

# Johannes Betz

Assistant Professor in Autonomous Systems  
Technical University of Munich (TUM)

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## RESEARCH INTEREST

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- Intelligent autonomous systems
- Path and behavioral planning for autonomous systems
- Advanced machine learning technologies
- Philosophy and ethics in autonomous driving and artificial intelligence

## EDUCATION

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10/2016 – 04/2020  
Munich, Germany **Master of Arts, Technical University of Munich**  
Course of Studies: Philosophy of Science and Technology  
Master thesis: “What is Mobility? Philosophical Perspectives”

11/2013 – 11/2019  
Munich, Germany **Ph.D., Technical University of Munich**  
Department of Mechanical Engineering, Institute of Automotive Technology  
Ph.D. thesis: “An evaluation of an intelligent fleet disposition for mixed vehicle fleets” Advisor: Prof. Dr.-Ing. Markus Lienkamp

04/2012 – 11/2013  
Bayreuth, Germany **Master of Science, University of Bayreuth**  
Courses of Study: Automotive Engineering and Mechatronics  
Master thesis: “Development of a RFID based service interface”

10/2008 – 04/2012  
Coburg, Germany **Bachelor of Engineering, University of Applied Science Coburg**  
Courses of Study: Automotive Technology  
Bachelor thesis: “Development of a method for optimizing the sequence of a shift quality assessment in automotive transmission systems”

## RESEARCH AND WORK EXPERIENCE

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01/2023 – present  
Munich, Germany **Assistant Professor, Technical University of Munich**  
Rudolf Mößbauer Tenure Track Assistant Professorship  
School of Engineering and Design, Department of Mobility Systems Engineering  
School of Computation, Information and Technology, Department of Computer Engineering (Secondary)  
Munich Institute of Robotics and Machine Intelligence (MIRMI)  
Professorship “Autonomous Vehicle Systems”

10/2020 – 10/2022  
Philadelphia, USA **Postdoctoral researcher, University of Pennsylvania**  
Department of Electrical and Systems Engineering  
Research group “xLab for Safe Autonomous Systems”  
Advisor: Prof. Dr. Rahul Mangharam

11/2018 – 09/2020  
Munich, Germany **Postdoctoral researcher, Technical University of Munich**  
Department of Mechanical Engineering, Institute of Automotive Technology  
Head of the research group “Intelligent Vehicle Systems”  
Founder of the “TUM Autonomous Motorsports” team  
Advisor: Prof. Dr.-Ing. Markus Lienkamp

02/2017 – 07/2017  
Berkeley, USA **Visiting researcher, Lawrence Berkeley National Laboratory**  
Research group “Grid Integration Group”

11/2013 – 11/2018 Munich, Germany	<b>Research associate, Technical University of Munich</b> Department of Mechanical Engineering, Institute of Automotive Technology Research group “Smart Mobility” Advisor: Prof. Dr.-Ing. Markus Lienkamp
06/2012 – 10/2013 Bayreuth, Germany	<b>Research assistant, University of Bayreuth</b> Fraunhofer Institute of Production Technology
10/2011 – 04/2012 Weissach, Germany	<b>Bachelor thesis, Porsche AG</b> Drivetrain development and transmission application
04/2009 – 10/2011 Coburg, Germany	<b>Research assistant, University of Applied Science Coburg</b> Institute of Automotive Technology
09/2010 – 03/2011 Dingolfing, Germany	<b>Internship, BMW AG</b> Quality management in the overall vehicle development

## TEACHING EXPERIENCE

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10/2024 – today	<b>Lecturer:</b> <i>Future Mobility Camp</i> , Technical University of Munich
10/2024 – today	<b>Lecturer:</b> <i>Autonomous Vehicles: Motion Planning &amp; Decision Making</i> , Technical University of Munich
10/2024 – today	<b>Lecturer:</b> <i>Engineering Ethics</i> , Technical University of Munich
05/2024 – today	<b>Lecturer:</b> <i>Ethical Robot Systems</i> , Technical University of Munich
10/2023 – today	<b>Lecturer:</b> <i>F1TENTH: Autonomous Driving Hands-on</i> , Technical University of Munich
04/2023 – today	<b>Lecturer:</b> <i>Foundations of Autonomous Vehicles</i> , Technical University of Munich
04/2023 – today	<b>Lecturer:</b> <i>Development and Design of Useful Autonomous Vehicles</i> , Technical University of Munich
02/2021 – 10/2022	<b>Lecturer:</b> <i>EAS 203 Engineering Ethics</i> , University of Pennsylvania
10/2020 – 10/2022	<b>Lecturer:</b> <i>ESE 615 F1/10 Autonomous Racing Cars</i> , University of Pennsylvania,
10/2018 – 10/2020	<b>Lecturer:</b> <i>Artificial Intelligence in Automotive Technology</i> , Technical University of Munich
10/2018 – 10/2020	<b>Lecturer:</b> <i>Vehicle Dynamics of Passenger Cars</i> , Technical University of Munich
10/2015 – 10/2018	<b>Lecturer:</b> <i>Charging Technologies and Energy Grid for EVs</i> , Technical University of Munich
10/2014 – 10/2020	<b>Lecturer:</b> <i>Race Car Technologies</i> , Technical University of Munich
03/2014 – 10/2018	<b>Lecturer:</b> <i>CAN-Bus Technologies</i> , Technical University of Munich
03/2014 – 10/2017	<b>Lecturer:</b> <i>Power Electronics for Electric Vehicles</i> , Technical University of Munich
11/2013 – present	<b>Thesis supervision:</b> 19 bachelor theses, 25 term papers, 15 master theses, 8 independent project studies

## PUBLICATIONS AND PRESENTATIONS

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### Books and Book Chapters

- [B1] Oppermann, B. H., & Stender-Vorwachs, J. (Eds.). (2019). *Autonomes Fahren – Rechtshandbuch*, Kapitel 1.1. *Technik Autonomer Fahrzeuge* (3rd ed.). Munich, Germany: Beck'sche CH Verlagsbuchhandlung Oscar Beck.

### PEER-REVIEWED JOURNAL PUBLICATIONS

- [J30] P. Karle, T. Betz, M. Bosk, F. Fent, N. Gehrke, M. Geisslinger, L. Gressenbuch, P. Hafemann, S. Huber, M. Hübner, S. Huch, G. Kaljavesi, T. Kerbl, D. Kulmer, T. Mascetta, S. Maierhofer, F. Pfab, F. Rezabek, E. Rivera, S. Sagmeister, L. Seidlitz, F. Sauerbeck, I. Tahiraj, R. Trauth, N. Uhlemann, G. Würsching, B. Zarrouki, M. Althoff, J. Betz, K. Bengler, G. Carle, F. Diermeyer, J. Ott, M. Lienkamp

“EDGAR: An Autonomous Driving Research Platform – From Feature Development to Real-World Application” *preprint arxiv, arxiv.org/abs/2309.15492*

