

Lukas Schäfer

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Research Profile

I am a postdoctoral researcher at Microsoft Research, focusing on efficient learning algorithms for decision-making and multi-agent systems. I am a co-author of the first introductory textbook on multi-agent reinforcement learning, and have published in top machine learning venues, including NeurIPS, TMLR, and AAMAS.

Publications

Citations on Google Scholar: 1,200+

Textbook

- [1] S. V. Albrecht, F. Christianos, and **Lukas Schäfer**. *Multi-Agent Reinforcement Learning: Foundations and Modern Approaches*. MIT press, 2024.

Journal and Conference Papers (Peer-Reviewed)

- [2] **Lukas Schäfer**, O. Slumbers, S. McAleer, Y. Du, S. V. Albrecht, and D. Mguni. “Ensemble Value Functions for Efficient Exploration in Multi-Agent Reinforcement Learning”. In: AAMAS. 2025.
- [3] A. A. Fernandez, **Lukas Schäfer**, E. Villar-Rodriguez, S. V. Albrecht, and J. D. Ser. “Using Offline Data to Speed-up Reinforcement Learning in Procedurally Generated Environments”. In: *Neurocomputing* (2024).
- [4] A. Krnjaic, R. D. Steleac, J. D. Thomas, G. Papoudakis, **Lukas Schäfer**, A. W. K. To, K.-H. Lao, M. Cubuktepe, M. Haley, P. Börsting, and S. V. Albrecht. “Scalable Multi-Agent Reinforcement Learning for Warehouse Logistics with Robotic and Human Co-Workers”. In: *IROS*. 2024.
- [5] T. McInroe, **Lukas Schäfer**, and S. V. Albrecht. “Learning representations for control with hierarchical forward models”. In: *Transactions on Machine Learning Research* (2023).
- [6] **Lukas Schäfer**, F. Christianos, J. P. Hanna, and S. V. Albrecht. “Decoupled Reinforcement Learning to Stabilise Intrinsically-Motivated Exploration”. In: AAMAS. 2022.
- [7] **Lukas Schäfer**. “Task Generalisation in Multi-Agent Reinforcement Learning”. In: AAMAS, *Doctoral Consortium*. 2022.
- [8] R. Zhong, D. Zhang, **Lukas Schäfer**, S. V. Albrecht, and J. P. Hanna. “Robust On-Policy Data Collection for Data Efficient Policy Evaluation”. In: *NeurIPS*. 2022.
- [9] G. Papoudakis, F. Christianos, **Lukas Schäfer**, and S. V. Albrecht. “Benchmarking Multi-Agent Deep Reinforcement Learning Algorithms in Cooperative Tasks”. In: *NeurIPS, Datasets and Benchmarks Track*. 2021.
- [10] F. Christianos, **Lukas Schäfer**, and S. V. Albrecht. “Shared Experience Actor-Critic for Multi-Agent Reinforcement Learning”. In: *NeurIPS*. 2020.

Workshops (Peer-Reviewed)

- [11] **Lukas Schäfer**, L. Jones, A. Kanervisto, Y. Cao, T. Rashid, R. Georgescu, D. Bignell, S. Sen, A. T. Gavito, and S. Devlin. “Visual Encoders for Data-Efficient Imitation Learning in Modern Video Games”. In: *Adaptive and Learning Agents Workshop at AAMAS*. 2025.
- [12] **Lukas Schäfer**, F. Christianos, A. Storkey, and S. V. Albrecht. “Learning Task Embeddings for Teamwork Adaptation in Multi-Agent Reinforcement Learning”. In: *Generalization in Planning Workshop at NeurIPS*. 2023.

