

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 interested in developing algorithms that enable autonomous agents to efficiently learn to solve complex real-world decision-making tasks. My research spans the areas of reinforcement learning, multi-agent systems, and imitation learning, with a particular interest in exploration towards sample-efficient learning and generalisation across tasks.

Work Experience

Microsoft Research

Postdoctoral Researcher

Oct 2024 - Present

Cambridge, UK

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

Microsoft Research

Research Intern

Apr 2023 - Oct 2023

Cambridge, UK

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

Huawei Noah's Ark Lab

Research Intern

Jul 2022 - Dec 2022

London, UK

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

Dematic - Technology and Innovation

Research Intern

Nov 2020 - Mar 2021

Remote

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

Education

University of Edinburgh

PhD, Data Science & Artificial Intelligence

Dec 2019 - Oct 2024

Edinburgh, UK

- Summary: Researched novel exploration methods for deep reinforcement learning in single-agent and multi-agent settings.
- Supervisors: Stefano V. Albrecht (primary) and Amos Storkey (secondary)

- Grade: Distinction (77.28%)
- Dissertation project: Researched curiosity-driven exploration in multi-agent reinforcement learning.
- Supervisor: Stefano V. Albrecht

- Grade: 1.2 (within top 5%)
- Dissertation project: Extended Action-Schema-Networks to learn heuristic functions for classical planning using neural networks.
- Supervisor: Jörg Hoffmann

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.

Theses

- [13] **Lukas Schäfer**. “Efficient Exploration in Single-Agent and Multi-Agent Deep Reinforcement Learning”. PhD Thesis. University of Edinburgh, 2024.
- [14] **Lukas Schäfer**. *Curiosity in Multi-Agent Reinforcement Learning*. Master’s Thesis. 2019.
- [15] **Lukas Schäfer**. *Domain-Dependent Policy Learning using Neural Networks in Classical Planning*. Bachelor’s Thesis. 2018.

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).

University of Edinburgh

Oct 2019 - Jun 2022

Teaching Assistant

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.

Saarland University

Sep 2017 - Oct 2017

Voluntary Lecturer and Coach

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.

Saarland University

Oct 2016 - Mar 2017

Teaching Assistant

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

Microsoft Research

Supervision of PhD Research Intern

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.

University of Edinburgh

Supervision of Visiting PhD Student

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].

University of Edinburgh

Supervision of Master's Students

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?

Funding

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

Awards

Jun 2025	Best reviewer award at ICML 2025
Jun 2024	Best reviewer award at ICML 2024
Jul 2022	Best reviewer award at ICML 2022
Oct 2017	BESTE-award for special student commitment 2017 of Saarland University

Academic Engagement

Organisation

UK Multi-Agent Systems Symposium 2025

Lead Organiser

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.

University of Edinburgh

RL Reading Group Organiser

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)

Invited Talks

- 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

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)

Other Engagement

Heidelberg Laureate Forum

Young Researcher Attendee

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.