The Future is Now!
Robotics, AI & Automation

Bruno Siciliano

University of Naples Federico II

My Home

City

1,000,000 inhabitants
Pole of Mediterranean culture
Historical and holiday sites
5 universities + several science institutions

University

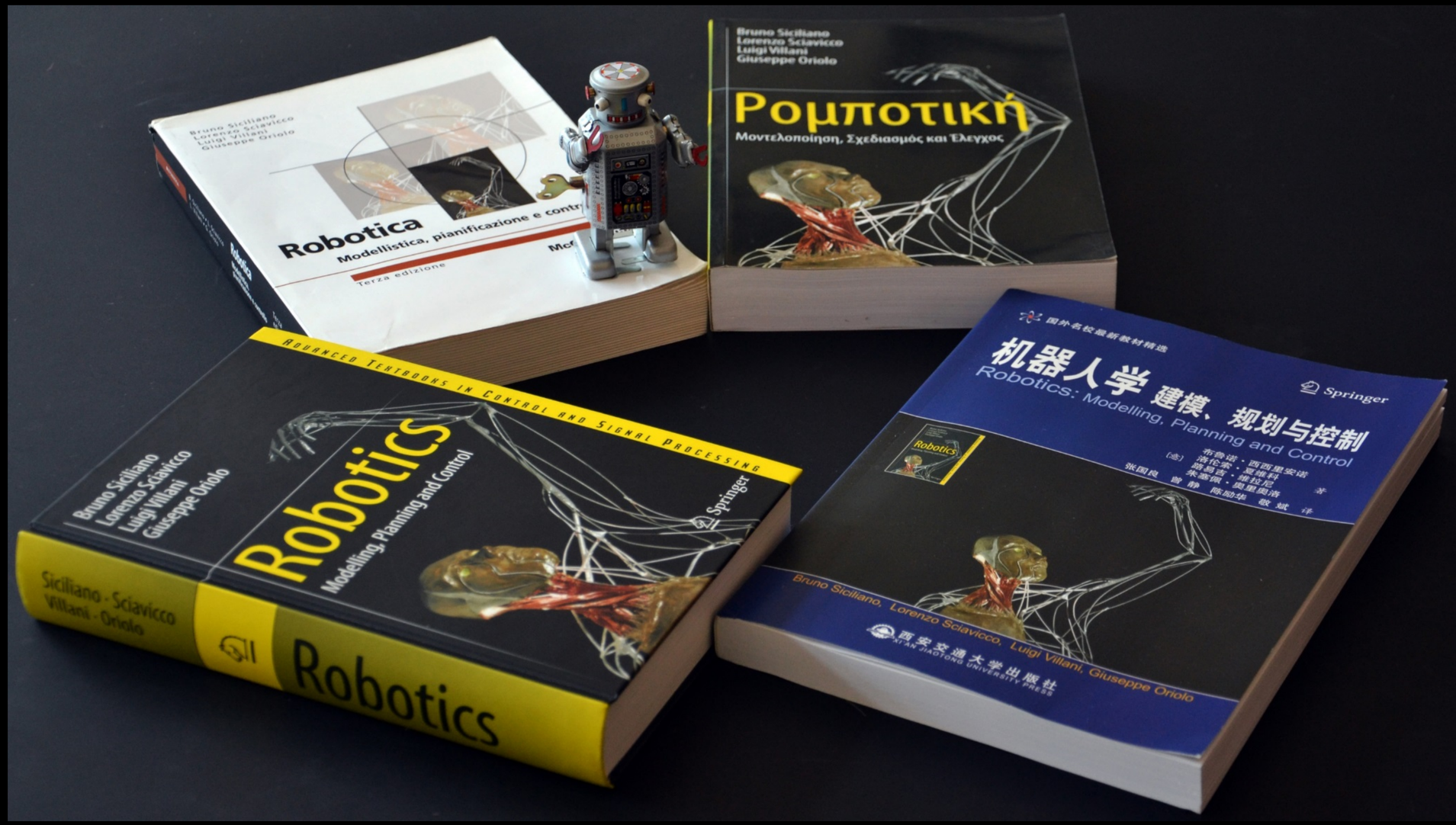
Founded in 1224 by Emperor Federico II
(oldest public university in Europe)
90,000 students
School of Engineering founded in 1811
by King Murat (oldest in Italy)
15,000 students (5,000 graduate)

UNIVERSITA' DEGLI STUDI DI NAPOLI FEDERICO II

The PRISMA Team

The ICAROS Center

The Textbook



The Handbook

Springer Handbook of Robotics

Editors: Bruno Siciliano, Oussama Khatib

Multimedia Editor: Torsten Kröger

SPRINGER NATURE

Our Research Portfolio

Our Funding

FP6
FP7 COOPERATION
FP7 IDEAS
HORIZON 2020
Funding > 12 M€ ☺
ethicbots
EMERGING TECHNOETHICS OF HUMAN INTERACTION WITH COMMUNICATION, BIONIC, AND ROBOTIC SYSTEMS
euRobotics coordination action
ROCK eu
ROCK eu²
PHRIENDS
DEXMART
SAPHARI
RoDyMan
AIRobots
ARA
SHERPA
MUSHA
ECHORD
European Robotics Challenges
RoMoL
RIMA
AEROARMS
HYFLIER
REFILLS
DIH²

