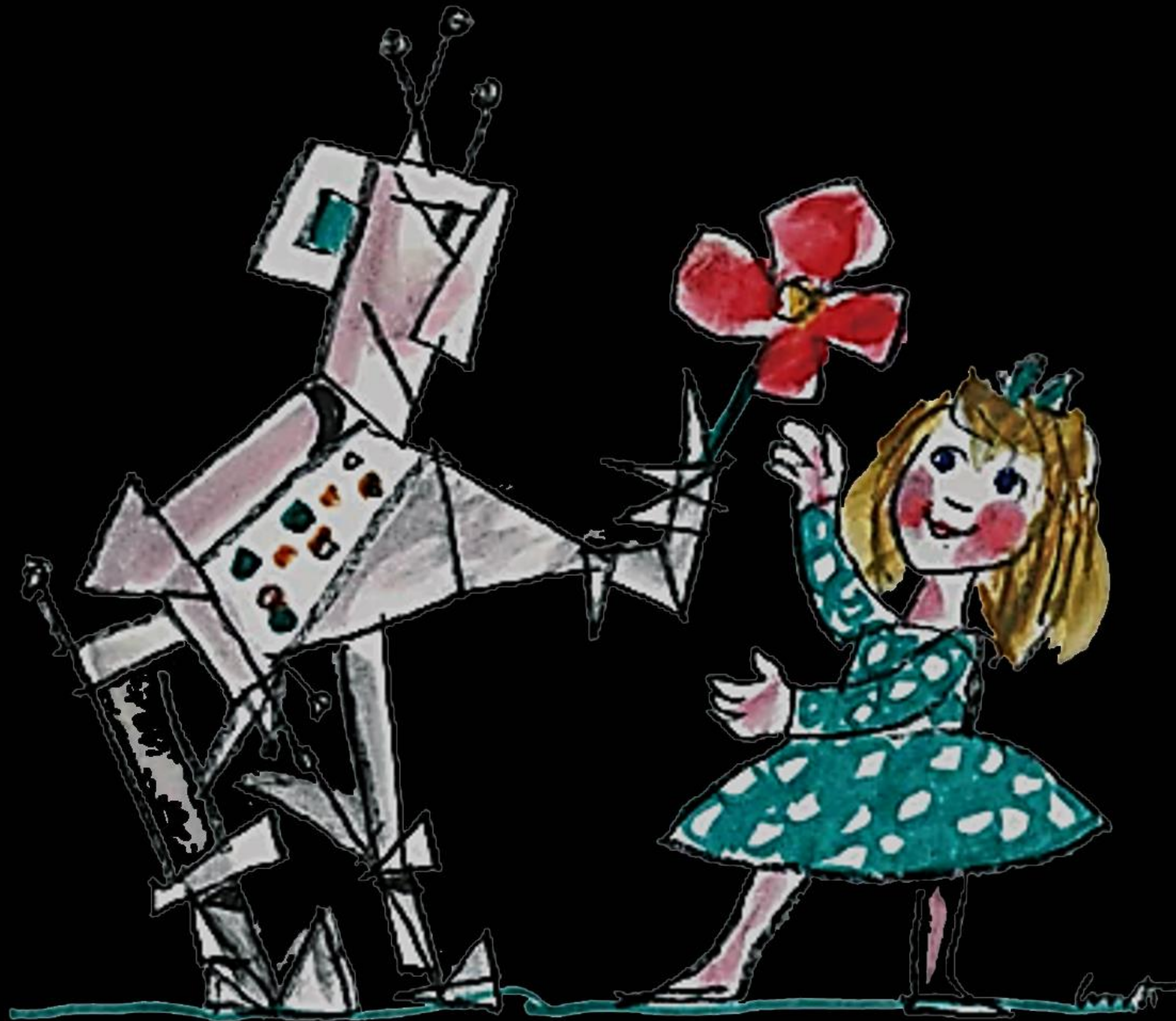
Robotics   AI

Physical human–robot interaction

... from Information Technology (IT)
to InterAction Technology (IAT)

Nature Italy, Antonio Bicchi & Bruno Siciliano (2021)

