Lucas Nunes Alegre

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Research Interests

My main research interest is **reinforcement learning** (RL). In my Ph.D., I tackled the problem of how to design **principled sample-efficient RL algorithms** capable of **learning and combining multiple behaviors** to solve **multi-task** and **multi-objective** sequential decision-making problems.

Education

Doctor of Philosophy – Computer Science Jan. 2021 – Feb. 2025
Universidade Federal do Rio Grande do Sul (UFRGS) and Vrije Universiteit Brussel (VUB) *Porto Alegre, Brazil*

- Supervisors: Prof. Ana L. C. Bazzan and Prof. Bruno C. da Silva (Univ. of Massachusetts)
- One-year Doctoral Stay at Vrije Universiteit Brussel (VUB) — Supervisor: Prof. Ann Nowé
- Title: Sample-Efficient Multi-Task and Multi-Objective Reinforcement Learning by Combining Multiple Behaviors

Bachelor of Science *Cum Laude* – Computer Science Jan. 2016 – Dec. 2020
Universidade Federal do Rio Grande do Sul (UFRGS) *Porto Alegre, Brazil*

- Supervisor: Prof. Bruno C. da Silva – Cumulative GPA: 4.0/4.0

Experience

Adjunct Assistant Professor March. 2025 – ongoing
Institute of Informatics - UFRGS *Porto Alegre, Brazil*

- Professor of the Fundamentals of Algorithms and Algorithmic Complexity courses.

Doctoral Researcher Jan. 2021 – Feb. 2025
Institute of Informatics - UFRGS *Porto Alegre, Brazil*

- Advisors: Prof. Ana L. C. Bazzan and Prof. Bruno C. da Silva (Univ. of Massachusetts)

Data Scientist Feb. 2025 – March. 2025
Big Data *Remote*

- Implemented a deep reinforcement learning framework for recommendation systems.

Research Intern Jun. 2024 – Sept. 2024
Disney Research *Zürich, Switzerland*

- Interned at the Robotics Group led by Dr. Moritz Bächer. Designed novel deep RL algorithms for motion tracking on physical characters that can be deployed in real-world robots.

Project Manager Jan. 2023 – ongoing
Farama Foundation *Remote*

- I am the creator and maintainer of MO-Gymnasium, the main library for multi-objective RL environments. The Farama Foundation is a nonprofit organization that maintains the largest open-source RL libraries in the world.

Doctoral Researcher Aug. 2022 – Aug. 2023
AI-Lab at Vrije Universiteit Brussel (VUB) *Brussels, Belgium*

- Advisor: Prof. Ann Nowé
- Introduced the first model-based multi-objective RL algorithm for domains with continuous state spaces.

Research Intern Jan. 2020 – Feb. 2020
Technische Universität Berlin *Berlin, Germany*

- Advisor: Prof. Kai Nagel. Developed a RL traffic signal controller with Fourier basis function approximation that outperformed a state-of-the-art rule-based controller in a real-world multiagent scenario.

Undergraduate Research Assistant Aug. 2017 – Dec. 2020
Multiagent Systems Lab. (Institute of Informatics - UFRGS) *Porto Alegre, Brazil*

- Advisors: Prof. Ana L. C. Bazzan and Prof. Bruno C. da Silva

Selected Publications (Full List on Google Scholar)

SIGGRAPH 2025 Lucas N. Alegre, Agon Serifi, Ruben Grandia, David Müller, Espen Knoop, Moritz Bächer. **AMOR: Adaptive Character Control through Multi-Objective Reinforcement Learning**. SIGGRAPH, 2025.

NeurIPS 2023 Lucas N. Alegre, Ana L. C. Bazzan, Ann Nowé and Bruno C. da Silva. **Multi-Step Generalized Policy Improvement by Leveraging Approximate Models**. Thirty-seventh Conference on Neural Information Processing Systems, 2023.

NeurIPS 2023 Florian Felten*, Lucas N. Alegre*, Ann Nowé, Ana L. C. Bazzan, El-Ghazali Talbi, Grégoire Danoy and Bruno C. da Silva. **A Toolkit for Reliable Benchmarking and Research in Multi-Objective Reinforcement Learning**. Thirty-seventh Conference on Neural Information Processing Systems Track on Datasets and Benchmarks, 2023.

AAMAS 2023 Lucas N. Alegre, Diederik M. Roijers, Ann Nowé, Ana L. C. Bazzan and Bruno C. da Silva. **Sample-Efficient Multi-Objective Learning via Generalized Policy Improvement Prioritization**. Proceedings of the 22nd International Conference on Autonomous Agents and Multiagent Systems, 2023.

ICML 2022 Lucas N. Alegre, Ana L. C. Bazzan and Bruno C. da Silva. **Optimistic Linear Support and Successor Features as a Basis for Optimal Policy Transfer**. Proceedings of the Thirty-ninth International Conference on Machine Learning, 2022.