xsens
prisma LAB

prisma LAB

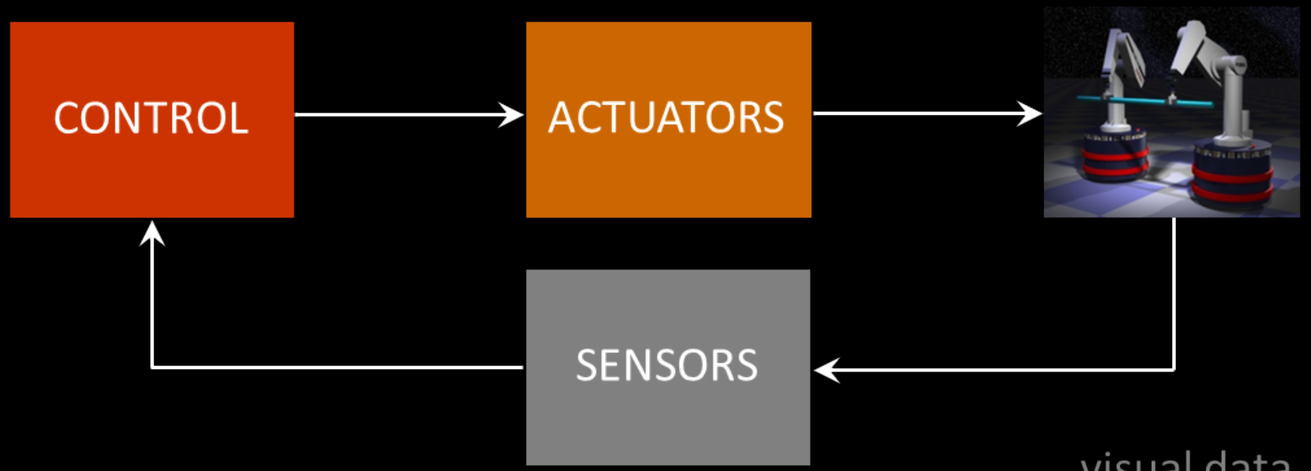
prisma LAB

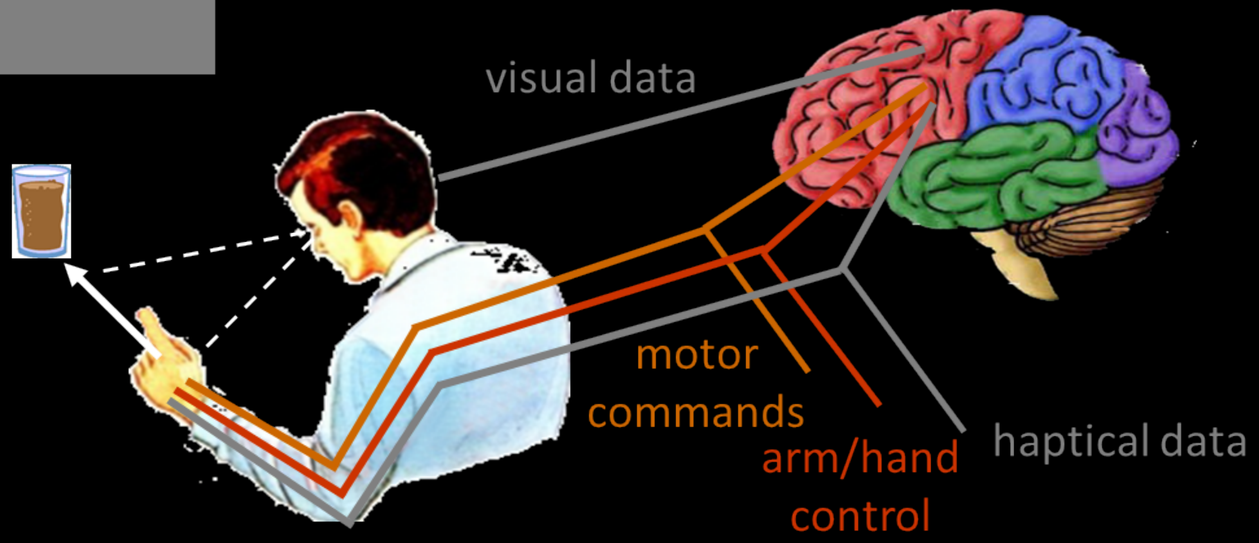
UBI Banca
UBI Banca

UBI Banca

Robotics

intelligent connection of perception to action

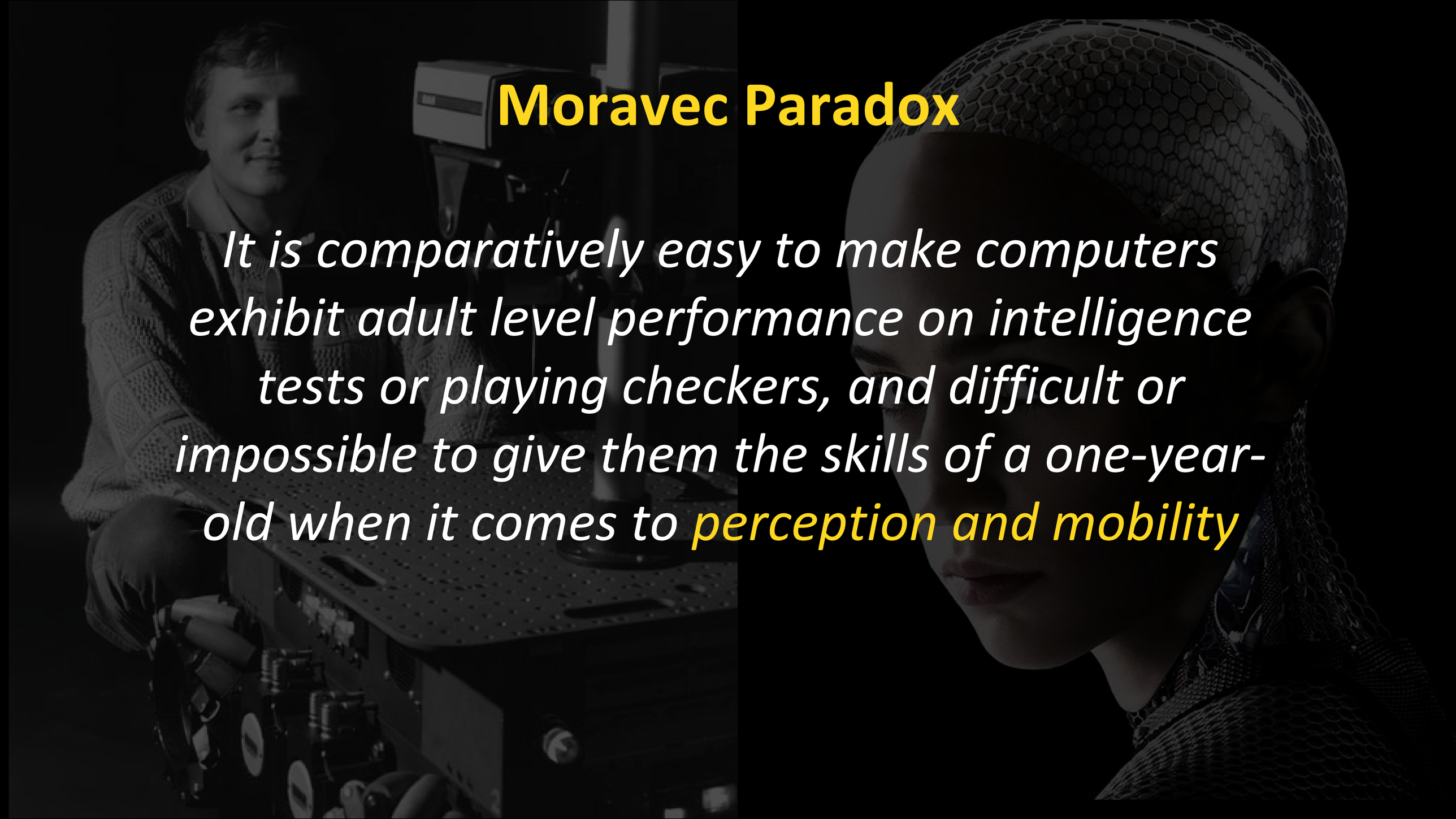




Artificial Intelligence

Computers mimicking functions and logics of human mind

