Walter Zimmer

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☆ Summary

Machine Learning Engineer with over 6 years of experience specializing in developing scalable data labeling pipelines and deploying safety-critical perception systems. Proven ability to leverage multi-modal data for real-world applications, with 30+ publications (15 first author, h-index: 13) in leading premier AI conferences and journals (CVPR, ECCV, ICCV, ICML, T-PAMI).

- Studied at 4 universities, 2 stays abroad at UC San Diego (US) and TU Delft (NL), awarded 10 scholarships & awards
- Authored dissertation: Roadside 3D Perception for Autonomous Driving, 1st ITS Best Dissertation Award 2025 🏆 $2,000
- Published >30 articles (14 first author): 14 peer-reviewed conf. articles, ICML'25, ICCV'25, 2x ITSC'25, 2x CVPR'24, ECCV'24, ICCV'23, 2x ITSC'24, IV'24, ITSC'23 (oral, Best Student Paper Award 🏆), IV'23 (oral), IV'22 (oral), IV'19, 5 peer-reviewed journal papers: T-PAMI'24 (IF:20.8), 3x T-IV'24 (IF:14.0), OJ-ITS'25 (IF:5.3). Total: >700 citations, h-index: 13
- Presented at 14 conferences: CVPR'25, CVPR'24 (oral), ECCV'24, 2x ITSC'24, IV'24, 2x ITSC'23 (oral & panel discussion), IV'23 (oral), MobilTUM'23, VDI'23, IV'22 (oral), VDI'22, ITS World Congress'21, IV'19, attended 19 conferences in total
- Organized 13 int. workshops: ICCV'25, 2x ITSC'25, 2x CVPR'25, CAIP'25, 2x IV'25, ECCV'24, ITSC'24, IV'24, IV'23, IV'21
- Reviewed >110 articles, served as Assoc. Editor (ITSC'25), Program chair (RSS'25, CAIP'25), Session chair (ITSC'24, IV'24)
- Obtained 45 training certificates, attended 19 conferences, supervised 44 student projects, lectured 4 seminars
- Participated in **6 hackathons**: HackaTUM: '16, '19 (1. place, 1,500 EUR 🏆), '22, SDHacks'18, WirVSVirusHackathon'20

Skills

- **Programming Languages**: Python, C++, TypeScript, C, SQL, Java, C#, Go, JavaScript, MATLAB, Bash. >2,000 code commits
- **Libraries**: PyTorch3D, TensorFlow, JAX, OpenCV, Open3D, NumPy, Pandas, Matplotlib, Scikit-learn, PCL, Ceres, THREE.js
- **Tools**: VS Code, PyCharm, IntelliJ, Colab, Blender, CARLA, Unreal Engine, Unity, ROS, Docker, Kubernetes, Git, UNIX
- **Methodologies**: Agile, Scrum, DevOps, MLOps, CI/CD, TDD, Pair Programming, UML, Design Patterns, Clean Code
- **Languages**: German (native), English (fluent, DAAD Certificate: C1), Spanish (basic), French (basic), Dutch (basic)
- **Certifications**: 45 training certificates, e.g. Self-Driving Cars Perception, Scientific Paper Writing, Modern C++
- **Soft Skills**: Leadership, Communication, Teamwork, Problem Solving, Creativity, Time Management, Presentation Skills
- **Academic Skills**: Peer Review, Scientific Writing, Grant & Funding Acquisition, Mentoring, Supervision, Teaching
- **Industry Skills**: Tech. Project Management, Agile SW Development, Rapid Prototyping, Product Design, Entrepreneurship

Education

Technical University of Munich (TUM), Chair of AI and Robotics (AIR) — Munich, Germany
PhD Student, Computer Science, advised by: Prof. Dr.-Ing. habil. Alois C. Knoll — *Mar 2020 — May 2025*

