

Robin Uhrich

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EDUCATION

University of Tübingen
Master Machine Learning

Tübingen, Germany
since October 2023

Politecnico di Milano
Erasmus Exchange, Master Computer Science

Milano, Italy
February 2025 – August 2025

University of Freiburg
Bachelor Computer Science

Freiburg im Breisgau, Germany
October 2019 – September 2023

University of Stuttgart
Aeronautics and Space Engineering

Stuttgart, Germany
October 2018 – September 2019

PUBLICATIONS

Occupancy Modeling via Drifting: One-Step Generation Enables Direct Policy Extraction 2026
Robin Uhrich, Marco Bagatella, Núria Armengol Urpí, Pavel Kolev, Georg Martius
Preprint, arXiv:2610.19883

PROJECT WORK

University

Master Thesis

since October 2025

- Master thesis at the lab of Prof. Georg Martius, supervised by Dr. Pavel Kolev, Núria Armengol Urpí and Marco Bagatella.
- Topics: occupancy modelling, generative models, and offline meta-RL.
- Resulted in the preprint arXiv:2610.19883 (see Publications).

Distributed RL on Optimal Transport *Research Project* 🏠

April 2025 – October 2025

- Project done at the lab of Prof. Marcello Restelli, supervised by Dr. Marco Mussi.
- Redesign of the rail environment from Flatland3 for multi-agent RL in an asynchronous setting to solve the train-scheduling problem.
- Switched the perspective from train-focused to switch-focused.
- Tools used: Python, Flatland3, Gymnasium, PettingZoo.

Field Robot Event *Multi-Disciplinary Project at PoliMi*

March 2025 – June 2025

- Course project on robotics under Prof. Matteo Matteucci, Dr. Simone Mentasti and Mirko Uselli.
- Third place at the Field Robot Event 2025 competition.
- Building and programming a robot for an agricultural-robotics competition in a team of nine.
- Implementation of navigation, computer-vision and decision making algorithms.
- Conducted study on visual object tracking in a moving stereo-camera setting with DeepSORT.
- Tools used: Python, ROS2, PyTorch, Yolo

Multi-Agent RL in Laser Hockey *Course Project* 🏠

December 2024 – February 2025

- Course project on “Reinforcement Learning” taught by Prof. Georg Martius.
- Took part in an organized multi-agent RL competition in laser hockey.
- Extended SAC from Stable-Baselines3 with a custom replay buffer.
- Implemented and extended Deep Dyna-Q with entropy regularization.
- Contributed to the development of the laser-hockey environment.

Generalized Simulation Based Inference *Practical Machine Learning*

October 2024 – April 2025

- ML-Lab project under supervision of Prof. Jakob Macke and Julius Vetter.
- Extended sampling strategies in simulation-based inference with amortized cost estimation presented by Dr. Richard Gao (paper) with guided diffusion models.
- Re-implemented GBI-ACE and used it for benchmarking on toy and real world datasets.
- Implementation was done using the PyTorch framework for deep learning.

LR - Scheduler Analysis *Seminar Project*

April 2024 – July 2024

- Project work for the seminar: “Deep Learning Research Kitchen” hosted by Prof. Philipp Hennig, Dr. Frank Schneider, Dr. Jonas Geiping, Dr. Antonio Orvieto.
- Conducted a study of multiple learning-rate schedulers and how their hyperparameters affect the training of a Vision Transformer trained on CIFAR-10.
- Implemented pipeline using PyTorch-Lightning, TensorBoard, Numpy and Matplotlib for training and analysis.

Precipitation Prediction Analysis *Data Literacy Group Project*

December 2023 – February 2024

- Course project on “Data Literacy” by Prof. Philipp Hennig. Project was supervised by Emilia Magnani.
- Data science project on climate data in a group of four.
- Performed steps: problem identification, data collection, and data analysis.
- Analyzed the accuracy of the precipitation forecast of the German weather agency against real data for the state of Baden-Württemberg, Germany.