Cortical homunculus



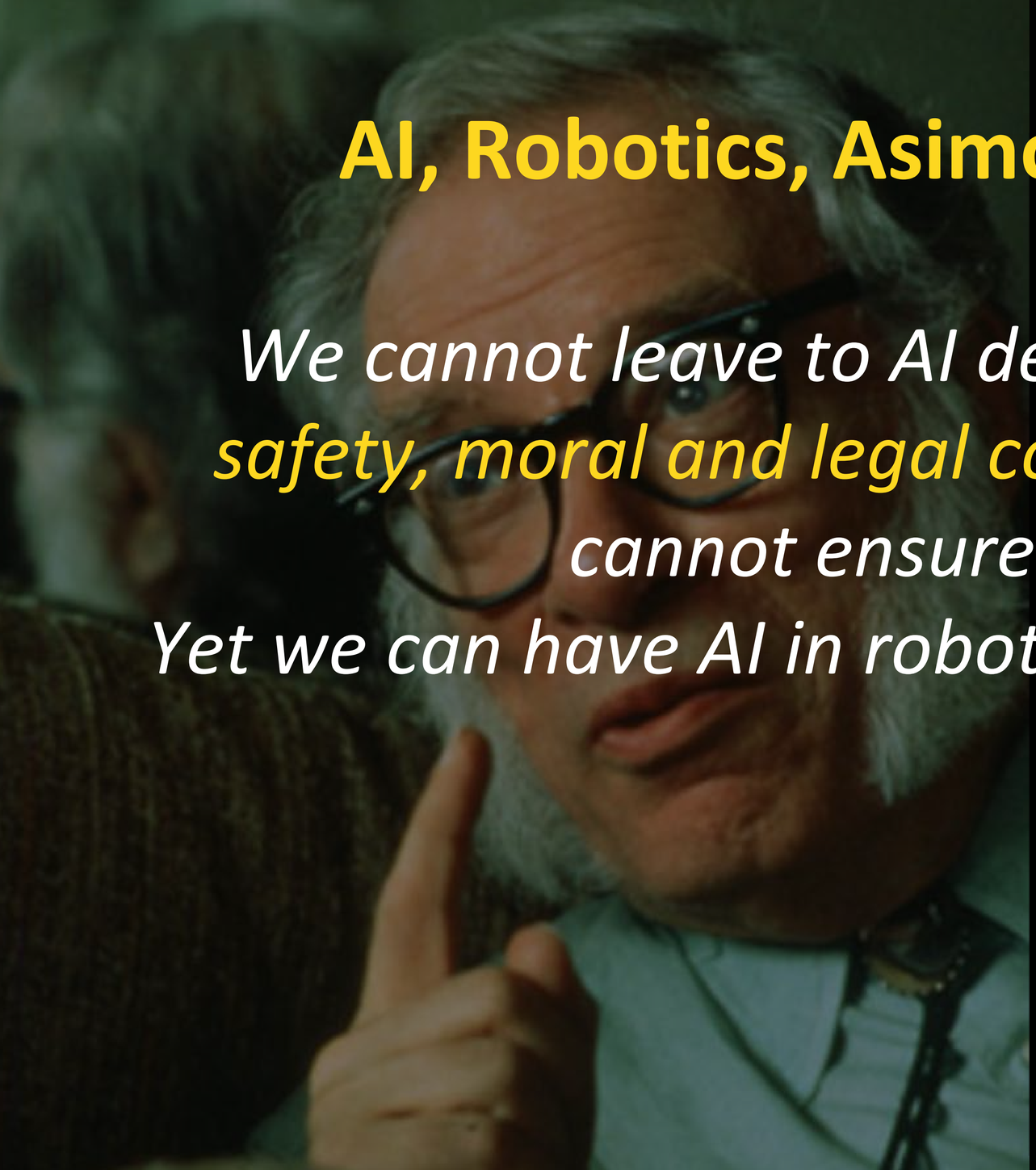
Moravec Paradox

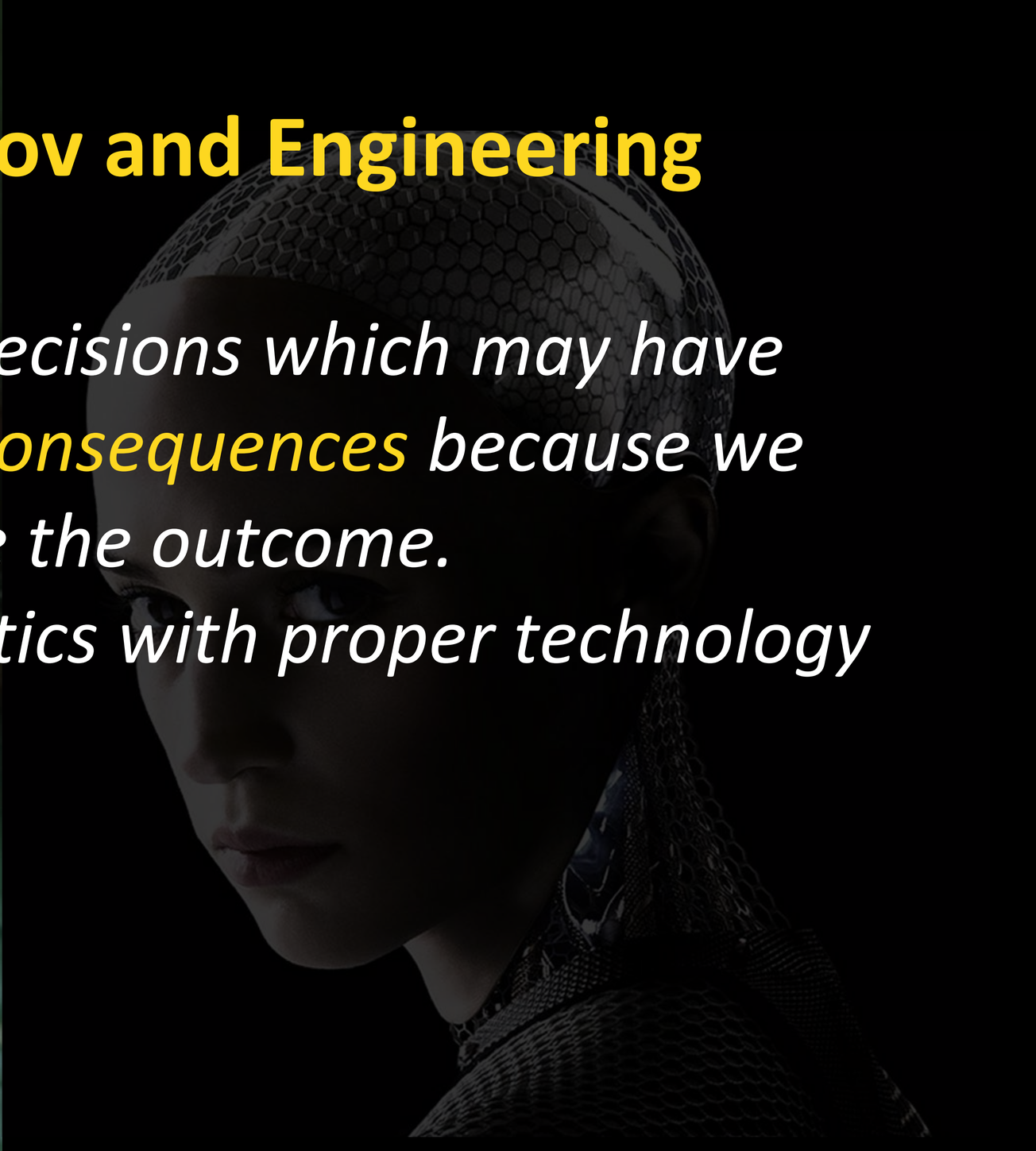
It is comparatively easy to make computers exhibit adult level performance on intelligence tests or playing checkers, and difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility

AI, Robotics, Asimov and Engineering

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



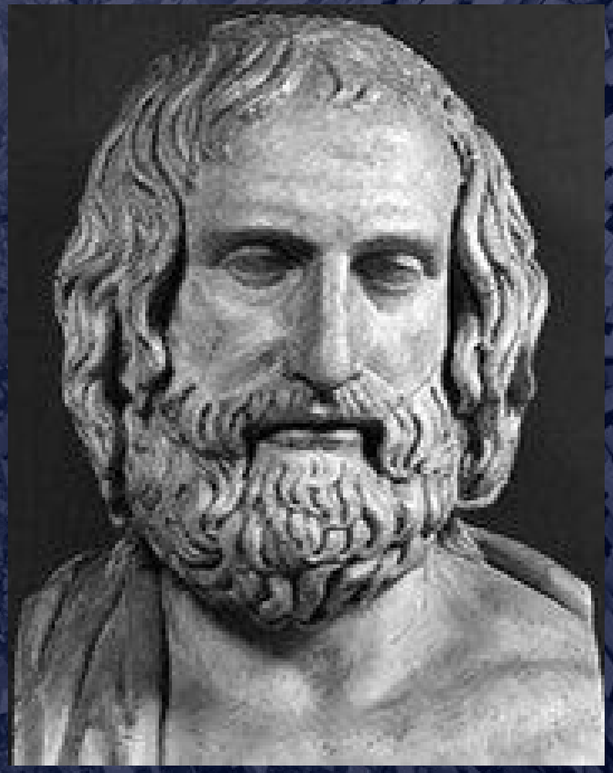


The Big Challenge

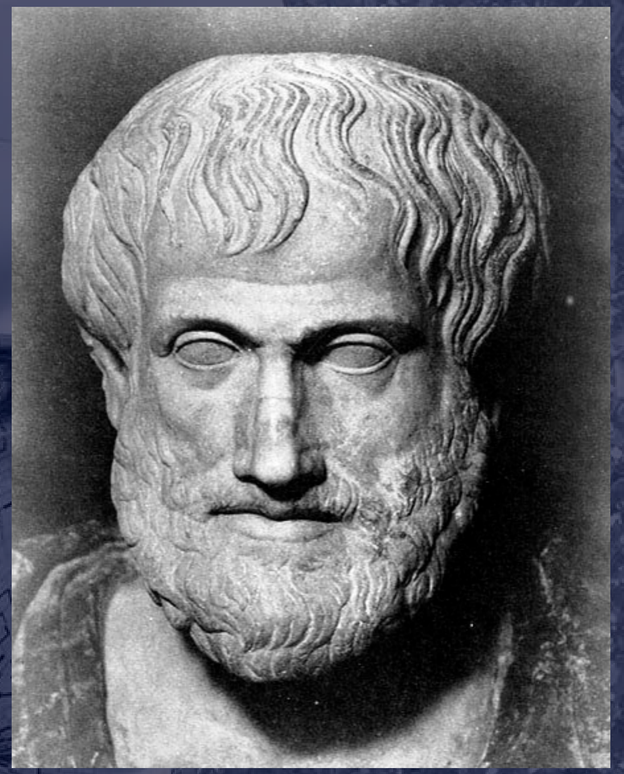
Manipulation

Cognition

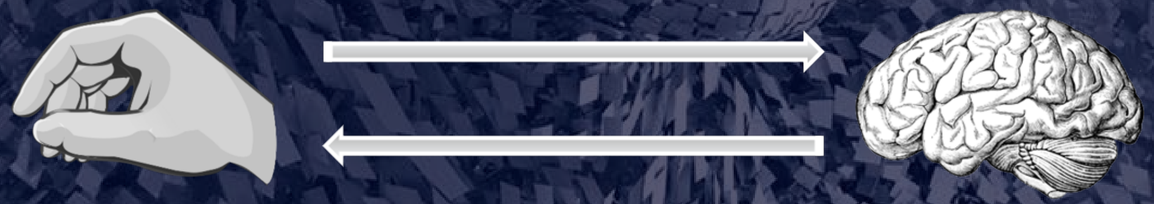
Body vs Mind



Anaxagoras



Aristotle

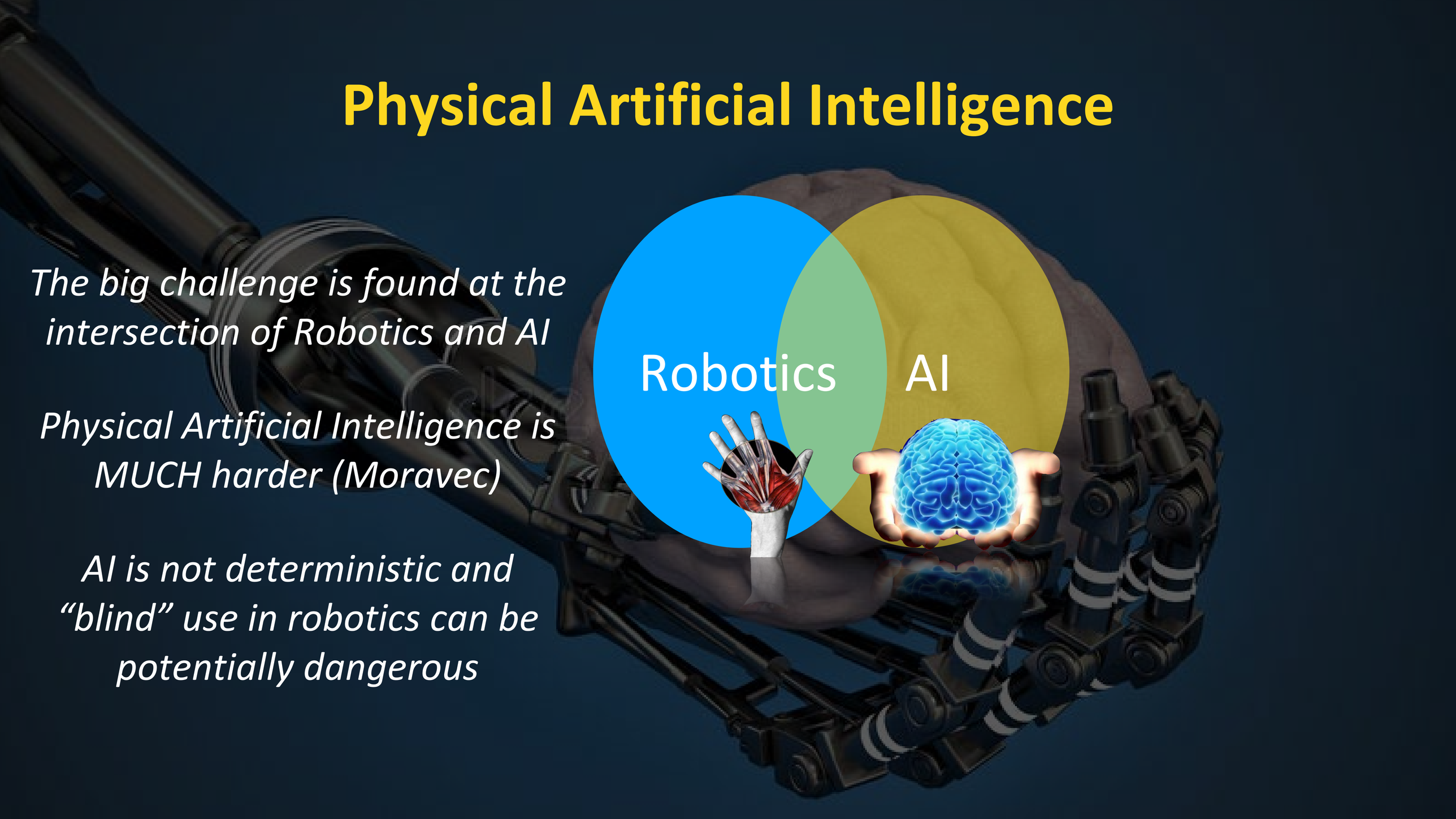


Physical Artificial Intelligence