- Authored dissertation: Roadside 3D Perception for Autonomous Driving, 1st ITS Best Dissertation Award 2025 🏆 $2,000
- Coordinated 2 research projects: Providentia++ (2020-2022) and AUTOtech.agil (2022-2025) in L4 Autonomous Driving
- Supervised 44 student projects: 2x ITS Bavaria Best Thesis Awards 🏆, 2x 500 EUR (🔗, 🔗), interviewed >100 students
- Automated data labeling, leveraging weak supervision to correct annotations and find problematic labels in large datasets.
- Built a data flywheel to continuously improve training pipelines, integrating labeled data to refine detection algorithms.
- Developed pipelines for continuous/iterative improvement, ensuring large-scale dataset consistency and quality.
- Created feedback loops to enhance dataset labeling accuracy, optimizing training data for perception models.
- Developed training pipelines to enhance SOTA performance, integrating YOLO & SAM models into existing architectures.

Uni. of California San Diego (UCSD), Lab for Intelligent and Safe Automobiles (LISA) — San Diego, USA
Visiting Scholar, 2 scholarships: PROMOS and StMWK, advised by: Prof. Dr. Mohan M. Trivedi — *Sept 2018 — Mar 2019*

- Developed 3D BAT to auto-label datasets using Python & TypeScript (730+ GitHub ⭐), 13,800 3D labels per hour, IV'19

Technical University of Munich (TUM) — Munich, Germany
Master of Science, Computer Science — *Sept 2016 — Aug 2018*

- Passed 27 exams (7 in addition, 161/120 ECTS), awarded DAAD scholarship for 1 semester at TU Delft University (NL)

Cooperative State University (DHBW) — Mosbach, Germany
Bachelor of Science, Dual Student in Computer Science, in coop. with SSI Schaefer IT Solutions GmbH — *Sept 2013 — Sept 2016*

Projects

TUM Traffic Datasets (Link) — Mar 2020 — Feb 2025

- Built automatic data collection & auto-labeling pipelines for large-scale datasets. Outcome: 12 TUM Traffic Datasets
- Indexed large amounts of labeled data, enabling real-time dataset retrieval and fine-tuning of perception models
- Improved dataset diversity through optimized data mining strategies, significantly enhancing model generalization
- Awarded IEEE ITSS Best Student Paper Award 🏆 at ITSC'23 for the TUM Traffic Intersection (TUMTraf-I) Dataset
- Curated TUMTraffic-VideoQA Dataset for multi-modal video question answering & robust perception of traffic scenarios
- Proposed benchmark with 3 new tasks: multi-choice video QA, referred object captioning & spatial-temporal grounding
- Evaluated and benchmarked model performance on public datasets (Waymo Open Dataset and nuScenes)

A9 Test Field for Autonomous Driving (Link) — Mar 2020 — Feb 2025

- Operated & maintained real-world Test Field for Autonomous Driving (8 sensor stations, 81 sensors, 20 Gbps data rate)
- Developed end-to-end data pipelines for streaming digital twins of the traffic, integrating roadside sensor data

Multi-Modal 3D Object Detection, Tracking, and Segmentation (Link) — Mar 2023 — Sep 2024

- Implemented InfraDet3D, a large multi-modal multi-task model, integrating 2D object detection and instance segmentation (YOLO), 3D object detection (MonoDet3D), and 3D multi-object tracking (PolyMOT) in a single architecture
- Showed that late fusion of LiDARs and cameras improves 3D object detection by +1.90 mAP compared to camera-only
- Improved 3D mAP by +29.83 on TUMTraf-I Dataset using deep multi-modal camera-LiDAR fusion instead of late fusion

Cooperative Perception Using Vehicle and Roadside Infrastructure Data (Link) — Mar 2023 — Sep 2024

- Developed coop. perception system (CoopDet3D) to fuse vehicle with roadside infrastructure camera and LiDAR data
- Achieved improvement of +14.36 mAP by fusing vehicle & roadside infrastructure data compared to vehicle data only
- Developed CoopCMT, improved 3D mAP by +8.53 mAP compared to vehicle only using deep fusion and transformers