Roboethics

Ethical, legal, societal and economic (ELSE) issues for design, construction and use of robots
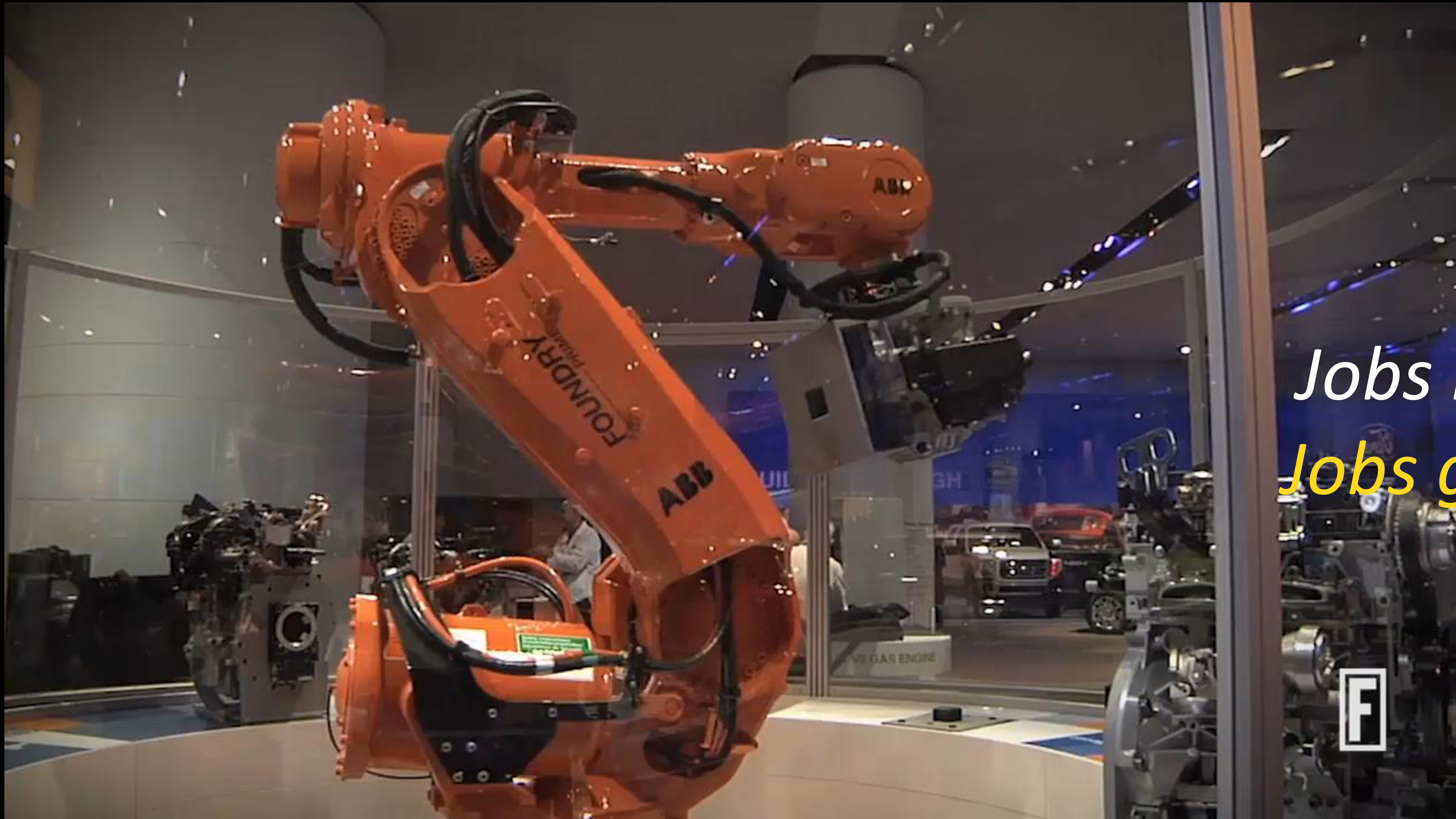
Cohabitation of humans with robots

Fundamental *human rights* and the *moral duties* corresponding to them

The role of ethical reflection

Certainly not to adjudicate the discussions between technological optimists and pessimists, but rather to analyze the problem under the lens of the concepts of *fairness, merit, equality, freedom*

