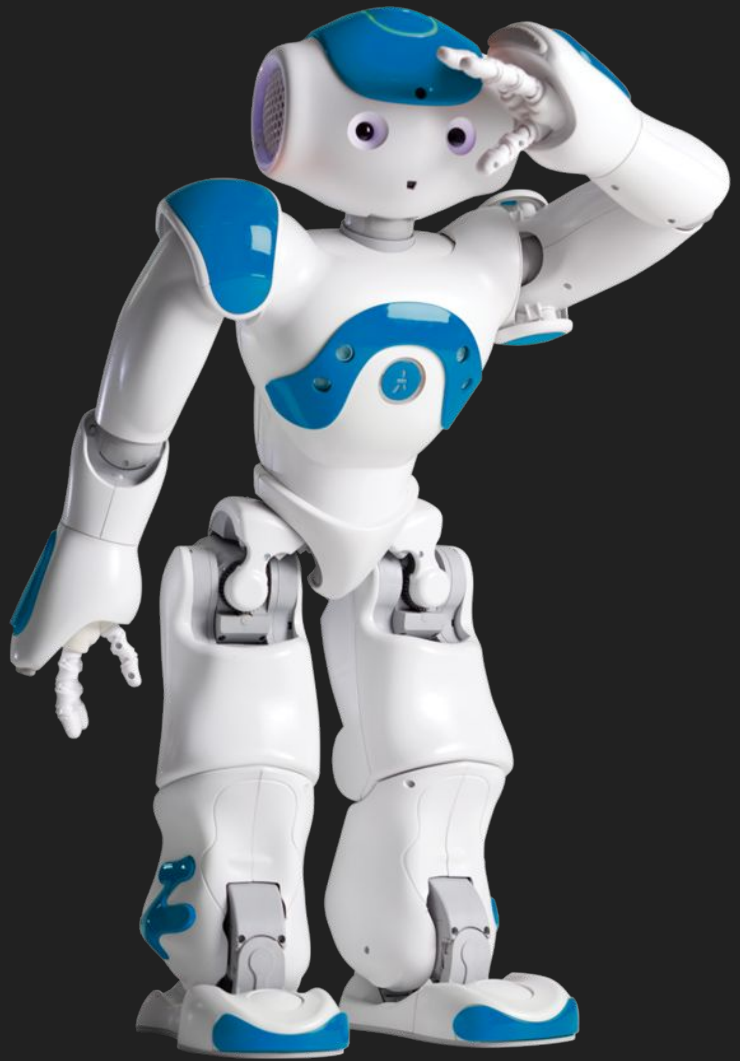
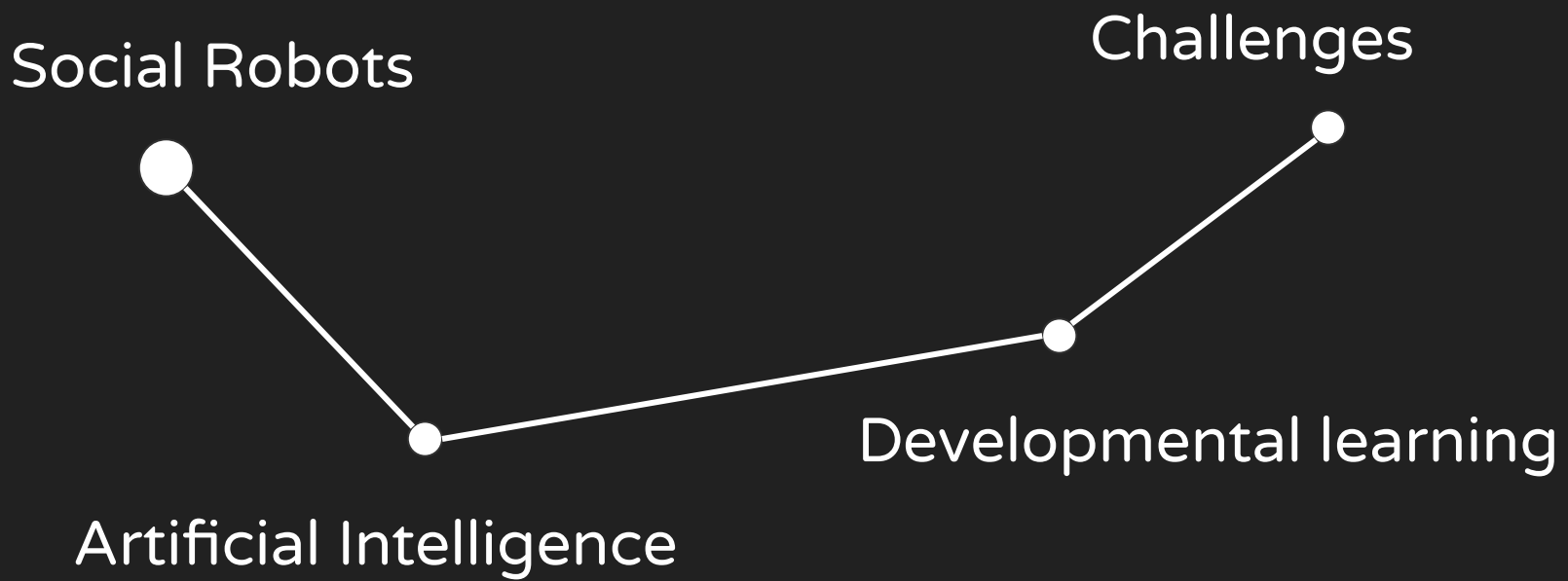