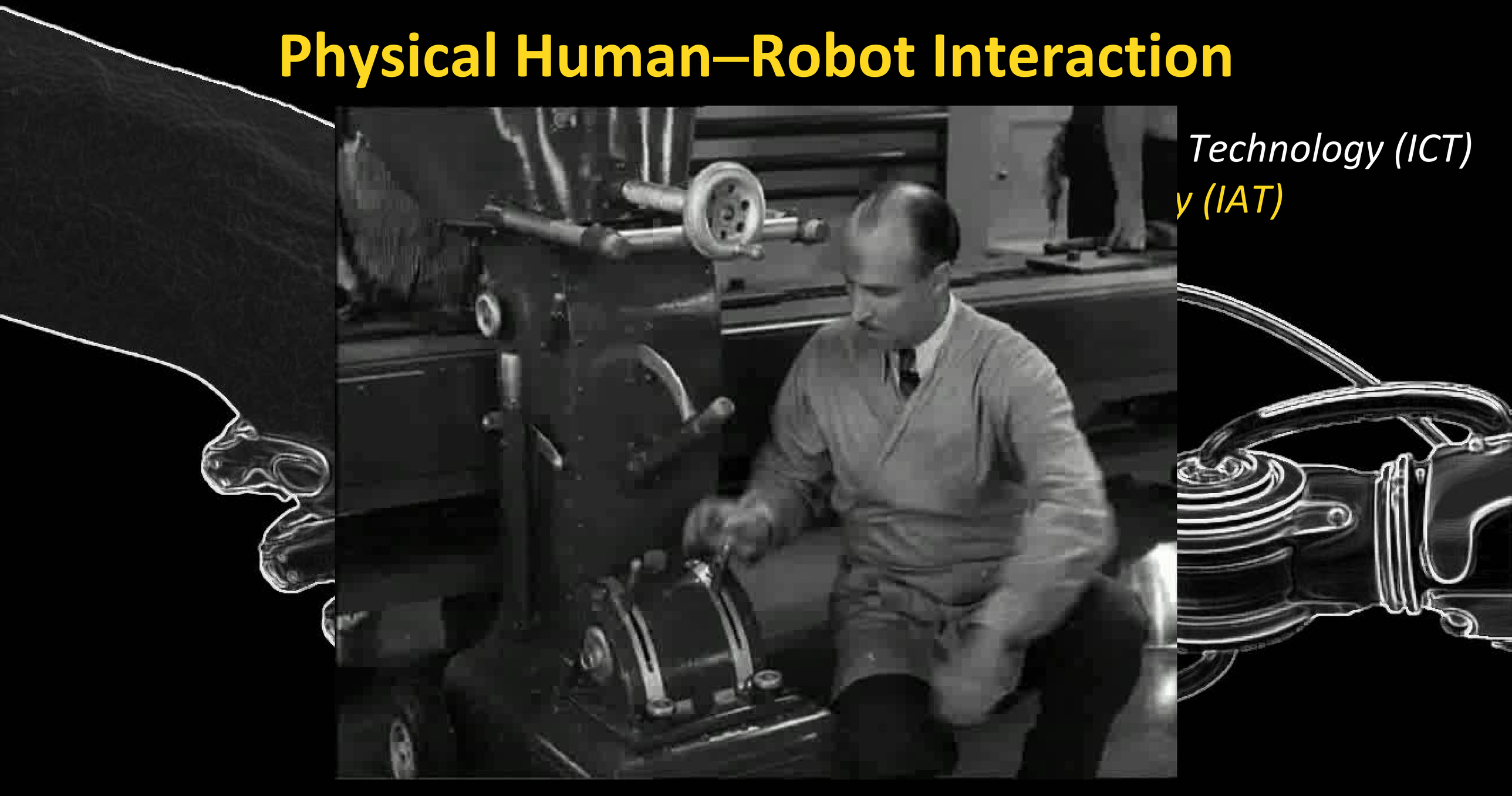
The big challenge is found at the intersection of Robotics and AI

Physical Artificial Intelligence is MUCH harder (Moravec)

AI is not deterministic and “blind” use in robotics can be potentially dangerous



Physical Human–Robot Interaction

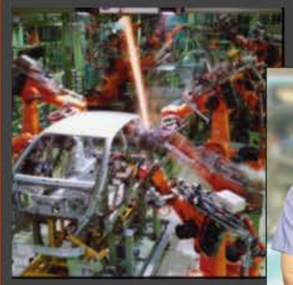


Technology (ICT)

y (IAT)

