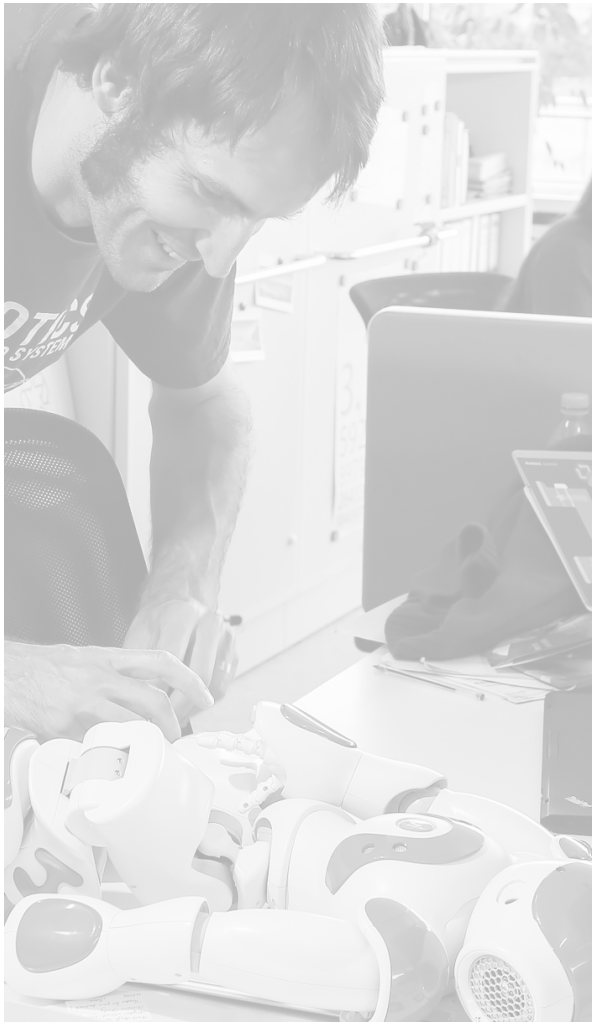
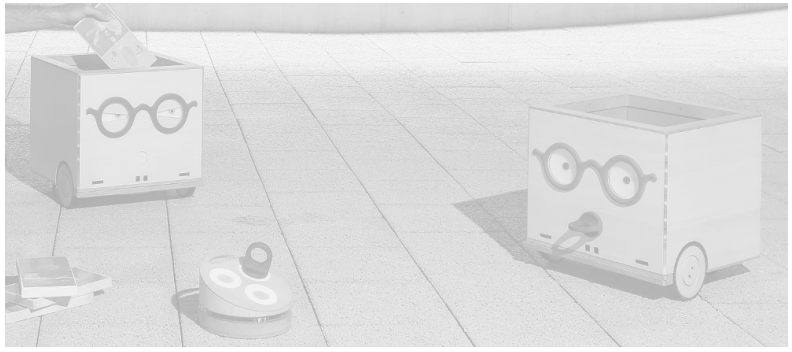
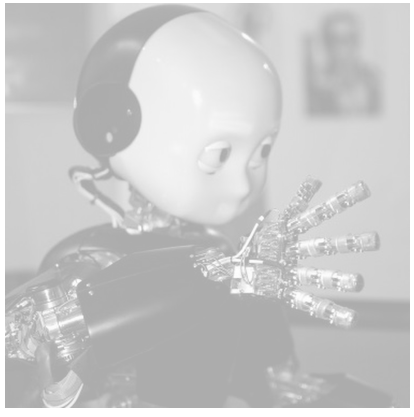
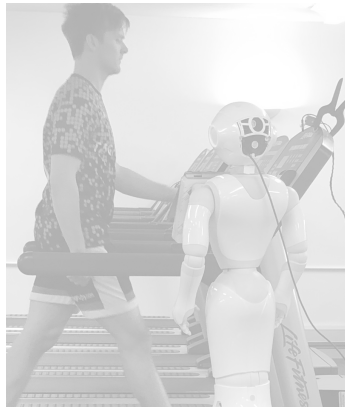
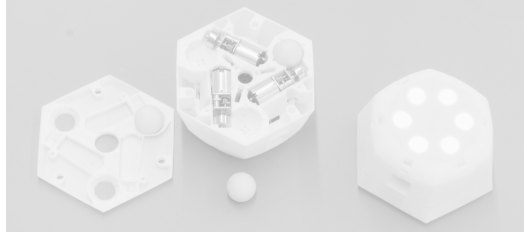
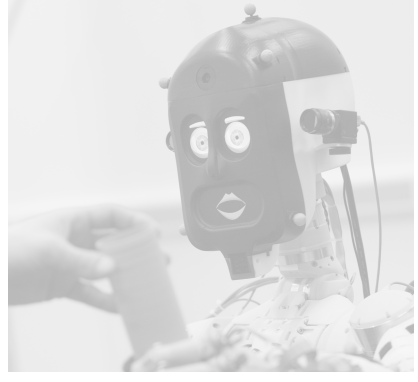







Dr. Séverin Lemaignan

A strategic vision towards Socially-Driven Autonomous Robots for Real-World HRI

SHORT BIO

- **2008–2012** Joint French (LAAS-CNRS) German (TU Munich) PhD
  - AI & Cognitive Robotics
  - Prix GdR Meilleure thèse
- **2013–2015** Post-doc at EPFL
  - Creation of an internationally recognised HRI team
- **2015-2018** Post-doc + lecturer at Plymouth University, UK
  - EU Marie Curie fellowship
  - Social Cognition in Robotics
- **2018–** Associate Prof. at Bristol Robotics Lab