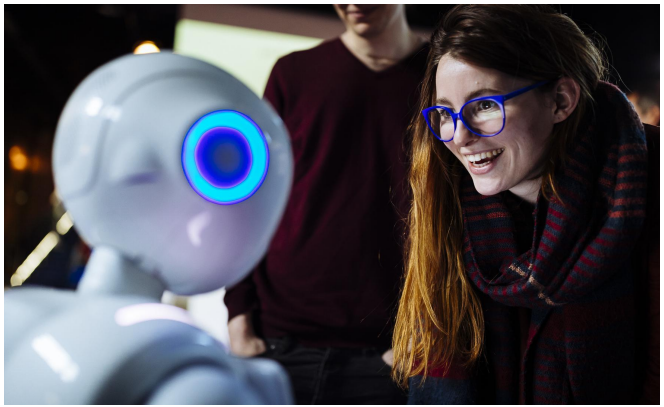
Challenges for artificial intelligence by… a social robot

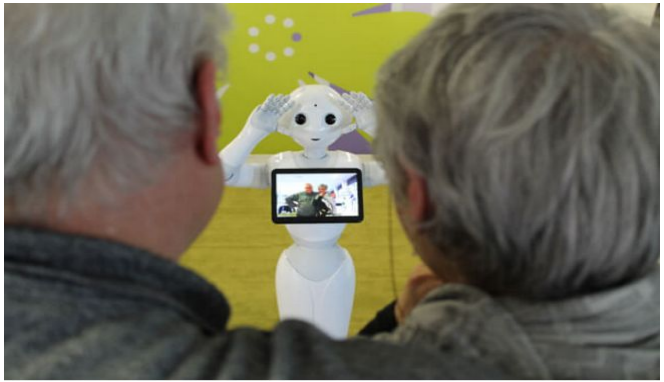
Amélie Cordier
@amcordier
March 21nd 2022

Roadmap


Social Robots
Challenges
Developmental learning
Artificial Intelligence

About Social Robots





Our robots

Pepper

SOFTBANK ROBOTICS

Nao

SOFTBANK ROBOTICS

I-Hease

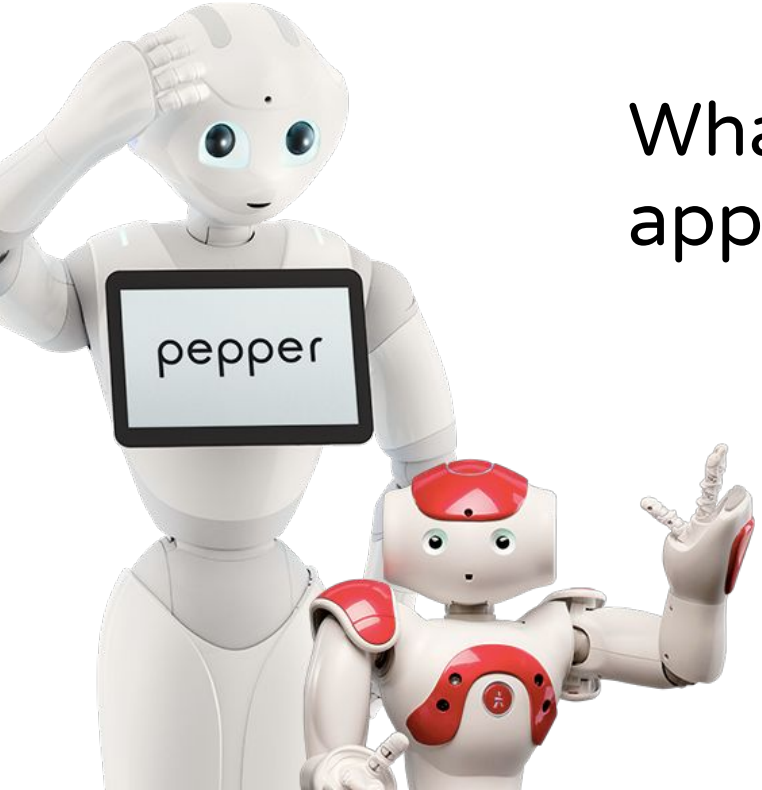
HEASE ROBOTICS

Buddy

BLUE FROG ROBOTICS

Sanbot

QIHAN



What does it mean to design applications for social robots?

Application examples

The design of social robot interactions

- Form factor
- Quality and performances of the provided services
- Vocal interaction
- Non verbal interactions
- Emotional intelligence

How do we do it?

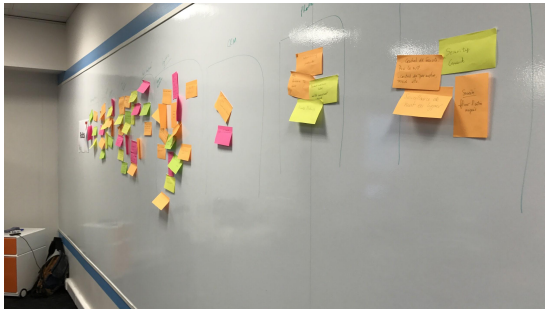
A lot of experiments with end-users in many different situation