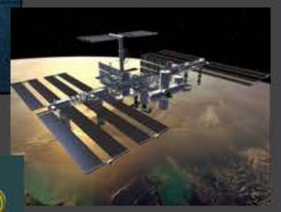
From Factories to Our Homes

industry



automobile
chemical
electronic
food

field



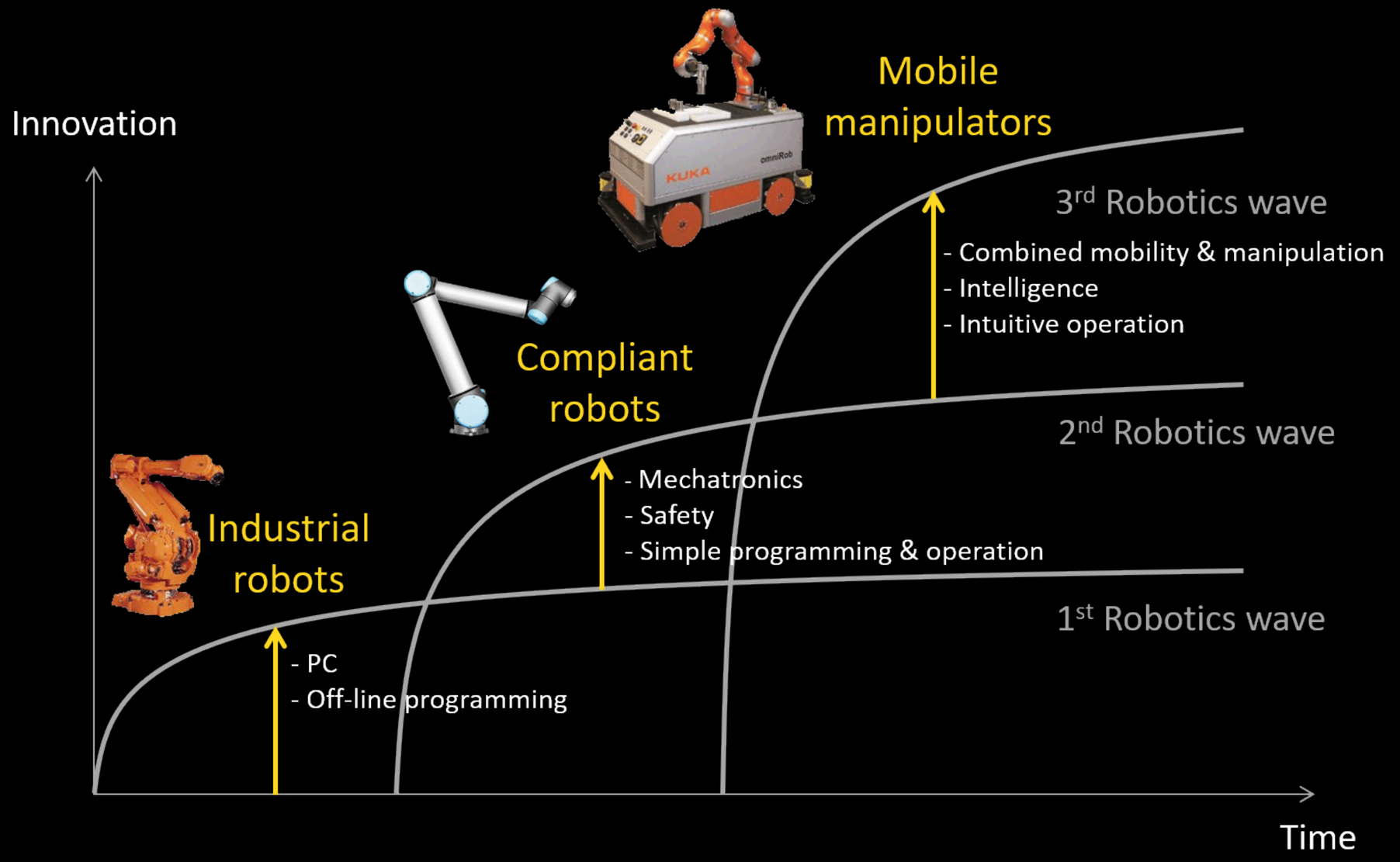
aeronautics
aerospace
subsea
rescue

service

domestic
edutainment
rehabilitation
medicine

level of autonomy

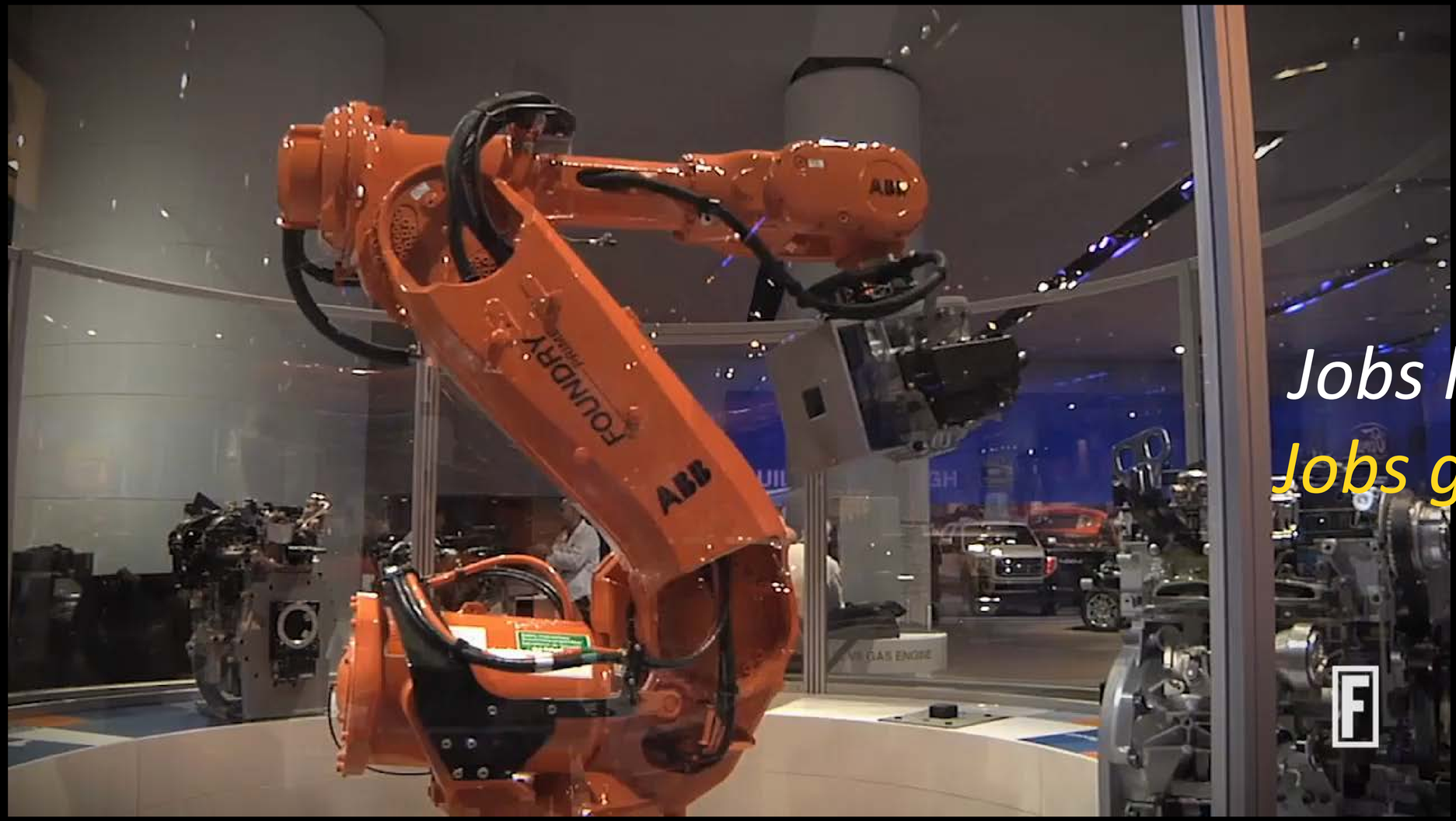
Industrial Robotics Evolution



Industry 4.0

Robot
ation
OT)

