

Lukas Schäfer

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🎓 EDUCATION

PhD Data Science & Artificial Intelligence

12/2019 - 10/2024

UNIVERSITY OF EDINBURGH - GRADE: PASS WITH NO CORRECTIONS

EDINBURGH, UNITED KINGDOM

- › Supervisors: **Stefano V. Albrecht** (primary) and **Amos Storkey** (secondary)
- › Thesis: **Sample Efficiency and Generalisation in Multi-Agent Reinforcement Learning**
- › Awarded **Principal's Career Development Scholarship** from the University of Edinburgh
- › Organisation and hosting of **RL reading group** with speakers from industry (DeepMind, MSR, Google Brain, FAIR) and academia (Oxford University, McGill University, Georgia Institute of Technology, National University of Singapore)

M.Sc. Informatics

09/2018 - 08/2019

UNIVERSITY OF EDINBURGH - GRADE: DISTINCTION

EDINBURGH, UNITED KINGDOM

- › Thesis: Curiosity in Multi-Agent Reinforcement Learning, advised by Stefano V. Albrecht
- › Awarded **DAAD graduate scholarship** and **Stevenson Exchange Scholarship**

B.Sc. Computer Science, minor subject Japanese

10/2015 - 09/2018

SAARLAND UNIVERSITY - WITHIN TOP 5% OF YEAR

SAARBRÜCKEN, GERMANY

- › Thesis: Domain-Dependent Policy Learning using Neural Networks in Classical Planning, advised by Jörg Hoffmann

👛 EXPERIENCE

Researcher

10/2024 - Present

MICROSOFT RESEARCH

CAMBRIDGE, UNITED KINGDOM

- › Working towards autonomous agents that can enable novel experiences and tools in video games.

Textbook Author

03/2022 - 10/2023

Designed and wrote an introductory **textbook on multi-agent reinforcement learning** with **Stefano V. Albrecht** and **Filippos Christianos** (equal contributions). The book will be published with **MIT Press** in 2024 [1].

Research Intern

04/2023 - 10/2023

MICROSOFT RESEARCH

CAMBRIDGE, UNITED KINGDOM

- › Mentored by **Sam Devlin** and **Tabish Rashid**
- › Conducted an empirical study on the effectiveness of various **visual encoders**, including pre-trained **vision foundation models**, for **imitation learning in modern video games** [12]
- › Developed **novel platform** for imitation learning in Minecraft Dungeons **from scratch**, including human gameplay recorder, imitation learning framework using **PyTorch Lightning**, and programmatic interface for online evaluation

Young Research Attendee

09/2022 - 09/2022

HEIDELBERG LAUREATE FORUM

HEIDELBERG, GERMANY

- › Selected as one of 100 international young researchers in computer science to network and discuss research

Research Intern

07/2022 - 12/2022

HUAWEI NOAH'S ARK LAB

LONDON, UNITED KINGDOM

- › Researched the application of **ensemble models** to guide exploration and improve training stability of **multi-agent reinforcement learning** under the supervision of **David Mguni** [schaefer2023emax]

Research Intern

11/2020 - 03/2021

DEMATIC - TECHNOLOGY AND INNOVATION

REMOTE

- › Applied multi-agent reinforcement learning to automate **robotic warehouse logistics** and **scale to real-world settings** [krnjaic2022]
- › My internship led to four further internship projects and a **fellowship-funded research collaboration**

Machine Learning & Data Science

Python: PyTorch • PyTorch Lightning • NumPy • Pandas • Scikit-Learn • Matplotlib • Jupyter • Anaconda

Software Engineering

C++ • C • Bash • Git • Docker • HTML • CSS • JavaScript

Natural Languages

German (native) • English (fluent) • Chinese (beginner)

Soft Skills

Teamwork • Teaching • Communication • Organisation

SELECTED PUBLICATIONS

Textbook

- [1] S. V. Albrecht, F. Christianos, and **Lukas Schäfer** (equal contributions), *Multi-Agent Reinforcement Learning: Foundations and Modern Approaches*. To be published with **MIT press**, 2024.

Conferences and Journals

- [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. Del Ser, “Using offline data to speed-up reinforcement learning in procedurally generated environments,” **Neurocomputing**, 2024.
- [4] A. Krnjaic, R. D. Stealeac, 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,” **TMLR**, 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

- [11] **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.

Pre-prints

- [12] **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,” *arXiv*, 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.

REVIEWING

- › 2024: ICML (**best reviewer award**), RLC, AAMAS, TMLR
- › 2023: NeurIPS, NeurIPS Datasets and Benchmark Track, ICML, AAMAS
- › 2022: NeurIPS, NeurIPS Datasets and Benchmark Track, ICML (**top 10% outstanding reviewer award**), AAMAS
- › 2021: NeurIPS
- › 2020: Pre-registration experiment workshop at NeurIPS

TEACHING AND SUPERVISION EXPERIENCE

Visiting PhD Student Supervision, University of Edinburgh 05/2022 - 05/2023

- › Supervised Alain Andres Fernandez from Tecalia, Spain, during his 3-month research visit and subsequent collaboration
- › Jointly developed and executed research project investigating the efficacy of imitation learning for pre-training and concurrent training of reinforcement learning agents in procedurally generated environments [**andres2023using**]

Teaching Assistant, University of Edinburgh 10/2019 - 06/2022

REINFORCEMENT LEARNING, SCHOOL OF INFORMATICS

- › **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

M.Sc. Student Supervision, University of Edinburgh 02/2021 - 08/2021

- › Co-supervised two M.Sc. students through project proposal, refinement and execution towards final thesis
- › Rujie Zhong: Data Collection for Policy Evaluation in Reinforcement Learning
Revised paper accepted at Workshop on Offline Reinforcement Learning at NeurIPS 2021, and later as a **main conference paper at NeurIPS 2022** [8]
- › Panagiotis Kyriakou: Reinforcement Learning with Function Approximation in Continuing Tasks: Discounted Return or Average Reward?

Voluntary Lecturer and Coach, Saarland University 09/2017 - 10/2017

MATHEMATICS PREPARATION COURSE

- › Delivered daily **lectures** on formal languages and predicate logic to **250 participants** in first week
- › The course received **BESTE-award** for special student commitment 2017 of Saarland University

Teaching Assistant, Saarland University 10/2016 - 03/2017

PROGRAMMING 1, DEPENDABLE SYSTEMS AND SOFTWARE GROUP

- › 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

AWARDS

- › Best reviewer award at ICML 2024 07/2024
- › Principal's Career Development Scholarship 12/2019 - 06/2024
- › Top 10% outstanding reviewer award at ICML 2022 07/2022
- › DAAD graduate scholarship 09/2018 - 08/2019
- › Stevenson Exchange Scholarship 09/2018 - 08/2019
- › BESTE-award for special student commitment 2017 of Saarland University 10/2017

[REFERENCES AVAILABLE ON REQUEST]