Johannes Betz

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RESEARCH INTEREST

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

EDUCATION

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

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 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” Advisor: Dr. Samveg Saxena

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

TEACHING EXPERIENCE

02/2021 – 10/2022	**Lecturer:** *EAS 203 Engineering Ethics,* University of Pennsylvania
10/2020 – 10/2022	**Lecturer:** *ESE 615 F1/10 Autonomous Racing Cars,* University of Pennsylvania,
10/2018 – 10/2020	**Lecturer:** *Artificial Intelligence in Automotive Technology,* Technical University of Munich
10/2018 – 10/2020	**Lecturer:** *Vehicle Dynamics of Passenger Cars*, Technical University of Munich
10/2015 – 10/2018	**Lecturer:** *Charging Technologies and Energy Grid for EVs*, Technical University of Munich
10/2014 – 10/2020	**Lecturer:** *Race Car Technologies*, Technical University of Munich
03/2014 – 10/2018	**Lecturer:** *CAN-Bus Technologies*, Technical University of Munich
03/2014 – 10/2017	**Lecturer:** *Power Electronics for Electric Vehicles*, Technical University of Munich
11/2013 – present	**Thesis supervision:** 19 bachelor theses, 25 term papers, 15 master theses, 8 independent project studies

PUBLICATIONS AND PRESENTATIONS

PEER-REVIEWED JOURNAL PUBLICATIONS

[20] T. Betz, P. Karle, F. Werner, J. Betz "Software Latency in Autonomous Vehicle Software Stacks - A Scenario-based Analysis" in in *SAE International Journal of Connected and Automated Vehicles, under Review*

[19] J. Betz, T. Betz, F. Fent, M. Geisslinger, A. Heilmeier, L. Hermansdorfer, et al. ,"TUM autonomous motorsport: An autonomous racing software for the Indy Autonomous Challenge". Journal of Field Robotics, 1– 27, 2023. Doi: https://doi.org/10.1002/rob.22153

[18] 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

[17] 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*, pp. 1–21, 2022. doi: 10.1109/tits.2022.3156011

[16] Z. Qiao, H. Loeb, V. Gurrla, 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. SAE International, Apr. 13, 2022. doi: 10.4271/12-05-04-0028

[15] 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, Jan. 2022, doi: 10.4271/12-05-01-0006

[14] 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

[13] H. Zheng, J. Betz and R. Mangharam, “Gradient-free Multi-domain Optimization for Autonomous Systems” in *IEEE Transactions on Intelligent Vehicles, under Review*

[12] 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

[11] M. Geisslinger, F. Poszler, J. Betz, C. Lütge, M. Lienkamp, “Autonomous Driving Ethics: From Trolley Problem to Ethics of Risk“ in *Philosophy & Technology*, https://doi.org/10.1007/s13347-021-00449-4

[10] 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

[9] 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

[8] 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*, *early access,* doi: 10.1109/TIV.2020.3047858

[7] 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

[6] 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

[5] 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

[4] 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

[3] 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

[2] 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

[1] 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

[43] 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.

[42] F. Sauerbeck, B. Obermeier, M. Rudolph, J. Betz “RGB-L: Enhancing Indirect Visual SLAM using LiDAR-based Dense Depth Maps” in *IEEE 3rd International Conference on Control, Automation, Robotics (ICCCR), in Print*

[41] R. Trauth, P. Karle, T. Betz, J. Betz “End-to-End Optimization of Autonomous Vehicle Software Parameters” in *IEEE 3rd International Conference on Control, Automation, Robotics (ICCCR), in Print*

[40] Z. Zang, H. Zheng, J. Betz, R. Mangharam, "Local_INN: Implicit Map Representation and Localization with Invertible Neural Networks" in *2023 IEEE International Conference on Robotics and Automation (ICRA), under Review*

[39] 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” *IEEE Intelligent Vehicles Symposium (IV 22), 2022,* doi: 10.1109/IV51971.2022.9827162

[38] S. Huber, J. Betz, M. Lienkamp, “Wheel Speed Is All You Need: How to Efficiently Detect Automotive Damper Defects Using Frequency Analysis” *IEEE Intelligent Vehicles Symposium (IV 22), 2022,* doi: 10.1109/IV51971.2022.9827269

[37] 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

[36] 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.

[35] 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

[34] 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

[33] 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

[32] 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

[31] 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

[30] 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*

[29] 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

[28] 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 *23rd IEEE International Conference on Intelligent Transportation Systems (ITSC)*, Sep. 2020, doi: 10.1109/itsc45102.2020.9294197

[27] 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

[26] 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

[25] 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

[24] 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

[23] 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

[22] 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

[21] 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

[20] 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

[19] 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

[18] 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*

[17] 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

[16] 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

[15] 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

[14] 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*

[13] 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

[12] 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

[11] 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

[10] 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

[9] 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

[8] 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

[7] 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

[6] 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

[5] 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

[4] 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

[3] 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.

