# Pascal **Leroy**

MACHINE LEARNING PHD

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## PERSONAL STATEMENT

I completed a Ph.D. in **machine learning** in June 2024. My research focuses on training teams of agents with **multi-agent reinforcement learning**. Aside, I conducted projects on **neural network compression** for computer vision and **reinforcement learning** for drone control applications. I am particularly passionate about applying machine learning to address **real-world** challenges and contribute to **impactful applications**. I am exploring opportunities abroad to contribute to the development of concrete projects.

## EDUCATION

### Ph.D. in Machine Learning - *Montefiore Institute, ULiège, Liège* 08/2018 - 06/2024

Advisors: Damien Ernst and Jonathan Pisane.
Research interests: reinforcement learning and multi-agent systems.
Thesis: Contributions to Multi-agent Reinforcement Learning.

### 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 the research in projects with industrial consortia of Belgian companies.
Responsible for writing proposals and administrative and financial reports.

### Student Trainee 10/2017 - 06/2018

*X-RIS: X-Ray Imaging Solutions* (Liège)
Development of image processing filters dedicated to X-ray image optimisation.
Additionally, a master's thesis on automatic defect recognition in X-ray imaging by machine learning.

## RESEARCH PROJECTS

### WalEdgeIA: Embedded AI for Walloon SME 2023 - Now

*Partners: Sirris, Cetic, UMons, ULiège.*
Develop methodology to facilitate embedded AI technologies for the industry.
Responsible for controlling a drone with embedded robust reinforcement learning.

### Infrastructure management planing 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, ULiège.*
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, ULiège.*
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 my internship at X-RIS. **Graded 85%.**

## SKILLS

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

## PERSONAL EXPERIENCE

### Association Generale des Etudiants Liegeois (AGEL) ASBL — 10/2014 - 09/2016

*Treasurer (2014-2015) and President (2015-2016)*
AGEL is a non-profit organisation in charge of holding 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.

### Federation des etudiants ULiege (FEDE) ASBL — 10/2013 - 09/2016

*Elected member of the general assembly and member of the Board of Directors of ULiège (2015-2016).*
The FEDE is a non-profit organisation representing 23000 ULiège students to academic authorities. Responsible for representing the Fede and the students as a member of the Board of Directors of ULiège.

## PUBLICATIONS

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.*

## TALKS

- *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

- 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

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

## AWARDS

- NeurIPS Travel Award (2023).

## REFEREES

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