A methodology to design better application

Human-centered design

AI based solutions

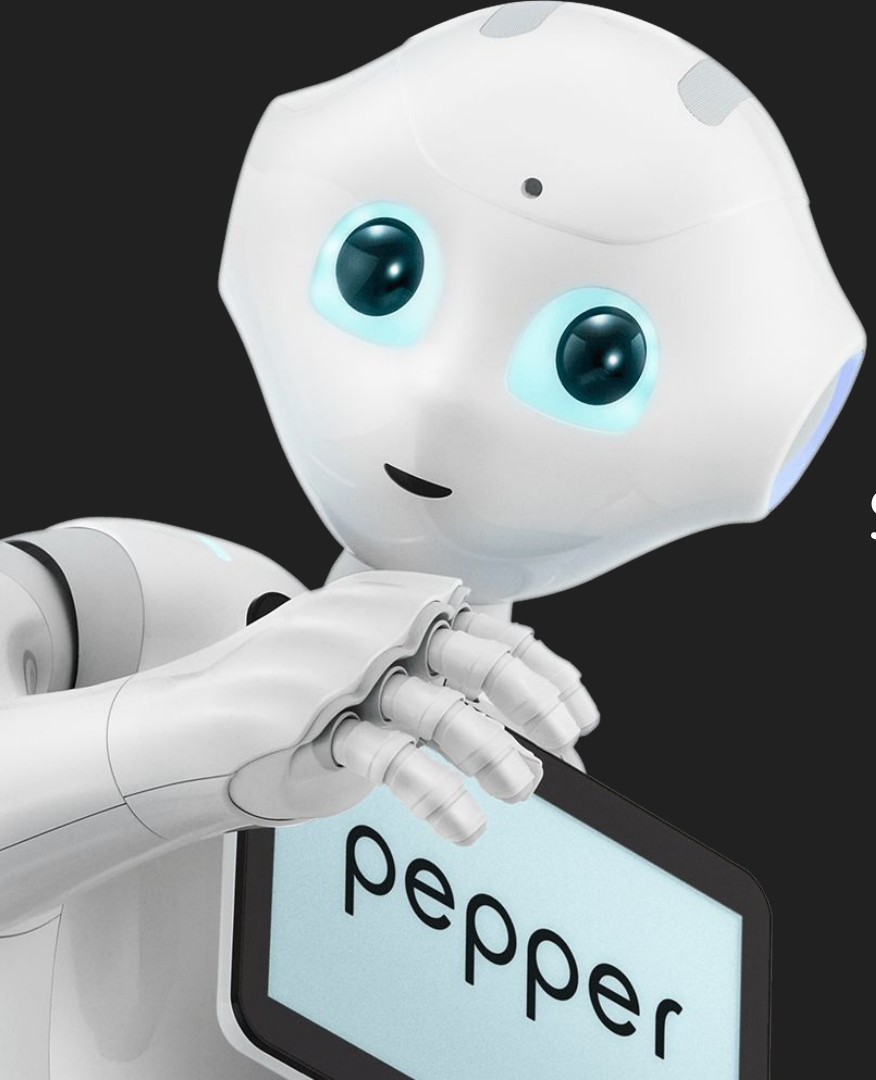
AI Lab (**behaviors.ai**)



Challenges and expectations

For social acceptance and usefulness, we need to:

- Improve perception
- Deal with performances and miniaturization issues
- Address ethical issues relating to privacy and personal data
- Build a form of emotional intelligence
- Make progresses on learning / adaptation capabilities



So, what about AI and **me**?

What AI is, and what it should be...


Artificial intelligence, often called deep learning by specialists...

What AI really is…

(as I see it)

AI is not only about focused **pattern recognition** tasks!

What AI really is about, and how we use it

Active perception

High level reasoning

Autonomy

Adaptation, learning

Lifelong learning, evolution

Bio-inspired, developmental learning

Emotions, emotional intelligence

Behaviors

Interaction, communication skills


C'étaient des céréales pour les enfants
Mange ton pamplemousse.

Developmental artificial intelligence

Developmental artificial intelligence

Bio-inspired approach

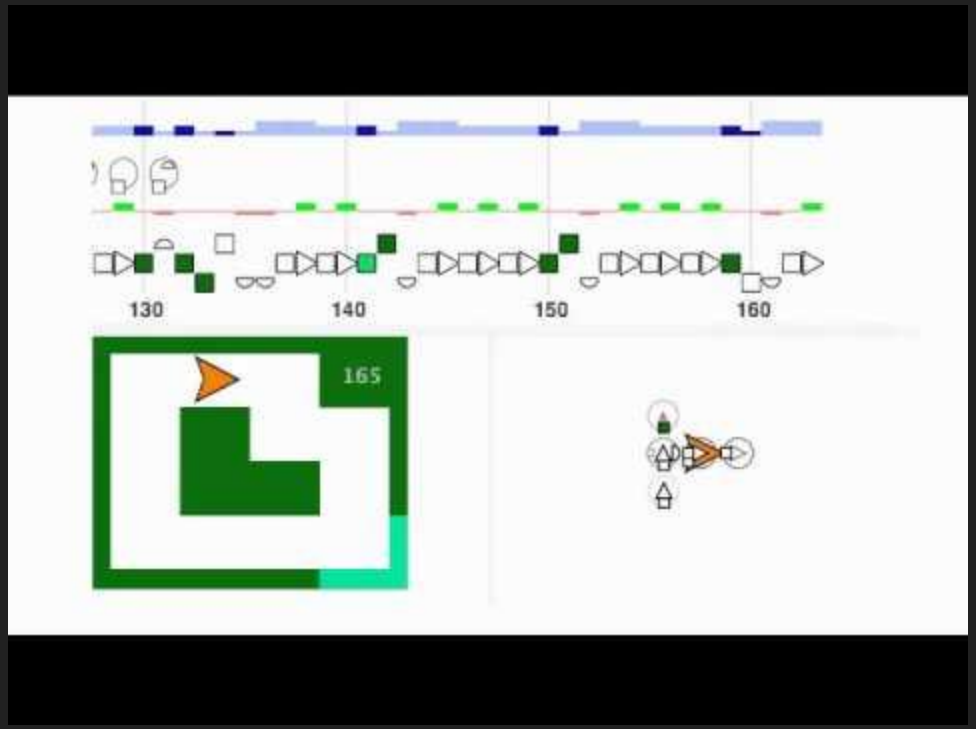
No a priori about the environment (agnostic)

