

Call for Master and PhD thesis on Efficient Planning and Learning for Resource Sharing

Location: IRIT and LAAS laboratories in Toulouse.
Master student: Starting date any time before summer 2023.
PhD Grant: PhD funding is available for a thesis to start in September 2023.

Research Summary: Markov decisions processes (MDPs) and their model-free counterpart in reinforcement learning (RL) have known a large success in the last two decades. Although research in these two areas has been taking place for more than fifty years, the field gained momentum only recently following the advent of powerful hardware and algorithms with which supra-human performance were obtained in games like Chess or Go. However, these impressive successes often rely on quite exceptional hardware possibilities and cannot be applied in many “usual” contexts, where, for instance, the volume of data available or the amount of computing power is more restricted. To define the next generation of more “democratic” and widely applicable algorithms, such methods still need to deal with very demanding exploration issues as soon as the state/action spaces are not small. One way around this is to use underlying knowledge and structure present in many MDPs. This is especially true for problems related to scheduling and resources sharing in among others server farms, clouds, and cellular wireless networks. The research will revolve around this theme of improving the efficiency of learning algorithms by leveraging the structure of the underlying problem. Both model-based and model-free frameworks will be studied.

Funded by the French National Agency of Research (ANR), the project EPLER has various openings at the level of Master Internships, PhDs and a postdoc on topics including: model-based learning for scheduling and resource-sharing problems, stability and sub-optimality in bandits, correlated bandits, exploration of reinforcement learning with sparse rewards, and others.

Keywords: Load balancing, reinforcement learning, multi-armed bandits, Markov decision processes

Requirements: Candidates should have a background in (applied) mathematics, operations research, computer science or electrical engineering. Experience in stochastic modeling, stochastic optimization, queueing theory or sequential learning will be appreciated. In the course of the project, the candidate is expected to perform some numerical experiments (Matlab, C++, Python ...).

Research supervisors: For further information, please contact:

- M. Jonckheere, CNRS-LAAS, [web]. Email: matthieu.jonckheere@laas.fr
- and M. Verloop, CNRS-IRIT, [web]. Email: verloop@irit.fr.

Other researchers participating in EPLER are: U. Ayesta, CNRS-IRIT and Ikerbasque UPV/EHU, [web], and B. Prabhu, CNRS-LAAS, [web]

Application: Please upload a single file including a detailed curriculum vitae including names and email addresses of two references, along with a brief cover letter motivating your interest, through the links:

- [Link to apply for PhD](#),
- [Link to apply for a Master thesis](#)