situation assessment

symbolic grounding

symbolic reasoning

SYMBOLIC SOCIAL COGNITION FOR ROBOTS

ontologies

perspective taking

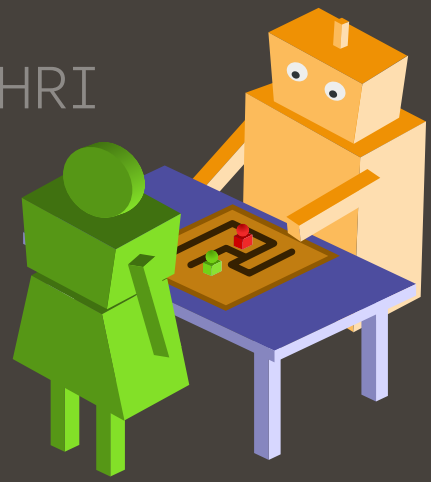
cognitive architectures

social situation assessment

joint action

ROS4HRI

natural language processing



REAL-WORLD SOCIAL AUTONOMY

DATA-DRIVEN HRI

learning of social policies

large datasets

theory of mind

group dynamics

human-in-the-loop ML

social robotics

responsible AI

trust

experimental robotics

HUMAN FACTORS

child-robot interaction

robotics for learning

engagement

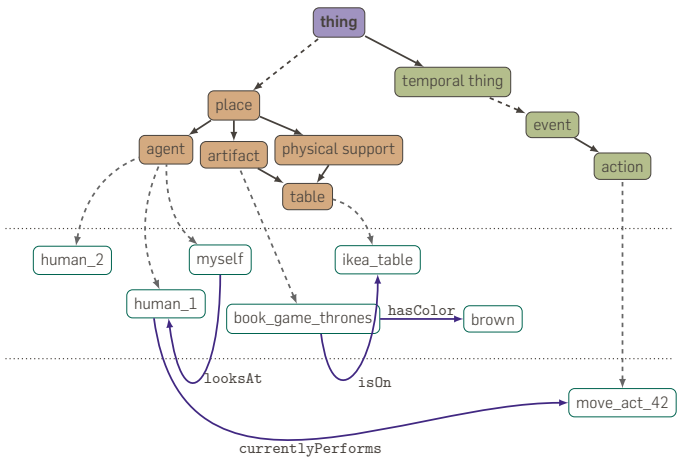
anthropomorphism

persuasion

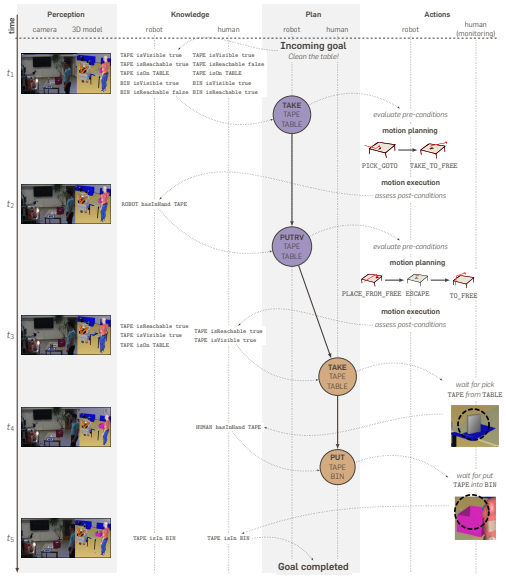
participatory design

SYMBOLIC SOCIAL COGNITION FOR REAL-WORLD AUTONOMY

- real-time situation assessment
- geometric reasoning
- perspective-taking



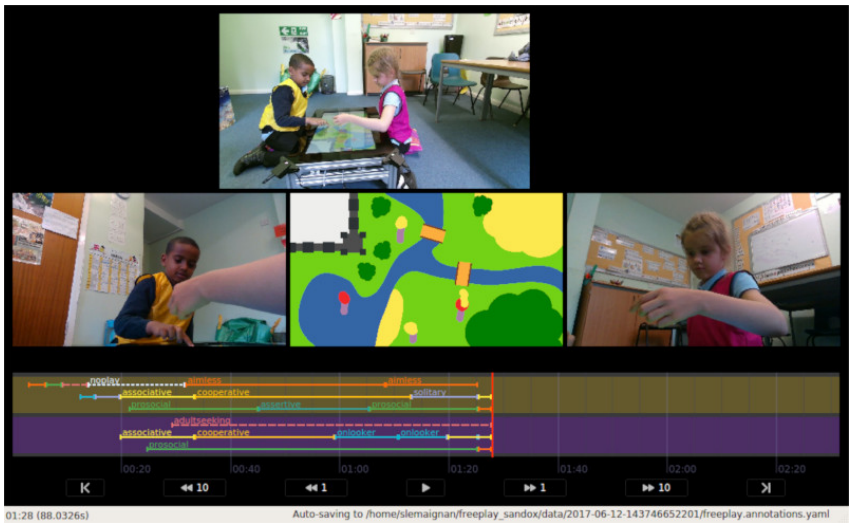
- ontologies
- real-time symbolic reasoning
- theory of mind

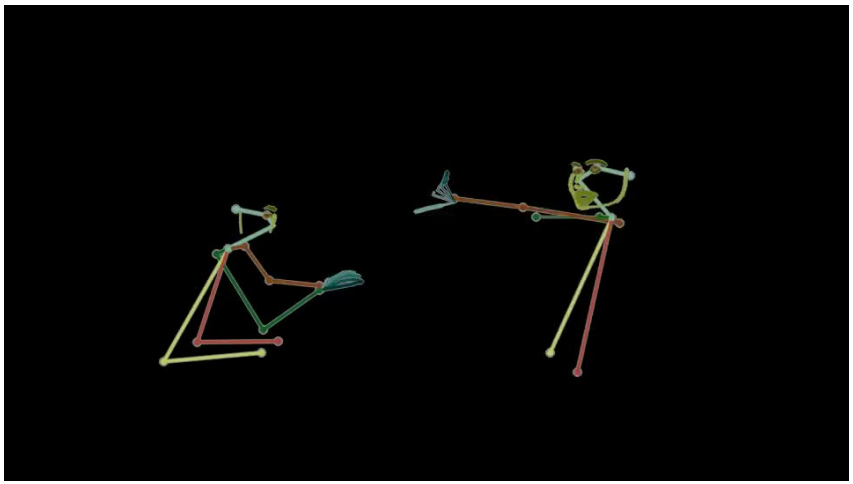


- Complete cognitive architecture
- Autonomy in semantic-rich social environments