EASRL-LM-2D-IKB *Bachelor Thesis* environment pipeline

July 2023 – September 2023

- Bachelor thesis at the lab of Prof. Joschka Boedecker, supervised by Jasper Hoffmann.
- Topic: Expanding Action Space in Reinforcement Learning through Latent Models: A 2D Inverse Kinematics Benchmark.
- Merging Soft Actor-Critic with generative models such as (pretrained) Variational Autoencoder for noise augmentation and faster learning.
- Implementation of a custom inverse kinematics environment with a scalable action space.

Learning Quadrupedal Locomotion From Scratch *Bachelor Project*

April 2022 – September 2022

- Bachelor research project together with Felix Schulz at the lab of Prof. Joschka Boedecker. Supervised by Jasper Hoffmann.
- Implemented training pipeline for reinforcement learning experiments around PPO concerned with perturbation and reward-shaping.
- Minimalist re-implementation of *Vision-Guided Quadrupedal Locomotion*.
- Used and extended an already existing physics-simulator which is based on PyBullet.
- Main libraries: Stable-Baselines3, PyTorch, Gym, Weights & Biases, and TensorBoard.
- Conducted a study on closing the sim-to-real gap on the Unitree A1 robot.

ALE Plots *Seminar Project*

May 2022 – September 2022

- Project work for the seminar: “Fair and Interpretable Machine Learning” hosted by Dr. Janek Thomas.

- Re-implementation of accumulated local effect plots.
- Implementation was done using Python alongside Numpy and Matplotlib.

Humboldt *Game development in class “software practical training”*

October 2020 – April 2021

- Course project on “Practical Software Development” organized by Prof. Andreas Podelski and Dr. Vincent Langenfeld. Supervised by Antonia Hinkerohe.
- Designed, implemented, and tested the real-time multi-agent strategy game “Humboldt”.
- Collaborated in a team of six and used Git for version control.
- Programmed in C# using the XNA-(monogame)-framework.

Student Assistant

Human2Humanoid VLA *Research Project*

October 2025 – March 2026

- Project done at the lab of Prof. Georg Martius and Prof. Wieland Brendel, under the supervision of Anna Manasyan and Jens Beißwenger.
- Finetuning Vision-Language-Action models applied to humanoid robotics.
- Collecting humanoid demonstration data.
- Conducting studies on action representations and generalization in behavior cloning.

Hand Kinematics Estimation from EMG Data *Software Development*

August 2024 – February 2025

- Project done at BG-Clinic under the supervision of Daniel Höglinger at the lab of Dr. Cosima Prahm.
- Designed a deep learning pipeline for hand kinematics estimation based on EMG data.
- Designed the pipeline for use by researchers outside computer science.
- Involved redesign of dataset acquisition and processing, network architecture setup, and augmentation handling.
- Pipeline based on PyTorch-Lightning.
- Using datasets like: NinaPro, SEED, and emg2pose.

Vision Imitation Learning for Modular Robots *Fraunhofer Italia*

May 2023 – August 2023

- Internship project done under Dr. Andrea Giusti and supervised by Dr. Marco Todescato.
- Implementation of a computer vision pipeline for 3D hand trajectory tracking, object recognition, and segmentation with multi-stereo camera feed.
- Re-implementation of task-parameterized Gaussian mixture models based on work from Sylvain Calinon (paper) for imitation learning.
- Development of Modular-Robot optimization pipeline.
- Web-based interface design for containerized pipeline setup.
- Used technologies: Python, Numpy, OpenCV, ROS2, C++, Moveit, and Eigen.

PACT *Deep Energy Retrofit*

August 2022 – March 2023

- Project done at Fraunhofer IPM under Dr. Annette Schmitt.
- Collected 3D data for point cloud segmentation with laser scanners.