- [J29] L. Zhang, H. Yin, W. Ye and J. Betz "DP-VINS: Dynamics Adaptive Plane-Based Visual-Inertial SLAM for Autonomous Vehicles," in *IEEE Transactions on Instrumentation and Measurement*, vol. 73, pp. 1-16, 2024, Art no. 5036516, doi: 10.1109/TIM.2024.3476615
- [J28] A. Mokhtarian, J. Xu, P. Scheffe, M. Kloock, S. Schäfer, H. Bang, V. Le, S. Uhlas, J. Betz, S. Wilson, S. Berman, L. Paull, A. Prorok, B. Alrifaae „A survey on small-scale testbeds for connected and automated vehicles and robot swarms” in *IEEE Robotics and Automation Magazine*, *in Print*
- [J27] R. Trauth, K. Moller, G. Würsching, J. Betz “FRENEX: A High-Performance and Modular Motion Planning Framework for Autonomous Driving”, In *IEEE Access*, vol. 12, pp. 127426–127439, doi: 10.1109/ACCESS.2024.3436835
- [J26] J. Betz, H. Zheng, Z. Zang, F. Sauerbeck, Y. Zheng, J. Biswas, V. Krovi, R. Mangharam “F1TENTH: Enhancing Autonomous Systems Education Through Hands-On Learning and Competition”, in *IEEE Transactions on Intelligent Vehicles*, *in Print*, doi: 10.1109/TIV.2024.3495227
- [J25] L. Zhang, H. Yin, W. Ye, J. Yan, H. Zhang, J. Betz” Loosely Coupled Stereo VINS based on Point-Line Features Tracking with Feedback Loops” in *IEEE Transactions on Vehicular Technology*, *under Review*, vol. 73, no. 8, pp. 10916-10931, 2024. doi: 10.1109/TVT.2024.3370732
- [J24] Y. Wang, R. Lian, H. He, J. Betz, D. Qiu "Auto-tuning Dynamics Parameters of Intelligent Electric Vehicles via Bayesian Optimization“, *IEEE Transactions on Transportation Electrification*. Institute of Electrical and Electronics Engineers (IEEE), vol. 10, no. 3, pp. 6915-6927, 2024. doi: 10.1109/tte.2023.3346874
- [J23] R. Trauth, K. Moller, J. Betz “Towards Safer Autonomous Vehicles: Occlusion-aware Trajectory Planning to Minimize Risky Behavior” in *IEEE Open Journal of Intelligent Transportation Systems (OJ-ITS)*, vol. 4, pp. 929-942, 2023. doi: 10.1109/ojits.2023.3336464
- [J22] F. Sauerbeck, D. Halperin, L. Connert, J. Betz “CamRaDepth: Semantic Guided Depth Estimation Using Monocular Camera and Sparse Radar for Automotive Perception,” in *IEEE Sensors Journal*, vol. 23, no. 22, pp. 28442-28453, 2023. doi: 10.1109/jsen.2023.3321886
- [J21] F. Poszler, M. Geisslinger, J. Betz, C. Lütge “Applying ethical theories to the decision-making of self-driving vehicles: A systematic review and integration of the literature” in *Technology in Society*, vol. 75. Elsevier BV, p. 102350, Nov. 2023. doi: 10.1016/j.techsoc.2023.102350
- [J20] F. Sauerbeck, S. Huch, F. Fent, P. Karle, D. Kulmer, J. Betz „Learn to See Fast: lessons Learned from Autonomous Racing on how to Develop Perception Systems“ in *IEEE Access*, vol. 11, pp. 44034-44050, 2023, doi: 10.1109/ACCESS.2023.3272750
- [J19] T. Betz, P. Karle, F. Werner, J. Betz “An Analysis of Software Latency for a High-Speed Autonomous Race Car – A Case Study in the Indy Autonomous Challenge” in *SAE International Journal of Connected and Automated Vehicles*, vol. 6, no. 3., 2023. doi: 10.4271/12-06-03-0018
- [J18] J. Betz, T. Betz, F. Fent, M. Geisslinger, A. Heilmeyer, L. Hermansdorfer, et al. „TUM autonomous motorsport: An autonomous racing software for the Indy Autonomous Challenge”. *Journal of Field Robotics*, vol. 40, no. 4, pp. 783–809,2023. doi: <https://doi.org/10.1002/rob.22153>
- [J17] J. Betz, H. Zheng, A. Liniger, U. Rosolia, P. Karle, M. Behl, V. Krovi, R. Mangharam, “Autonomous Vehicles on the Edge: A Survey on Autonomous Vehicle Racing”, in *IEEE Open Journal of Intelligent Transportation Systems*, vol. 3., pp. 458–488, 2022. doi: 10.1109/ojits.2022.3181510
- [J16] P. Karle, M. Geisslinger, J. Betz, and M. Lienkamp, “Scenario Understanding and Motion Prediction for Autonomous Vehicles - Review and Comparison,” in *IEEE Transactions on Intelligent Transportation Systems*, vol. 23, no. 10, pp. 16962–16982, 2022. doi: 10.1109/tits.2022.3156011
- [J15] Z. Qiao, H. Loeb, V. Gurrila, M. Lebermann, J. Betz, and R. Mangharam, “Drive Right: Autonomous Vehicle Education through an Integrated Simulation Platform,” in *SAE International Journal of Connected and Automated Vehicles*, vol. 5, no. 4., 2022. doi: 10.4271/12-05-04-0028

- [J14] F. Sauerbeck, L. Baierlein, J. Betz, M. Lienkamp, "A Combined LiDAR-Camera Localization for Autonomous Race Cars" in *SAE International Journal of Connected and Automated Vehicles*, vol. 5, no. 1, 2022. doi: 10.4271/12-05-01-0006
- [J13] T. Herrmann, F. Sauerbeck, M. Bayerlein, J. Betz, M. Lienkamp, "Optimization-Based Real-Time-Capable Energy Strategy for Autonomous Electric Race Cars" in *SAE International Journal of Connected and Automated Vehicles*, vol. 5, no. 1, Jan. 2022. doi: 10.4271/12-05-01-0005
- [J12] F. Nobis, E. Shafiei, P. Karle, J. Betz, and M. Lienkamp, "Radar Voxel Fusion for 3D Object Detection," in *Applied Sciences*, vol. 11, no. 12, p. 5598, Jun. 2021. doi: 10.3390/app11125598
- [J11] M. Geisslinger, F. Poszler, J. Betz, C. Lütge, M. Lienkamp, "Autonomous Driving Ethics: From Trolley Problem to Ethics of Risk" in *Philosophy & Technology*, vol. 34, no. 4, pp. 1033–1055, 2021. doi: 10.1007/s13347-021-00449-4
- [J10] F. Nobis, F. Fent, J. Betz, M. Lienkamp, „Kernel Point Convolution LSTM Networks for Radar Point Cloud Segmentation" in *Applied Sciences*, vol. 11, no. 6, p. 2599, Mar. 2021, doi: 10.3390/app11062599
- [J9] S. Huch, A. Ongel, J. Betz, and M. Lienkamp, "Multi-Task End-to-End Self-Driving Architecture for CAV Platoons," in *Sensors*, vol. 21, no. 4, p. 1039, Feb. 2021, doi: 10.3390/s21041039
- [J8] T. Herrmann, A. Wischnewski, L. Hermansdorfer, J. Betz, M. Lienkamp, "Real-Time Adaptive Velocity Optimization for Autonomous Electric Race Cars" in *IEEE Transactions on Intelligent Vehicles*, vol. 6, no. 4., pp. 665–677, Dec. 2021, doi: 10.1109/TIV.2020.3047858
- [J7] A. Heilmeier, A. Thomaser, M. Graf, J. Betz, "Virtual Strategy Engineer: Using Artificial Neural Networks for Making Race Strategy Decisions in Circuit Motorsport" in *Applied Sciences*, vol. 10, no. 21, p. 7805, Nov. 2020, doi: 10.3390/app10217805
- [J6] A. Heilmeier, M. Graf, J. Betz, M. Lienkamp, "Application of Monte Carlo Methods to Consider Probabilistic Effects in a Race Simulation for Circuit Motorsport," in *Applied Sciences*, vol. 10, no. 12, p. 4229, Jun. 2020, doi: 10.3390/app10124229
- [J5] J. Betz, A. Heilmeier, A. Wischnewski, T. Stahl, M. Lienkamp, "Autonomous Driving – A Crash Explained in Detail" in *Applied Sciences*, vol. 9, no. 23, p. 5126, Nov. 2019, doi: 10.3390/app9235126
- [J4] P.R. Palafox, J. Betz, F. Nobis, K. Riedl, M. Lienkamp, "SemanticDepth: Fusing Semantic Segmentation and Monocular Depth Estimation for Enabling Autonomous Driving in Roads Without Lane Lines" in *Sensors*, vol. 19, no. 14, p. 3224, 2019, doi: 10.3390/s19143224
- [J3] A. Heilmeier, A. Wischnewski, L. Hermansdorfer, J. Betz, M. Lienkamp, B. Lohmann, "Minimum curvature trajectory planning and control for an autonomous race car" in *Vehicle System Dynamics*, vol. 58, no. 10, p. 1497–1527, Jun. 2019 doi: 10.1080/00423114.2019.1631455
- [J2] J. Betz, M. Lienkamp, "Approach for the development of a method for the integration of battery electric vehicles in commercial companies, including intelligent management systems" in *Automotive and Engine Technology - The International Journal of WKM*, vol. 1, no.1-4, p. 107-117, 2016, doi: 10.1007/s41104-016-0008-y
- [J1] T. Tang, D. Soto-Setzke, C. Kohl, T. Köhn, J. Lohrer, and J. Betz, "EE-Architektur für mobile Dienste," *ATZ Extra*, vol. 19, no. 14, pp. 40–45, Oct. 2014, doi: 10.1365/s35778-014-1356-8