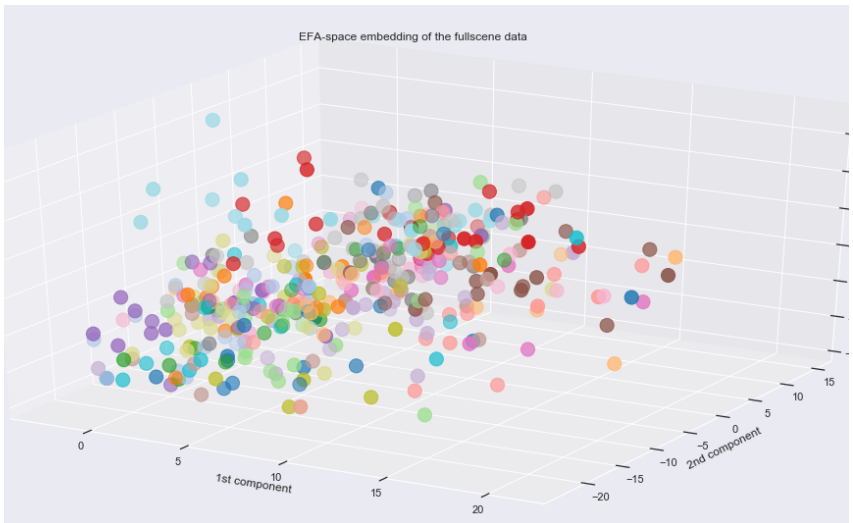
[Lemaignan et al. **Grounding the Interaction: Anchoring Situated Discourse in Everyday [...]** Intl. Journal of Social Rob. 2011],
[Lemaignan et al. **Artificial Cognition for Social Human-Robot Interaction: An Implementation** Artificial Intelligence 2017]

DATA-DRIVEN HRI — dataset of natural interactions



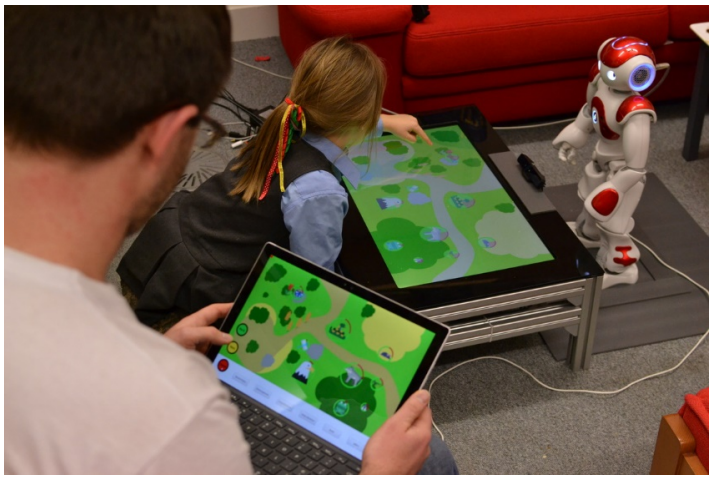


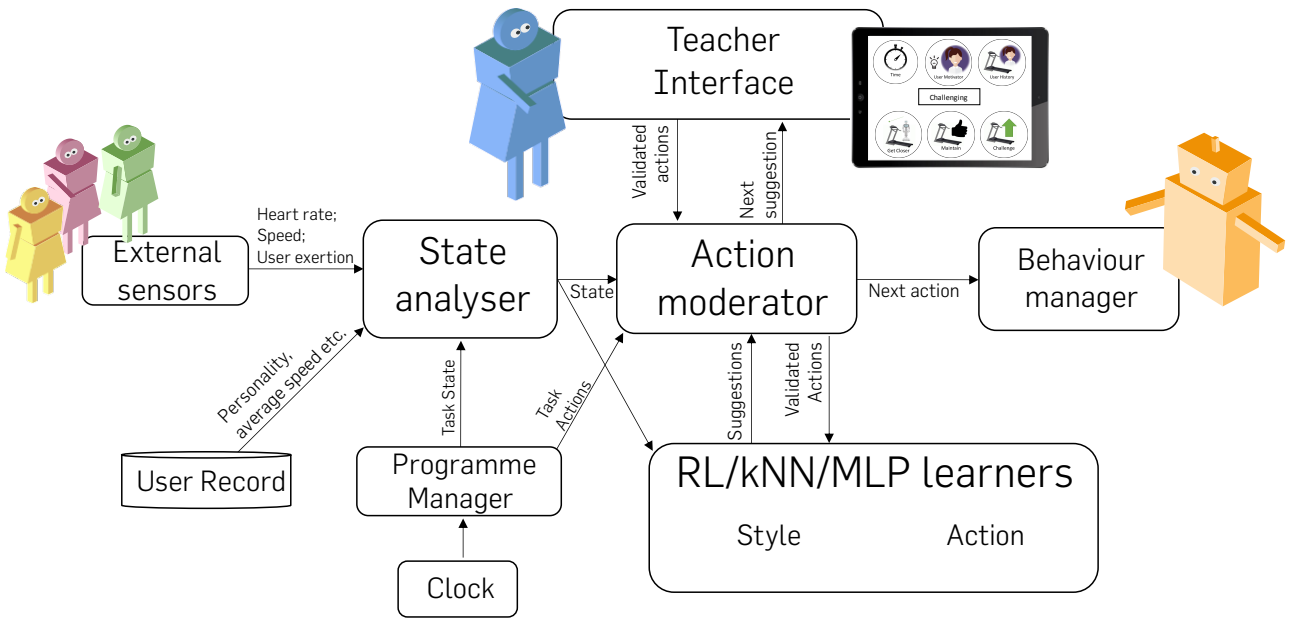
- PInSoRo dataset: 45h+ and 2M frames of annotated natural interactions
- new data analysis techniques to estimate internal state from body language
- first-in-kind dataset for data-driven study of social interactions in robotics



