

Emmanuel RACHELSON
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French, born June 5th 1982, married, 1 child
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<https://github.com/erachelson>

EDUCATION AND POSITIONS

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| 2011-today | Associate Professor , ISAE-SUPAERO <i>Contributions in Reinforcement Learning.</i> <i>Founder of the ISAE-SUPAERO Reinforcement Learning Initiative (SuReLI).</i> <i>Coordination of Master-level training programs in Data Science / Artificial Intelligence.</i> |
| 2011 | Researcher , EDF Research and Development (1 year) <i>Contributions in Operations Research and Supervized Learning for energy management.</i> |
| 2010 | Post-doctoral fellow , with Pr. D. Ernst and Pr. L. Wehenkel, Univ. of Liege (1 year) <i>Contributions in Reinforcement Learning, Bandit Algorithms and Randomized Trees.</i> |
| 2009 | Invited researcher EDF Research and Development (3 months) <i>Contributions in Operations Research, Supervised Learning and energy Management.</i> |
| 2009 | Post-doctoral fellow , with Pr. M. G. Lagoudakis, Tech. Univ. of Crete (1 year) <i>Contributions in Reinforcement Learning.</i> |
| 2009 | PhD in Artificial Intelligence , University of Toulouse, ONERA <i>Temporal Markov Decision Problems – Formalization and Resolution.</i> |
| 2005 | MS in Control Theory , University of Toulouse |
| 2005 | SUPAERO Engineer (Grande Ecole in Aeronautics and Space) , Control systems major |

RESEARCH

Research interests

Reinforcement Learning, Optimal Control and Sequential Decision Making. Specific focus on robustness issues, including model uncertainty, policy transfer, non-stationary environments. Theoretical analysis and real-world applications.

Core research projects

- Learning to fly

Autonomous soaring for unmanned gliders via Reinforcement Learning.

Contributions: Atmospheric convection modeling and simulator. Flight dynamics simulator. Empirical evaluation of Q-learning algorithms in non-stationary environments. Performance bounds for open loop Monte-Carlo Tree Search. Performance bounds for MDP planning in non-stationary environments.

- Learning4Opt

Improving the performance of optimization solvers for recurrent problems via ML.

Contributions: General framework of recurrent optimization problems. Learning boolean variables assignment via multi-label classification. Scaling up optimal subset selection via Naive Bayes learning. Parameter control for optimization processes as a Reinforcement Learning problem. Applications on unit commitment (energy management), traveling salesman, facility location and air traffic management problems.

- Robustness of Rainbow

Weaknesses and variability of the Rainbow algorithm's result on standard benchmark.

Contributions: Influence of the initialization. Study on the possibly negative interaction of the constituents of Rainbow. Network design influence.

- Pinky and the Brain

Preliminary work on the design of reusable Deep Neural Network controllers ("Brain") for transfer and fine-tuning in real-life Reinforcement Learning ("Pinky").

- Enoskelet'

Design of a rehabilitation exoskeleton for children suffering from cerebral palsy.

Extra projects and applications

- Attentional Tunneling monitoring

Classification for the detection of attentional tunneling in human operator automation interactions.

- Surrogate modelling

Scaling up multi-output Gaussian Processes learning for physics constrained modelling of aircraft loads.

- Large coverage satellite planning

Coupling Multi-Agent Systems and Reinforcement Learning for large scale planning under uncertainty.

ACADEMIC RESPONSIBILITIES AND ACHIEVEMENTS

- Program chair of the 2019 Francophone Conference on Planning, Decision and Learning.
- Program committee of IJCAI and ICPRAM.
- Organization committee of the 2019 French AI Conference and the French ML Conference.
- Member of the French AI Association (AFIA).
- Founder (2015) and co-head of the ISAE-SUPAERO Reinforcement Learning Initiative (SuReLI, <https://sureli.github.io>). 5 PhD students, 12 graduate and undergrads in 2018.
- Coordinator for the design of the Decision Sciences final year major (240 hours, Master of Science) in the ISAE-SUPAERO Grande Ecole curriculum (2013-2015).
- Head of the Decision Sciences final year major (2015-2017).
- Founder and head of the Data and Decision Sciences Master program (2015-present).
- Co-founder of the AI & business executive Master program (2018-present).

PHD SUPERVISION

- A. Chiplunkar (2014-2017). Co-supervised with Pr. J. Morlier (ISAE-SUPAERO). Funded by Airbus.
- E. Lecarpentier (2016-2019). Co-supervised with Dr. G. Infantes (Jolibrain) and Dr. C. Lesire (ONERA). Funded by the Occitanie region and ONERA.
- L. Mossina (2016-2019). Co-supervised with Pr. D. Delahaye (ENAC). Funded by the Occitanie region and ISAE-SUPAERO.
- T. Jammot (2017-2020). Co-supervised with Pr. P. Glize (IRIT). Funded by IRT Saint-Exupery.
- S. Ikli (2017-2020). Co-supervised with Pr. M. Mongeau (ENAC). Funded by ENAC and ISAE-SUPAERO.
- F. Lamothe (2018-2021). Co-supervised with A. Hait (ISAE-SUPAERO). Funded by CNES and Thalès Alenia Space.

TEACHING (CURRENT YEAR ONLY)

- Algorithms in Machine Learning – Supervised and Unsupervised Learning (graduate, 40h)
- Algorithms in Machine Learning – Reinforcement Learning (graduate, 20h)
- ISAE-SUPAERO Data Science Hackathon (graduate, 30h)
- Differentiable Optimization (graduate, 5h)
- Combinatorial Optimization (undergraduate, 5h)

SELECTED PUBLICATIONS

- Lecarpentier, E., Infantes, G., Lesire, C., Rachelson, E. (2018). Open Loop Execution of Tree-Search Algorithms. In *proc. of the 27th International Joint Conference on Artificial Intelligence*.
- Garcia, F., Rachelson, E. (2013). Markov Decision Processes. In *Markov Decision Processes in Artificial Intelligence*, pp. 1-38.
- Rachelson, E., Schnitzler, F., Wehenkel, L., Ernst, D. (2011). Optimal sample selection for batch-mode reinforcement learning. In *Proc. of the 3rd International Conference on Agents and Artificial Intelligence*.
- Rachelson, E., Lagoudakis, M. G. (2009). On the Locality of Action Domination in Sequential Decision Making. In *proc. of the International Symposium on Artificial Intelligence and Mathematics*.
- Rachelson, E., Quesnel, G., Garcia, F., Fabiani, P. (2008). A Simulation-based Approach for Solving Generalized Semi-Markov Decision Processes. In *proc. of the 18th European Conference on Artificial Intelligence* (pp. 583-587).