Learning from interactions regularities (patterns)

Intrinsic motivation, curiosity

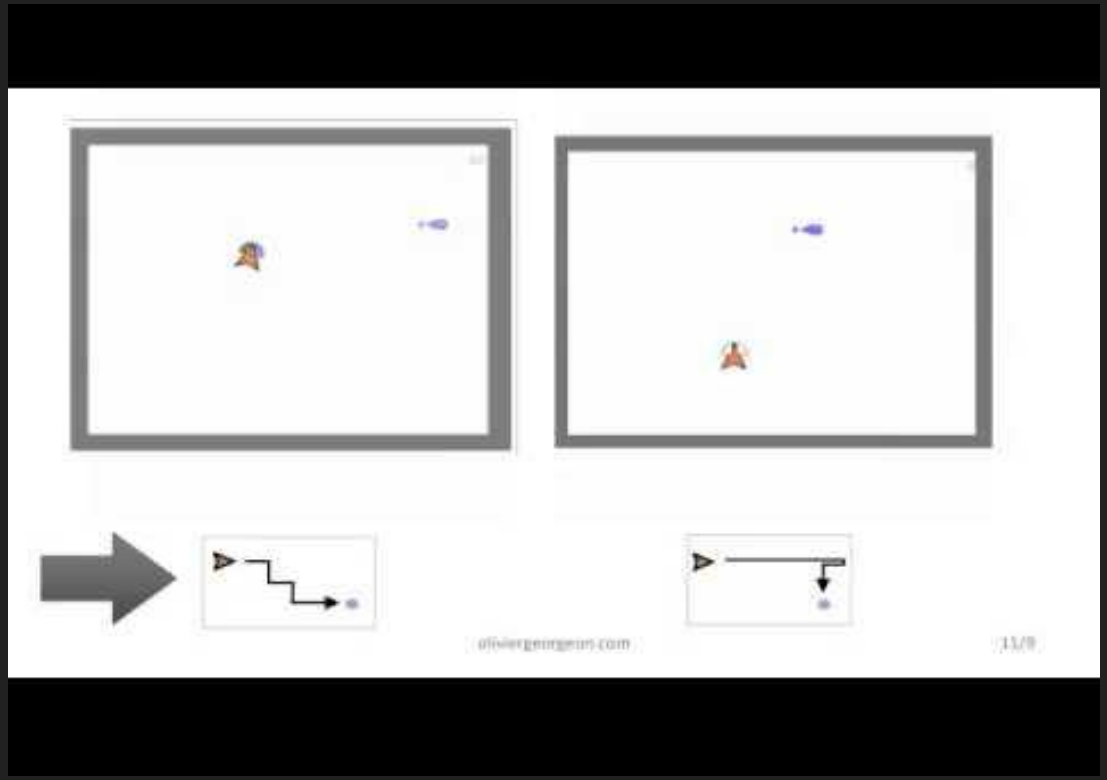
We all do it!

Implementation



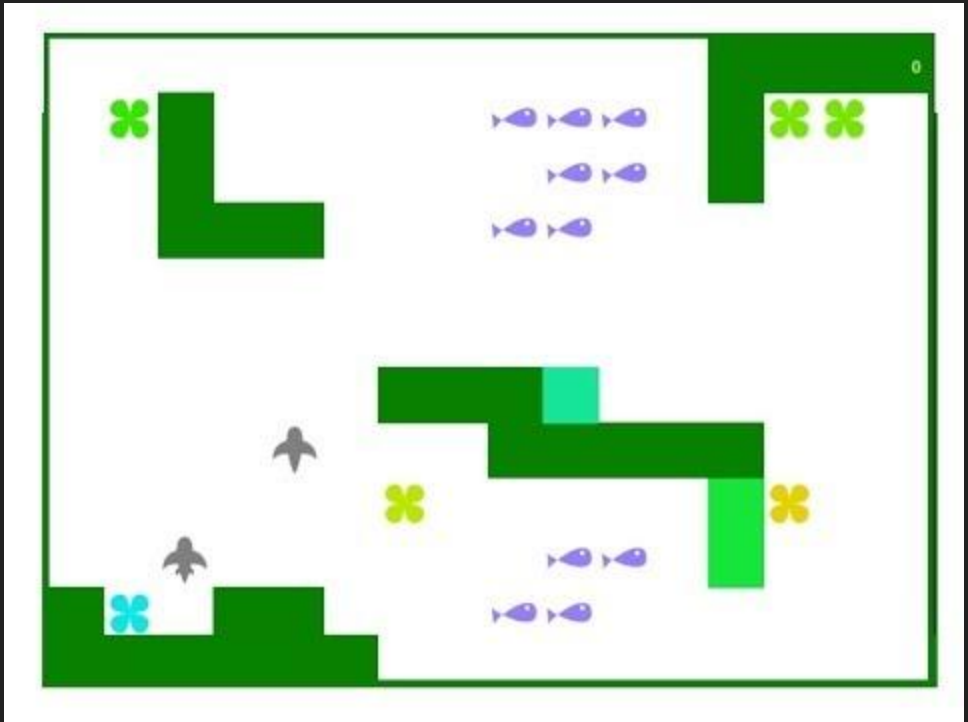
Work and video by Olivier Georgeon - https://lirirs.cnrs.fr/ideal