[Lemaignan et al. **The PInSoRo dataset: Supporting the data-driven study of child-child and child-robot [...]** PLOS One 2018]
[Bartlett et al. **What Can You See? Identifying Cues on Internal States from the Kinematics [...]** FrontiersIn 2019]

DATA-DRIVEN HRI — expert-in-the-loop machine learning



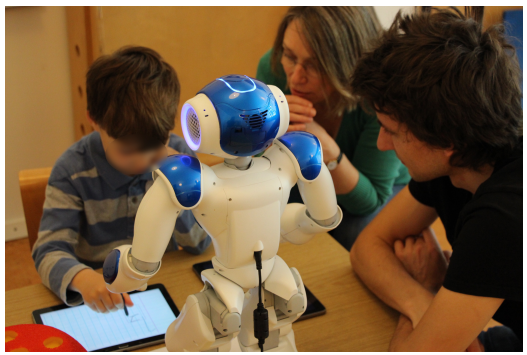


[Senft et al. **Teaching robots social autonomy from in situ human guidance** Science Robotics 2019]
[Winkle et al. **In-Situ Learning from a Domain Expert for Real World Socially Assistive Robot Deployment** RSS 2020]

HUMAN FACTORS — experimental work

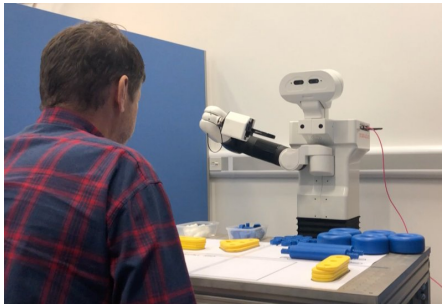
Extensive experimental work:

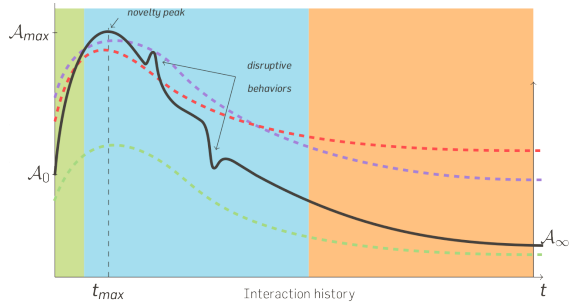
- over 25 field experiments over the past 10 years
- mixed methods; focus on real-world experiments (eg schools, gyms)
- child-robot interaction expertise: worked with 200+ children



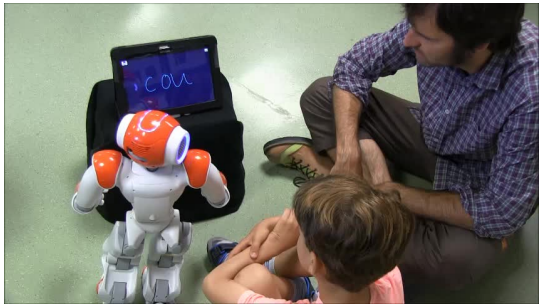
HUMAN FACTORS — expertise

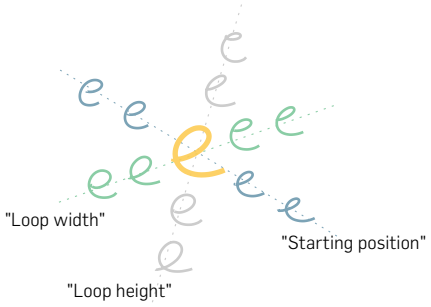
Understanding interaction

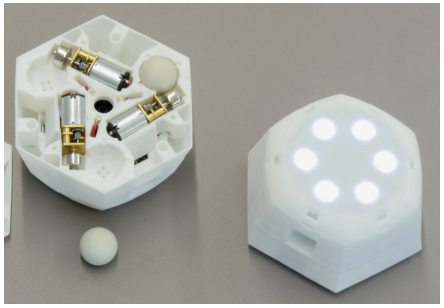




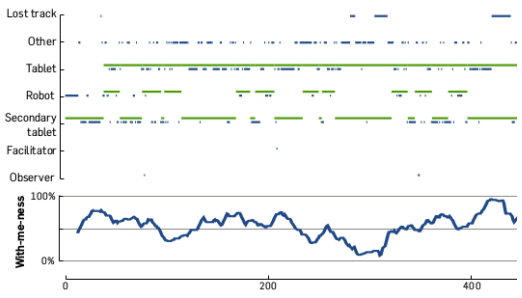
Robots for Learning

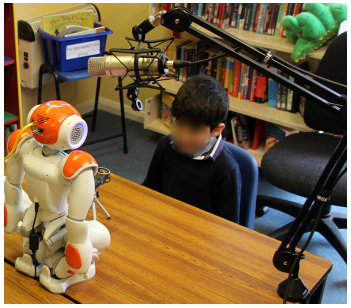


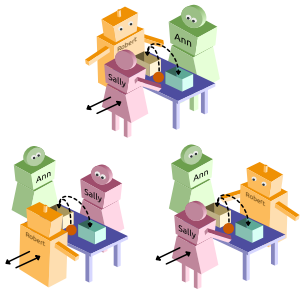




Methodology







SCIENTIFIC IMPACT

Contributions to basic research, experimental methodology and technology:

1. **ontologies** for robot knowledge modeling and symbolic reasoning
2. **perspective taking** and **theory of mind**: generate and maintain symbolic knowledge models for all the agents
3. framing & implementing **cognitive architecture for social interaction**
4. leading role in **shaping the emergent field of data-driven HRI**: **large datasets**; transdisciplinary **data-driven behaviour analysis**
5. major advances towards **learning autonomous social policies** for service robots
6. transdisciplinary expertise; number of **cross-disciplinary experimental work** and literature surveys;
7. **Child-robot interaction** expert in Europe