#### PEER-REVIEWED CONFERENCE PUBLICATIONS

- [C68] S. Goblirsch, M. Weiman, J. Betz „Three-Dimensional Vehicle Dynamics State Estimation for High-Speed Race Cars under varying Signal Quality" in *IEEE International Conference on Intelligent Robots and Systems (IROS) 2024, in Print*
- [C67] B. Zarrouki, C. Wang, J. Betz "Adaptive Stochastic Nonlinear Model Predictive Control with Look-ahead Deep Reinforcement Learning for Autonomous Vehicle Motion Control" in *IEEE International Conference on Intelligent Robots and Systems (IROS) 2024, in Print*

- [C66] M. Rowold, A. Langmann, B. Lohmann, J. Betz „Open-Loop and Feedback Nash Trajectories for Competitive Racing with iLQGames“ in *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2024, in Print
- [C65] M. Gudelj, M. Meyer, S. Tomfore, J. Betz “Dopper Beam Shaprening for 3D Object Detection“ in *IEEE European Radar Conference (EuRAD)*, 2024, doi: 10.23919/EuRAD61604.2024.10734915
- [C64] H. Teper, T. Betz, M. Günzel, D. Ebner, G. von der Brüggen , J. Betz, J. -J. Chen, "End-To-End Timing Analysis and Optimization of Multi-Executor ROS 2 Systems," in *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, 2024, doi: 10.1109/RTAS61025.2024.00025
- [C63] D. Wang, Z. Lai, Y. Li, Y. Wu, Y. Ma, J. Betz, R. Yang "ESP: Extro-Spective Prediction for Long-term Behavior Reasoning in Emergency Scenarios," in *IEEE International Conference on Robotics and Automation (ICRA)*, 2024, doi: 10.1109/ICRA57147.2024.10610002
- [C62] T. Betz, L. Wen, F. Pan, G. Kaljavesi, A. Zuepke, A. Bastoni, M. Caccamo, A. Knoll, J. Betz "A Containerized Microservice Architecture for a ROS 2 Autonomous Driving Software: An End-to-End Latency Evaluation," in *IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA)*, 2024, doi: 10.1109/RTCSA62462.2024.00018
- [C61] F. Werner, R. Oberhuberr, J. Betz „Accelerating Autonomy: Insights from Pro Racers in the Era of Autonomous Racing - An Expert Interview Study“ in *IEEE Intelligent Vehicles Symposium (IV)*, 2024, doi: 10.1109/IV55156.2024.10588407
- [C60] J. Betz, M. Lutwitz, S. Peters “A new Taxonomy for Automated Driving: Structuring Applications based on their Operational Design Domain, Level of Automation and Automation Readiness” in *IEEE Intelligent Vehicles Symposium (IV)*, 2024, doi: 10.1109/IV55156.2024.10588711
- [C59] M. Leitenstern, F. Sauerbeck, D. Kulmer, J. Betz “FlexMap Fusion: Georeferencing and Automated Conflation of HD Maps with OpenStreetMap” in *IEEE Intelligent Vehicles Symposium (IV)*, 2024, doi: 10.1109/IV55156.2024.10588414
- [C58] M. Kaufeld, R. Trauth, J. Betz “Investigating Driving Interactions: A Robust Multi-Agent Simulation Framework for Autonomous Vehicles” in *IEEE Intelligent Vehicles Symposium (IV)*, 2024, doi: 10.1109/IV55156.2024.10588423
- [C57] B. Zarrouki, M. Spanakakis, J. Betz “A Safe Reinforcement Learning driven Weights-varying Model Predictive Control for Autonomous Vehicle Motion Control” in *IEEE Intelligent Vehicles Symposium (IV)*, 2024, doi: 10.1109/IV55156.2024.10588747
- [C56] R. Trauth, A. Hobmeier, J. Betz “A Reinforcement Learning-Boosted Motion Planning Framework: Comprehensive Generalization Performance in Autonomous Driving” in *IEEE Intelligent Vehicles Symposium (IV)*, 2024, doi: 10.1109/IV55156.2024.10588750
- [C55] K. Moller, R. Trauth, J. Betz “Overcoming Blind Spots: Occlusion Consideratios for Improved Autonomous Driving Safety” in *IEEE Intelligent Vehicles Symposium (IV)*, 2024, doi: 10.1109/IV55156.2024.10588481
- [C54] B. Zarrouki, J. Nunes, J. Betz "R<sup>2</sup>NMPC: A Real-Time Reduced Robustified Nonlinear Model Predictive Control with Ellipsoidal Uncertainty Sets for Autonomous Vehicle Motion Control" in *2024 American Control Conference (ACC), IFAC-PapersOnLine, vol. 58, no. 18, pp. 309–316*, doi: 10.1016/j.ifacol.2024.09.048 – *Best Interactive Poster Finalist*
- [C53] B. Zarrouki, C. Wang, J. Betz "A Stochastic Nonlinear Model Predictive Control with an Uncertainty Propagation Horizon for Autonomous Vehicle Motion Control" in *2024 American Control Conference (ACC)*, 2024, doi: 10.23919/ACC60939.2024.10645032
- [C52] H. Yin, L. Zhang, J. Yan, J. Betz „Ground-optimized SLAM with Hierarchical Loop Closure Detection in Large-scale Environment“ in *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, 2023. doi: 10.1109/ITSC57777.2023.10422438

- [C51] B. Evans, J. Betz, H. Zheng, H. Engelbrecht, R. Mangharam, H. W. Jordaan, "Bypassing the Simulation-to-Reality Gap: Online Reinforcement Learning Using a Supervisor," *2023 21st International Conference on Advanced Robotics (ICAR)*. IEEE, Dec. 05, 2023. doi: 10.1109/icar58858.2023.10406465
- [C50] F. Sauerbeck, D. Kulmer, M. Pielmeier, M. Leitenstern, C. Weiss, J. Betz, „Multi-LiDAR Localization and Mapping Pipeline for Urban Autonomous Driving” in *IEEE SENSORS*, 2023, pp. 1-4, doi: 10.1109/SENSORS56945.2023.10325207
- [C49] H. Teper, T. Betz, G. von der Brüggen, K.-H. Chen, J. Betz, J.-J. Chen „Timing-Aware ROS2 Architecture and System Optimization” in *29th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA’23)*, doi: 10.1109/RTCSA58653.2023.00032
- [C48] R. Trauth, M. Kaufeld, M. Geisslinger, J. Betz, „Learning and Adapting Behavior of Autonomous Vehicles Through Inverse Reinforcement Learning” in *IEEE Intelligent Vehicles Symposium (IV)*, 2023, doi: 10.1109/IV55152.2023.10186668
- [C47] X. Sun, M. Zhou, Z. Zhuang, S. Yang, J. Betz, R. Mangharam, “A Benchmark Comparison of Imitation Learning-Based Control Policies for Autonomous Racing” in *IEEE Intelligent Vehicles Symposium (IV)*, 2023, doi: 10.1109/IV55152.2023.10186780
- [C46] S. Huch, F. Sauerbeck, J. Betz, “DeepSTEP - Deep Learning-Based Spatio-Temporal End-To-End Perception for Autonomous Vehicles” in *IEEE Intelligent Vehicles Symposium (IV)*, 2023, doi: 10.1109/IV55152.2023.10186768
- [C45] T. Betz, M. Schmeller, H. Teper, J. Betz, “How Fast is My Software? Latency Evaluation for a ROS2 Autonomous Driving Software” in *IEEE Intelligent Vehicles Symposium (IV)*, 2023, doi: 10.1109/IV55152.2023.10186585
- [C44] T. Betz, M. Schmeller, A. Korb, J. Betz, “Latency Measurement for Autonomous Driving Software Using Data Flow Extraction” in *IEEE Intelligent Vehicles Symposium (IV)*, 2023, doi: 10.1109/IV55152.2023.10186686
- [C43] Z. Zang, H. Zheng, J. Betz, R. Mangharam, "Local\_INN: Implicit Map Representation and Localization with Invertible Neural Networks" in *IEEE International Conference on Robotics and Automation (ICRA)*, 2023, doi: 10.1109/icra48891.2023.10161015
- [C42] R. Trauth, P. Karle, T. Betz, J. Betz “End-to-End Optimization of Autonomous Vehicle Software Parameters” in *IEEE 3<sup>rd</sup> International Conference on Control, Automation, Robotics (ICCCR)*, 2023, doi: 10.1109/icccr56747.2023.10193889 – *Excellent Oral Presentation Award*
- [C41] F. Sauerbeck, B. Obermeier, M. Rudolph, J. Betz “RGB-L: Enhancing Indirect Visual SLAM using LiDAR-based Dense Depth Maps” in *IEEE 3<sup>rd</sup> International Conference on Control, Automation, Robotics (ICCCR)*, 2023, doi: 10.1109/ICCCR56747.2023.10194045
- [C40] S. Huber, P. Preindl, and J. Betz, “TireEye: Optical On-board Tire Wear Detection,” *Annual Conference of the PHM Society*, vol. 14, no. 1. PHM Society, Oct. 28, 2022. doi: 10.36001/phmconf.2022.v14i1.3242.
- [C39] Z. Zang, R. Tumu, J. Betz, H. Zheng, R. Mangharam, “Winning the 3rd Japan Automotive AI Challenge--Autonomous Racing with the Autoware. Auto Open Source Software Stack” in *IEEE Intelligent Vehicles Symposium (IV 22)*, 2022, doi: 10.1109/IV51971.2022.9827162
- [C38] S. Huber, J. Betz, M. Lienkamp, “Wheel Speed Is All You Need: How to Efficiently Detect Automotive Damper Defects Using Frequency Analysis” in *IEEE Intelligent Vehicles Symposium (IV 22)*, 2022, doi: 10.1109/IV51971.2022.9827269
- [C37] H. Zheng, J. Betz, A. Ramamurthy, H. Jin, and R. Mangharam, “Combinatorial and Parametric Gradient-Free Optimization for Cyber-Physical System Design,” *2022 IEEE Workshop on Design Automation for CPS and IoT (DESTION)*. IEEE, May 2022. doi: 10.1109/destion56136.2022.00012