Emergence of behaviors, free-will and individuation



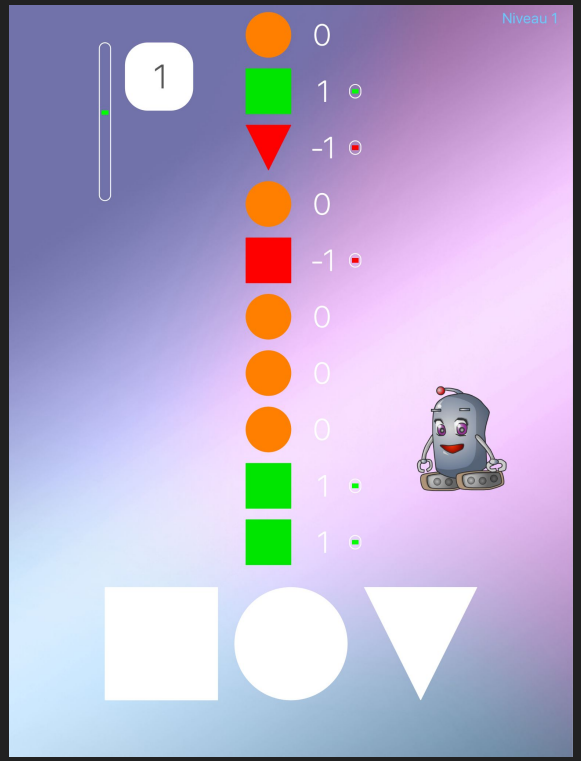
Work and video by Olivier Georgeon - https://lirirs.cnrs.fr/ideal

More complex behaviors, continuous environment



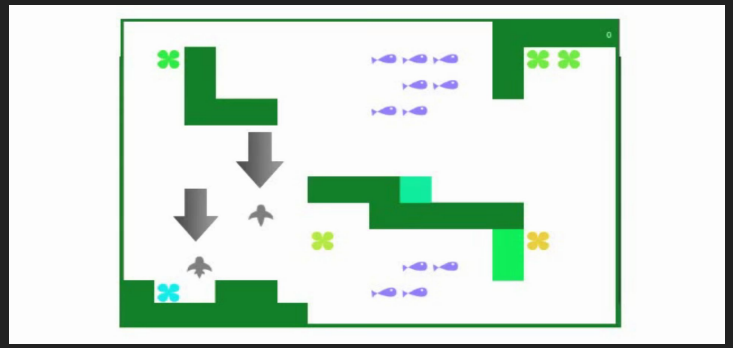
Work and video by Olivier Georgeon - https://lirirs.cnrs.fr/ideal

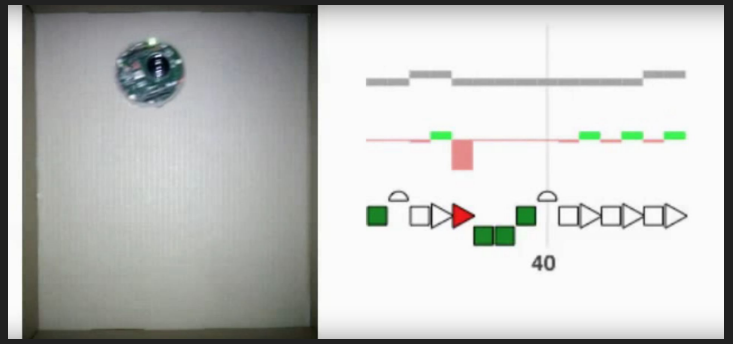
If you want to try by yourself...

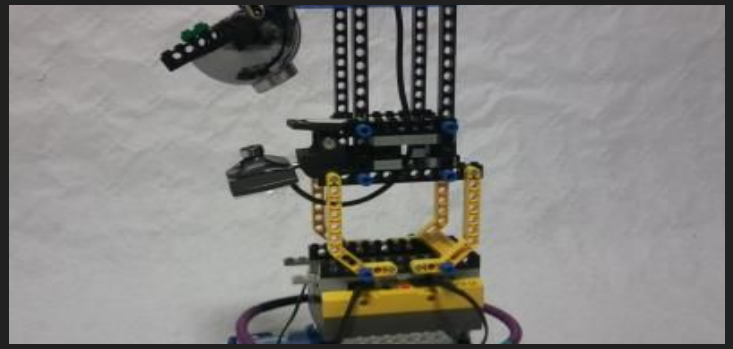


LittleAI - https://little-ai.com - Available on iOS only (for now...)

