# Fabian **Otto**

Research Scientist · Software Engineer

fabian.otto@bosch.com | ottofabian.github.io | OttoFabian | ottofabianRL | ottofabian


## Education

### Ph.D. in Computer Science

*Tübingen, Germany*

University of Tübingen

*11/2019–10/2023 (expected)*

- Thesis: Differentiable Trust Region Projection Layers for Deep Reinforcement Learning
- Advisor: Gerhard Neumann

### M.Sc. in Computer Science (with distinction), Minor in Psychology

*Darmstadt, Germany*

Technical University of Darmstadt

*10/2017–10/2019*

- GPA: 1.0 (on a scale of 1-5, with 1 being the highest score)
- Honors & Awards: ECTS A Ranking; Germany Scholarship; Schaeffler Top Student Scholarship
- Thesis: Deep Demand Management

### B.Sc. in Business Information Systems – Software Engineering

*Mannheim, Germany*

Baden-Württemberg Cooperative State University

*10/2014–09/2017*

- GPA: 1.4 (on a scale of 1-5, with 1 being the highest score)
- Honors & Awards: ECTS A Ranking

## Research Experience

### Graduate Research Assistant

*Tübingen, Germany*

University of Tübingen & Bosch Center for Artificial Intelligence

*11/2019–Present*

- Developed novel **trust region methods** for deep reinforcement learning in **PyTorch** comparing to baselines, such as **PPO**, **SAC**, **TD3**, and **MPO**, on **MuJoCo** tasks.
- Integrated **movement primitives** into deep reinforcement learning to combine benefits of **episode-based** and **step-based** reinforcement learning, especially for scenarios with **sparse** and **non-Markovian** rewards.

### Research Assistant

*Darmstadt, Germany*

Technical University of Darmstadt

*10/2017–09/2019*

- Jan Peters' lab: Implemented and evaluated reinforcement learning algorithms, such as **DQN**, **A3C**, and **PILCO**, in **PyTorch**, for **simulation** and **physical** robotic systems.
- Kristian Kersting's lab: Utilized **TensorFlow** to implement the **PixelNet** architecture for **semantic segmentation** of the city scenes dataset.
- Kristian Kersting's lab: Employed **CRFs** and **HMMs** to accurately classify **POS tags** and **named entities** in the Groningen Meaning Bank.
- Iryna Gurevych's lab: Developed a system to **classify tweet authorship** using **random forests** and deep approaches with **GloVe embeddings**.

### Research Intern: Animal Biometrics

*Darmstadt, Germany*

Fraunhofer Institute for Computer Graphics Research

*04/2018–09/2018*

- Implemented **ResNet** and **RetinaNet** in **TensorFlow** for classifying individual animals and species in **low-quality camera trap images**.
- Reduced biologists' workload by eliminating the need to review approximately 90% of the images, enabling them to focus on relevant cases, aiding **wildlife conservation efforts** and **ecological research**.

## Occupational Experience

### Data Scientist (Part-time)/Corporate Scholarship

*Langen, Germany*

Schaeffler Group

*10/2017–10/2019*

- Recognized as exceptional dual student, selected for Schaeffler's Top Student Scholarship, pursuing a master's degree and working part-time.
- Conducted a comprehensive evaluation of **traditional**, **deep learning**, and **hybrid** approaches to enhance **demand forecasting**. Successfully **improved forecast quality by 30%** compared to the existing system.
- Played a key role in **strategizing and optimizing the intricate data landscape** to elevate analytics capabilities and unlock valuable insights.

### Dual Student

*Herzogenaurach, Germany*

Schaeffler Group

*10/2014–09/2017*

- Designed and implemented a **user-friendly graphical editor**, streamlining configuration management for production machines. Part of a system that was recognized with the *German Design Award 2023 "Special Mention"*.
- Led the development of a global **document security concept**, ensuring the protection and integrity of sensitive information.
- Provided instrumental support to **project management** in the successful rollout of an SAP system. Collaborated with **cross-functional teams**, ensuring smooth and timely **communication**, as well as efficient **issue resolution**. Contributed to system configuration, **user training**, and facilitated a seamless transition, maximizing the utilization of the SAP system.
- Engineered a data mapping tool with **Java**, optimizing the loading process of CAD models, saving approximately 10 minutes per model loaded.