Work Experience

Autonomous Systems Engineer — Apr 2019 — Mar 2020
STTech GmbH, advised by: Gereon Hinz — *Munich, Germany*

- Built large-scale distributed systems for multi-agent data processing in self-driving simulations. (CARLA, TensorFlow, C++)
- Calibrated cameras (OpenCV, Python, C++). Implemented aut. recommender systems using NLP (Python, spaCy)

Research Internship — Mar 2018 — Sept 2018
AUDI AG, Sensor Data Fusion Department, advised by: Prof. Dr. Mirko Mählisch — *Ingolstadt, Germany*

- Master's thesis in multi-modal 3D object detection (Python, TensorFlow, C++, ADTF, Docker), Grade: 1.3 (3.7/4.0 US)
- Improved 86.5% of the ground truth frames of the AUDI dataset by applying custom correction methods

Research Assistant — Oct 2016 — Aug 2017
Siemens AG — *Munich, Germany*

- Developed data extraction & filtering pipelines in Python. Implemented visualization dashboards in NodeJS, AngularJS

Software Engineer — Sept 2013 — Feb 2018
SSI Schaefer IT Solutions GmbH — *Giebelstadt, Germany*

- Implemented 3D simulations for warehouse automations (Java, OpenGL, LWJGL, WebGL, Three.js)

Academic Service

- Served as Assoc. Editor (ITSC'25), program chair (RSS'25, CAIP'25), session chair (ITSC, IV), 10x general chair (workshops)
- Reviewed >110 articles at **10 journals**: T-PAMI ('25, '24), T-MM'25, RA-L ('25, '24, '23), T-ITS ('25, '24, '23), T-IV'24, and **21 conferences:** CVPR'25, ICCV'25, IROS'25, RSS'25, WACV'25, CoRL'25, CAIP'25, ECCV'24, ICCV'23, ITSC ('25, '24, '23, '22, '21), IV ('25, '24, '23, '22, '21, '20, '19)

Awards & Scholarships

- 2025: IEEE ITSS Best Dissertation Award, 1st Prize: $2,000, Awarded by the Intelligent Transportation Systems Society
- 2023: IEEE ITSS Best Student Paper Award at IEEE International Conference on Intelligent Transportation Systems
- 2019: hackaTUM hackathon Challenge Winner Award, 1. Place at AID challenge (of 121 teams), Prize: 1,500 EUR
- 2017/18: Awarded 3 scholarships: DAAD, PROMOS and StMWK for 2 stays abroad (TU Delft University and UCSD)
- 2017: TUM ranking: Within the best 28% of master students, passed 27 exams (131 ECTS) within 3 semesters
- 2016: Awarded Bachelor's degree within the best 10-20% of students at DHBW Mosbach. GPA: 1.7 (3.3/4.0 US)

Teaching

- Lectured 4 seminars: Adv. Foundation and Perception Models for Aut. Driving (SS'25), 3D Perception for Aut. Driving (WS'21/22, SS'22), Visual Feature Learning for Aut. Driving (SS'21), guest lecture at Uni. of California San Diego, UCSD '21

Selected First-Author Publications

[1] **Walter Zimmer***, Christian Creß*, Huu Tung Nguyen*, Alois C. Knoll, "TUMTraf Intersection Dataset: All You Need for Urban 3D Camera-LiDAR Roadside Perception," in *IEEE Int. Conf. on Intelligent Transportation Systems (ITSC). IEEE ITSS Best Student Paper Award*, 2023, pp. 1030–1037. doi: 10.1109/ITSC57777.2023.10422289.

[2] **Walter Zimmer**, Gerhard Arya Wardana, Suren Sritharan, Xingcheng Zhou, Rui Song, Alois C. Knoll, "TUMTraf V2X Cooperative Perception Dataset," in *IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR)*, 2024, pp. 22668–22677. doi: 10.1109/CVPR52733.2024.02139.