Identify which forms of protection it is morally right to put in place to protect workers who will face *technological unemployment* *in the short term, but also to deal with any unedited long-term effects, if the impact of intelligent machines will actually constitute a* *singularity in the history of automation*
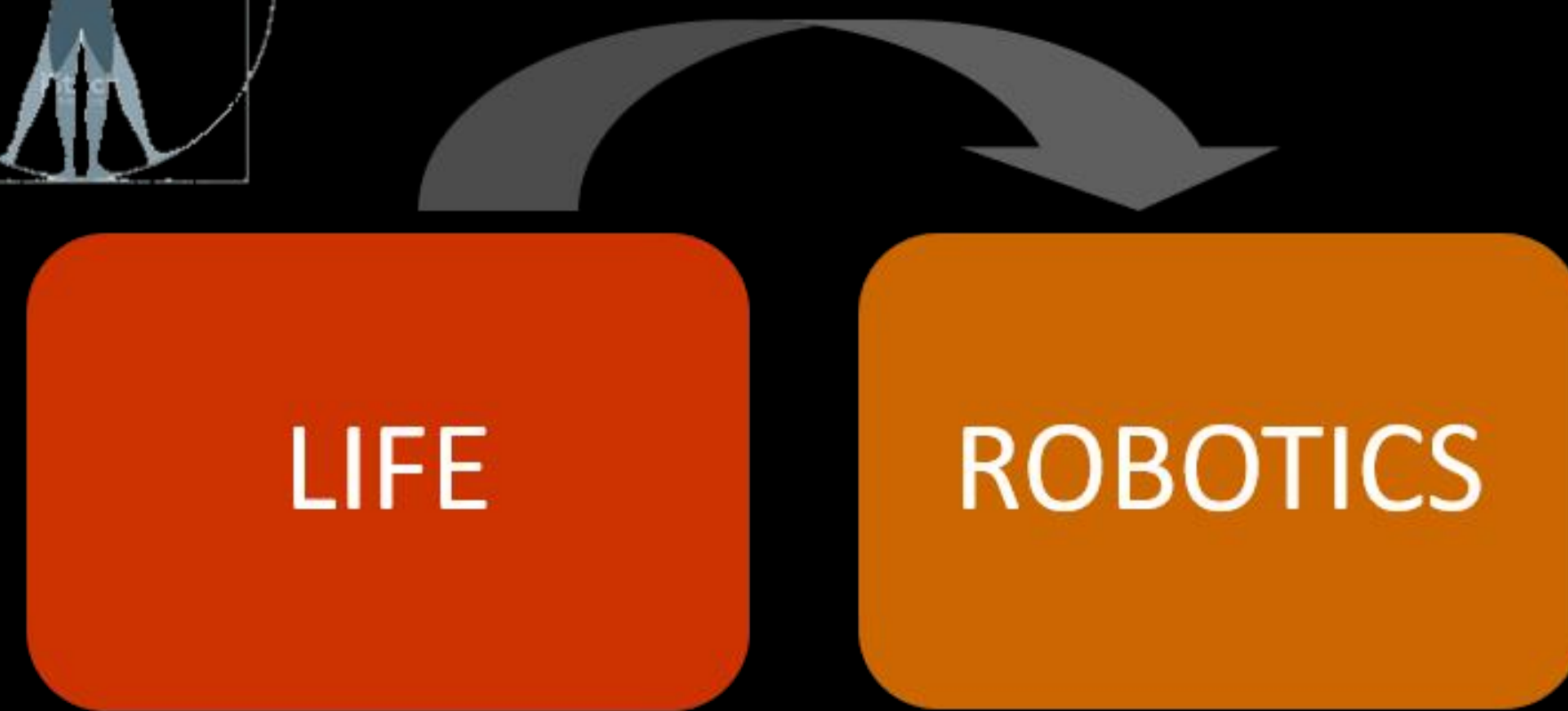
Robots as job killers?