- **80+ publications** (2900+ citations, h-index=26 on Google Scholar), incl. *Artificial Intelligence*, *Science Robotics*
- Prix GdR Meilleure thèse
- Best Paper awards at RoMan, HRI
- major contributions to open-source robotics (core ROS dev); 150+ GitHub repos

MANAGEMENT OF RESEARCH

- **Associate professor in AI and Social Robotics**
- **Supervising 2 groups** at BRL (embodied cognition and autonomous vehicles), ≈**15 researchers**
- Responsible for **defining and implementing their research strategy**
- Currently managing >**€1M funding**
- Previously **established and led cHRI group at EPFL**; now internationally recognised
- Supervised or co-supervised **10 PhDs** to date
- **10+ years of teaching experience**; currently teaching HRI at Master level

IMPACT IN THE SCIENTIFIC COMMUNITY

Editorial activities

- Currently **Programme committee/editorial board** of FrontiersIn Robotics and AI; HRI; RSS; IROS; IJCAI
- Invited member of the **Steering committee** + **Organisation committee** of ACM/IEEE HRI since 2016

Bids and grants:

- PI or Co-I on **19 grant submissions** since 2013, incl. 4 EU ICT bids; 1 EU FET bids; **5 successful to date**
- **EU H2020 Marie-Curie fellowship** on Theory of Mind in 2015
- First **ERC Consolidator submission** in 2019

IMPACT ON THE BROADER SOCIETY

Policy making:

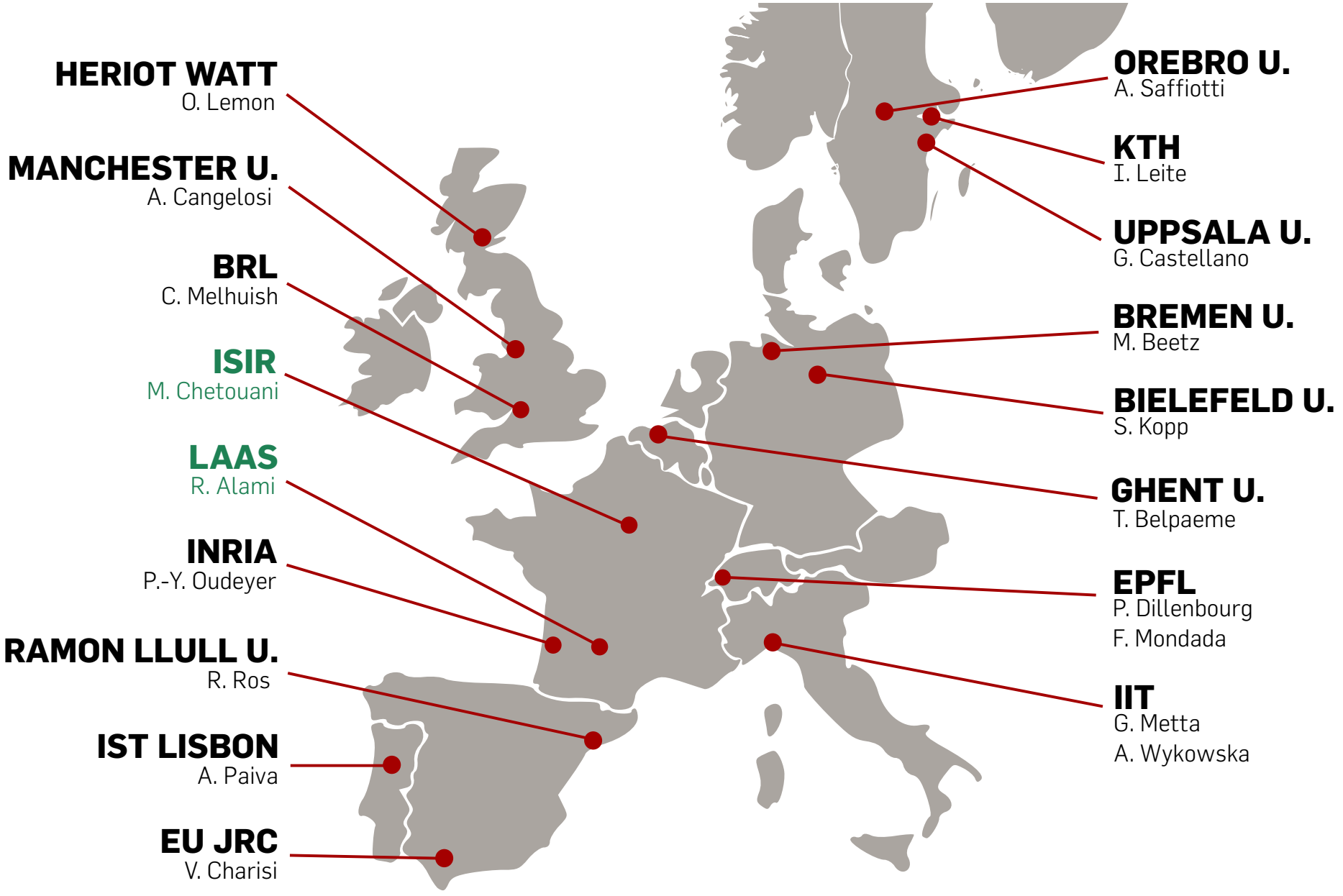
- **Invited expert to EU** on child-robot interaction
- **Scientific advisor for UNICEF** on ethics of cHRI

Technology transfer:

- **Scientific expert** for EU TERRINET, EU SABRE and 3 UK-based industry-led projects
- **Scientific advisor** for start-up KickSum Ltd
- US **patent** US20190016213A1 on haptic locomotion

Public engagement:

- Cluster **lead for outreach** at UWE
- Significant **media engagement** (TV, radio, press; eg CoWriter, Couck25K projects)
- Scientific engagement with public institutions, eg **London Science Museum**



