

Stage de recherche – Master 2

Normative regulation to frame the reinforcement learning of ethical behaviors

Duration: 5 months starting from February-March 2025

Supervision:

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Keywords : Reinforcement learning, normative systems, hybrid AI systems

Context Description

This internship is part of the project [ANR Acceler-AI](#). The objective of the project is to develop hybrid AI systems capable of learning behaviors aligned with moral values, in co-construction with users. The ethical behaviors learned by autonomous systems must also comply with norms (e.g., legal norms) by integrating a normative regulation process to set boundaries for these systems' behavior. The project is led by a multidisciplinary and multi-university consortium, with expertise in learning, normative systems, human-machine interfaces, and philosophy of science. Two demonstrators will be used in this project. one is related to energy (with a smart grid simulator), and the other is related to urban mobility (based on the [plateforme territoire](#) developed by the partner from Saint-Etienne).

Internship subject

Reinforcement learning methods primarily focus on optimizing policies based on rewards, without any of them being able to guarantee safety or compliance with norms (e.g., avoiding dangerous states) during the learning process. The proposed internship focuses on regulatory mechanisms that ensure agents operate within specified limits while remaining sufficiently autonomous to learn and adapt to changing contexts and objectives. Various mechanisms have been proposed in the literature, based on the regimentation of the agent's actions (Regimentation), systems that monitor the agent's actions (Shield RL) [7], or normative supervisors that evaluate the agent's actions according to a normative system (norm-guided RL) [6,8]

A first objective of this internship will be to conduct a state-of-the-art review of various regulatory methods in reinforcement learning. The second objective will be to implement different mechanisms for controlling actions (regimentation, regulation) in one of the project's demonstrators. Preliminary work from a previous internship has already been done to evaluate alternatives to regulated zones (ZFE) in the mobility simulator [5]. The third objective will be to extend the regulatory mechanisms to a multi-agent and/or multi-objective framework, in order to address ethical issues, such as data sharing between different agents or considering multiple objectives (the agent's initial goal and compliance with norms).

Work context

The internship will be carried out over a period of 5 months, ideally starting in February – March 2025. The intern will be located at LIRIS (Lyon), with the possibility of traveling to EMSE (Saint-Etienne) and participating in various ACCELER-AI project follow-up meetings.

Applications:

Master's degree in computer science with a specialization in AI, ML, DS...

Please send a cover letter, your CV, and transcripts from your first year of the Master's program via email to gnardin@emse.fr et laetitia.matignon@univ-lyon1.fr

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