







Lukas Schäfer

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WORK EXPERIENCE

Research Intern

11/2020 -- 03/2021

DEMATIC - TECHNOLOGY AND INNOVATION

REMOTE

- ▶ Applying state-of-the-art AI technology to automate large-scale robotic warehouse logistics.

Navigation Software Engineer and Navigation Advisor

09/2018 -- 08/2020

HYPED -- UNIVERSITY OF EDINBURGH HYPERLOOP TEAM

EDINBURGH, UNITED KINGDOM

- ▶ Developing navigation system of "The Flying Podman" Hyperloop prototype using sensor filtering, processing and control techniques to estimate location, orientation and speed of the pod
- ▶ Finalist for the SpaceX 2019 Hyperloop competition in California in Summer 2019
- ▶ Advising navigation team on the adaptation and implementation of improved sensor and filtering techniques

PUBLICATIONS

Refereed Publications

- [1] Lukas Schäfer, F. Christianos, J. Hanna, and S. V. Albrecht, "Decoupling exploration and exploitation in reinforcement learning," in *ICML Workshop on Unsupervised Reinforcement Learning (URL); (Revised Under Review)*, 2021.
- [2] G. Papoudakis, F. Christianos, Lukas Schäfer, and S. V. Albrecht, "Benchmarking multi-agent deep reinforcement learning algorithms in cooperative tasks," in *Neural Information Processing Systems (NeurIPS), Datasets and Benchmarks Track*, 2021.
- [3] F. Christianos, Lukas Schäfer, and S. V. Albrecht, "Shared experience actor-critic for multi-agent reinforcement learning," in *Neural Information Processing Systems (NeurIPS)*, 2020.

Under Review

- [4] T. McInroe, Lukas Schäfer, and S. V. Albrecht, "Learning temporally-consistent representations for data-efficient reinforcement learning," (*Under Review*), 2021.
- [5] R. Zhong, J. Hanna, Lukas Schäfer, and S. V. Albrecht, "Robust on-policy data collection for data efficient policy evaluation," (*Under Review*), 2021.

EDUCATION

PhD Data Science & Artificial Intelligence

12/2019 -- Present

UNIVERSITY OF EDINBURGH

EDINBURGH, UNITED KINGDOM

- ▶ Supervisors: Stefano V. Albrecht (primary) and Amos Storkey (secondary) | Expected graduation: December 2023
- ▶ Project: Sample Efficiency and Generalisation in Multi-Agent Reinforcement Learning
- ▶ Receiving **Principal's Career Development Scholarship** from the University of Edinburgh
- ▶ Research: Reinforcement Learning, Multi-Agent Systems, Generalisation, Exploration, Intrinsic Rewards

M.Sc. Informatics

09/2018 -- 08/2019

UNIVERSITY OF EDINBURGH

EDINBURGH, UNITED KINGDOM

- ▶ Degree classification: **Distinction** (77.28%)
- ▶ Received **DAAD** (German Academic Exchange Service) **graduate scholarship** and **Stevenson Exchange Scholarship**
- ▶ Modules include: Reinforcement Learning, Algorithmic Game Theory and its Applications, Machine Learning and Pattern Recognition, Probabilistic Modelling and Reasoning, Decision Making in Robots and Autonomous Agents

B.Sc. Computer Science, minor subject Japanese

10/2015 -- 09/2018

SAARLAND UNIVERSITY

SAARBRÜCKEN, GERMANY

- ▶ Degree classification: grade of **1.2** (German scale) equivalent to UK **1st class honours**

Abitur - Secondary School

08/2008 -- 06/2015

WARNDTGYMNASIUM GEISLAUTERN, VÖLKLINGEN

GEISLAUTERN, GERMANY

- ▶ **Grade of 1.0**; school year's best student award, computer science and mathematics award of Saarland University

SKILLS

Programming

Competent

Python • C++

Familiar

C • Java • Rust • SML • HTML • CSS • Matlab • Bash

Technologies and Tools

PyTorch • TensorFlow • Keras • NumPy • UNIX • Git

Languages

Native in German • Fluent in English • Intermediate in French • Beginner in Chinese • Beginner in Japanese

PROJECT EXPERIENCE

Reinforcement Learning for Soccer Playing, University of Edinburgh

02/2019 -- 03/2019

PROJECT FOR REINFORCEMENT LEARNING LECTURE

- › Implemented several RL methods including value iteration, Q-learning, SARSA and DQN for simple control tasks
- › Implemented tabular multi-agent RL methods to control two cooperative agents in a 2D football game

Autonomous Robot Localisation, University of Edinburgh

09/2018 -- 12/2018

GROUP PROJECT FOR ROBOTICS: SCIENCE AND SYSTEMS LECTURE

- › Constructed a differential steering mobile robot using LEGO, a Raspberry Pi, and an array of IR, camera and sonar sensors
- › Implemented particle-filter localisation and obstacle avoidance in a predetermined environment
- › Robot successfully managed to navigate through the constructed arena, detect and communicate points of interest using light sensors and return back to its deployment location

For more project experience, see lukaschaefer.com/#projects

DISSERTATIONS

M.Sc. Dissertation, Autonomous Agents Research Group

05/2019 -- 08/2019

CURIOSITY IN MULTI-AGENT REINFORCEMENT LEARNING (74%)

- › Applied curiosity as intrinsically computed exploration bonuses for multi-agent reinforcement learning (MARL)
- › Implemented count- and prediction-based curiosities for value-based and policy-gradient MARL methods using PyTorch
- › Evaluated the influence of curiosity on cooperative and competitive MARL under partial observability and sparse rewards in a multi-agent particle environment
- › Applied curiosity led to improved stability and convergence of policy-gradient MARL trained with sparse reward signals

B.Sc. Dissertation, Foundations of Artificial Intelligence (FAI) Group

04/2018 -- 07/2018

DOMAIN-DEPENDENT POLICY LEARNING USING NEURAL NETWORKS IN CLASSICAL PLANNING (1.0)

- › Transferred domain-dependent policy learning Action-Schema Networks to classical automated planning
- › Keras implementation, adjusted training for classical planning and extended the FastDownward planning framework
- › Extensive evaluation and analysis on IPC domains identifying limitations in generalisation and scalability

TEACHING EXPERIENCE

Teaching Assistant, University of Edinburgh

10/2019 -- Present

REINFORCEMENT LEARNING, SCHOOL OF INFORMATICS

Voluntary Lecturer and Coach, Saarland University

09/2017 -- 10/2017

MATHEMATICS PREPARATION COURSE

Teaching Assistant, Saarland University

10/2016 -- 03/2017

PROGRAMMING 1, DEPENDABLE SYSTEMS AND SOFTWARE GROUP

REVIEWING

- › Reviewer for **NeurIPS 2021 Datasets and Benchmarks Track**
- › Reviewer for **NeurIPS 2020 workshop "The pre-registration experiment: an alternative publication model for machine learning research"**