+ **YALE** B. Scasselatti
WASHINGTON U. M. Cakmak
COLORADO U. T. Williams
J. HOPKINS U. C.-M. Huang
SYDNEY M.-A. Williams, W. Johal

situation assessment

symbolic grounding

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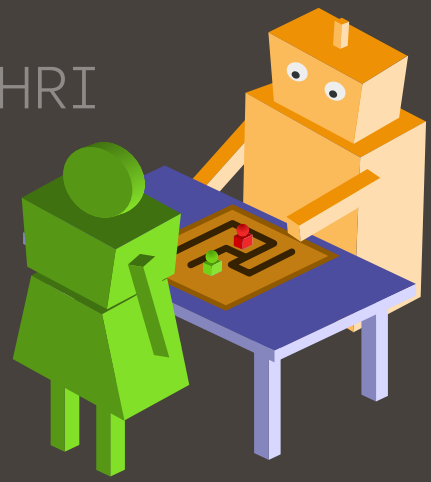

REAL-WORLD SOCIAL AUTONOMY

DATA-DRIVEN HRI

learning of social policies

large datasets

theory of mind

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responsible AI

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persuasion

participatory design

RESEARCH PROJECT: SOCIAL ROBOTICS

Creating interactive robots that are **embedded and understand their (human) social context**; **generate and adopt appropriate social behaviours**; have a **positive impact on human society**.

⇒ designing and implementing the **assistant and companion robots** for tomorrow.

Direct impact on ageing society, education, customer service. **Major socio-economic challenge** + **European priority** ⇒ need to **develop capacity** and assert **leadership**

RESEARCH PROJECT: SOCIAL ROBOTICS

Autonomous social robot: beyond state-of-the-art

Major scientific challenges:

- Understand and sustain long-term autonomous social interactions;
- Closing the interaction loop;
- Real-world algorithmic robustness;
- Complex ethical landscape;
- ⇒ cross-disciplinary & holistic approach required

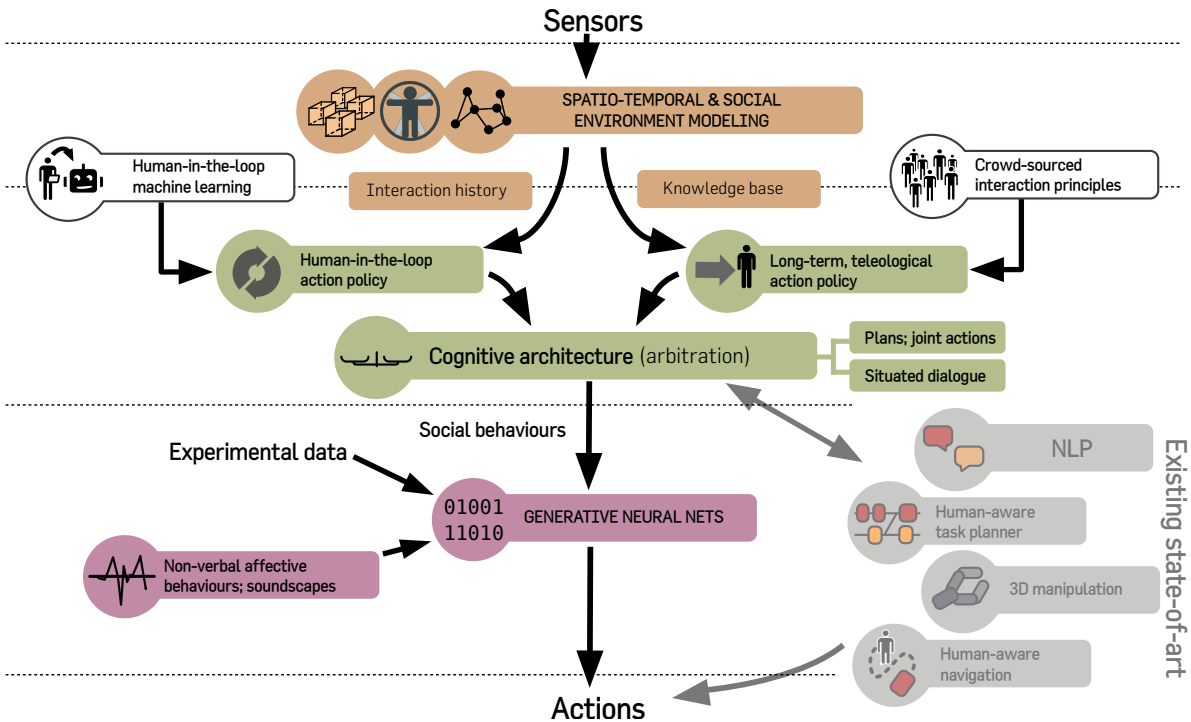
RESEARCH PROJECT: SOCIAL ROBOTICS

My research proposal:

Socially-Driven Autonomous Robots for Real-world Human-Robot Interactions

KEY SCIENTIFIC AIMS

1. beyond state-of-art **robust real-world social modelling**; **social embeddings**
2. **public-in-the-loop** approach to design of **intrinsic social motivation**
3. **generative social behaviours** for robots
4. **cognitive architecture** for **long-term interaction**



