Hanna Krasowski

PhD student · Computer science

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Positions

04/2020 – **PhD student** Cyber-Physical Systems Group · Technical University of Munich (TUM)
05/2020 – **Member** DFG Graduate School ConVeY · TUM & LMU Munich
11/2022 – **Affiliate** Munich Center for Machine Learning · TUM & LMU Munich

Interests

Topics safety-critical applications · autonomous systems · robotics · motion planning
Methods reinforcement learning · formal methods · temporal logic · reachability analysis

Education

Technical University of Munich *Munich, Germany*
PhD in Computer Science *04/2020 – present*
School of Computation, Information and Technology
Cyber-Physical Systems Group (Matthias Althoff)

California Institute of Technology *Pasadena, CA, US*
Research Visit *07/2022 – 12/2022*
Department of Mechanical and Civil Engineering
AMBER Lab (Aaron D. Ames)

Technical University of Munich *Munich, Germany*
MSc Robotics, Cognition, Intelligence *10/2017 – 02/2020*
Focus on artificial intelligence and machine learning | passed with high distinction

Technical University of Darmstadt *Darmstadt, Germany*
BSc Mechanical and Process Engineering *10/2013 – 04/2017*
Focus on product development and mechatronics | Top 10%

Boğaziçi University *Istanbul, Turkey*
Study abroad (Erasmus+ Program) *09/2015 – 03/2016*
Department of Mechanical Engineering

Publications

** first author(s)*

Journal Articles

Hanna Krasowski*, Jakob Thumm*, Marlon Müller, Lukas Schäfer, Xiao Wang, and Matthias Althoff. "Provably Safe Reinforcement Learning: Conceptual Analysis, Survey, and Benchmarking". In: *Transactions on Machine Learning Research* (2023). eprint: https://openreview.net/pdf?id=mcN0ezbnz0

Niklas Kochdumper*, **Hanna Krasowski***, Xiao Wang*, Stanley Bak, and Matthias Althoff. "Provably Safe Reinforcement Learning via Action Projection using Reachability Analysis and Polynomial Zonotopes". In: *IEEE Open Journal of Control Systems* 2 (2023), pp. 79–92. DOI: 10.1109/OJCSYS.2023.3256305

Conference Papers

Hanna Krasowski*, Prithvi Akella, Aaron D. Ames, and Matthias Althoff. "Safe Reinforcement Learning with Probabilistic Guarantees Satisfying Temporal Logic Specifications in Continuous Action Spaces". In: *IEEE Conference on Decision and Control*. 2023, pp. 4372–4378. DOI: 10.1109/CDC49753.2023.10383601

Andreas Doering*, Marius Wiggert*, **Hanna Krasowski**, Manan Doshi, Pierre F.J. Lermusiaux, and Claire J. Tomlin. "Stranding Risk for Underactuated Vessels in Complex Ocean Currents: Analysis and Controllers". In: *IEEE Conference on Decision and Control*. 2023, pp. 7055–7060. DOI: 10.1109/CDC49753.2023.10383383

Hanna Krasowski*, Yinqiang Zhang*, and Matthias Althoff. "Safe Reinforcement Learning for Urban Driving using Invariably Safe Braking Sets". In: *In Proc. of the IEEE Int. Conf. on Intelligent Transportation Systems (ITSC)*. 2022, pp. 2407–2414. DOI: 10.1109/ITSC55140.2022.9922166

Hanna Krasowski* and Matthias Althoff. "CommonOcean: Composable Benchmarks for Motion Planning on Oceans". In: *In Proc. of the IEEE Int. Conf. on Intelligent Transportation Systems (ITSC)*. 2022, pp. 1676–1682. DOI: 10.1109/ITSC55140.2022.9921925

Hanna Krasowski* and Matthias Althoff. "Temporal Logic Formalization of Marine Traffic Rules". In: *In Proc. of the Intelligent Vehicles Symposium (IV)*. 2021, pp. 186–192. DOI: 10.1109/IV48863.2021.9575685

Xiao Wang*, **Hanna Krasowski**, and Matthias Althoff. "CommonRoad-RL: A Configurable Reinforcement Learning Environment for Motion Planning of Autonomous Vehicles". In: *In Proc. of the IEEE Int. Conf. on Intelligent Transportation Systems (ITSC)*. 2021, pp. 466–472. DOI: 10.1109/ITSC48978.2021.9564898

Hanna Krasowski*, Xiao Wang*, and Matthias Althoff. "Safe Reinforcement Learning for Autonomous Lane Changing Using Set-Based Prediction". In: *Proc. of the IEEE Int. Conf. on Intelligent Transportation Systems (ITSC)*. 2020, pp. 1–7. DOI: 10.1109/ITSC45102.2020.9294259

Under Review

Hanna Krasowski* and Matthias Althoff. *Provable Traffic Rule Compliance in Safe Reinforcement Learning on the Open Sea*. 2024. arXiv: 2402.08502

Matthias Killer*, Marius Wiggert*, **Hanna Krasowski**, Manan Doshi, Pierre F.J. Lermusiaux, and Claire J. Tomlin. *Maximizing Seaweed Growth on Autonomous Farms: A Dynamic Programming Approach for Underactuated Systems Navigating on Uncertain Ocean Currents*. 2023. arXiv: 2307.01916

Software Packages

CommonRoad-RL	Reinforcement learning environment for motion planning of autonomous vehicles
CommonOcean	Benchmarking framework for motion planning on oceans

Invited Talks

December 2023. *Benchmarking for motion planning – Showcasing CommonRoad and beyond*. CDC 2023 Workshop on Benchmarking, Reproducibility, and Open-Source Code in Controls. Youtube recording.

