

# Lukas Schäfer

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## 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

## EDUCATION

### 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 1<sup>st</sup> 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 - Secondary School

Warndtgymnasium Geislautern, Völklingen

08/2008 – 06/2015

Geislautern, Germany

- › Graduated Abitur 1.0 with examination subjects:  
Mathematics - 15, English - 12, Computer Science - 14, German - 15, History - 15
- › Year's best student award of the Warndtgymnasiums Geislautern
- › Computer science and mathematics award 2015 of Saarland University

## WORK EXPERIENCE

### Team Advisor, University of Edinburgh

HYPED – University of Edinburgh Hyperloop Team

09/2019 – Present

- › Consulting the HYPED software team especially regarding navigation and sensor filtering to achieve a reliable prototype design competing at the 5th SpaceX Hyperloop Competition

### Navigation Software Engineer, University of Edinburgh

HYPED – University of Edinburgh Hyperloop Team

09/2018 – 08/2019

- › 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

## PROJECT EXPERIENCE

### Autonomous Robot Localisation, University of Edinburgh

Group Project for Robotics: Science and Systems Lecture

09/2018 – 12/2018

- › 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

## Galaxy-based Search, University of Edinburgh

09/2018 – 12/2018

Group Project for Natural Computing Lecture

- › Implemented the Galaxy-based Search Algorithm (GbSA) and Particle Swarm Optimisation (PSO) baseline for PCA approximation as metaheuristic optimisation algorithms
- › Evaluated and analysed GbSA and its foundational research paper, outlined limitations, proposed adjustments to the algorithm and showed their positive impact on performance in an evaluation

## 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

## Concurrent CDCL SAT-Solver, Saarland University

07/2017 – 09/2017

Group Project for Modern Imperative Programming Languages Seminar

- › Planned and implemented a concurrent Conflict-Driven Clause Learning SAT-Solver using Rust
- › Optimised literal assignment using multiple heuristic strategies, pure variable detection and handling

## RESEARCH EXPERIENCE

### M.Sc. Dissertation, University of Edinburgh

05/2019 – 08/2019

Autonomous Agents Research Group

- › 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

04/2018 – 07/2018

Foundations of Artificial Intelligence (FAI) Group

- › 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

## TEACHING EXPERIENCE

### 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 importance of mathematics for CS, 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

### Programming 1 Teaching Assistant, Saarland University

10/2016 – 03/2017

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