Robots for Learning - R4L: Adaptive Learning

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***Abstract*—The Robots for Learning workshop series aims at advancing the research topics related to the use of social robots in educational contexts. This year's half-day workshop follows on previous events in Human-Robot Interaction conferences focusing on efforts to design, develop and test new robotics systems that help learners. This 5th edition of the workshop will be dealing in particular on the potential use of robots for *adaptive learning*. Since the past few years, inclusive education have been a key policy in a number of countries, aiming to provide equal changes and common ground to all. In this workshop, we aim to discuss strategies to design robotics system able to adapt to the learners' abilities, to provide assistance and to demonstrate long-term learning effects.**

***Index Terms*—learning; education; social robots; human-robot interaction**

I. Introduction

Learning occurs throughout our entire life. We all learn about different things, at our own pace and method. In classical education, a class of learners is meant to learn a standard course in a pace consistent for the entire class. However, when a group of students are taught the same lessons at the same pace some students may lag in comprehension while some others excel. The concept of adaptive learning originates from the fact that every learner has a unique learning curve and personalized content aligned to her learning curve can improve learning outcomes. Recent technologies have made it possible to capture learner's data, on the basis of which the system provides adaptation to the learner (e.g. adaptive language tutoring [3], reflecting upon age and gender [2], adaptive robot's scaffolding [4]).

The Robots for Learning workshop, in its 5th series [1], focuses on *adaptive learning*. Adaptive learning systems are envisioned to maximize learning efficiency, improve learning outcomes, create personalised learning experience, generate analytics for early interventions, increase engagement, and allow for customizability to fit individual needs and preferences. In this workshop, we aim to discuss the approaches and challenges of using robots for learner-centric methods, learning path adaptation, social personalisation, remediation and multi-modal techniques. Robots can be able to perceive and monitor learning, and at the same time empathize and give personalized feedback to the learners. With this workshop, we aim at discussing recent advances in empirical and theoretical state-of-the-art research contributions on HRI in educational contexts regarding the following challenges: how adaptivity can play a role in the educational context? How can we use machine learning to provide better learning? How could robots be used to foster adaptive learning for a group of users?

II. Workshop overview

The proposed workshop is a half-day workshop on the topic of Robots for Learning. The workshop aims will be achieved through presentations and discussions. Prospective participants are invited to submit papers up to four pages describing work in progress, or containing preliminary results to discuss with the community. In order to stimulate interactions, the workshop will include lightning talks and a poster session. There will be a keynote by invited senior researcher. The workshop will also have discussions in structured groups. The workshop will include:

- Lightning talks: authors of accepted papers will provide short introduction of their posters.
- Poster sessions: authors of accepted papers will present their papers in a poster session.
- Keynotes: invited senior researchers will share their perspectives and experiences on the field of technologies for education.
- Structured group discussions: workshop attendees will engage in discussions on principal research questions or debates in the robots for education.

Schedule:

09:00-09:10 Introduction

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09:10-09:40 Keynote
09:40-10:30 Lightning talks
10:30-11:30 Coffee break and Poster session
11:30-12:00 Semi-structured group discussions

List of Topics:

- Adaptive mechanisms for robot tutors, personalization and adaptation algorithms for tutoring interactions
- Design of autonomous systems for tutoring interactions
- Theories and methods for tutoring (pedagogical and language acquisition)
- Shared knowledge and knowledge modelling in HRI
- Human-robot collaborative learning
- Attachment and learning with a social robot (social and cognitive development)
- Engagement in educational human-robot interaction
- Human-robot relationship assessment
- Designing student models and assessing students learning
- Playful learning with a robot
- Human-robot creativity
- Kinesthetic and non-verbal communication in human-robot interaction
- Impact of embodiment on learning
- Technical innovation in learning or teaching robots
- Long-term learning interactions, design and methodologies for repeated human-robot encounters
- Robots for learners with special needs and special abilities
- Education and re-training for adults
- Rehabilitation and re-education
- Privacy and ethical issues in robot tutoring applications

Organizers:

Wafa Johal, École Polytechnique Fédérale Lausanne, Switzerland. Wafa Johal obtained her PhD in 2015 from the University of Grenoble (France) focusing on bodily signals in Child-Robot Interaction. She is a Postdoctoral researcher in the Computer and Human Interaction Laboratory for Learning and Instruction at EPFL. She works within the CoWriter, Cellulo and ANIMATAS projects dealing with robots for education.

Anara Sandygulova, Nazarbaeyv University, Astana, Kazakhstan. Anara Sandygulova is an Assistant Professor in the Department of Robotics and Mechatronics at the School of Science and Technology. She received her PhD in 2015 from University College Dublin where she investigated how children's perception of the robot changes with age and gender in order to make a robot adapt to these differences. Her research interests are human-oriented perception to enable adaptive human-robot interaction.

Jan de Wit, Tilburg University, the Netherlands. Jan de Wit is a PhD candidate in the Department of Communication and Cognition at the Tilburg School of Humanities and Digital Sciences. He obtained his PDEng in User System Interaction from the University of Eindhoven, and his MSc in Game and Media Technology from Utrecht University, the Netherlands. His research is done within the L2TOR project, where he focuses in particular on the role of robot-performed gestures in children's second language learning.

Mirjam de Haas, Tilburg University, the Netherlands. Mirjam de Haas finished her Master's degree in Artificial Intelligence at the Radboud University and is a PhD candidate at the Department of Cognitive Science and Artificial Intelligence at Tilburg University. She works in the L2TOR project where her focus lies within a successful interaction between robots and children, how this interaction should be designed and how children stay engaged throughout the interaction.

Brian Scassellati, Yale University, CT, USA. Brian Scassellati is a Professor of Computer Science, Cognitive Science, and Mechanical Engineering at Yale University and Director of the NSF Expedition on Socially Assistive Robotics. His research focuses on building embodied computational models of human social behavior, especially the developmental progression of early social skills. Using computational modeling and socially interactive robots, his research evaluates models of how infants acquire social skills and assists in the diagnosis and quantification of disorders of social development (such as autism). His other interests include humanoid robots, human-robot interaction, artificial intelligence, machine perception, and social learning.

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