

# Lukas Schäfer

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## Research Profile

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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+

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### 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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<b>Postdoctoral Researcher</b> <b>Microsoft Research</b> 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 <a href="#">real-time world models deployed on Copilot Labs</a> . <b>Supervisor:</b> Sergio Valcarcel Macua	Oct 2024 - Present <i>Cambridge, UK</i>
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## Work Experience – Past

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<b>Research Intern</b> <b>Microsoft Research</b> 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]. <b>Supervisors:</b> Sam Devlin and Tabish Rashid	Apr 2023 - Oct 2023 <i>Cambridge, UK</i>
<b>Research Intern</b> <b>Huawei Noah’s Ark Lab</b> 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 <b>oral paper at AAMAS 2025</b> [2]. <b>Supervisor:</b> David Mguni	Jul 2022 - Dec 2022 <i>London, UK</i>
<b>Research Intern</b> <b>Dematic - Technology and Innovation</b> 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 <b>fellowship funded research collaboration</b> , four further internship projects, and a publication at IROS 2024 [4]. <b>Supervisors:</b> Aleksandar Krnjaic and Stefano V. Albrecht	Nov 2020 - Mar 2021 <i>Remote</i>

## Education

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<b>PhD, Data Science &amp; Artificial Intelligence</b> <b>University of Edinburgh</b> 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. <b>Supervisors:</b> Stefano V. Albrecht (primary) and Amos Storkey (secondary)	Dec 2019 - Oct 2024 <i>Edinburgh, UK</i>
<b>MSc, Informatics</b> <b>University of Edinburgh</b> 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. <b>Supervisor:</b> Stefano V. Albrecht   <b>Award:</b> 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

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**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

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**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**

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### **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 | <b>University of Sheffield, ML Seminar Series</b><br>Decision-Making in Modern Video Games: From Human Play to World Models              |
| Jul 2025 | <b>Belgium-Netherlands Workshop on Reinforcement Learning (BeNeRL)</b><br>Decision Making in Video Games                                 |
| Nov 2024 | <b>Gazi University Turkey, AI Research &amp; Big Data Seminars</b><br>An Introduction to the Multi-Agent Reinforcement Learning Textbook |
| May 2024 | <b>Microsoft Research Cambridge</b><br>Efficient and Scalable Decision Making In Complex Environments                                    |
| Mar 2024 | <b>University of Maryland, MARL Reading Group</b><br>An Introduction to MARL Textbook and EPyMARL Codebase                               |
| Feb 2024 | <b>Stanford University, Stanford Intelligent Systems Laboratory</b><br>Sample-Efficient Multi-Agent Reinforcement Learning               |
| Jul 2022 | <b>Berkeley RL Reading Group</b><br>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	<b>Principal's Career Development Scholarship</b> PhD scholarship from University of Edinburgh
Apr 2023 - Oct 2023	£12,860	<b>Microsoft Research internship extension</b> 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	<b>Huawei Noah's Ark Lab internship extension</b> funding to extend research internship from 4 to 5 months
Sep 2018 - Aug 2019	16,500 €	<b>DAAD graduate scholarship</b> postgraduate scholarship from German Academic Exchange Service
Sep 2018 - Aug 2019	£300	<b>Stevenson Exchange Scholarship</b> postgraduate scholarship to support studies in Scotland