October 2023. *Toward Trustworthy Cyber-physical Systems Through Provably Safe Reinforcement Learning*. Group seminar, Murat Arcak, UC Berkeley.

November 2022. *Provably Safe Reinforcement Learning – General Framework and Results for Autonomous Driving*. Group seminar, Hybrid Systems Lab (Claire J. Tomlin), UC Berkeley.

July 2022. *Provably Safe Reinforcement Learning – Motion Planning for Safety-critical Tasks*. Group seminar, Ames-Burdick Labs, Caltech.

June 2021. *Temporal Logic Formalization of Marine Traffic Rules*. ConVeY seminar, LMU/TUM Munich.

July 2020. *Safe Reinforcement Learning for Autonomous Lane Changing Using Set-based Prediction*. ConVeY seminar, LMU/TUM Munich.

Teaching Experience

Lectures

Summer 2021 & 2022	**Cyber-Physical Systems,** Teaching assistant
Fall 2020 & 2021	**Formal Methods for Cyber-Physical Systems,** Teaching assistant and lecture conceptualization

Student Projects

Fall 2020 – Fall 2023 **Practical course · Motion Planning for Autonomous Vehicles,** Advising students on group programming projects
Selected topics: motion planning for autonomous vessels; set-based prediction of vessels; benchmarking marine motion planning

Fall 2020 – Summer 2022 **Seminar · Cyber-Physical Systems,** Advising students on literature research
Selected topics: safe reinforcement learning with logical specifications; dynamic vessel models and their applications; safe multi-agent reinforcement learning

Student Theses Supervision

2020 – **Master theses,** six at Technical University of Munich (TUM) and two at University of California Berkeley (UCB)

2020 – **Bachelor theses,** six at Technical University of Munich (TUM)

Skills

Programming Python (proficient) · LaTeX (proficient) · Matlab (advanced) · C++ (advanced) · C (beginner) · SolidWorks (beginner) · HTML/CSS (beginner)

Languages German (native) · English (fluent) · Swedish (beginner) · Turkish (beginner) · French (beginner)

Professional Experience

03/2019 – 04/2019 **Visiting associate** · Boston Consulting Group

03/2018 – 07/2018 **Innovation project** · Bosch Center for Artificial Intelligence

05/2017 – 07/2017 **Internship** · Continental Powertrain Research & Development

04/2015 – 08/2016 **Undergraduate teaching assistant** · Technical University of Darmstadt

07/2013 – 08/2013 **Manufacturing internship** · Liebherr Group

Service to the Profession

Initiatives

2020 – **TUM Entdeckerinnen,** Organization of recurring 2-day robotics workshop for female high-school students *TUM*

2018 – **Girls macht MI(N)T!,** Lead initiatives of female role models who encourage female students to consider a career in STEM *Femtec Alumnae*

Committees & Organization

04/2022 **ConVeY Workshop Spring 2023,** Organization of a four-day workshop with poster sessions and talks for the ConVeY graduate school at Neuschönau, Germany *ConVeY*

2021 – 2022 **Faculty Appointment Committee,** Interview and selection process for associate professorship in computer science *TUM*

2021 – **CPS-RL Seminar Series,** Organization of bi-weekly group-internal seminar on reinforcement learning for cyber-physical systems *TUM*

10/2021 **CPS Workshop,** Organization of a four-day workshop for CPS group at Lake Garda, Italy *TUM*

10/2020 **CPS Workshop,** Organization of a three-day workshop for CPS group in Munich, Germany *TUM*

Peer Review

Journals: Transactions on Vehicular Technology (TVT), Transactions on Intelligent Vehicles (TIV), Transactions on Intelligent Transportation Systems (T-ITS)

Conferences: International Conference on Robotics and Automation (ICRA), Conference on Decision and Control (CDC), Conference on Learning for Decision and Control (L4DC), Conference on Intelligent Transportation Systems (ITSC), Advanced Control of Chemical Processes (ADCHEM)

Awards, Fellowships, & Grants

2022 **Research stay scholarship,** German Academic Exchange Service (DAAD)
2021 **Exceptional engagement award,** Femtec Alumae Association (FTA)
2019 – **Fast forward program membership,** Boston Consulting Group (BCG)
2018 – 2019 **Study scholarship,** Technical University of Munich (TUM)