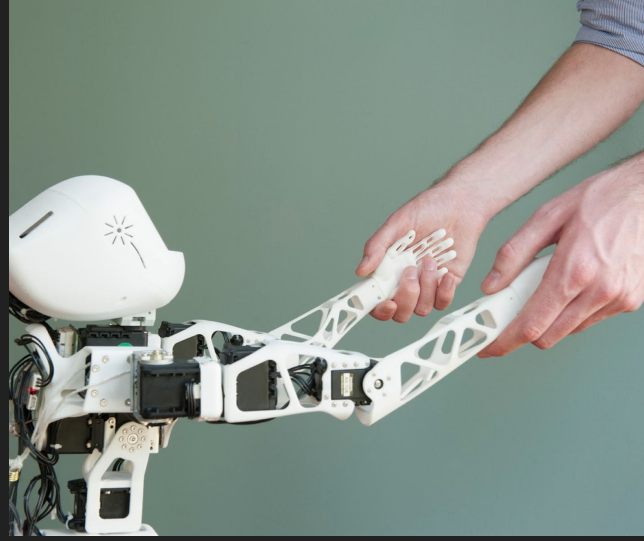
From agent simulation to social robots

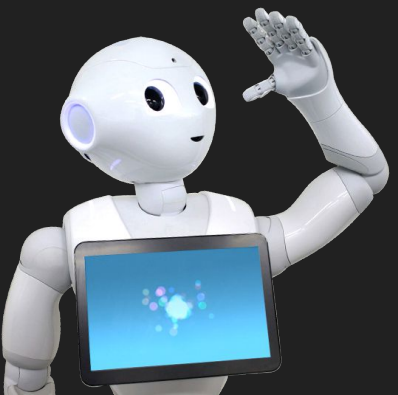






The first line represents the interactions the agent intended to enact (no background color means he just tries the experiment to see what happens)





“I believe that, soon enough, we will stop programming and training AI, and we will start to educate them on a daily basis…”

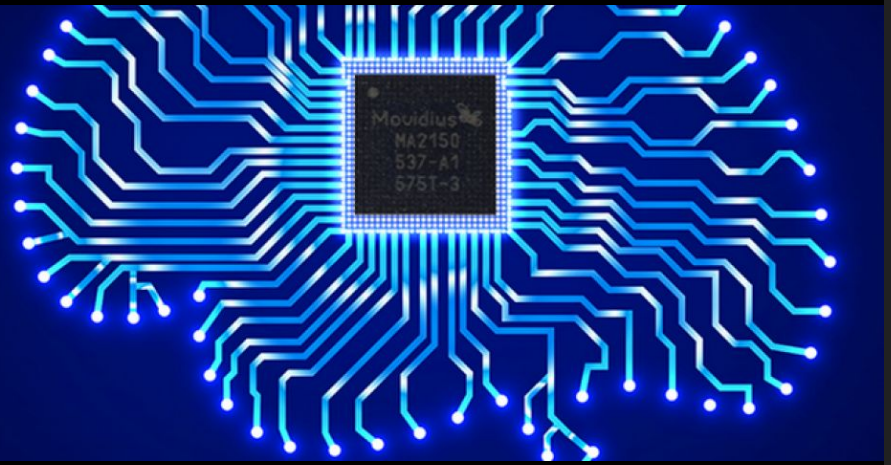
Implications

- natural and instinctive interactions
- many **challenges** to address

Challenge 1 - perception

intelligence in the sensor

1. AI in the sensor



Perception? Vision? Audio?
Situated AI?

Which standards for perception?

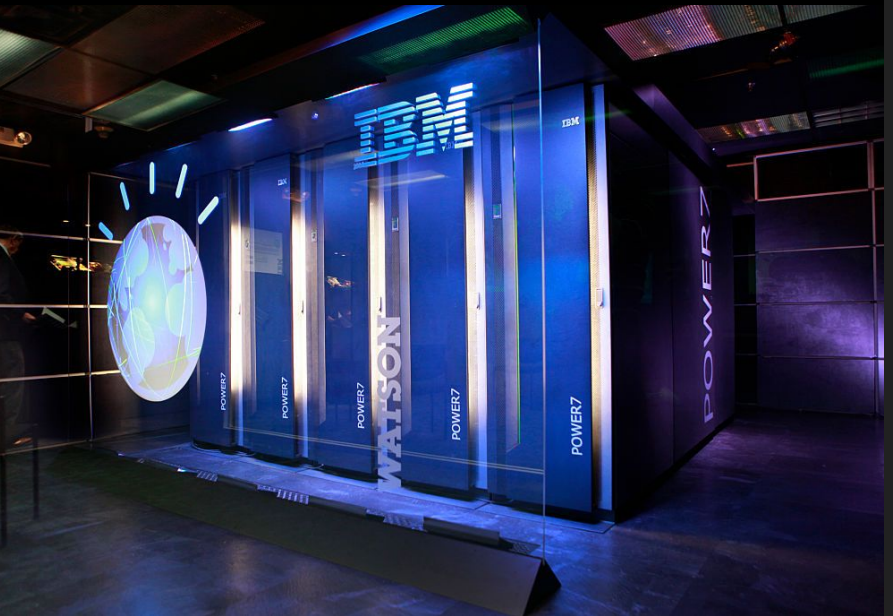
How to represent knowledge?

Stop thinking pixels, start thinking abstract representations!