Work Experience – Current

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| Postdoctoral Researcher Microsoft Research My postdoctoral research focuses on developing novel imitation learning algorithms that enable decision making from few demonstrations in complex environments. I also contributed to the recording and data pipeline for training real-time world models deployed on Copilot Labs . Supervisor: Sergio Valcarcel Macua | Oct 2024 - Present <i>Cambridge, UK</i> |
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Work Experience – Past

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| Research Intern Microsoft Research I conducted an empirical study on the effectiveness of 16 visual encoders, including pre-trained vision foundation models, for imitation learning in modern video games. Our findings were presented at the ALA workshop at AAMAS 2024 [11]. Supervisors: Sam Devlin and Tabish Rashid | Apr 2023 - Oct 2023 <i>Cambridge, UK</i> |
| Research Intern Huawei Noah’s Ark Lab I researched ensemble models and how they can guide exploration and improve training stability in multi-agent reinforcement learning. The resulting publication was accepted and presented as an oral paper at AAMAS 2025 [2]. Supervisor: David Mguni | Jul 2022 - Dec 2022 <i>London, UK</i> |
| Research Intern Dematic - Technology and Innovation I designed and implemented an efficient multi-agent robotic warehouse simulator and novel multi-agent reinforcement learning algorithms for scalable robotic warehouse logistics. My internship led to a fellowship funded research collaboration , four further internship projects, and a publication at IROS 2024 [4]. Supervisors: Aleksandar Krnjaic and Stefano V. Albrecht | Nov 2020 - Mar 2021 <i>Remote</i> |

Education

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| PhD, Data Science & Artificial Intelligence University of Edinburgh My PhD research focused on novel exploration methods to enable sample-efficient deep reinforcement learning in single-agent and multi-agent settings. I also studied the ability of agents to generalise across tasks, and how meta-learning task representations can facilitate such generalisation. Supervisors: Stefano V. Albrecht (primary) and Amos Storkey (secondary) | Dec 2019 - Oct 2024 <i>Edinburgh, UK</i> |
| MSc, Informatics University of Edinburgh My Master’s dissertation project researched the efficacy of curiosity-driven exploration for multi-agent reinforcement learning. I also completed advanced modules on reinforcement learning, machine learning, robotics, and game theory. Supervisor: Stefano V. Albrecht Award: Distinction (77.28%) | Sep 2018 - Aug 2019 <i>Edinburgh, UK</i> |

BSc, Computer Science
Saarland University

Oct 2015 - Sep 2018
Saarbrücken, Germany

My Bachelor's dissertation project extended Action-Schema-Networks to learn heuristic functions for classical planning using neural networks. Beyond foundational modules in mathematics and computer science, I completed advanced modules on automated planning, neural networks, and software engineering.

Supervisor: Jörg Hoffmann | **Award:** 1.2 (within top 5%)

Teaching Experience

Textbook Author

Mar 2022 - Dec 2024

Designed and wrote an introductory **textbook on multi-agent reinforcement learning** with Stefano V. Albrecht and Filippos Christianos (equal contributions). I also co-designed the accompanying [codebase](#) and developed [exercises](#) for the Barcelona summer school on multi-agent reinforcement learning (2024).

Teaching Assistant
University of Edinburgh

Oct 2019 - Jun 2022
Edinburgh, UK

Re-designed the Reinforcement Learning course as teaching assistant for three consecutive years (2019 – 2022). Delivered lectures and designed coursework on reinforcement learning (including deep and multi-agent RL) for last year undergraduate and M.Sc. students. Supervised and marked coursework and exam scripts for 100+ students.

Voluntary Lecturer and Coach
Saarland University

Sep 2017 - Oct 2017
Saarbrücken, Germany

Delivered daily lectures on formal languages and predicate logic to 250 participants in the mathematics preparation course for upcoming computer science students. The course received **BESTE-award** for special student commitment 2017 of Saarland University.

Teaching Assistant
Saarland University

Oct 2016 - Mar 2017
Saarbrücken, Germany

Taught functional programming, basic complexity theory, and inductive proofs to first-year undergraduate students in weekly tutorials and office hours. Collectively created learning materials and discussed student progress as part of the whole teaching team. Marked weekly tests, mid-term and final exams.

Supervision and Mentorship Experience

Supervision of PhD Research Intern
Microsoft Research

Apr 2025 - Aug 2025
Cambridge, UK

Supervised PhD research intern Somjit Nath (McGill University/ Mila, Canada) during his 4-month internship. His work designed novel data augmentations for efficient imitation learning in video games.

Supervision of Visiting PhD Student University of Edinburgh

May 2022 - May 2023
Edinburgh, UK

Supervised visiting PhD student Alain Andres Fernandez (Tecnalia, Spain) during his 3-month research visit and following collaboration. The project researched imitation learning for pre-training and concurrent training of reinforcement learning agents, and resulted in a publication at the **Neurocomputing Journal** [3].

