# Lars C.P.M. Quaedvlieg

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## SUMMARY

Highly motivated final-year master's student with a broad range of experiences across various machine learning domains, including foundation models, reinforcement learning for decision-making, and AI for mathematics. I am particularly interested in using multimodal foundation models for embodied sequential decision-making agents.
**Interests:** Foundation Models, Sequential Decision-Making (RL), AI4Math.

## SKILLS

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|---|---|
| **Languages** | English (C2), Dutch (C2), German (B1), French (A2). |
| **Programming** | Python, Java, SQL, R, C, C++, JavaScript, CSS, HTML. |
| **Tools** | Jax, Haiku, Optax, Flax, PyTorch, Hydra, Neptune, Google Cloud Platform, HDF5. |
| **Relevant Courses** | Optimization, Natural Language Processing, Graph Machine Learning, Computer Vision. |

## WORK EXPERIENCE

**Scholar Research Assistant** **Oct. 2023 – Present**
*Caglar Gulcehre Lab for AI Research* *Lausanne, Switzerland*

- I perform part-time research in **state-space models**, **reinforcement learning (RL)**, and **AI for mathematics**.
- Learning to encode reinforcement learning algorithms with state-space models, on problems requiring a context length of 100,000+ tokens *(Primary project, in progress)*.
- Creating a **large language model** (7B+ parameters) for mathematical theorem proving and problem solving, participating in the AI Mathematics Olympiads competition *(Side project, in progress)*.

**Research Intern** **Jun. 2023 – Jan. 2024**
*InstaDeep AI* *Paris, France*

- Worked on the PASTA project, which involved pre-training state-action conditioned transformers on a variety of reinforcement learning environments. I was responsible for the pipeline on the Atari domain.
- Implemented and trained a **VQ-VAE** to near pixel-perfect reconstruction of Atari frames.
- Successfully implemented and pre-trained transformers on a vast offline RL dataset containing > 1 billion transitions in a multi-processing setting, resulting in a >80% testing accuracy.
- Fine-tuning the pre-trained transformers using **Offline RL** methods, resulting in outperforming previous state-of-the-art performance by up to 2.5x on some Atari environments.

**Research Assistant (Unofficial)** **Nov. 2022 – Oct. 2023**
*Laboratory for Information and Inference Systems* *Lausanne, Switzerland*

- Developed a method to use **self-supervised learning** for **combinatorial optimization** problems, resulting in a new state-of-the-art for the Maximum Independent Set problem and good out-of-distribution generalisation.
- Utilised **graph neural networks** and reinforcement learning for the nurse rostering problem, achieving superior performance across both synthetic and real-world datasets and high out-of-distribution generalisation.

**AI Research Intern** **Jun. 2018 – Jun. 2020**
*Aucos A.G.* *Aachen, Germany*

- Explored a solution to the online multi-hoist scheduling problem using graph neural networks and **multi-agent reinforcement learning**, enhancing production line throughput by coordinated and learned job allocations.
- Demonstrated a 7.50% to 10% performance improvement over conventional algorithms and ensuring provable deadlock avoidance in all scenarios.

## EDUCATION

**École Polytechnique Fédérale de Lausanne** **Sep 2022 – Jul, 2025 *(Expected)***
*MSc in Data Science* *Lausanne, Switzerland*

- Excellence Fellowship holder; Research Scholarship recipient; 5.7/6 GPA *(Currently)*.
- Google Developer Student Club PR Manager: In the founding year of the club, we organised 15 events with 212+ total attendees, and 163 community members together with a team of 11 members.

**Maastricht University** **Sep 2019 – Jul, 2022**
*BSc in Data Science and Artificial Intelligence* *Maastricht, The Netherlands*

- Graduated with *summa cum laude* distinction; Best bachelor's thesis award recipient with a thesis grade of 9.5; Ranked first of 104 within the cohort; 9.50/10 GPA.
- Student Representative: I demonstrated leadership skills in representing peer viewpoints by advocating for their interests, and fostering academic improvements by the enhancement of the program curriculum.
- MSV Incognito Board Member: In three distinct roles within the board, I orchestrated educational and social events for an 800-member study association, demonstrating strong leadership and organisational skills.

## SELECTED AWARDS & HONOURS

**First Place Hackathon Winner**, HackUPC [website] **May 2024**
Project on e-mail question-answering using GPT-4 and Retrieval Augmented Generation with hybrid search.

**Research Scholar Assistant**, EPFL **Feb 2024**
Year-long highly competitive research program. Part-time researcher at the Caglar Gulcerhe's Lab for AI Research.

**CS-503 Visual Intelligence Best Project Award**, EPFL [website] **Jul 2023**
Researched dynamics between predators and prey using self-play on an asymmetric zero-sum game with RL.

**Best Bachelor's Thesis Award**, Maastricht University **Jan 2023**
University-wide award for the best bachelor's thesis research among all other students in the cohort.

**Master's Excellence Fellowship**, EPFL **Sep 2022**
Two-year fellowship, awarded to ~3% of EPFL master students based on outstanding academic records.

## EXTRACURRICULARS & INTERESTS

**AI Horizon**: Personal blog where I write about state-of-the-art machine learning research, with over 10,000 total page views. [website]

**Semi-professional Field-Hockey player**: Represented HC Nova in the Dutch semi-pro men's hockey league from 2016 to 2022.

## PUBLICATIONS (* = equal contributions)

Boige, R.,Flet-Berliac, Y., **Quaedvlieg, L.C.P.M.**, Flajolet, A., Richard, G., Pierrot, T. **Aug 2024**
PASTA: Pretrained Action-State Transformer Agents. *International Conference on Reinforcement Learning (RLC)*.

**Quaedvlieg L.C.P.M.***, Brusca L.*, Skoulakis S., Chrysos G., Cevher V. **Dec 2023**
Maximum Independent Set: Self-Training through Dynamic Programming. *Advances in neural information processing systems (NeurIPS)*.

**Quaedvlieg L.C.P.M.**, Möckel R., Weiss G.B. **Jul 2023**
Optimising Job Allocation using Reinforcement Learning with Graph Neural Networks. *(Thesis preprint)*.