Mirco Theile

Machine Learning Researcher

I am looking for a research scientist role where I can apply my skills in reinforcement learning and deep learning to high-impact problems in interdisciplinary areas.

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25th July, 2024

Experience

Sep 2018 – present **Researcher at TU Munich**, *under Prof. Marco Caccamo*, Munich, Germany.

- As the first Ph.D. student, co-created a new institute for Cyber-Physical Systems, actively shaping its research focus, recruitment, and infrastructure, growing it to 7 Ph.D. students and 3 post-docs.
- Established the institute's reinforcement learning research branch, leading to several publications.
- Co-authored 20 peer-reviewed publications in collaboration with 20 researchers from 9 institutions, demonstrating strong interdisciplinary and international research efforts.
- Mentored 3 Ph.D. students in reinforcement learning and AI, advised 7 Master's and 2 Bachelor's theses, and guided 4 student assistants.

Apr 2022 – Jan 2024 **Visiting Researcher at UC Berkeley**, *under Prof. Alberto Sangiovanni-Vincentelli*, Berkeley, California, USA.

- Established and continue to maintain long-term collaborations between UC Berkeley and TU Munich, including ongoing research projects with Prof. Sangiovanni-Vincentelli and Prof. Edward A. Lee's group.
- Developed reinforcement learning algorithms for cyber-physical systems, integrating modeling and learning to enhance reliability and performance.
- Contributed to the open-source Scenic probabilistic programming language, advancing automated scenario generation for testing autonomous systems.

May 2017 – Aug 2018 **Visiting Scholar at University of Illinois at Urbana-Champaign**, *under Prof. Marco Caccamo*, Champaign, USA.

- Conducted MS Thesis research within an NSF project, developing long-endurance solar UAVs for real-time data processing.
- Established open-source tools (uavEE, uavAP) to advance UAV research and education.
- Advised and managed several undergraduate students contributing to the project.

2015–2017 **Student Employee in Automotive Connectivity**, *Fraunhofer Institute for Embedded Systems and Communication Technology*, Munich, Germany.

- Collaborated on the "ezC2X" prototyping framework for Car-to-X communication.
- Contributed to the European "Timon" project, enhancing real-time services for automated mobility.
- Conducted software unit tests for test-oriented development.

2014–2015 **Student Employee in Automotive Electronics**, *Leopold Kostal GmbH & Co KG*, Dortmund, Germany.

- Designed and programmed a generic illumination library for smooth interior lighting changes based on human photometry.
- Conducted software unit tests for Autosar-based automotive electronics.

Education

Sep 2018 – July 2024 **Ph.D. in Computer Science**, *Technical University Munich*, Germany
Focus – Reinforcement Learning for Cyber-Physical Systems.

Oct 2015 – Mar 2018 **M.Sc. in Electrical and Information Engineering**, *Technical University Munich*, Germany, Focus – Robotics and Automation.
Passed with High Distinction (summa cum laude)

Aug 2016 – Jan 2017 **Semester Abroad**, *KTH Royal Institute of Technology*, Stockholm, Sweden
Focus – Control Theory.

Oct 2012 – Sep 2015 **B.Sc. in Electrical and Information Engineering**, *Technical University Dortmund*, Germany, Focus – Information and Communication Engineering.

2003–2012 **Abitur**, *Theodor-Heuss Gymnasium Hagen*, Germany.

Recent Peer Reviews

Journals.
IEEE Transactions on Robotics, IEEE Transactions on Communications, IEEE Transactions on Vehicular Technology, IEEE Transactions on Aerospace and Electronic Systems, IEEE Transactions on Mobile Computing, IEEE Access, IEEE Sensors Letters, Journal of Systems Architecture, International Journal of Digital Earth, Measurement

Conferences.
IROS 2021-24, ICRA 2021-23, ICAR 2021/23, WCNC 2022, ICCPS 2022-23, RTSS 2024

Technical Skills

AI Reinforcement Learning (on policy, off policy), Supervised Learning (Computer Vision), Deep Learning (Convolution, Attention, Graph Neural Networks)