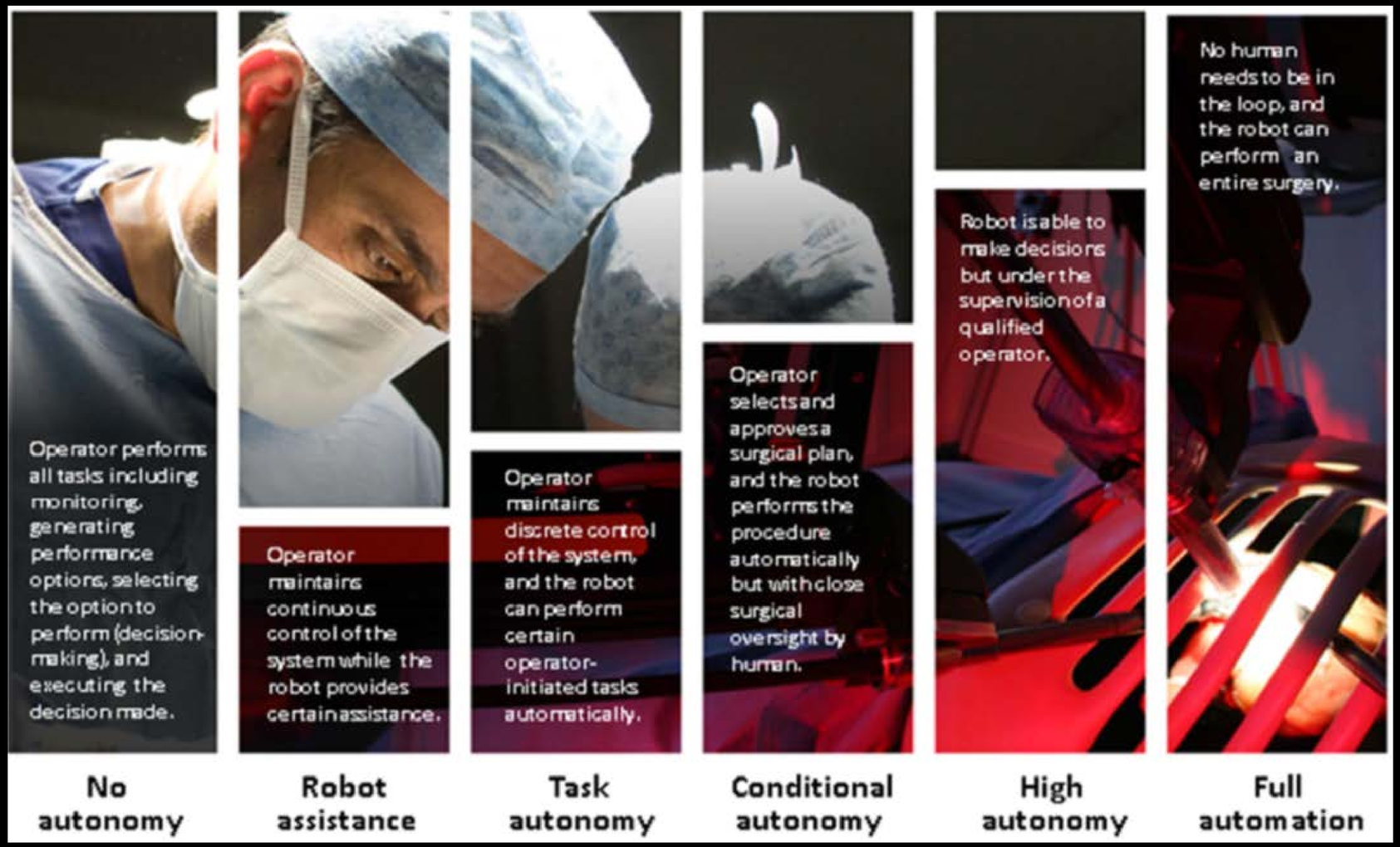
Robots as Job Killers?



Jobs lost …

Jobs gained

Levels of Autonomy



Challenges and Outreach

New emerging areas

Biomechanics

Haptics

Neurosciences

Machine learning

Virtual prototyping

Animation

Surgery

Sensor networks

...

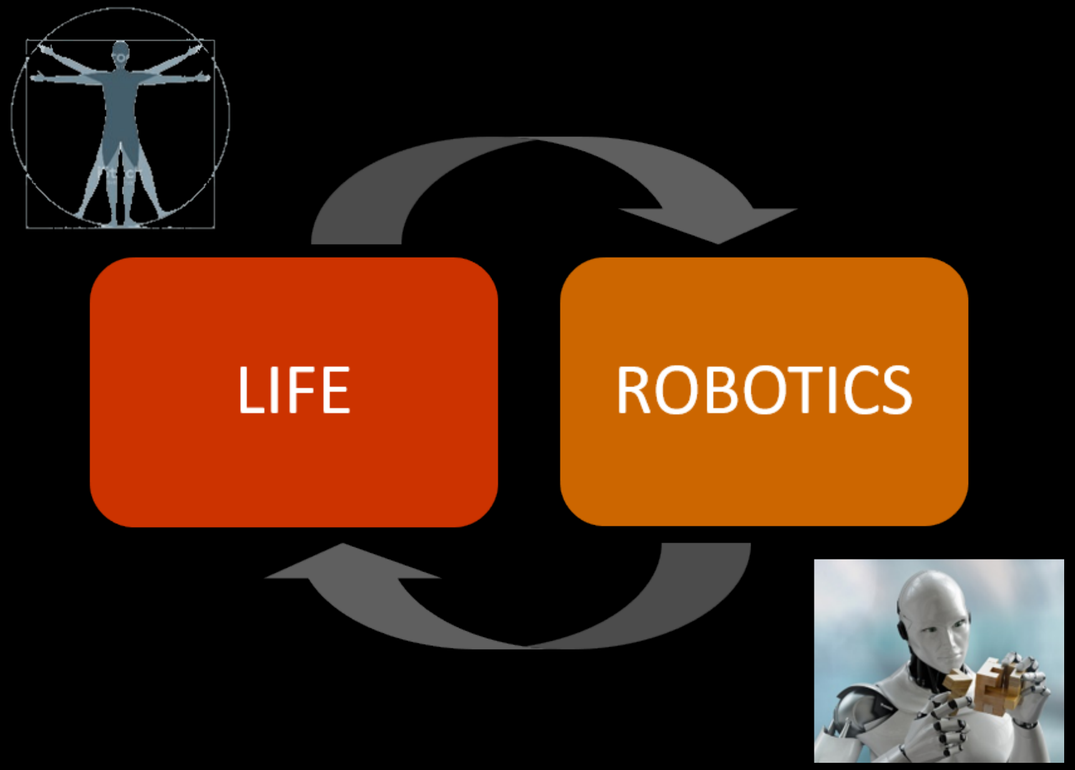
New communities of users and developers

Most striking advances happening at intersection of disciplines

Future developments and expected growth of field largely depending on scientific cooperation

Robotics technology becoming ubiquitous, distributed and embedded into smart environments