- [C36] A. Wischnewski, M. Geisslinger, J. Betz, et al. , “Indy Autonomous Challenge - Autonomous Race Cars at the Handling Limits,” *Proceedings*. Springer Berlin Heidelberg, pp. 163–182, 2022. doi: 10.1007/978-3-662-64550-5\_10.
- [C35] J. Bhargav, J. Betz, H. Zheng, and R. Mangharam, “Deriving Spatial Policies for Overtaking Maneuvers with Autonomous Vehicles” in *2022 14th International Conference on COMMunication Systems & NETWORKS (COMSNETS)*, 2022, doi: 10.1109/COMSNETS53615.2022.9668548
- [C34] S. Bak, J. Betz, A. Chawla, H. Zheng, R. Mangharam, “Stress Testing Autonomous Racing Overtake Maneuvers with RRT” in *IEEE Intelligent Vehicles Symposium (IV 22)*, 2022, doi: 10.1109/IV51971.2022.9827237
- [C33] M. Geisslinger, P. Karle, J. Betz, M. Lienkamp, “Watch-and-Learn-Net: Self-supervised Online Learning for Probabilistic Vehicle Trajectory Prediction” in *IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, 2021, doi: 10.1109/SMC52423.2021.9659079
- [C32] D. Ziegler, J. Betz, M. Lienkamp, “Unified Mobility Estimation Model” in *2021 IEEE International Intelligent Transportation Systems Conference (ITSC)*, Sep. 19, 2021, doi: 10.1109/itsc48978.2021.9564453
- [C31] J. Bhargav, J. Betz, H. Zheng, and R. Mangharam, “Track based offline policy learning for overtaking maneuvers with autonomous racecars” in *2021 IEEE International Conference on Robotics and Automation (ICRA 2021) - Workshop Opportunities and Challenges With Autonomous Racing*, 2021 preprint: <https://arxiv.org/abs/2107.09782>
- [C30] L. Hermansdorfer, R. Trauth, J. Betz, M. Lienkamp, “End-to-End Neural Network for Vehicle Dynamics Modeling” presented at the 2020 6th IEEE Congress on Information Science and Technology (CiSt), Jun. 2020, doi: 10.1109/cist49399.2021.9357196 – *Best Paper Award*
- [C29] A. Wischnewski, J. Betz, B. Lohmann, “Real-Time Learning of Non-Gaussian Uncertainty Models for Autonomous Racing” presented at the 2020 59th IEEE Conference on Decision and Control (CDC), Dec. 2020, doi: 10.1109/cdc42340.2020.9304230
- [C28] A. Waclaw, F. Gotzler, J. Betz, “Techno-Economic Analysis of State-of-the-Art Charging Infrastructure Concepts for Typical Commercial Battery Electric Vehicle Fleets” in *23<sup>rd</sup> IEEE International Conference on Intelligent Transportation Systems (ITSC)*, Sep. 2020, doi: 10.1109/itsc45102.2020.9294197
- [C27] T. Stahl, M. Eicher, J. Betz, F. Diermeyer, “Online Verification Concept for Autonomous Vehicles - Illustrative Study for a Trajectory Planning Module” in *23rd IEEE International Conference on Intelligent Transportation Systems (ITSC)*, Sep. 2020, doi: 10.1109/ITSC45102.2020.9294703
- [C26] F. Nobis, J. Betz, M. Lienkamp, “Exploring the Capabilities and Limits of 3D Monocular Object Detection - A Study on Simulation and Real World Data” in *23rd IEEE International Conference on Intelligent Transportation Systems (ITSC)*, Sep. 2020, doi: 10.1109/ITSC45102.2020.9294625
- [C25] T. Herrmann, F. Passigato, J. Betz, M. Lienkamp, “Minimum Race-Time Planning-Strategy for an Autonomous Electric Racecar” in *23rd IEEE International Conference on Intelligent Transportation Systems (ITSC)*, Sep. 2020, doi: 10.1109/ITSC45102.2020.9294681
- [C24] T. Stahl, J. Betz, “An Open-Source Scenario Architect for Autonomous Vehicles” in *the 2020 Fifteenth International Conference on Ecological Vehicles and Renewable Energies (EVER)*, Sep. 2020, doi: 10.1109/ever48776.2020.9243029
- [C23] F. Nobis, O. Papanikolaou, J. Betz, and M. Lienkamp, “Persistent Map Saving for Visual Localization for Autonomous Vehicles: An ORB-SLAM 2 Extension,” in *the 2020 Fifteenth International Conference on Ecological Vehicles and Renewable Energies (EVER)*, 2020, doi: 10.1109/ever48776.2020.9243094