Challenge 2 - scale

complexity, ubiquity

2. Scaling up



From human to society

From home to earth

How to forget, abstraction

Compute / predict the future

Complexity

Challenge 3 - sustainability

energetical challenges,
problems and solutions with AI

3. Sustainability

Challenge 4 - security

Cyber-security and privacy by design

4. Embedded security

Embed security in devices

Process encrypted data directly

Tools for validation and verification of algorithms

Transparency for the end-user

Challenge 5 - situated AI

… and consequences

5. Situated AI

In between the physical world and the digital world

UX and UI multimodal challenges

Context understanding

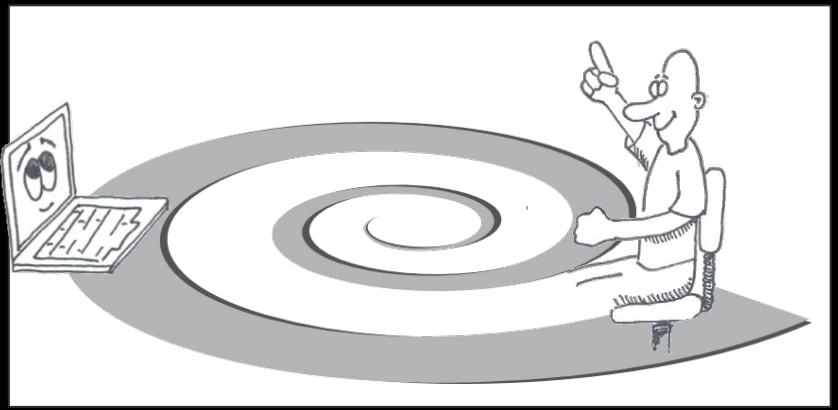
Explainability

Temporality

Challenge 6 - learning

lifelong learning and resilient AI

6. Lifelong learning and resilient AI



Human in the loop

Common sense knowledge

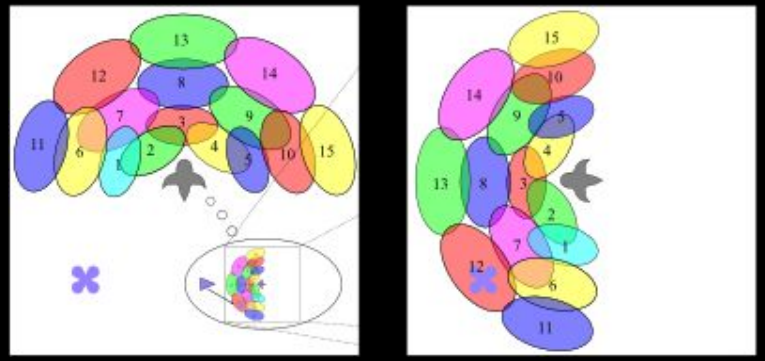
Emergence of knowledge

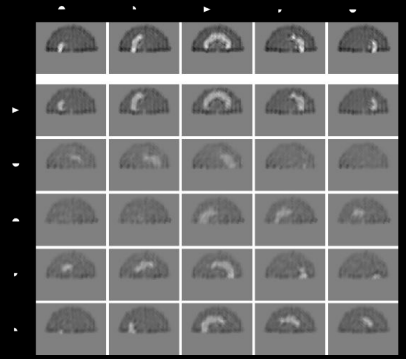
Uncertainty

Challenge 7 - memory

bio-inspired memory!

7. Bio-inspired memory



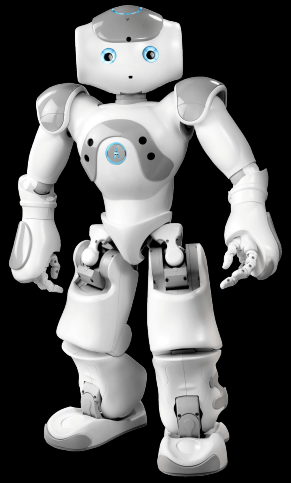


Are 0 and 1 a good way to encode our knowledge?

Challenge 8 - emotions

because communication does not only use words...

8. Emotions



Detect emotions

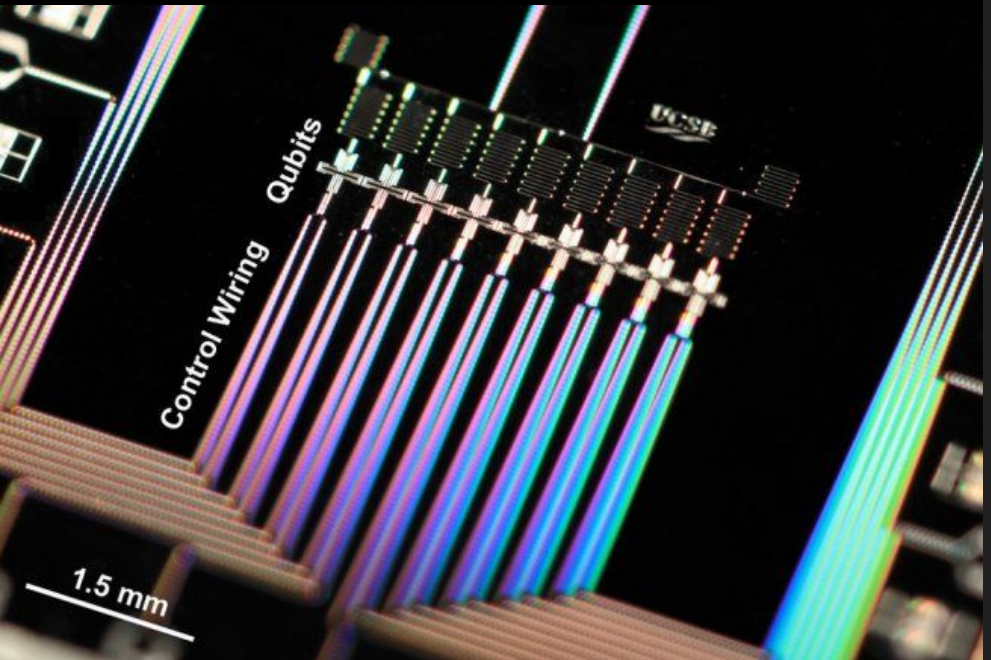
Model emotions

Interpret emotions

Communicate emotions

Challenge 9 - quantum computing

9. Quantum computing



Computing capacities?