Jobs lost …
Jobs gained

Robots & humans

«La scienza m'interessa proprio nel mio sforzo per uscire da una conoscenza antropomorfa; ma allo stesso tempo sono convinto che la nostra immaginazione non possa essere che antropomorfa» *Italo Calvino*
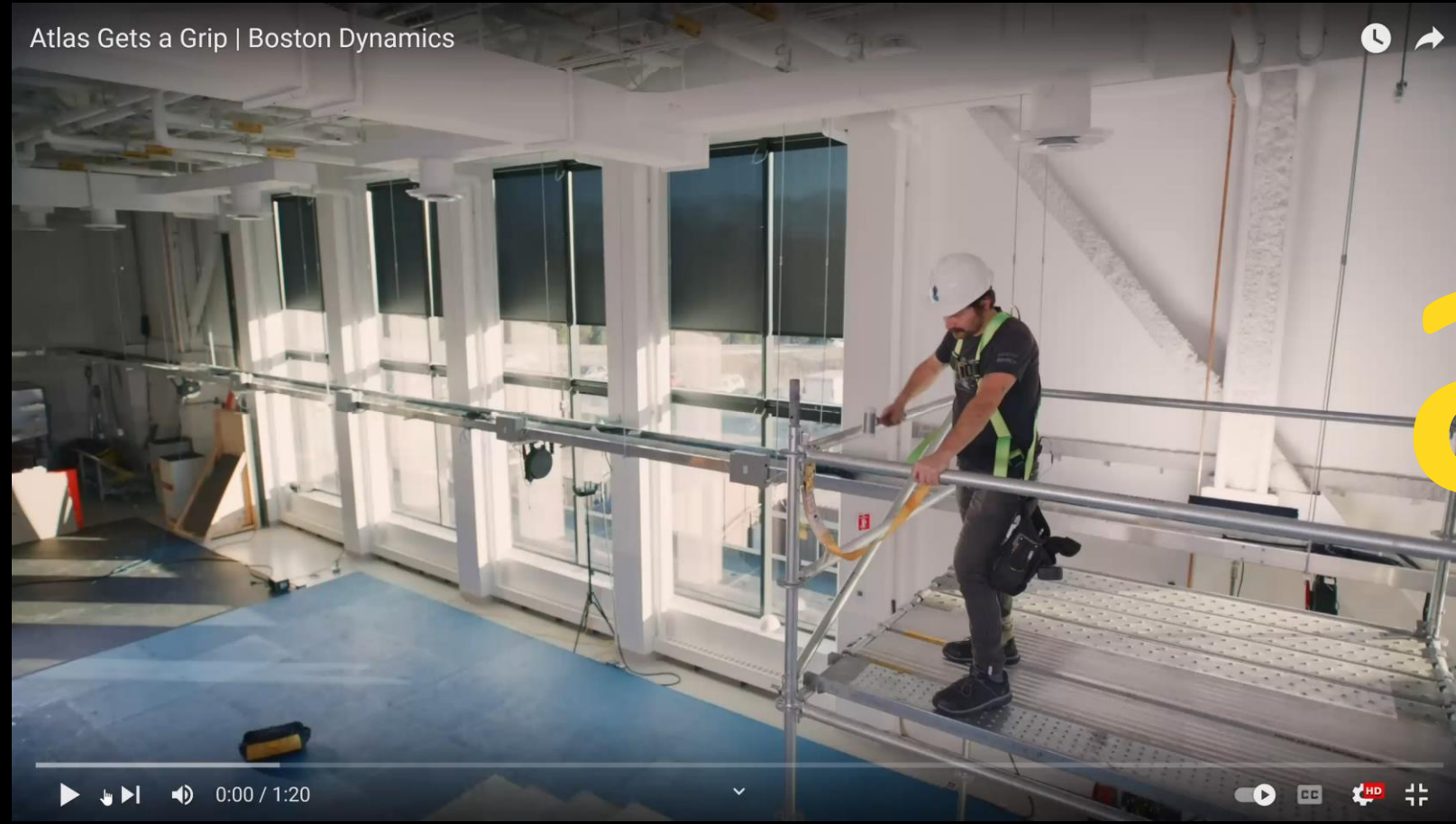