- [C22] K. Riedl, S. Huber, M. Böhmer, J. Kreibich, J. Betz, "Importance of Contextual Information for the Detection of Road Damages," in the *2020 Fifteenth International Conference on Ecological Vehicles and Renewable Energies (EVER)*, 2020, doi: 10.1109/ever48776.2020.9242954
- [C21] L. Hermansdorfer, J. Betz, M. Lienkamp, "Benchmarking of a software stack for autonomous racing against a professional human race driver," in the *2020 Fifteenth International Conference on Ecological Vehicles and Renewable Energies (EVER)*, 2020, doi: 10.1109/ever48776.2020.9242926
- [C20] F. Nobis, M. Geisslinger, M. Weber, J. Betz, M. Lienkamp, "A Deep Learning-based Radar and Camera Sensor Fusion Architecture for Object Detection," in *2019 Sensor Data Fusion: Trends, Solutions, Applications (SDF)*, doi: 10.1109/SDF.2019.8916629
- [C19] J. Betz, A. Wischnewski, A. Heilmeier, F. Nobis, T. Stahl, L. Hermansdorfer, T. Herrmann, M. Lienkamp, "A Software Architecture for the Dynamic Path Planning of an Autonomous Racecar at the Limits of Handling" in *2019 IEEE International Conference on Connected Vehicles and Expo (ICCVE 2019)*, doi: 10.1109/ICCVE45908.2019.8965238
- [C18] A. Wischnewski, J. Betz, B. Lohmann, "A Model-Free Algorithm to Safely Approach the Handling Limit of an Autonomous Racecar" in *2019 IEEE International Conference on Connected Vehicles and Expo (ICCVE), 2019*, doi: 10.1109/ICCVE45908.2019.8965218 – *Best Student Paper Finalist*
- [C17] T. Herrmann, F. Christ, J. Betz, M. Lienkamp, "Energy Management Strategy for an Autonomous Electric Racecar using Optimal Control" in *2019 IEEE Intelligent Transportation Systems Conference (ITSC)*, 2019, doi: 10.1109/ITSC.2019.8917154
- [C16] L. Hermansdorfer, J. Betz, M. Lienkamp, "A Concept for Estimation and Prediction of the Tire-Road Friction Potential for an Autonomous Racecar" in *2019 IEEE Intelligent Transportation Systems Conference (ITSC)*, 2019, doi: 10.1109/ITSC.2019.8917024
- [C15] T. Stahl, A. Wischnewski, J. Betz, M. Lienkamp, "Multilayer Graph-Based Trajectory Planning for Race Vehicles in Dynamic Scenarios" in *2019 IEEE Intelligent Transportation Systems Conference (ITSC)*, 2019, doi: 10.1109/ITSC.2019.8917032
- [C14] A. Wischnewski, T. Stahl, J. Betz, B. Lohmann, "Vehicle Dynamics State Estimation and Localization for High Performance Race Cars" in *IFAC-PapersOnLine*, vol. 52, no. 8, p. 154–161, 2019, doi: 10.1016/j.ifacol.2019.08.064 – *Young Author Award*
- [C13] K. Riedl, S. Kurscheid, A. Noll, J. Betz, M. Lienkamp, "Road Network Coverage Models for Cloud-based Automotive Applications: A Case Study in the City of Munich" in *IEEE Intelligent Vehicles Symposium (IV'19)*, 2019, doi: 10.1109/IVS.2019.8814020
- [C12] A. Waclaw, J. Betz, M. Lienkamp, "Techno-Economical Assessment of Implementing Holistic Electromobility Solutions to Commercial Companies" in *2019 Fourteenth International Conference on Ecological Vehicles and Renewable Energies (EVER)*, 2019, doi: 10.1109/EVER.2019.8813533
- [C11] A. Heilmeier, M. Geißlinger, J. Betz, "A Quasi-Steady-State Lap Time Simulation for Electrified Race Cars" in *2019 Fourteenth International Conference on Ecological Vehicles and Renewable Energies (EVER)*, 2019, doi: 10.1109/EVER.2019.8813646
- [C10] J. Betz, A. Wischnewski, A. Heilmeier, F. Nobis, T. Stahl, L. Hermansdorfer, M. Lienkamp, "A Software Architecture for an Autonomous Racecar" in *IEEE 89th Vehicular Technology Conference (VTC2019-Spring)*, 2019, doi: 10.1109/VTCspring.2019.8746367
- [C9] T. Stahl, A. Wischnewski, J. Betz, M. Lienkamp, "ROS-based localization of a race vehicle at high-speed using LIDAR" in *E3S Web of Conferences*, vol. 95, p. 4002, 2019, doi: 10.1051/e3sconf/20199504002
- [C8] F. Nobis, J. Betz, L. Hermansdorfer, and M. Lienkamp, "Autonomous Racing: A Comparison of SLAM Algorithms for Large Scale Outdoor Environments" in *ICVARS '19: 2019 the 3rd International Conference on Virtual and Augmented Reality Simulations*, Feb. 2019, doi: 10.1145/3332305.3332319



- [C7] J. Betz, A. Wischnewski, A. Heilmeier, F. Nobis, T. Stahl, L. Hermansdorfer, B. Lohmann M. Lienkamp, "What can we learn from autonomous level 5 Motorsport?" in *Proceedings, Springer Fachmedien Wiesbaden*, 2018, p. 123–146. doi: 10.1007/978-3-658-22050-1\_12
- [C6] M. Wittmann, L. Lohrer, J. Betz, B. Jäger, M. Ott, M. Klöppel, M. Hann, M. Lienkamp, "A Holistic Framework for Acquisition, Processing and Evaluation of Vehicle Fleet Test Data" in *IEEE International Conference on Intelligent Transportation Systems (ITSC 17)*, 2017, doi: 10.1109/ITSC.2017.8317637
- [C5] J. Betz, L. Walther, M. Lienkamp, "Analysis of the Charging Infrastructure for Battery Electric Vehicles in Commercial Companies" in *IEEE Intelligent Vehicle Symposium (IV 17)*, 2017, doi: 10.1109/IVS.2017.7995945
- [C4] J. Betz, M. Hann, B. Jäger, M. Lienkamp, "Evaluation of the Potential of Integrating Battery Electric Vehicles into Commercial Companies on the Basis of Fleet Test Data" *2017 IEEE 85th Vehicular Technology Conference (VTC Spring)*, 2017, doi: 10.1109/VTCSpring.2017.8108289
- [C3] J. Betz, S. Prottung, and M. Lienkamp, "An evaluation of the car-free city potential for the city of Munich regarding mobility data," *2017 Twelfth International Conference on Ecological Vehicles and Renewable Energies (EVER)*, 2017, doi: 10.1109/ever.2017.7935875.
- [C2] J. Betz, T. Scholz, and M. Lienkamp, "Evaluation of the potential of integrating battery electric vehicles into the energy structure of a commercial company," presented at the *2016 IEEE Smart Energy Grid Engineering (SEGE)*, 2016, doi: 10.1109/sege.2016.7589541
- [C1] J. Betz, D. Werner, M. Lienkamp, "Fleet disposition modeling to maximize utilization of battery electric vehicles in companies with on-site energy generation" *Transportation Research Procedia*, vol. 19, pp. 241-257, 2016, doi: 10.1016/j.trpro.2016.12.084

## OTHER PUBLICATIONS

- [O2] B. Jäger, R. Schawohl, W. Christl, F. Bachmann, M. Hann, J. Betz, C. Frank, M. Lienkamp, "VEM- Virtuelle Elektromobilität im Taxi- und Gewerbeverkehr München" Final report for the BMWi-funded project ICT for Electric Mobility II, 2016, doi: 10.2314/GBV:871992922
- [O1] M. Hann, B. Jäger, J. Betz, C. Frank, and W. Christl, "Elektromobilität im Taxi- und Gewerbeverkehr München-Teilvorhaben der Handwerkskammer für München und Oberbayern (HWK)", Final report of the Subproject Electric vehicles in commercial companies for the BMWi-funded project ICT for Electric Mobility II, 2016, doi: 10.2314/GBV:872639819

## INVITED TALKS AND PRESENTATIONS

Stellenbosch University, March 2024

Title: "Operate everywhere, every time under every condition - Autonomous software features for for the next generation of autonomous vehicles"

Automotive IQ's Generative AI for Automotive 2025, February 2024

Title: "DualAD Planner: Enhancing Reasoning in Motion Planning with Large Language Models

LMU Munich, Senior Study Program Seminar Series, December 2024

Title: Introduction to Autonomous Vehicles

IBM Generative AI event (Industry Talk), November 2024

Title: Learning from Humans: Creating the next generation of intelligent algorithms

CARIAD PhD Day (Industry talk), **Keynote Speaker**, November 2024

Title: "DualAD Planner: Enhancing Reasoning in Motion Planning with Large Language Models

Munich Event Generative Ai, Human Decision Making and Responsible Design, November 2024

Participant Panel Discussion "How AI Systems Shape Our Choices and How to Drive Responsible Design? A Technical, Ethical and Psychological Perspective"

Symposium Autonomous Driving Munich, **Keynote Speaker**, November 2024,  
 Title: "Where do we stand in Europe in terms of autonomous driving compared to China and the USA?"