Radical change in the way we think about knowledge representation

Quantic hypothesis about the emergence of the consciousness

Challenge 10 - ethics

Ethics, social and economical impacts

10. Ethics, social and economical impact

Data market

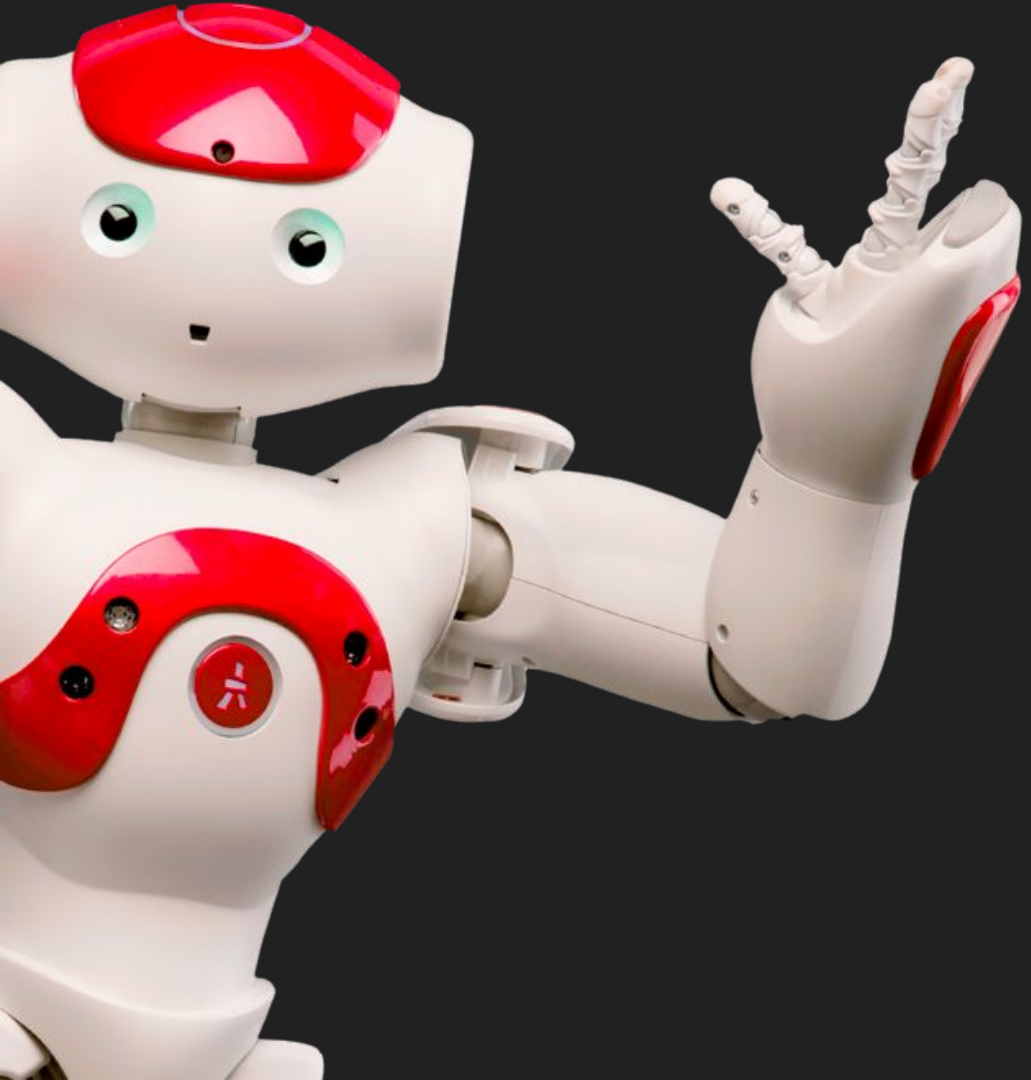
Roles of personal assistants… how do they change the way we “see” the world?

Norms and values of AI systems

How AI alters our jobs…

We have to make sure that AI is beneficial for all…
and not just for the lucky ones!


Thank you for your attention!
@amcordier



More?

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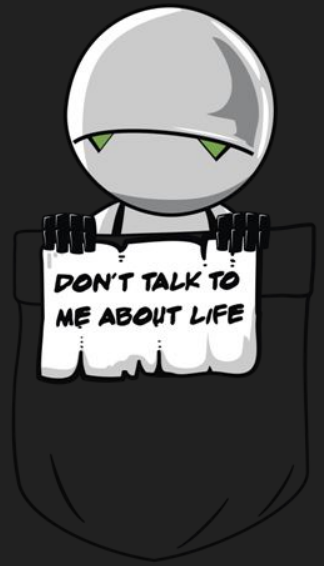
Real dangers of AI according to Diettrich and Horvitz

The actual risk is not the “loss of control” risk

- Bugs
- Cyber attacks
- Bad guesses about the wishes of the users
- Shared autonomy
- Social impacts of IA

Little AI in action

Interaction engine


DON'T TALK TO
ME ABOUT LIFE