Amphora *Automated Pavement Operation*

September 2021 – November 2022

- Project done with Fraunhofer-IPM team under Prof. Alexander Reiterer, with Dr. Annette Schmitt and international project-partners.
- Implemented multilabel image classification pipeline on laser scan data with convolutional neural networks (ResNet & VGG) and Vision-Transformer.
- Conducted classification-oriented real-time and classification study with hyper-parameter-optimization (Bayesian-Optimization + Hyperband).
- Implemented image processing pipeline: laser scanner → geojson

Molecular Tumor Board Research Database

March 2020 – May 2021

- Project done with the IBSM team under Prof. Melanie Börries.
- Development of a database application oriented for molecular tumor research.
- Conducted a study on database design choices between SQL, document-based, and graph-based database systems.
- Knowledge acquisition of data collection from tissue, to sequencing to the final annotation pipeline.
- Collecting wet-lab experience and testing UI-design choices together with the research staff.

Private

LazySlurm *Software Project*

since November 2025

- Terminal user interface for monitoring Slurm HPC jobs, published on PyPI as `lazyslurm-py` under the MIT license.
- Live overview of running and past jobs, log inspection, resource and CPU/GPU usage, job cancellation, editing and resubmission, and partition load.
- Remote mode running over a single background SSH connection with one-time two-factor authentication.
- Built in Python with the Textual framework.

Simplified RNNs *Research Project*

since April 2025

- Based on the GateL0rd paper written by Dr. Christian Gumbsch.
- Simplifying the architecture and conducting a study on latent state similarities.

SPARK *Research Project*

April 2025 – November 2025

- Stochastic Policies Augmented for Robust Knowledge/Exploration.
- Builds on top of the idea of my Bachelor's thesis.
- Augmentation of stochastic policies for robust exploration and more expressive action distributions.
- Extension of SAC to leverage non-diagonal Gaussian distributions for action sampling.
- Benchmarking done on a 2D inverse kinematics environment.
- Using Stable-Baselines3 as the baseline for SAC.

Tide – Torch Integrated Data Engine *Software Project*

since February 2025

- Data toolkit for handling sequential data for single or multi-file datasets.
- Compatible with PyTorch dataset, data-loader integration, feature engineering, time-based splitting, filtering, ...
- Integration into publicly available time series data: EMG, climate, finance, robotics ...

Config2Class *Private*

since October 2024

- Developed Python tool to automatically generate structured configuration classes from various file formats.
- Adds support for code completion in IDE.
- Integrates with Hydra and OmegaConf.

PyArgWriter (CLIfy) *Private*

since September 2023

- Developed a Python tool to automatically create command-line interface for Python projects based on the OOP paradigm.
- Implemented automatic code generation, code parsing tooling, tree-structured command generation, Hydra integration.

Hexapod Robot *Private*

since May 2021

- Building custom Hexapod robot using the Freenove Big-Hexapod robot kit, Jetson Nano B01, Stereo vision, and custom stationary power supply.

- Implementing RViz2 and Gazebo simulation plugins, ROS2 architecture, low-level servo controller, high-level walking controller.
- Designing custom proprioceptive sensing for closed-loop controller design for cheap-PWM sensors.
- Conducted a study on mobile neural-depth estimation for stereo-vision.

ACADEMIC WORK EXPERIENCE

University of North Carolina at Chapel Hill

Group of Prof. Weitong Zhang

Visiting Researcher (upcoming)

- Research stay on offline reinforcement learning with expressive probabilistic samplers.

Chapel Hill, NC, USA
November 2026 – December 2026

University of Tübingen

Autonomous Learning Group

Student Assistant

- Worked on humanoid robots in the group of Prof. Georg Martius, supervised by Jens Beißwenger and Anna Manasyan.
- Development of VLA models applied to humanoid robotics.

Tübingen, Germany
October 2025 – March 2026

BG Clinic - Tübingen

Hand, plastic, reconstructive, and burn surgery

Student Assistant

- Developed software interfaces in the group of Dr. Cosima Prahm and Dr. Dominik Steiner, supervised by Daniel Höglinger.
- Implemented a deep learning pipeline for EMG-to-pose data.
- Implemented convolutional, recurrent, and transformer architectures for time series data.
- Made the NinaPro dataset accessible through PyTorch.