Connected Germany Conference Munich, November 2024  
 Participant Panel Discussion "Intelligent Traffic"

Software-defined Vehicle Meetup, September 2024  
 Title: "The Software Architecture of the next generation of Autonomous Vehicles"

IEEE Intelligent Vehicles (IV) Symposium 2024, Workshop on Interaction-Driven Behavior, May 2024  
 Title: "Overcoming Blind Spots: Occlusion Consideration for Improved Autonomous Driving Safety"

DELL Incentive Conference Munich (Industry talk), June 2024  
 Title: "The Fast and The Driverless – Accelerating Innovation through Cutting-Edge AV Research"

IEEE Conference on Robotics and Automation (ICRA) 24, Workshop on Field Robots, May 2024  
 Title: "Opportunities and Challenges with Autonomous Racing"

Abu Dhabi Autonomous Racing League Conference, April 2024  
 Title: "Beyond the Limits: Crafting the Future of High-Speed Autonomous Driving"

MCube Speaker Series, Januar 2024  
 Title: "From Autonomous Handling at the Limits to the Next Generation of Autonomous Vehicles"

Karlsruhe Institute of Technology (KIT), Seminar Talk Series, Januar 2024  
 Vollautonomes Fahren – Softwarefunktionen für die nächste Generation von autonomen Fahrzeugen

Hochschule Coburg, Seminar talk in lecture series "Trends in Automotive Technology ", November 2023  
 Title: "From Autonomous Handling at the Limits to the Next Generation of Autonomous Vehicles"

dSPACE Korea User Conference (Industry talk), **Keynote Speaker**, November 2023  
 Title: "From Autonomous Handling at the Limits to the Next Generation of Autonomous Vehicles"

SAE DACH Meet-up, October 2023  
 Title: "Autonomous motorsport - How high speed and quick decisions drive AVs forward"

Tsinghua University, Mechanical Engineering Seminar Talk Series, September 2023  
 Title: "Operate everywhere, every time under every condition - Autonomous software features for for the next generation of autonomous vehicles"

IEEE International Conference on Intelligent Robots and Systems (IROS) 23, Workshop on Last mile robotics, August 2023  
 Title: "Operate everywhere, every time under every condition - Autonomous software features for last-mile robot platforms in unstructured and uncertain environments"

IAA Mobility 2023 Munich with Webasto, September 2023  
 Title: "Autonomous Driving – Opportunities and Boundaries"

Generation E Mobility Podcast, June 2023  
 Title: "Autonomes Fahren soll den Menschen ersetzen"

IEEE Intelligent Vehicle (IV) 23 Symposium, The Autoware Workshop, June 2023  
 Title: "From the Lab to the Street – Accelerating Autonomous Driving Testing"

MCUBE Speaker Series, "Mai 2023  
 Title: "Artificial Intelligence – Foundation of All Future Mobility Systems"

dSPACE World Conference 2023 (Industry talk), **Keynote Speaker**, Mai 2023  
 Title: "From Autonomous Handling at the Limits to the Next Generation of Autonomous Vehicles"

Automotive Software Development Meetup Munich, Mai 2023  
 Title: "Operate everywhere, every time under every condition - Autonomous software features for for the next generation of autonomous vehicles"

University of Colorado, Guest Lecture, April 2023

Title: "Learning to drive fast and accurate at the vehicle dynamics limits - Experiences From The Indy Autonomous Challenge"

Future Moves - New Mobility Podcast, March 2023

Title: "FUTURE MOVES #62 – Wann das autonome Auto moralisch handeln wird"

ADAC Mobility Center (Industry Talk), March 2023

Title: "From Autonomous Handling at the Limits to the Next Generation of Autonomous Vehicles"

Conference on Robot Learning (CoRL), December 2022

Title: "Learning to drive fast and accurate at the vehicle dynamics limits"

F1TENTH competition Korea, December 2022

Title: "Motion Planning and Control in High Dynamic Multi Vehicle Environments"

TU Munich, Junge Akademie, November 2022

Fireside Chat

Autonomy Talk Speaker Series, ETH Zurich, September 2022

Title: "Learning to drive fast and accurate at the vehicle dynamics limits - Experiences From The Indy Autonomous Challenge"

ZGC Forum Munich, September 2022

Title: "EDGAR – An Autonomous Vehicle Testing Environment"

Honda Research Institute (Industry talk), August 2022

Title: "Learning to drive fast and accurate at the vehicle dynamics limits - Experiences From The Indy Autonomous Challenge"

2nd IJCAI Workshop on Artificial Intelligence for Autonomous Driving (AI4AD), July 2022

Title: "Autonomous Handling at the Limits - Experiences From The Indy Autonomous Challenge"

TU Darmstadt, June 2022

Title: "Autonomous Vehicles on the Edge: Learning to drive fast at the vehicle dynamics limits"

IEEE Conference on Robotics and Automation (ICRA) 22, SeasonDepth Prediction Challenge and Workshop on Trustworthy Autonomy and Robotics, May 2022

Title: "Learning to drive fast and accurate at the vehicle dynamics limits – Autonomously!"

IEEE Smart Cities Week 2022, Tutorial Section, March 2022

Title: Johannes Betz, Rahul Mangharam, Venkat Krovi, Madhur Behl, Houssam Abbas "Learn to Drive (and Race) Scaled Autonomous Vehicles"

AIR Lab Speaker Series, Lehigh University, February 2022

Title: "Autonomous Vehicles on the Edge: Autonomous Racing & The Indy Autonomous Challenge"

GRASP SFI talks, University of Pennsylvania, February 2022

Title: "Autonomous Handling at the Limits: Winning the Indy Autonomous Challenge"

Selected Topics in Science and Technology, Technical University of Munich, January 2022

Title: "From Autonomous Handling at the Limits to the next Generation of Intelligent Autonomous Vehicles"

ADLink Technology (Industry talk), Future of Autonomous Driving Talk, December 2021

Title: "Learnings from The Indy Autonomous Challenge"

Autoware Foundation Meetup, December 2021

Title: "Autonomous Vehicles on the Edge: Autonomous Racing & The Indy Autonomous Challenge"

Arizona State University, November 2021

Title: "Autonomous Vehicles on the Edge: Autonomous Racing & The Indy Autonomous Challenge"

Formula Student Symposium, November 2021

Title: "Autonomous Vehicles on the Edge: Autonomous Racing"

Nokia Bell Labs (Industry talk), November 2021  
 Title: R. Mangharam, J. Betz, H. Zheng "What can we learn from autonomous racing?"

Embedded Systems Week (ESweek) 2021, Education Track, October 2021  
 Title: Rahul Mangharam, Johannes Betz "Learn to Drive (and Race) Autonomous Vehicles"

Fall 2021 GRASP Seminar, University of Pennsylvania, October 2021  
 Title: R. Mangharam, J. Betz, H. Zheng "What can we learn from autonomous racing?"

DiY Robocar Event at Circuit Launch Oakland California, August 2021,  
 Title: Christian John, Johannes Betz "Autoware.Auto and Autonomous Racing"

Podcast "Die Zukunftsmobilisten", July 2021  
 Title: "Autonomous Driving"

5<sup>th</sup> Virtual Autonomous Driving Meetup, June 2021  
 Title: "F1TENTH Autonomous Racing: Vehicle, Research & Community"

Automatic Controls Seminar, Technical University of Munich, June 2021  
 Title: "Derivative Free Multi Domain Optimization for Autonomous Systems"

University of Applied Sciences Munich, June 2021  
 Title: "Autonomous Vehicles at the Limits of Handling – Trajectory Planning Enhanced with Machine Learning"

Karlsruhe Institute of Technology (KIT), Mai 2021  
 Title "A Dynamic Trajectory Planning Approach for Autonomous Vehicles at the Limits of Handling"

Technische Hochschule Ingolstadt (THI), Mai 2021  
 Title "A Graph-Based Trajectory Planning Approach for High Speeds in Dynamic Scenarios"

Guest Lecture, University of Nebraska-Lincoln, April 2021  
 Title: "Multilayer Graph-Based Trajectory Planning for Race Vehicles in Dynamic Scenarios"

NVIDIA GTC Conference 2021, April 2021  
 Title: R. Mangharam, J. Betz: "F1/10 Autonomous Racing: Community, Course & Competitions"

AUE Lecture Series, Clemson University, March 2021  
 Title: "Multilayer Graph-Based Trajectory Planning for Race Vehicles in Dynamic Scenarios"

Lecture Artificial Intelligence in Automotive Technology, Technical University of Munich, February 2021  
 Title: "Foundations of Knowledge Graphs"

Traffic21/Mobility21 UTC Deployment Partner Consortium Symposium, November 2020  
 Title: "F1/10 Autonomous Racing: Community, Course & Competitions"

Guest Lecture Autonomous Racing, University of Pennsylvania, April 2020  
 Title: "Path and Behavioral Planning for Autonomous Race Vehicles"

Fahrzeug- und Motortechnisches Seminar, Technical University Darmstadt, June 2019  
 Title: "Roborace – Autonomous Level 5 Motorsport"

Werner-Heisenberg-Gymnasium Garching, May 2019  
 Title: "Autonomes Fahren – Forschung und Lehre"

Munich Science Days 2018, November 2018, [video available online](#)  
 Title: „Autonomes Fahren und die neuen Arbeitswelten – das Beispiel Roborace“

NVIDIA GTC Conference 2018 in Munich, October 2018, [video available online](#)  
 Title: J. Betz, B. Balcombe: "Roborace: A Case Study in Collaboration"

VDI-Dienstagsvortrag, Hochschule München, April 2018  
 Title: "Was können wir vom Motorsport mit autonomen Level-5 Fahrzeugen lernen?"

