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.

EDUCATION

PhD Data Science & Artificial Intelligence
12/2019 -- Present

University of Edinburgh — Edinburgh, United Kingdom

- Principal supervisor: Dr. Stefano V. Albrecht (Autonomous Agents Research Group)
- Project: Collaborative Exploration in Multi-Agent Reinforcement Learning using Intrinsic Curiosity
- 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**

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

SKILLS

Programming

Competent
Python • C++ • SML

Familiar
C • Java • Rust • 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

TEACHING EXPERIENCE

Teaching Assistant, University of Edinburgh — 10/2019 -- Present

Reinforcement Learning, School of Informatics

- **Delivering lectures** and **designing RL coursework** coveringwide 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
- Explained formal languages and predicate logic to ~ 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

PUBLICATIONS

Journal & Conference Publications

[1] Filippos Christianos, **Lukas Schäfer**, and Stefano V. Albrecht. Shared Experience Actor-Critic for Multi-Agent Reinforcement Learning. In *34th Conference on Neural Information Processing Systems*, 2020.

Preprint Publications

[2] Georgios Papoudakis, Filippos Christianos, **Lukas Schäfer**, and Stefano V. Albrecht. Comparative Evaluation of Multi-Agent Deep Reinforcement Learning Algorithms, 2020.

REVIEWING

- Reviewer for **NeurIPS 2020 workshop** "**The pre-registration experiment**: an alternative publication model for machine learning research"

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

[References available on request - Last updated on February 3, 2021]