Tübingen, Germany
August 2024 – February 2025

Volatilis

Software Development

Freelancer

- Implemented a browser-based simulation engine for risk modeling.
- Contributed to business and operational development.

Ludwigsburg, Germany
July 2024 – February 2025

AI-Center Tübingen

Central Office

Student Assistant

- Wrote a wiki covering organizational topics for international PhD students and post-doctoral researchers.
- Performed and analyzed a department-wide survey on the experiences of international researchers.

Tübingen, Germany
December 2023 – May 2024

Fraunhofer Italia

Group: Advanced Robotics

Internship

- Internship under the guidance of Dr. Andrea Giusti and Dr. Marco Todescato.
- Built a vision-guided imitation learning pipeline for a modular robot manipulator.
- Handled multi-camera streams for trajectory recording in assembly work.
- Designed interfaces for modular software components.

Bolzano, Italy
April 2023 – August 2023

Institute of Intelligent Machine-Brain Interfacing Technology (IMBIT)

Group: Neurorobotics

Student Assistant

Freiburg im Breisgau, Germany
July 2022 – April 2023

- Worked in the group of Prof. Joschka Boedecker, supervised by Jasper Hoffmann.
- Maintenance and mechanical work for the Unitree A1 robot.
- Interface documentation for custom quadrupedal policy deployment on the Unitree A1.
- Literature review in reinforcement learning and control theory.

Fraunhofer Institute for Physical Measurement Technology (IPM)

Department: Object and Shape Detection

Student Assistant

Freiburg im Breisgau, Germany

June 2021 – March 2023

- Worked under Prof. Alexander Reiterer, supervised by Dr. Philipp von Olshausen and Dr. Annette Schmitt.
- Development of a multi-label image classification pipeline with convolutional neural networks.
- Conducted hyperparameter optimization study on fine-tuning of convolutional neural networks.
- Collection of 3D point cloud data of urban habitation.

University Clinic Freiburg im Breisgau

Group: Institute of Medical Bioinformatics and System Biology (IBSM)

Student Assistant

Freiburg im Breisgau, Germany

March 2020 – May 2021

- Developed a database application for molecular cancer research under Prof. Melanie Börries, supervised by Dr. Patrick Metzger and Maria Hess.
- Conducted a technical feasibility study involving the use of relational and non-relational databases.
- Implemented a web interface for an SQL database with Flask and SQLAlchemy.
- Making the application feasible for server-deployment in a containerized fashion.

TECHNICAL SKILLS

- | | |
|--|--------------------------------------|
| • Python (NumPy, PyTorch (Lightning), Gymnasium, SciKit-Learn, Pandas, SB3, PettingZoo, ...) | • Git |
| • C, C++, C# | • SVN |
| • (NO-)SQL-Databases | • Mechanical CAD (Autodesk Inventor) |
| • Docker | • Embedded systems (Arduino, ESP) |
| • ROS, ROS2 | • SCRUM |
| | • SLURM |

AWARDS

- **Field Robot Event** *3rd place*
- **System Design Project** *3rd place*

August 2025

February 2020

EXTRA CURRICULAR ACTIVITIES

Private Statistics Tutor

- Tutoring undergraduate students in statistics.

September 2025 – October 2025

Organizational Staff at EWRL 18

- Volunteer at the 18th European Workshop on Reinforcement Learning in Tübingen.
- Assisting at registration, discussions, demonstrations, ...

September 2025

Organizer Machine Learning Reading Club

February 2025 – June 2025

- Took part in organizing a machine learning journal club for computer science master students at Politecnico di Milano, within the association “Polimi Data Scientists”.
- Tasks: selecting papers, organizing speakers, communicating with fellow students.

LANGUAGES

German (native), English (C1/C2)

PERSONAL INTERESTS

Archery (bronze medal at European Championships 2018), Running, Road cycling, Photography