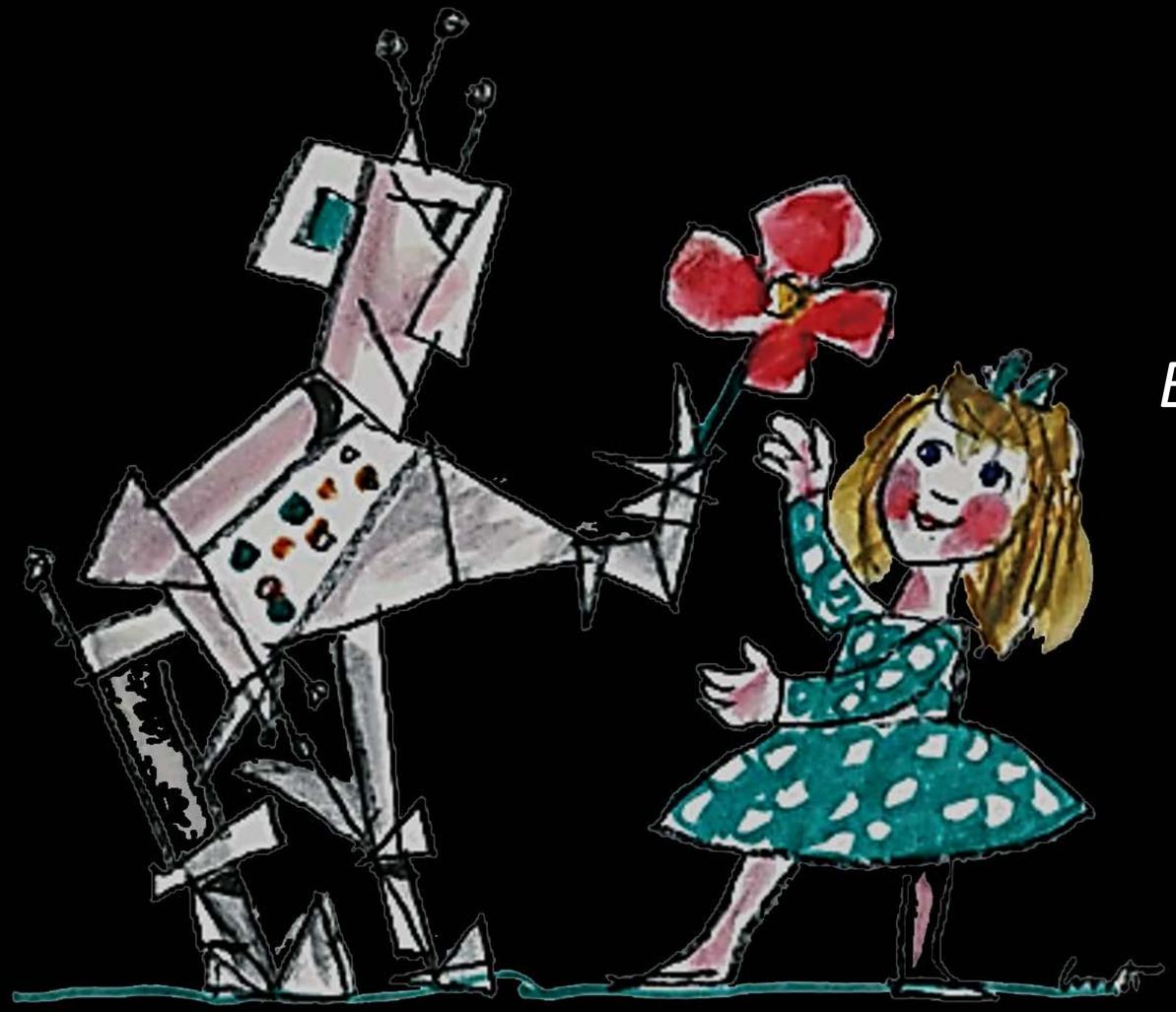
Robots & Humans



A future where robots are more social than solitary

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

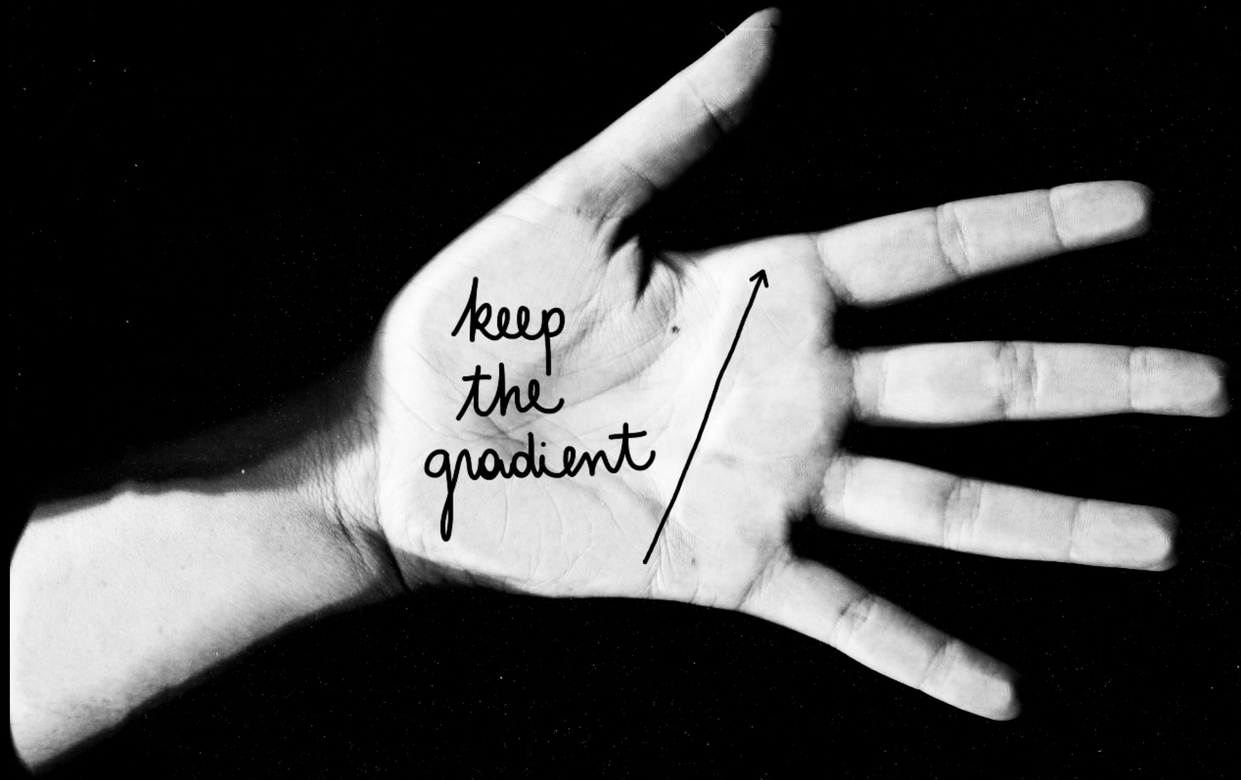
Roboethics



Ethical, legal, societal and economical (ELSE) issues for design, construction and use of robots

Cohabitation of humans with robots

robots are
with us,
within us
and among us



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