### Intern: Disaster Recovery and Business Continuity Planning

*Wooster, OH, USA*

Schaeffler Transmission, LLC *05/2016–08/2016*

- Assessed the **reliability** of the site's network infrastructure and the potential repercussions along the supply chain in the event of an **outage**.
- Identified critical dependencies and vulnerabilities, enabling proactive **risk management** and **continuity planning** to mitigate downtime risks.

## Publications


[1] Philipp Becker, Sebastian Markgraf, **Fabian Otto**, and Gerhard Neumann. "Reinforcement Learning from Multiple Sensors via Joint Representations". Under submission. 2023.

[2] Ge Li, Zeqi Jin, Michael Volpp, **Fabian Otto**, Rudolf Lioutikov, and Gerhard Neumann. "ProDMP: A Unified Perspective on Dynamic and Probabilistic Movement Primitives". In: *IEEE Robotics and Automation Letters (RA-L)/International Conference on Intelligent Robots and Systems (IROS)* 8.4 (2023), pp. 2325–2332.

[3] **Fabian Otto**, Onur Celik, Hongyi Zhou, Hanna Ziesche, Vien Anh Ngo, and Gerhard Neumann. "Deep Black-Box Reinforcement Learning with Movement Primitives". In: *Conference on Robot Learning (CoRL)*. PMLR. 2022, pp. 1244–1265.

[4] **Fabian Otto**, Philipp Becker, Ngo Anh Vien, Hanna Ziesche, and Gerhard Neumann. "Differentiable Trust Region Layers for Deep Reinforcement Learning". In: *International Conference on Learning Representations (ICLR)*. 2021.

[5] **Fabian Otto**. "Model-Free Deep Reinforcement Learning — Algorithms and Applications". In: *Reinforcement Learning Algorithms: Analysis and Applications*. Ed. by Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters. Springer Cham: Springer International Publishing, 2021, pp. 109–121. ISBN: 978-3-030-41188-6.


## Teaching Experience

### Student Supervision

*Tübingen, Germany*

University of Tübingen & Karlsruhe Institute of Technology

- **"Air HocKIT" student team**: NeurIPS 2023 Competition Track: Robot Air Hockey Challenge (Intern) *04/2023–today*
- **Leonhard Kraft**: Deep Black-Box Reinforcement Learning with Movement Primitives on Infinite-Horizon Problems (B.Sc.) *05/2023–today*
- **Moritz Behr**: Deep Black-Box Reinforcement Learning with NeRFs (M.Sc.) *11/2022–today*
- **Dhimiter Pikuli**: Learning Complex Robot Arm Manipulations with Deep Reinforcement Learning (M.Sc., Intern) *09/2022–03/2023*
- **Dominik Roth**: Exploration Strategies in Step-Based Deep Reinforcement Learning (B.Sc., 3x Intern) *08/2022–11/2022*
- **Denis Megerle**: Stable Optimization of Gaussian Likelihoods (M.Sc.) *03/2022–09/2022*
- **Ahmed Agha**: Improved Trust Regions for Adversarial Imitation Learning (M.Sc.) *03/2021–09/2022*
- **Ricardo Dominguez**: Action Correlations for Deep Reinforcement Learning (2x Intern) *06/2021–02/2022*

## Community Service

### Workshop Organization

- **IROS 2023:** Policy Learning in Geometric Spaces (Main Organizer)
- **CoRL 2022:** Geometry, Physics, and Human Knowledge as Inductive Bias in Robot Learning (Main Organizer)

### Reviewing

- NeurIPS
- ICML
- CoRL
- Springer Nature, Machine Learning
- IEEE Robotics and Automation Letters (RA-L)

### Open Source Contributions

- **Farama Foundation**: Contributions to Shimmy and Meta-World

## Skills

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|---|---|
| **Language** | German (native), English (fluent) |
| **Machine Learning** | Gymnasium, MuJoCo, Numpy, Pandas, Pytorch, Scipy, Tensorflow |
| **Software Engineering** | Docker, Git, Java, Jira, Jupyter, Kafka, LSF, Optuna, Slurm, Spark, SQL, Unitest |
| **Other** | LaTeX, Linux–Ubuntu, Microsoft Office |