Programming Python (TensorFlow, NumPy, PyTorch, matplotlib, pandas, seaborn), C++ (c++17, Eigen, pybind11, Boost, Qt, ROS), Bash, CMake, C, MATLAB, MATLAB/SIMULINK

Embedded Raspberry Pi, Arduino IDE

Reporting Academic writing, LaTeX, Git, MS Office

OS Linux, Mac OS, Windows

Languages

Native Speaker German

Fluent English

Basics Swedish, French, Italian

Selected Publications

2024 **M. Theile**, H. Cao, M. Caccamo, and A. L. Sangiovanni-Vincentelli, "Equivariant ensembles and regularization for reinforcement learning in map-based path planning," *accepted at IROS 2024*, 2024

2024 **M. Theile**, D. Bernardini, R. Trumpp, C. Piazza, M. Caccamo, and A. L. Sangiovanni-Vincentelli, "Learning to generate all feasible actions," *IEEE Access*, 2024

2024 B. Sun, **M. Theile**, Z. Qin, D. Bernardini, D. Roy, A. Bastoni, and M. Caccamo, "Edge generation scheduling for dag tasks using deep reinforcement learning," *IEEE Transactions on Computers*, 2024

2023 **M. Theile**, H. Bayerlein, M. Caccamo, and A. L. Sangiovanni-Vincentelli, "Learning to recharge: UAV coverage path planning through deep reinforcement learning," *arXiv preprint arXiv:2309.03157*, 2023

2022 H. Cao, **M. Theile**, F. G. Wyrwal, and M. Caccamo, "Cloud-edge training architecture for sim-to-real deep reinforcement learning," in *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 9363–9370, IEEE, 2022

2021 H. Bayerlein, **M. Theile**, M. Caccamo, and D. Gesbert, "Multi-UAV path planning for wireless data harvesting with deep reinforcement learning," *IEEE Open Journal of the Communications Society*, vol. 2, pp. 1171–1187, 2021

2021 **M. Theile**, H. Bayerlein, R. Nai, D. Gesbert, and M. Caccamo, "UAV path planning using global and local map information with deep reinforcement learning," in *2021 20th International Conference on Advanced Robotics (ICAR)*, pp. 539–546, IEEE, 2021

2020 M. Verucchi, **M. Theile**, M. Caccamo, and M. Bertogna, "Latency-aware generation of single-rate dags from multi-rate task sets," in *2020 IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, pp. 226–238, IEEE, 2020

2020 **M. Theile**, O. Dantsker, R. Nai, M. Caccamo, and S. Yu, "uavap: A modular autopilot framework for UAVs," in *AIAA AVIATION 2020 FORUM*, p. 3268, 2020

2020 H. Bayerlein, **M. Theile**, M. Caccamo, and D. Gesbert, "UAV path planning for wireless data harvesting: A deep reinforcement learning approach," in *GLOBECOM 2020-2020 IEEE Global Communications Conference*, pp. 1–6, IEEE, 2020

2020 **M. Theile**, H. Bayerlein, R. Nai, D. Gesbert, and M. Caccamo, "UAV coverage path planning under varying power constraints using deep reinforcement learning," in *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1444–1449, IEEE, 2020

2019 **M. Theile**, S. Yu, O. D. Dantsker, and M. Caccamo, "Trajectory estimation for geofencing applications on small-size fixed-wing UAVs," in *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1971–1977, IEEE, 2019

Theses

July 2024 **Ph.D.: Modeling Planning, Control, and Scheduling of Cyber-Physical Systems for Reinforcement Learning**, *TUM School of Computation, Information and Technology*, Technical University of Munich.

Mar 2018 **M.Sc.: Power-Aware Emulation Environment for Unmanned Aerial Vehicles**, *Department of Computer Science*, University of Illinois at Urbana-Champaign.

Aug 2015 **B.Sc.: Monte-Carlo based Robustness Analysis for Nonlinear Model Predictive Control**, *Chair of Control Theory*, Technical University Dortmund.