Master's Department of Engineering Sciences

MSc in Automation Engineering and Robotics

Name of the unit: Learning for Human-Robot Interaction

Lecturer: Sylvia TULLI (silvia.tulli@sorbonne-universite.fr)
Course code:
Student workload: 12 h of lectures, 2 h of tutorials, 16 h of labs
Credits: 3 ECTS
Specialization tracks: ☒ ROBOT (elective) ☒ SI (elective) ☐ MeDH
Semester offered: ☐ S1 ☐ S2 ☒ S3 ☐ S4
Language of instruction: ☐ French ☒ English
Targeted audience: ☒ Engineering Sciences students ☐ Other (specify):
Localization : ☒ PMC Campus ☐ Other (specify):

Course Overview

Review of machine learning and reinforcement learning Introduction to interactive machine learning Interactive task learning / Communication in learning Learning from feedback Learning from demonstration Learning from instruction Evaluation of interactive systems Learning for robot-behavior generation (transparency, explainable AI)
Keywords: Interactive robot learning, imitation learning, interactive reinforcement learning, explainable AI

Prerequisites

Students should have previously acquired the following prerequisites to follow this course:

- Fundamental principles of machine learning (supervised learning, reinforcement learning)

Intended Learning Outcomes

By the end of this course, students will be able to:

1. Master the fundamentals of machine learning and reinforcement learning
2. Understand the principles of interactive learning
3. Design a feedback-based learning system
4. Implement a learning-from-demonstration system
5. Evaluate an interactive robot-learning system
6. Apply explainable-AI methods to robot behaviors

Indicative Teaching Sequence and Methods

Week	C/TD/TP*	Content	Preparation	Learn. outc.
S1	C (2h)	Review of machine-learning and reinforcement-learning concepts		AAV1
S2				
S3	C (2h)	Introduction to interactive machine learning		AAV2
S4	C (2h)	Learning from feedback		AAV3
S5	TP (4h)	Learning from demonstration (LfD)		AAV3
S6	C (2h)	Learning from demonstration (LfD)		AAV4
S7	TP (4h)	Language-based learning: instructions, explanations and grounding		AAV4
S8	C (2h)	Explainability and evaluation of interactive robot-learning systems		AAV3 / AAV4
S9	C (2h)	Final project — Interactive robot learning		AAV5 / AAV6
S10	TP (4h)	Final project — Interactive robot learning		AAV2, AAV3, AAV4, AAV5, AAV6
S12	TP (4h)	Project presentation		AAV2, AAV3, AAV4, AAV5, AAV6
S15	TD (2h)			AAV2, AAV3, AAV4, AAV5, AAV6

* C/TD/TP respectively corresponds to lectures, tutorials and lab sessions.

Indicative Assessment of Intended Learning Outcomes (1st session)

Week	Individ./group	In-person/remote	Type of exam	Evaluated outcomes	Scale %
S15	Group	In-person	Other		80 %
S5	Individual	In-person	TP		20 %

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Session	Individ./group	In-person/remote	Type of exam	Evaluated outcomes	Scale %
2	Group	In-person	Written exam	AAV 1-10	50 %
1	Group	In-person	Quiz	AAV1-8	50 %

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