

# Pascal Leroy

PHD STUDENT · MACHINE LEARNING

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## PERSONAL STATEMENT

I am a Ph.D. student in **machine learning**. My research focuses on training teams of agents with **multi-agent reinforcement learning**, which can evolve in fully cooperative or mixed cooperative-competitive environments. I am particularly passionate about applying reinforcement learning to address **real-world** challenges and contribute to **impactful applications**. I am currently writing my PhD thesis and exploring opportunities for a position abroad to further contribute to the development of concrete applications.

## EDUCATION

- Ph.D. student in Machine Learning - *Montefiore Institute, ULiège, Liège* 08/2018 - Now  
Advisors: Damien Ernst and Jonathan Pisane.  
Research interests: reinforcement learning and multi-agent systems.
- Master in Computer Science and Engineering - *ULiège, Liège* 09/2016 - 09/2018  
Master's thesis: Automatic defect recognition in X-ray imaging by machine learning.  
*Cum Laude* - 75%
- Bachelor in Engineering - *ULiège, Liège* 09/2010 - 06/2016

## WORK EXPERIENCE

- Research Engineer 08/2018 - Now  
*Montefiore Institute, ULiège*  
Responsible for writing proposals and administrative and financial reports.  
Responsible for the research in projects with industrial consortia of Belgian companies:
  - IRIS: Intelligent Recognition Information System.
  - IADAS: Artificial Intelligence for Autonomous Drones and Satellites.
- Student Trainee 10/2017 - 06/2018  
*X-RIS: X-Ray Imaging Solutions* (Liège)  
Development of image processing filters dedicated to X-ray image optimisation and the master's thesis.

## RESEARCH PROJECTS

- Infrastructure management planning 2022 - Now  
*Collaboration with Pablo G. Morato*  
Using multi-agent RL for planning inspections, repairs or retrofits in structures like bridges or wind turbines.  
We are maintaining an open-source repository of these real-world environments (published in **NeuRIPS**) and working on new environments to promote such applications in the machine learning community.
- IADAS: Artificial Intelligence for Autonomous Drones and Satellites 2021 - 2023  
*Partners: Deltatec, Spacebel, Multitel, ALX.*  
Design hardware and software for embedding neural networks in drones and satellites.  
Responsible for compressing and optimising a neural network for monocular depth estimation.
- IRIS: Intelligent Recognition Information System 2018 - 2022  
*Partners: John Cockerill Defense, ACIC, Multitel, Royal Military Academy.*  
Decision-aid based on detection, recognition and analysis of behaviours and threats.  
Responsible for designing environments and algorithms for multi-agent reinforcement learning.
- Automatic defect recognition in X-ray imaging by machine learning 2017 - 2018  
*Master's thesis supervised by Vincent Libertiaux, Raphaël Marée and Pierre Geurts.*  
Support for non-destructive testing with tree-based ensemble methods to detect defects in X-ray images.  
This work was done during the internship in X-RIS. **Graded 85%.**

## PERSONAL EXPERIENCE

- AGEL ASBL 10/2014 - 09/2016  
*Treasurer (2014-2015) and President (2015-2016)*  
The Association Generale des Etudiants Liegeois is a non-profit organisation in charge of holding main student events (turnover > 300k€, 15000 students).
  - As Treasurer, responsible for the financial viability and accounting management.
  - As President, responsible for managing the team, public communication and major choices.
- FEDE ULiège ASBL 10/2013 - 09/2016  
*Elected member of the general assembly and member of the Board of Directors of ULiège (2015-2016).*  
The Federation des etudiants ULiège is a non-profit organisation in charge of representing students to academic authorities (23000 ULiège students). Responsible for representing the Fede and the students as a member of the Board of Directors of the University of Liege.

## PUBLICATIONS

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IMP-MARL: a Suite of Environments for Large-scale Infrastructure Management Planning via MARL

Pascal Leroy, Pablo G. Morato, Jonathan Pisane, Athanasios Kolios, Damien Ernst

*Thirty-seventh Conference on Neural Information Processing Systems Datasets and Benchmarks Track (NeuRIPS), 2023.*

Value-based CTDE Methods in Symmetric Two-team Markov Game: from Cooperation to Team Competition

Pascal Leroy, Jonathan Pisane, Damien Ernst

*Deep Reinforcement Learning Workshop NeurIPS, 2022.*

QVMix and QVMix-Max: extending the deep quality-value family of algorithms to cooperative multi-agent reinforcement learning.

Pascal Leroy, Damien Ernst, Pierre Geurts, Gilles Louppe, Jonathan Pisane, Matthia Sabatelli

*AAAI-21 Workshop on Reinforcement Learning in Games, 2021.*

## SKILLS

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- **Programming languages:** Python, Bash, C, C++, Java, Matlab, Latex, Typst.
- **Software development:** Git, Agile.
- **Libraries:** PyTorch, TensorFlow, Numpy, Matplotlib, Pandas, Onnx, RL libraries,...
- **Languages:** French (native), English (professional proficiency).

## TALKS

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- *Multi-Agent Reinforcement Learning.* Deep Reinforcement Learning, University of Groningen. 05/2023
- *Workshop on Reinforcement Learning and Multi-Agent RL.* Thales Belgium. 04/2023
- *Emergent Tool Use From Multi-Agent Autocurricula.* Advanced Machine Learning, ULiège. 04/2020

## TEACHING

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- Optimal decision-making for complex problems (lecture on multi-agent RL). 2020 & 21 & 22 & 23
- Introduction to artificial intelligence (Python projects). 2019 & 20
- Complementary computer science course (C projects). 2019 & 20

## REVIEWING

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- *Workshop:* SynS and ML (ICML, 2023).

## AWARDS

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- NeurIPS Travel Award (2023).

## REFEREES

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- Damien Ernst (dernst@uliege.be) - Ph.D. advisor.
- Jonathan Pisane - Ph.D. advisor.