

¶ Lukas Schäfer

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# ♣ WORK FXPERIENCE

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.

## **FDUCATION**

### PhD Data Science & Artificial Intelligence

12/2019 -- Present

University of Edinburgh

EDINBURGH, UNITED KINGDOM

- > Supervisors: Stefano V. Albrecht (primary) and Amos Storkey (secondary)
- > 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



# PUBLICATIONS

#### Journal & Conference 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), 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 34th Conference on Neural Information Processing Systems, 2020.

# **Q** 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"

# III SKILLS

# **Programming**

Competent Python · C++ · SML

· Java · Rust · HTML · CSS · Matlab · Bash

**Technologies and Tools** PyTorch · TensorFlow · Keras · NumPy · UNIX · Git

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



### 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 was conducted on IPC domains of varying complexity identifying limitations in generalisation and scalability



# ■ TEACHING EXPERIENCE

# Teaching Assistant, University of Edinburgh

10/2019 -- Present

REINFORCEMENT LEARNING, SCHOOL OF INFORMATICS

- > Delivering lectures and designing RL coursework covering wide range of topics from single- to multi-agent and deep RL
- > Marking project and exam for reinforcement learning course
- Advising students on various challenges regarding lecture material and content

### Voluntary Lecturer and Coach, Saarland University

09/2017 -- 10/2017

MATHEMATICS PREPARATION COURSE

- > Assisted the organization of the mathematics preparation course for upcoming computer science students
- $\triangleright$  Explained formal languages and predicate logic to  $\sim 250$  participants in daily lectures of the first week
- Supervised two groups to provide feedback and further assistance in daily coaching-sessions
- > 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 first-year students concepts of functional programming, basic complexity theory and inductive correctness proofs in weekly tutorials and office hours
- > Collectively created learning materials and discussed student progress as part of the whole teaching team

# PROJECT EXPERIENCE

# Navigation Software Engineer, University of Edinburgh

09/2018 -- 08/2019

HYPED -- University of Edinburgh Hyperloop Team

- > Developing navigation system of "The Flying Podsman" 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

# Autonomous Robot Localisation, University of Edinburgh

09/2018 -- 12/2018

GROUP PROJECT FOR ROBOTICS: SCIENCE AND SYSTEMS LECTURE

- > Constructed a four-wheel differential steering mobile robot as group of three for autonomous localisation in a known environment using LEGO aside of technical components including a Raspberry Pi computer
- Implemented particle-filter localisation and obstacle avoidance based on IR and sonar sensors
- 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