Supervision of Master's Students University of Edinburgh

Sep 2021 - May 2022
Edinburgh, UK

Supervised two Master's students during their M.Sc. dissertation projects:

- Rujie Zhong: Data Collection for Policy Evaluation in Reinforcement Learning
Led to publication at **NeurIPS 2022** [8], after presentation at Workshop on Offline Reinforcement Learning (NeurIPS 2021)
- Panagiotis Kyriakou: Reinforcement Learning with Function Approximation in Continuing Tasks: Discounted Return or Average Reward?

Research Community Engagement

Reviewing

- 3-time **best reviewer award** for ICML conference (2022, 2024, 2025)
- Journals: Transactions on Machine Learning Research (TMLR, 2024)
- Conferences: NeurIPS (2021, 2022, 2023), ICLR (2026), ICML (2021, 2022, 2023, 2024, 2025), AAMAS (2022, 2023, 2024), RLDM (2025), RLC (2024)
- Workshops: NeurIPS Pre-registration experiment workshop (2020)

Invited Talks

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| Oct 2025 | University of Sheffield, ML Seminar Series Decision-Making in Modern Video Games: From Human Play to World Models |
| Jul 2025 | Belgium-Netherlands Workshop on Reinforcement Learning (BeNeRL) Decision Making in Video Games |
| Nov 2024 | Gazi University Turkey, AI Research & Big Data Seminars An Introduction to the Multi-Agent Reinforcement Learning Textbook |
| May 2024 | Microsoft Research Cambridge Efficient and Scalable Decision Making In Complex Environments |
| Mar 2024 | University of Maryland, MARL Reading Group An Introduction to MARL Textbook and EPyMARL Codebase |
| Feb 2024 | Stanford University, Stanford Intelligent Systems Laboratory Sample-Efficient Multi-Agent Reinforcement Learning |
| Jul 2022 | Berkeley RL Reading Group Deep Reinforcement Learning for Multi-Agent Interaction |

Organisation

Lead Organiser UK Multi-Agent Systems Symposium 2025

Jul 2024 - Mar 2025
London, UK

Co-lead organiser of the **UK Multi-Agent Systems Symposium 2025** with 200 participants in collaboration with the Alan Turing Institute and King's College London.

RL Reading Group Organiser
University of Edinburgh

Sep 2020 - Sep 2022
Edinburgh, UK

Organised and hosted RL reading group at University of Edinburgh with speakers from industry (e.g. DeepMind, MSR, FAIR) and academia (e.g. Oxford University, McGill University, NUS)

Awards

Young Researcher Attendee
Heidelberg Laureate Forum

Sep 2022
Heidelberg, Germany

Selected as one of 100 international young researchers in computer science to participate in the prestigious Heidelberg Laureate Forum where I had the opportunity to network and discuss research with laureates of the most prestigious awards in mathematics and computer science.

Open-Source Software Contributions

EPyMARL – Core Contributor

Core contributor to the EPyMARL codebase, an open-source codebase for multi-agent reinforcement learning research. EPyMARL has been developed as part of a benchmarking effort [9] and has since received **over 600 stars on Github**.

MARL Textbook Codebase – Core Contributor

Core contributor to the accompanying codebase to our textbook on multi-agent reinforcement learning [1], an open-source codebase designed for ease of use and teaching in multi-agent reinforcement learning research. Within the first year of its release, the codebase has received **over 550 stars on Github**.

Funding

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| Dec 2019 - Jun 2024 | £58,731 | Principal's Career Development Scholarship PhD scholarship from University of Edinburgh |
| Apr 2023 - Oct 2023 | £12,860 | Microsoft Research internship extension funding to extend research internship from 3 to 6 months; granted by Xbox after demo of internship project progress |
| Jul 2022 - Dec 2022 | £4,160 | Huawei Noah's Ark Lab internship extension funding to extend research internship from 4 to 5 months |
| Sep 2018 - Aug 2019 | 16,500 € | DAAD graduate scholarship postgraduate scholarship from German Academic Exchange Service |
| Sep 2018 - Aug 2019 | £300 | Stevenson Exchange Scholarship postgraduate scholarship to support studies in Scotland |