About the research centre or Inria department

The Inria Lille - Nord Europe Research Centre was founded in 2008 and employs a staff of 360, including 300 scientists working in sixteen research teams. Recognised for its outstanding contribution the socio-economic development of the Nord - Pas-de-Calais Region, the Inria Lille - Nord Europe Research Centre undertakes research in the field of computer science in collaboration with a range of academic, institutional and industrial partners.

Collaboration:

Natural collaborators of the candidate will be the member of the Sequel team, due to their complementary skills and points of view on sequential learning as well the other members of the ANR lead by Odalric-Ambrym Maillard: Emilie Kaufmann and Richard Combes. Likely external collaborators include collaborators of the team on RL questions, as well as specific researchers such as Borja Balle (Hankel matrices and Predictive State Representations), Alexandre Proutiere (Structured bandits and MDPs), Ronald Ortner (UCRL) to name a few. Obviously, actual collaborations will evolve according to the advances made and difficulties encountered during the PhD.

Assignment

Assignments

In this thesis, we want to better understand how the notion of structure modifies the learning guarantees and suggests novel improved algorithms in the context of Markov Decision Processes , Predictive State Representations, as well as Multi-armed bandits.

The objective of this PhD is to study and develop novel decision-making strategies in order to be adaptive to different notions of structure in the context of sequential prediction and reinforcement learning. For instance structure in an MDP may be considered as a notion of equivalence of certain states, or by the presence of specific bottlenecks, or a specific property of the recovery times after playing a sub-optimal action.

For a better knowledge of the proposed research subject:

A more detailed description of the topic, together with bibliographic references are available at the following URL: http://odalricambrymaillard.neowordpress.fr//wp-content/uploads/sites/18032/2018/02/Sujet_de_these_MDPs_StructuresInria.pdf

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Conditions for application

Instructions to apply

Candidates will be treated firstly with a complete file : CV + letter of motivation + one or more letters of recommendation + transcripts from previous years.

Defence Security:

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy:

As part of its diversity policy, all Inria positions are accessible to people with disabilities.
Main activities

In this thesis, we want to better understand how the notion of structure modifies the learning guarantees and suggests novel improved algorithms in the context of MDPs, PSRs, as well as bandits. The objective of this PhD is to study and develop novel decision-making strategies in order to handle (or suggest) various notions of structure in the context of sequential prediction and reinforcement learning.

The proposed strategies will be developed with a generic application purpose and thus be given theoretically grounded performance guarantees under application-friendly assumptions. The candidate should be mathematically strong and interested in solving theoretical problems using probability, statistics and optimization.

Along the duration of the PhD, the student will have to master a number of tools coming from different fields of research and thus will be provided with a significant but targeted amount of articles and books related to Information theory, Multi-armed bandits, Concentration of measure, Markov Decision Processes, Spectral methods, Hierarchical Reinforcement Learning, to name a few. This continuous training during the whole PhD will be complemented with summer schools, especially the Machine learning summer school and the Ecole d’été de Saint-Flour, and the attendance to regular seminars or research events within the related communities.

Skills

Technical skills and level required: Master in Machine Learning or Mathematical Statistics, prior knowledge of Reinforcement Learning.

Languages: English is mandatory, French is optional.

Relational skills: We are working in a team, thus a strong team spirit is valuable.

Other valued appreciated: Creativity, imagination, self-determination, etc.

Benefits package

Subsidised catering service
Partially-reimbursed public transport
Social security
Paid leave
Sports facilities
Flexible working hours

Benefits

More information about Lille:

http://www.lille3000.eu/portal/
http://www.lillemetropole.fr/mel.html

Remuneration

The gross monthly salary is 1982€ for the 1st and the 2nd year, 2085€ for the 3rd year.