Christopher **Diehl**

Doctoral Candidate · Fast Learner · Machine Learning and Robotics Expert · Seven Years of Research and Development Experience for Robotics

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Experience

Institute of Control Theory and Systems Engineering, TU Dortmund University *Dortmund, Germany*

Research Scientist *Okt. 2019 - Apr. 2024*

- Pioneered robot reinforcement learning and imitation learning approaches, focusing on multi-agent systems and the integration of safety constraints. Notably, I developed the first offline RL approach for automated driving in dense traffic, which earned the Best Paper Award at NeurIPS W.
- Spearheaded the development of deep learning algorithms for motion forecasting and behavior planning using industry-scale datasets (200,000km) in a joint project (KISSaF) with industry partners (e.g., ZF Group). Our approaches outperformed the state-of-the-art in all common prediction metrics
- Developed environment perception modules and a novel motion planning and control stack for a radar-based automated valet parking project, which were continually tested in a real-world vehicle of an industry partner
- Supervised the thesis and research projects of 26 students and gave lectures (Learning for Robotics, Optimal Control, Data-Driven Decision-Making)

Hella Aglaia Mobile Vision GmbH (Department acquired by Volkswagen's CARIAD SE) *Berlin, Germany*

Perception Intern and Master Thesis *Jan. 2019 - Jul. 2019*

- Developed a novel multi-modal sensor fusion algorithm for multi-object detection, tracking and dynamic grid mapping using lidar and radar data
- Achieved a final grade of 1.0 (Very good) and received recognition for outstanding performance without additional training period and prior knowledge in the topic

Institute of Control Theory and Systems Engineering, TU Dortmund University *Dortmund, Germany*

Student Research Assistant *Apr. 2017 - Sep. 2018*

- Developed a new interaction-aware motion game-theoretic planning algorithm (project in corporation with ZF Group)
- Applied deep learning algorithms for environment perception and prediction

Bertrandt Group *Cologne, Germany*

Simulation Software Engineering Intern *Mar. 2016 - Jun. 2016*

- Developed control strategies for a 5-DOF driving simulator

Education

TU Dortmund University *Dortmund, Germany*

Doctor of Engineering *Okt. 2019 - Present*

- Thesis: Learning Interactive Multi-Agent Behavior for Forecasting and Decision-Making
- Proven track record of scientific innovations by publishing research work in high-influence journals (e.g., IEEE Robotics and Automation Letters), conferences (e.g., CoRL, IEEE IROS), and workshops (e.g., NeurIPS W., ICML W.)

TU Dortmund University *Dortmund, Germany*

M.Sc. in Electrical Engineering and IT, Focus: Robotics and Automotive, Grade: 1.1 (Graduated with Distinction) / ECTS: A *Oct. 2016 - Oct. 2019*

- Master's thesis in cooperation with HELLA Aglaia Mobile Vision GmbH (now CARIAD SE) focused on environment perception
- Successfully completed multiple projects with evaluation on real-world robots (mobile robots, manipulation)

TU Dortmund University *Dortmund, Germany*

B.Sc. in Electrical Engineering and IT, Grade: 2.4 (good) / ECTS: B *Oct. 2013 - Oct. 2016*

- Bachelor's thesis focused on sampling-based motion planning for automated vehicles

Skills

Programming Languages	Python, C++, MATLAB
Tools/Libraries	PyTorch, Theseus, Weights&Biases, Tensorboard, NumPy, Git, Matplotlib, OpenCV, LaTeX, ROS, Obsidian
Theoretical Knowledge	Reinforcement/ Imitation Learning, Generative Models (EBM, VAE, GAN, Diffusion), Differentiable Optimization, Deep Learning, Computer Vision, Optimal Control, Game-Theory
Languages	German (Native), English (Full professional proficiency)

Honors & Awards

2022	**Young-Author Award 2022**, VDI expert committee 5.14 Computational Intelligence	*Berlin, Germany*
2021	**Best Paper Award**, Conference on Neural Information Processing Systems (NeurIPS), Machine Learning for Autonomous Driving Workshop	*Virtual Conference*
2019	**Master Graduation with Distinction**, TU Dortmund University	*Dortmund, Germany*
2013-2017	***Deutschlandstipendium* of the Wilo-Foundation**, TU Dortmund University	*Dortmund, Germany*
2013	**Award for outstanding results in physics**, German Physics Association	*Dortmund, Germany*