LIFE → ROBOTICS
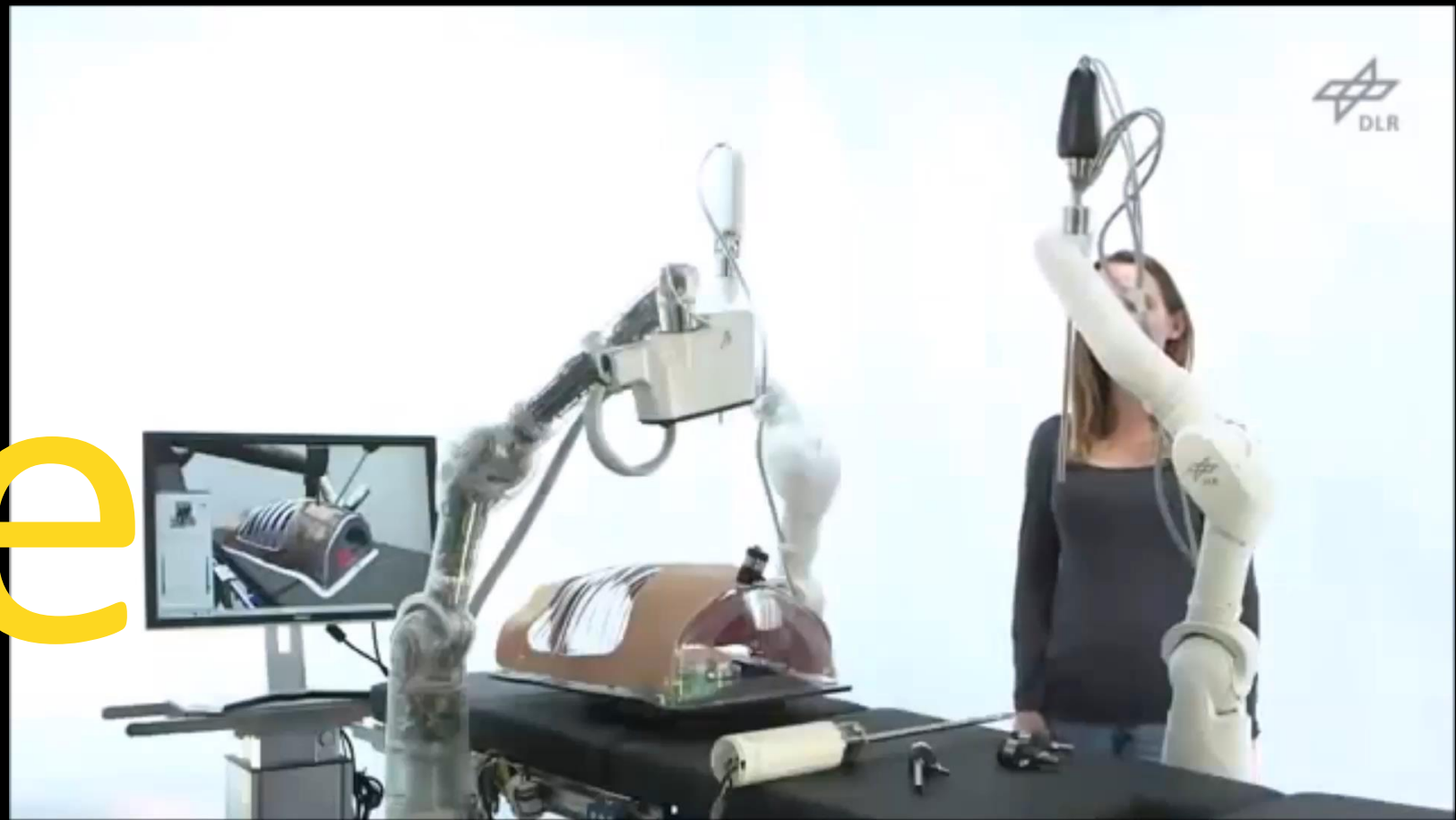
Biological inspiration in design and learning from nature (biomimicry and bionics)

A future where robots are more social than solitary (robot companion)

Robots will enhance human work and life rather than replace us in our homes, hospitals, factories, farms and freeways

Robots are
with us
within us
among us

Towards a technological humanism

«In effetti l'uomo si dimostra essere cosa divina perché dove la natura finisce di produrre le sue spetie l'uomo quivi comincia colle cose naturali a fare coll'aiutorio d'essa natura infinite spetie»
Leonardo da Vinci

«100 years after the entry of the word robot into our lexicon, the challenge and at the same time the opportunity that the world of research will have to represent is related to future scenarios in which robotics will become an interactive means to help improve conditions of life. In this vision, the robot revolution will be able to help us reassert the least artificial feature of our world: our humanity»

Atlante Treccani, Bruno Siciliano (2020)

https://youtu.be/8_uE7lUgsz0

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