7<sup>th</sup> E-Motive Expertenforum München, June 2015, doi: 10.13140/RG.2.2.30235.46887  
 "Visio.M – Leichtfahrzeugkonzept für die urbane Elektromobilität"

## HONORS AND AWARDS

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10/2024	New Generation Star Project Award, IEEE IROS 2024, Abu Dhabi, UAE
08/2024	Best Interactive Presentation Award Finalist, IFAC NMPC 2024, Kyoto, Japan
04/2024	Outstanding Reviewer Award, IEEE Intelligent Vehicle Symposium (IV) 24
04/2024	1 <sup>st</sup> Place, Abu Dhabi Autonomous Racing League (with TUM Autonomous Motorsport)
01/2024	1 <sup>st</sup> Place, Indy Autonomous Challenge@CES Las Vegas (with TUM Autonomous Motorsport)
10/2023	1 <sup>st</sup> Place, Teaching Award-Golden Lecture (TUM, School of Engineering and Design)
08/2023	1 <sup>st</sup> Place, CommonRoad Challenge, IEEE ITSC 2023
02/2023	Excellent Oral Presentation Award, IEEE ICCCR 2023
12/2022	IEEE ITS Outstanding Application Award (with TUM Autonomous Motorsport)
11/2022	IEEE ITS Young Professional Travel Fellowship
03/2022	DAAD Alnet Fellow 2022
01/2022	1 <sup>st</sup> Place, 3 <sup>rd</sup> Japan Automotive AI Challenge
01/2022	2 <sup>nd</sup> Place, Indy Autonomous Challenge@CES Las Vegas
10/2021	1 <sup>st</sup> Place, Indy Autonomous Challenge
06/2021	2 <sup>nd</sup> Place, Indy Autonomous Challenge Ansys Simulation Race
10/2020	Best Paper Award, IEEE CiSt 2020, Agadir, Morocco
11/2019	Best Student Paper Finalist, IEEE ICCVE 2019, Graz, Austria
11/2019	PhD graduation with highest distinction (summa cum laude)
10/2019	1 <sup>st</sup> Place, Roborace Season Alpha Event 5
07/2019	Young Author Award, IFAC IAV 2019, Gdansk, Poland
11/2018	Selected for German-Japan Young Professional Exchange Program 2018
05/2018	1 <sup>st</sup> Place, Roborace "Human + Machine Challenge"
09/2017	Nvidia GPU Grant: Sponsoring of one "Titan Xp" GPU
04/2012	3 <sup>rd</sup> best graduate in Bachelor of Engineering at FH Coburg

## SERVICE TO ACADEMIC COMMUNITY

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### MEMBERSHIP OF JOURNAL COMMITTEES

06/2024 – present	<b>Associate Editor</b> , IEEE Transactions on Intelligent Transportation
01/2023 – present	<b>Associate Editor</b> , IEEE Open Journal of Intelligent Transportation Systems
05/2022 – 05/2023	<b>Guest Editor</b> , Field Robotics Journal Special Issue on "Opportunities and Challenges with Autonomous Racing"
01/2021 – 12/2022	<b>Outreach Team</b> , IEEE Open Journal of Intelligent Transportation Systems
10/2020 – present	<b>Associate Editor</b> , SAE International Journal of Connected and Automated Vehicles
10/2020 – 08/2021	<b>Guest Editor</b> , SAE Special Issue on "Autonomy and Connectivity at the Edge – Autonomous Racing"

### MEMBERSHIP OF CONFERENCE COMMITTEES

05/2025	<b>Competition Organizer</b> (with Hongrui Zheng, Rahul Mangharam, Venkat Krovi, Ahmad Amine) of the 22 <sup>nd</sup> F1TENTH Autonomous Racing Grand Prix, 2024 IEEE International Conference on Robotics and Automation (ICRA), Atlanta, USA
05/2025	<b>Program Committee</b> , 2024 3 <sup>rd</sup> IEEE International Conference on Mobility: Operations, Services, and Technologies (MOST), Newark Delaware, USA
03/2025	<b>Organizer</b> , 1 <sup>st</sup> German Robotics Conference (GRC), Nürnberg, Germany
11/2024	<b>Website Chair &amp; Organizer</b> , 2024 Conference on Robot Learning (CORL), Munich, Germany
10/2024	<b>Competition Organizer</b> (with Hongrui Zheng, Rahul Mangharam, Venkat Krovi, Ahmad Amine) of the 21 <sup>st</sup> F1TENTH Autonomous Racing Grand Prix, 2024 IEEE International Conference on Intelligent Robots and Systems (IROS), Abu Dhabi, UAE

10/2024	<b>Workshop Organizer</b> (with Lounis Adouane, Philippe Martinet, Antonios Tsourdos, Xuebo Zhang) of the Workshop on Safety of Intelligent and Autonomous Vehicles: Formal Methods vs. Machine Learning approaches for reliable navigation (SIAV-FM2L), 2024 IEEE International Conference on Intelligent Robots and Systems (IROS), Abu Dhabi, UAE
10/2024	<b>Workshop Organizer</b> (with Huijing Zhao, Marcelo H Ang Jr, Yufeng Yu) of the 14 <sup>th</sup> Workshop on Planning, Perception and Navigation for Intelligent Vehicles, 2024 IEEE International Conference on Intelligent Robots and Systems (IROS), Abu Dhabi, UAE
10/2024	<b>Associate Editor for the Conference Editorial Board (CEB)</b> , 2024 IEEE International Conference on Intelligent Robots and Systems (IROS), Abu Dhabi, UAE
06/2024	<b>Workshop Organizer</b> (with Bassam Alrifaae, Jianye Xu, Armin Mokhtarian) of the 1 <sup>st</sup> Workshop on Small-scale Testbeds for Connected and Automated Vehicles and Robot Swarms, IEEE IV 2024, Jeju Island, Korea
05/2024	<b>Publicity Co-Chair &amp; Organizer</b> , 2024 IEEE 2 <sup>nd</sup> International Conference on Mobility: Operations, Services, and Technologies (MOST), Dallas Texas, USA
05/2024	<b>Competition Organizer</b> (with Hongrui Zheng, Rahul Mangharam, Venkat Krovi, Ahmad Amine) of the 16 <sup>th</sup> F1TENTH Autonomous Racing Grand Prix (Competition), 2024 IEEE International Conference on Robotics and Automation (ICRA), Yokohama, Japan
05/2024	<b>Workshop Organizer</b> (with Hongrui Zheng, Venkat Krovi, Rahul Mangharam) of the 2 <sup>nd</sup> Workshop on Multi-Agent Dynamic (MAD) Games, 2024 IEEE International Conference on Robotics and Automation (ICRA), Yokohama, Japan
05/2024	<b>Workshop and Tutorial Co-Chair &amp; Organizer</b> , 2024 IEEE International Conference on Robotics and Automation (ICRA), Yokohama, Japan
11/2023	<b>Program Committee</b> , 11 <sup>th</sup> Automated Driving Symposium 2023, Munich, Germany
10/2023	<b>Workshop Organizer</b> (with Hongrui Zheng, Venkat Krovi, Rahul Mangharam) of the 1 <sup>st</sup> Workshop on Multi-Agent Dynamic (MAD) Games, 2023 IEEE International Conference on Intelligent Robots and Systems (IROS), Detroit, USA
05/2023	<b>Competition Organizer</b> (with Hongrui Zheng, Rahul Mangharam, Venkat Krovi) of the 13 <sup>th</sup> F1TENTH Autonomous Racing Grand Prix (Competition), 2023 IEEE International Conference on Intelligent Robots and Systems (IROS), Detroit, USA
06/2023	<b>Tutorial Co-Chair &amp; Organizer</b> , 2023 IEEE Intelligent Vehicles Symposium (IV), Anchorage, Alaska
05/2023	<b>Associate Editor for the Conference Editorial Board (CEB)</b> , 2023 IEEE International Conference on Robotics and Automation (ICRA), London, UK
05/2023	<b>Competition Organizer</b> (with Hongrui Zheng, Rahul Mangharam, Nicola Paoletti) of the 11 <sup>th</sup> F1TENTH Autonomous Racing Grand Prix (Competition), 2023 IEEE International Conference on Robotics and Automation (ICRA), London, UK
05/2023	<b>Program Committee</b> , 1 <sup>st</sup> IEEE International Conference on Mobility: Operations, Services, and Technologies (MOST) 2023
12/2022	<b>Program Committee</b> , 5 <sup>th</sup> Robot Learning Workshop: Self-Supervised and Lifelong Learning at the 36 <sup>th</sup> Conference on Neural Information Processing Systems (NeurIPS) 2022
10/2022	<b>Workshop Organizer</b> (with Philippe Martinet, Christian Laugier, Huijing Zhao, Marcelo H Ang Jr, Yufeng Yue, David Sierra-Gonzalez) of the 13 <sup>th</sup> Workshop on Planning, Perception and Navigation for Intelligent Vehicles, 2022 IEEE International Conference on Intelligent Robots and Systems (IROS), Kyoto, Japan
06/2022	<b>Workshop Organizer</b> (with Alexander Carballo, Shinpei Kato, Bonolo Mathibela, David Walmroth, Daisuke Tana) of the 4 <sup>th</sup> Autoware Workshop, 2022 IEEE Intelligent Vehicles Symposium (IV), Aachen, Germany