Invited Talks & Services

Invited Talks:	Wayve Technologies Ltd (Jul. 2022), Zeta Alpha (Jan. 2022), Dortmunder Vehicle Day (Sep. 2020/2022/2023)
Review Services:	NeurIPS W., ICML W., IEEE RA-L, IEEE ICRA, IEEE IROS, IEEE IV, IEEE ITSC, IEEE T-ITS, IEEE AIM

References

[1] C. Diehl, M. Krüger, N. Murzyn T. Bertram: "Initialization Strategies for Energy-based Multi-Agent Motion Forecasting", IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR), 2023 (In Preparation)

[2] C. Diehl, T. Klosek, M. Krüger, N. Murzyn T. Bertram: "Energy-based Potential Games for Joint Motion Forecasting and Control", Conference on Robot Learning (CoRL), 2023

[3] C. Diehl, T. Klosek, M. Krüger, N. Murzyn, T. Bertram: "On a Connection between Differential Games, Optimal Control, and Energy-based Models for Multi-Agent Interactions", International Conference on Machine Learning (ICML) F4LCD Workshop, 2023

[4] C. Diehl, T. Sievernich, M. Krüger, F. Hoffmann, T. Bertram: "Uncertainty-Aware Model-Based Offline Reinforcement Learning for Automated Driving", IEEE Robotics and Automation Letters (RA-L) / International Conference on Intelligent Robots and Systems (IROS), 2023

[5] C. Diehl, J. Adamek, M. Krüger, F. Hoffmann, T. Bertram: "Differentiable Constrained Imitation Learning for Robot Motion Planning and Control", IEEE International Conference on Intelligent Robots and Systems Workshop (IROS), 2023

[6] T. Osterburg, C. Diehl, M. Krüger, F. Hoffmann, T. Bertram: "Social Behavior Prediction for Automated Vehicles Using Contrastive Learning", IFToMM D-A-CH, 2023

[7] M. Krüger, P. Palmer, C. Diehl, T. Osterburg, T. Bertram: "Recognition Beyond Perception: Environmental Model Completion by Reasoning for Occluded Vehicles", IEEE Robotics and Automation Letters (RA-L), 2022.

[8] C. Diehl, A. Makarow, C. Rösmann, T. Bertram: "Time-Optimal Nonlinear Model Predictive Control for Radar-based Automated Parking", IFAC Symposium on Intelligent Autonomous Vehicles (IAV), 2022

[9] C. Diehl, T. Osterburg, N. Murzyn, G. Schneider, F. Hoffmann, T. Bertram: "Conditional Behavior Prediction for Automated Driving on Highways", Proc. 32. Workshop Computational Intelligence, 2022

[10] A. S. Novo, M. Stolpe, C. Diehl, T. Osterburg, T. Bertram, V. Parsi, N. Murzyn, F. Mualla, G. Schneider, P. Töws: "Mid-term status report on KISSaF: AI-based Situation Interpretation for Automated Driving", Automotive meets Electronics, 2022

[11] C. Diehl, T. Sievernich, M. Krüger, F. Hoffmann, T. Bertram: Uncertainty-Aware Model-Based Offline Reinforcement Learning Leveraging Planning, Advances in Neural Information Processing Systems (NeurIPS) ML4AD Workshop, 2021

[12] C. Diehl, N. Stannartz, T. Bertram: "Navigation with Uncertain Map Data for Automated Vehicles", Automated Driving, 2021

[13] C. Diehl, T. Waldeyer, F. Hoffmann, T. Bertram: "VectorRL: Interpretable Graph-based Reinforcement Learning for Automated Driving", Proc. 31. Workshop Computational Intelligence, 2021

[14] C. Diehl, E. Feicho, A. Schwambach, T. Dammeier, E. Mares, T. Bertram: Radar-based Dynamic Occupancy Grid Mapping and Object Detection, IEEE International Conference on Intelligent Transportation Systems (ITSC), 2020