MIXED METHODS

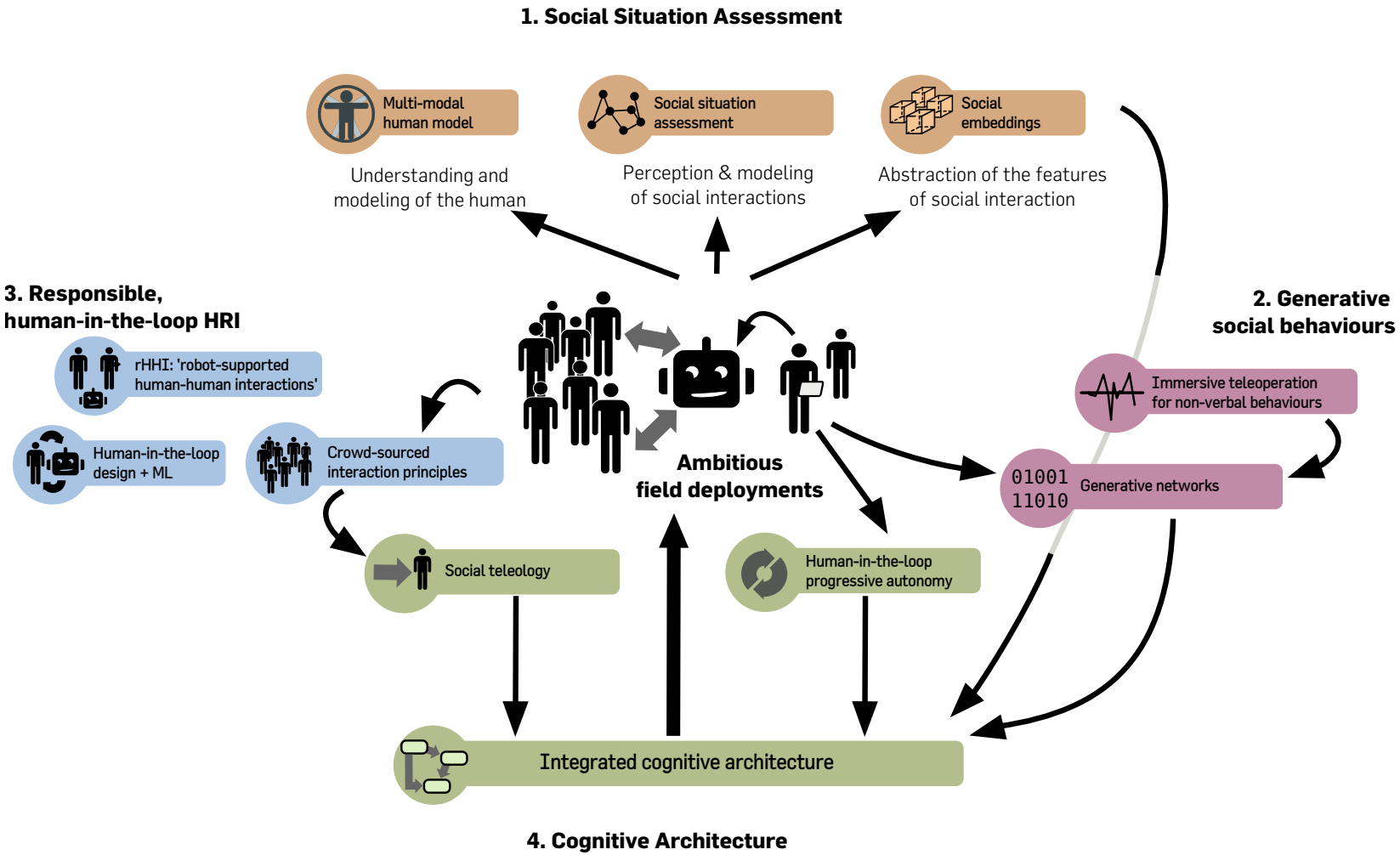
Standard methods:

- Exploratory field work/case studies
- Participatory design; co-design
- Ecologically-valid controlled studies
- Longitudinal studies
- Large-scale online crowd-sourcing

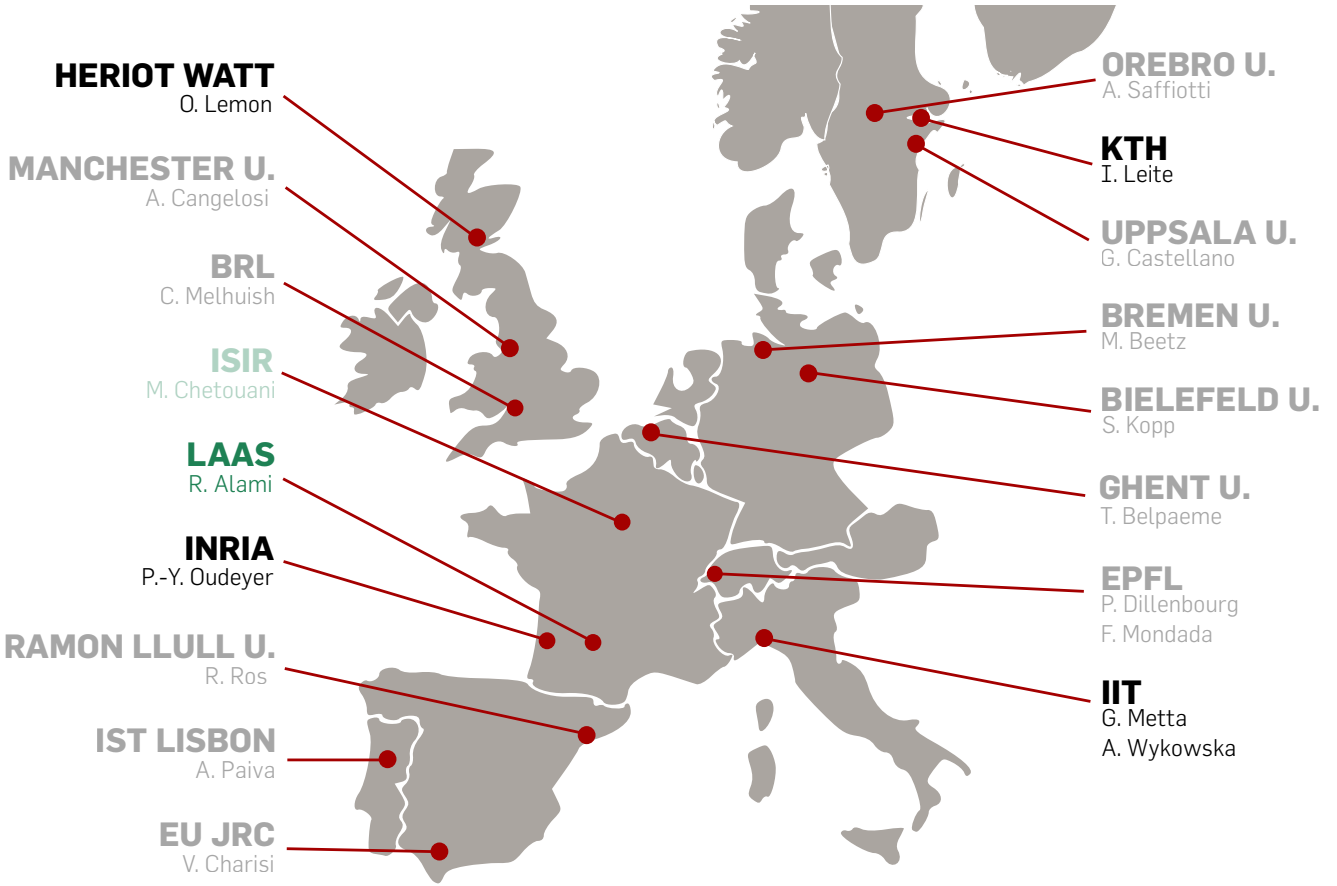
Novel methods that I introduce in my project:

- **Public-in-the-loop machine learning**
- **Immersive teleoperation and generative behaviours** with artists

4 AXES TO SCAFFOLD AN AMBITIOUS RESEARCH GROUP



2022: EU ICT BID: Socially-Driven Autonomous Robots



INTEGRATION LAAS

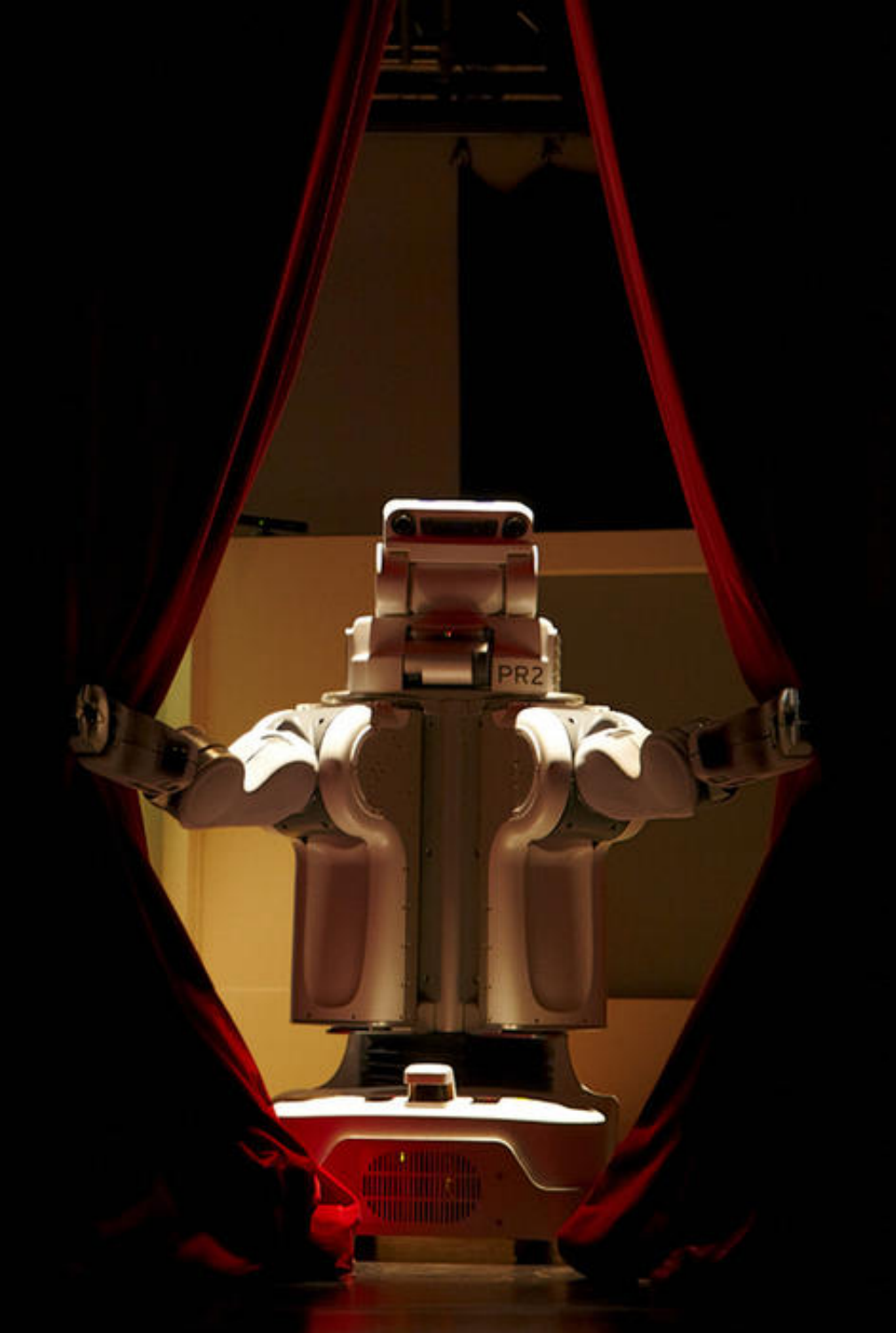
- Long-standing expertise in autonomous social robots (R. Alami) → natural integration to RIS team
- Excellent infrastructure & access to robots
- Software engineering expertise almost unique in academia
- ANITI: Excellent academic environment & collaboration opportunities

INTEGRATION LAAS

- Long-standing expertise in autonomous social robots (R. Alami) → natural integration to RIS team
- Excellent infrastructure & access to robots
- Software engineering expertise almost unique in academia
- ANITI: Excellent academic environment & collaboration opportunities

What I would bring:

- Experimental know-how with extensive expertise in real-world deployments
- Emerging theme: Data-driven HRI
- ANITI: transverse applications for AI and robotics



Thank you!

(photo of roboscopie*, a theatre play I created with director Nicolas Darrot in 2012)*