[2] 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

[1] 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

[2] 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

[1] 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

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
Future Moves - New Mobility Podcast, October 2022
Title: “Autonomes Fahren”
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)- 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”

5th 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, Mai 2021
Title “A Dynamic Trajectory Planning Approach for Autonomous Vehicles at the Limits of Handling”

TH Ingolstadt, 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?“

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

HONORS AND AWARDS

12/2022	IEEE ITS Outstanding Application Award (with TUM Autonomous Motorsport)
11/2022	IEEE ITS Young Professional Travel Fellowship
03/2022	DAAD AInet Fellow 2022
01/2022	1st Place, 3rd Japan Automotive AI Challenge
01/2022	2nd Place, Indy Autonomous Challenge@CES Las Vegas

10/2021	1st Place, Indy Autonomous Challenge
06/2021	2nd 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	1st 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	1st Place, Roborace "Human + Machine Challenge"
09/2017	Nvidia GPU Grant: Sponsoring of one "Titan Xp" GPU
04/2012	3rd best graduate in Bachelor of Engineering at FH Coburg

SERVICE TO ACADEMIC COMMUNITY

MEMBERSHIP OF JOURNAL COMMITTEES

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

MEMBERSHIP OF CONFERENCE COMMITTEES

06/2023	**Organizer & Tutorial Co-Chair,** 2023 IEEE Intelligent Vehicles Symposium (IV), Anchorage, Alaska
05/2023	**Associate Editor for the Conference Editorial Board (CEB**), 2023 IEEE International Conference on Robotics and Automation (ICRA), London, UK
05/2023	**Program Committee**, 1st IEEE International Conference on Mobility: Operations, Services, and Technologies (MOST) 2023
12/2022	**Program Committee,** 5th Robot Learning Workshop: Self-Supervised and Lifelong Learning at the 36th Conference on Neural Information Processing Systems (NeurIPS) 2022
10/2022	**Organizer** (with Philippe Martinet, Christian Laugier, Huijing Zhao, Marcelo H Ang Jr, Yufeng Yue, David Sierra-Gonzalez) of the 13th Workshop on Planning, Perception and Navigation for Intelligent Vehicles, 2022 IEEE International Conference on Intelligent Robots and Systems (IROS), Kyoto, Japan
06/2022	**Organizer** (with Alexander Carballo, Shinpei Kato, Bonolo Mathibela, David Walmroth, Daisuke Tana) of the 4th Autoware Workshop, 2022 IEEE Intelligent Vehicles Symposium (IV), Aachen, Germany
05/2022	**Organizer** (with Hongrui Zheng, Jack Silberman, Rosa Zheng, Rahul Mangharam) of the 10th F1TENTH Autonomous Racing Grand Prix (Competition), 2022 IEEE International Conference on Robotics and Automation (ICRA), Philadelphia, USA
05/2022	**Organizer,** (with Madhur Behl, Rahul Mangharam, Venkat Krovi) of the 2nd Workshop "Opportunities and Challenges with Autonomous Racing", 2022 IEEE International Conference on Robotics and Automation (ICRA), Philadelphia, USA
01/2022	**Program Committee**, ITS Workshop at the 14th International Conference on COMmunication Systems & Networks 2022 (COMMSNET)
12/2021	**Program Committee,** 4th Robot Learning Workshop: Self-Supervised and Lifelong Learning at the 35th Conference on Neural Information Processing Systems (NeurIPS) 2021

09/2021 **Organizer** (with Michael Sojka, Rahul Mangharam) of the 9th F1TENTH Autonomous Racing Grand Prix (Competition), 2021 IEEE International Conference on Intelligent Robots and Systems (IROS), Praque, Czech Republic

05/2021 **Organizer** (with Madhur Behl, Rahul Mangharam, Venkat Krovi) of the 1st Workshop on Opportunities and Challenges with Autonomous Racing, 2021 IEEE International Conference on Robotics and Automation (ICRA), Xi´an, China

10/2020 – 06/2022 **Program Committee**, IEEE International Conference on Ecological Vehicles and Renewable Energies (EVER)

UNIVERSITY SERVICE

02/2021 – present 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

01/2023 – present **Strategic Planning Committee**, The Autoware Foundation

03/2022 – present **Junior Co-Chair**, IEEE RAS Technical Committee on AGV-ITS (Autonomous Ground Vehicles and Intelligent Transportation Systems)

01/2021 – 12/2022 **Working Group Leader** (together with Christian John), The Autoware Foundation

REVIEW ACTIVITIES

Journal of Field Robotics (JFR)
IEEE Transaction on Robotics (T-RO)
IEEE Transactions on Intelligent Vehicles (T-IV)
IEEE Transactions on Intelligent Transportations Systems (T-ITS)
International Journal of Vehicle Mechanics and Mobility
MDPI Sustainability Journal
MDPI Applied Sciences Journal
SAE International Journal of Connected and Automated Vehicles
Conference on Robot Learning (CoRL)
IEEE Conference on Intelligent Transportation Systems (ITSC)
IEEE International Conference on Robotics and Automation (ICRA)
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)
Workshop on Dynamics of Road Vehicles: Connected and Automated Vehicles

OPEN-SOURCE PROJECTS AND TOOL DEVELOPMENT

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

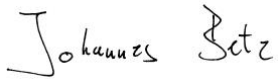
COMPETENCES

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

Travel, soccer, triathlon

Munich, 2/16/2023



Johannes Betz