

Lukas Schäfer

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EDUCATION

PhD Data Science & Artificial Intelligence

University of Edinburgh

12/2019 – Present

Edinburgh, United Kingdom

- › Principal supervisor: Dr. Stefano V. Albrecht
- › Project: Collaborative Exploration in Multi-Agent Reinforcement Learning using Intrinsic Curiosity
- › Research: Reinforcement Learning, Multi-Agent Systems, Exploration, Intrinsic Rewards

M.Sc. Informatics

University of Edinburgh

09/2018 – 08/2019

Edinburgh, United Kingdom

- › Degree classification: Distinction (77.28%)
- › MSc thesis: Dissertation: Curiosity in Multi-Agent Reinforcement Learning (74%)
- › DAAD (German Academic Exchange Service) graduate 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

Saarland University

10/2015 – 09/2018

Saarbrücken, Germany

- › Degree classification: grade of 1.2 (German scale) equivalent to UK 1st class honours
- › BSc thesis: Domain-Dependent Policy Learning using Neural Networks in Classical Planning (1.0)
- › Modules include: Automated Planning, Admissible Search Enhancements, Neural Networks: Implementation and Application, Information Retrieval and Data Mining, Software Engineering, Modern Imperative Programming Languages

Abitur 1.0 - Secondary School

Warndtgymnasium Geislautern, Völklingen

08/2008 – 06/2015

Geislautern, Germany

RESEARCH EXPERIENCE

M.Sc. Dissertation, University of Edinburgh

Autonomous Agents Research Group

05/2019 – 08/2019

- › 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, Saarland University

Foundations of Artificial Intelligence (FAI) Group

04/2018 – 07/2018

- › Transferred domain-dependent policy learning Action-Schema Networks to classical automated planning
- › Implemented the network using Keras, slightly adjusted its 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 Japanese

TEACHING EXPERIENCE

Teaching Assistant, University of Edinburgh

10/2019 – Present

Reinforcement Learning, School of Informatics

- › Designing reinforcement learning (RL) project covering wide range of topics including dynamic programming, single- and multi-agent RL as well as 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 fundamental concepts of functional programming, basic complexity theory and inductive correctness proofs in weekly tutorials and office hours
- › Marked weekly tests as well as mid- and endterm exams
- › 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 Podsmen" 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

Reinforcement Learning for Soccer Playing, University of Edinburgh

02/2019 – 03/2019

Project for Reinforcement Learning Lecture

- › Implemented several foundational RL methods including value iteration, Q-learning, first-visit Monte Carlo and SARSA for simple control tasks and the half-field-offense (HFO) 2D environment
- › Implemented asynchronous 1-step Q-learning with deep Q-networks (DQNs)
- › Implemented multi-agent RL methods independent Q-learning, joint action learning and WoLF-PHC controlling two cooperating agents in the HFO environment

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

Plagiarism Detection Tool, Saarland University

04/2017 – 07/2017

Group Project for Software Engineering Lecture

- › Researched, planned and built a reliable similarity detection for text & code in Python with language-specific analysis for Python and C as a group of five
- › Designed and implemented a web-based output creation, highlighting similar submissions and plagiarism
- › Our software is now successfully used in our customer's lectures to detect plagiarism cases on Python code