05/2022	<b>Competition Organizer</b> (with Hongrui Zheng, Jack Silberman, Rosa Zheng, Rahul Mangharam) of the 10 <sup>th</sup> F1TENTH Autonomous Racing Grand Prix (Competition), 2022 IEEE International Conference on Robotics and Automation (ICRA), Philadelphia, USA
05/2022	<b>Workshop Organizer</b> , (with Madhur Behl, Rahul Mangharam, Venkat Krovi) of the 2 <sup>nd</sup> Workshop “Opportunities and Challenges with Autonomous Racing”, 2022 IEEE International Conference on Robotics and Automation (ICRA), Philadelphia, USA
01/2022	<b>Program Committee</b> , ITS Workshop at the 14 <sup>th</sup> International Conference on COMMunication Systems & Networks 2022 (COMMSNET)
12/2021	<b>Program Committee</b> , 4 <sup>th</sup> Robot Learning Workshop: Self-Supervised and Lifelong Learning at the 35 <sup>th</sup> Conference on Neural Information Processing Systems (NeurIPS) 2021
09/2021	<b>Competition Organizer</b> (with Michael Sojka, Rahul Mangharam) of the 9 <sup>th</sup> F1TENTH Autonomous Racing Grand Prix (Competition), 2021 IEEE International Conference on Intelligent Robots and Systems (IROS), Prague, Czech Republic
05/2021	<b>Workshop Organizer</b> (with Madhur Behl, Rahul Mangharam, Venkat Krovi) of the 1 <sup>st</sup> Workshop on Opportunities and Challenges with Autonomous Racing, 2021 IEEE International Conference on Robotics and Automation (ICRA), Xi’an, China
10/2020 – 06/2022	<b>Program Committee</b> , IEEE International Conference on Ecological Vehicles and Renewable Energies (EVER)

## UNIVERSITY SERVICE

03/2025 – present	Co-Department Head, Department of Mobilit Systems, School of Engineering and Design, TU Munich
12/2023 – present	TUM Agnes-Mackensen-Programm: Mentorship for first generation female students at TU Munich
10/2023 – present	TUM Junge Akademie scholarship program: Supervisor
10/2023 – 11/2023	TUM Internationalization support: Visiting Professorship of Dr. Otto Lappi from Helsinki, Finland
05/2023 – present	TUM Integrative Research Center “MIRMI – Munich School of Robotics and Machine Intelligence” Member
02/2021 – 10/2022	Postdoc Peer Support Program at University of Pennsylvania
12/2020	ESE PhD Committee member at University of Pennsylvania
07/2019	Organization of the “Roadshow: Autonomous Driving” at TUM
04/2019 – 10/2020	Organization of the doctoral seminar “Autonomous Driving” at TUM
04/2018 – 10/2019	Organization of the doctoral seminar “Ai in Mechanical Engineering” at TUM
10/2015 – 10/2020	Faculty Advisor for the TUFast Formula Student Team at TUM

## OTHER ACADEMIC SERVICES

01/2024 - present	<b>Committee Member</b> , VDI expert committee on automation/networking
01/2024 - present	<b>Leading Co-Chair</b> , IEEE RAS Technical Committee on AGV-ITS (Autonomous Ground Vehicles and Intelligent Transportation Systems)
11/2023	<b>Reviewer for DAAD</b> , PRIME Program (Postdoctoral Researchers International Mobility Experience)
01/2023 – present	<b>Committee Member</b> , German Association of Automotive Industry (VDA) – Working Group “Autonomous Driving”
05/2023	<b>Jury Member</b> , Robothon – The Grand Grand Challenge
01/2023 – present	<b>Strategic Planning Committee</b> , The Autoware Foundation
03/2022 – 12/2023	<b>Junior Co-Chair</b> , IEEE RAS Technical Committee on AGV-ITS (Autonomous Ground Vehicles and Intelligent Transportation Systems)
01/2021 – 12/2022	<b>Working Group Leader</b> (together with Christian John), The Autoware Foundation

## REVIEW ACTIVITIES

**Journals:** Journal of Field Robotics (JFR), IEEE Transaction on Robotics (T-RO), IEEE Robotics and Automation Letters (RA-L), IEEE Transactions on Intelligent Vehicles (T-IV), IEEE Transactions on Intelligent Transportation Systems (T-ITS), IEEE Open Journal on Intelligent Transportation Systems (OJ-ITS), IEEE Access, International Journal of Vehicle Mechanics and Mobility, SAE International Journal of Connected and Automated Vehicles,

**Conferences:** Conference on Robot Learning (CoRL), IEEE International Conference on Robotics and Automation (ICRA), International Conference on Intelligent Robots and Systems (IROS), IEEE Conference on Intelligent Transportation Systems (ITSC), IEEE Intelligent Vehicles Symposium (IV), IEEE International Conference on Ecological Vehicles and Renewable Energies (EVER), IEEE Vehicular Technology Conference (VTC), International Scientific Conference on Mobility and Transport, International Munich Chassis Symposium, Forum on Integrated and Sustainable Transportation Systems (FISTS)

## OPEN-SOURCE PROJECTS AND TOOL DEVELOPMENT

MIND-Stack: Modular Interpretable E2E Differentiability for Autonomous robots, [available on Github](#)

ESP-Dataset, [available on Github](#)

TUM EDGAR Digital Twin, [available on Github](#)

FlexMap Fusion: Multi-LiDar Localization and Mapping Pipeline, [available on Github](#)

FRENETIX-Occlusion: Occlusion-aware Trajectory Assessment, [available on Github](#)

FRENETIX: Motion Planner for autonomous vehicles, [available on Github](#)

ROS2 Latency Analysis Framework, [available on Github](#)

CamRaDepth: Semantic Guided Depth Estimation for Camera and Radar, [available on Github](#)

ORB-SLAM3-RGBL depth measurements, [available on Github](#)

F1TENTH 2D Simulator, [available on Github](#)

F1TENTH Courses: An openEDX course for autonomous driving; [courses.f1tenth.org](#)

F1TENTH Autonomous Racing Project, [f1tenth.org](#)

A vehicle dynamics simulation for autonomous vehicles; [available on Github](#)

A graph based local trajectory planner for dynamic environments, [available on Github](#)

A library with functions for trajectory planning for autonomous vehicles, [available on Github](#)

A scenario architect for autonomous driving benchmarks, [available on Github](#)

A neural network for object detection with camera and radar, [available on Github](#)

ORB-SLAM2 map saving extension, [available on Github](#)

An optimization algorithm for the creation of a global, optimal raceline, [available on Github](#)

A path and velocity controller for an autonomous racecar, [available on Github](#)

A quasi-static laptime simulation, [available on Github](#)

## COMPETENCES

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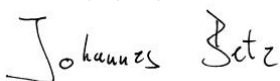
Computer skills	Programming: Python, Matlab/Simulink, C/C++, CUDA, ROS, ROS2 Development: GitLab, git, SVN, Continuous Integration AI-Frameworks: Tensorflow, Keras, TensorRT Operating systems: Windows, Linux, MacOS
Language	German: Native English: Full Professional working proficiency

## EXTRACURRICULAR ACTIVITIES

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Travel, soccer, triathlon

Munich, 3/16/2025



Johannes Betz