AAMAS 2021 Lucas N. Alegre, Ana L. C. Bazzan and Bruno C. da Silva. **Minimum-Delay Adaptation in Non-Stationary Reinforcement Learning via Online High-Confidence Change-Point Detection**. Proceedings of the 20th International Conference on Autonomous Agents and Multiagent Systems, 2021.

Open Source Projects

MO-Gymnasium | github.com/Farama-Foundation/MO-Gymnasium | Paper ★+320
- Library of environments for multi-objective reinforcement learning (MORL).

MORL-Baselines | github.com/LucasAlegre/morl-baselines | ★+380
- Library of MORL algorithms implementations.

SUMO-RL | github.com/LucasAlegre/sumo-rl ★+850
- Open source repository of reinforcement learning environments for traffic signal control.

Honors & Awards

- Doctoral thesis awarded with distinction - PPGC/UFRGS, 2025
- 1/200 selected internationally for the Heidelberg Laureate Forum 2024 and 1/30 selected to receive the Abbe Grant from the Carl Zeiss Foundation
- NeurIPS 2023 Scholar Award
- AAMAS 2023 Student Scholarship
- Best Paper Award - LXAI Workshop @ ICML 2021
- Brazilian Computer Society Distinguished Student Award, 2021
- Top Reviewer - NeurIPS 2022
- Highlighted Reviewer - ICLR 2022
- Graduated *cum laude* in Computer Science. Cumulative GPA: 4.0/4.0, 2021
- Ph.D. Scholarship from the Brazilian National Council for Scientific and Technological Development (CNPq) and the Brazilian Coordination for the Improvement of Higher Education Personnel (CAPES) (2021–2024)
- Finalist of the City Brain Challenge - KDD Cup 2021
- 1st Place at PUCRS University Entrance Exam - Computer Science, 2016

Teaching

Fundamentals of Algorithms - Professor Mar. 2025 – ongoing
Institute of Informatics - UFRGS *Porto Alegre, Brazil*
Algorithms Complexity - Professor Mar. 2025 – ongoing
Institute of Informatics - UFRGS *Porto Alegre, Brazil*
Data Science Specialization Course - Teaching Assistant Aug. 2023 — Aug. 2024
Institute of Informatics - UFRGS *Porto Alegre, Brazil*
Artificial Intelligence - Teaching Assistant Jan. 2022 — Jul. 2022
Institute of Informatics - UFRGS *Porto Alegre, Brazil*
Fundamentals of Algorithms - Teaching Assistant Aug. 2021 — Dec. 2021
Institute of Informatics - UFRGS *Porto Alegre, Brazil*
Introduction to Algorithms - Monitor Aug. 2016 — Dec. 2016
Institute of Informatics - UFRGS *Porto Alegre, Brazil*

Invited Talks

Princeton RL Lab. Sample-Efficient Multi-Task and Multi-Objective Reinforcement Learning by Combining Multiple Behaviors. 2024.
Cohere For AI. Sample-Efficient Multi-Task and Multi-Objective Reinforcement Learning by Combining Multiple Behaviors. 2024. [Talk Link]
University of Luxembourg. Towards Sample-Efficient Multi-Objective Reinforcement Learning. 2023.
Vrije Universiteit Brussel. Sample-Efficient Multi-Objective Learning via Generalized Policy Improvement. 2023.

Students

Liam Mertens (Bachelor, VUB) 2023
Vicent N. de Almeida (Bachelor, UFRGS) 2022

Program Committee Member/Reviewer

International Conference on Machine Learning (ICML) 2022–2025
Conference on Neural Information Processing Systems (NeurIPS) 2022–2025
International Conference on Learning Representations (ICLR) 2022–2025
Reinforcement Learning Conference (RLC) 2024–2025
AAAI Conference on Artificial Intelligence 2023–2025
International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2020–2025
International Joint Conference on Artificial Intelligence (IJCAI) 2024
Neural Computing and Applications (NCAA)
IEEE Transactions on Artificial Intelligence
The Knowledge Engineering Review
Revista de Informática Teórica e Aplicada (RITA)

Workshop Reviewer: ALA (2023–2025), MODeM (2023–2024), EWRL 2023, LXAI@ICML 2021

Volunteer: Khipu 2025, AAMAS 2023, AAMAS 2021, LXAI@ICML 2021, NIME 2019.

Technical Skills

Languages: Portuguese (Native), English (Fluent), Spanish (Beginner).
Programming Languages: Python, C/C++, Java, R, MATLAB, Kotlin, SQL.
Tools & Others: Jax, PyTorch, Tensorflow, Scikit-Learn, Gym/Gymnasium, Pandas, NumPy, Matplotlib, i-graph, OpenCV, QT, Git, Unix/Linux, Cplex, LaTeX, SUMO, Network Analysis, Graphistry, VS Code.

Other Interests

- Guitar playing • Music • Travelling • Football/Soccer • Cinema • Board Games