Fabian **Otto**

Research Scientist · Software Engineer

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Education

PhD in Computer Science

Tübingen, Germany

University of Tübingen

11/2019–Present

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

Master of Science 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

Bachelor of Science 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

10/2017–04/2019

- 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)/Top Student 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] **Fabian Otto**, Philipp Becker, Vien Anh Ngo, and Gerhard Neumann. "Vlearn: Off-Policy Learning with Efficient State-Value-Function Estimation". Under submission. 2023.

[2] Ge Li, Hongyi Zhou, Dominik Roth, Serges Thilges, **Fabian Otto**, Rudolf Lioutikov, and Gerhard Neumann. "Open the Black Box: Step-based Policy Updates for Temporally-Correlated Episodic Reinforcement Learning". Under submission. 2023.

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

[4] **Fabian Otto***, Hongyi Zhou*, Onur Celik, Ge Li, Rudolf Lioutikov, and Gerhard Neumann. "MP3: Movement Primitive-Based (Re-)Planning Policy". In: *CoRL Workshop on Learning Effective Abstractions for Planning (LEAP)*. 2023.

[5] 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.

[6] **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.

[7] **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.

[8] **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

- **"AirHocKIT" student team**: NeurIPS 2023 Competition Track: Robot Air Hockey Challenge (Intern) *04/2023–today*
- **Dominik Roth**: Exploration Strategies in Deep Reinforcement Learning (B.Sc., 3x Intern) *08/2022–today*
- **Leonhard Kraft**: Deep Black-Box Reinforcement Learning with Movement Primitives on Infinite-Horizon Problems (B.Sc.) *05/2023–10/2023*
- **Moritz Behr**: Deep Black-Box Reinforcement Learning with NeRFs (M.Sc.) *11/2022–05/2023*
- **Dhimiter Pikuli**: Learning Complex Robot Arm Manipulations with Deep Reinforcement Learning (M.Sc., Intern) *09/2022–03/2023*
- **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

- Conference on Neural Information Processing Systems (NeurIPS)
- International Conference on Machine Learning (ICML)
- Conference on Robot Learning (CoRL)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE Robotics and Automation Letters (RA-L)
- Springer Nature, Machine Learning

Open Source Contributions

- **Farama Foundation:** Contributions to Shimmy and Meta-World
- **Fancy Gym:** Core Maintainer

Skills

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