[3] **Walter Zimmer**, Ross Greer, Xingcheng Zhou, Rui Song, Hu Cao, Daniel Lehmberg, Marc Pavel, Ahmed Alaaeldin Ghita, Akshay Gopalkrishnan, Holger Caesar, Mohan M. Trivedi, Alois C. Knoll, "Towards Vision Zero: The Accid3nD Dataset," in *Accepted for IEEE/CVF Int. Conf. on Computer Vision (ICCV) 2025*, 2025. doi: https://doi.org/10.48550/arXiv.2503.12095.

[4] **Walter Zimmer**, Joseph Birkner, Marcel Brucker, Huu Tung Nguyen, Stefan Petrovski, Bohan Wang, Alois C. Knoll, "InfraDet3D: Multi-Modal 3D Object Detection based on Roadside Infrastructure Camera and LiDAR Sensors," in *IEEE Intelligent Vehicles Symposium (IV)*, 2023, pp. 1–8. doi: 10.1109/IV55152.2023.10186723.

[5] **Walter Zimmer**, Akshay Rangesh, Mohan Trivedi, "3D BAT: A Semi-Automatic, Web-based 3D Annotation Toolbox for Full-Surround, Multi-Modal Data Streams," in *IEEE Intelligent Vehicles*, 2019. doi: 10.1109/IVS.2019.8814071.

[6] Christian Creß*, **Walter Zimmer***, Leah Strand*, Maximilian Fortkord*, Siyi Dai*, Venkatnarayanan Lakshminarasimhan*, Alois Knoll*, "A9-Dataset: Multi-Sensor Infrastructure-Based Dataset for Mobility Research," in *IEEE Intelligent Vehicles Symposium (IV)*, 2022, pp. 965–970. doi: 10.1109/IV51971.2022.9827401.

[7] Sondos Mohamed*, **Walter Zimmer***, Ross Greer, Ahmed Alaaeldin Ghita, Modesto Castrillón-Santana, Mohan M. Trivedi, Alois C. Knoll, Salvatore Mario Carta, Mirko Marras, "Transfer Learning from Simulated to Real Scenes for Monocular 3D Object Detection," in *Europ. Conf. on Computer Vision ECCV*, 2024. doi: 10.48550/arXiv.2408.15637.

[8] **Walter Zimmer**, Ross Greer, Xingcheng Zhou, Rui Song, Marc Pavel, Daniel Lehmberg, Ahmed Ghita, Akshay Gopalkrishnan, Mohan M. Trivedi, Alois C. Knoll, "Safety-Critical Learning for Long-Tail Events: The TUM Traffic Accident Dataset," in *Int. Conf. on Robotics and Automation, 40th Anniv. (ICRA@40)*, 2024.

[9] Ahmed Ghita*, Bjørk Antoniussen*, **Walter Zimmer***, Ross Greer*, Christian Creß, Andreas Møgelmose, Mohan M. Trivedi, Alois C. Knoll, "ActiveAnno3D - An Active Learning Framework for Multi-Modal 3D Object Detection," in *IEEE Intelligent Vehicles Symposium (IV)*, 2024, pp. 1699–1706. doi: 10.1109/IV55156.2024.10588452.

[10] **Walter Zimmer**, Jialong Wu, Xingcheng Zhou, Alois C. Knoll, "Real-Time And Robust 3D Object Detection with Roadside LiDARs," in *Proc. of Int. Conf. on Mobility and Transport: Mobility Innovations for Growing Megacities*, Springer Nature, 2023, pp. 199–219. doi: 10.1007/978-981-19-8361-0_13.

[11] **Walter Zimmer**, Emec Ercelik, Xingcheng Zhou, Xavier Jair Diaz Ortiz, Alois Knoll, "A Survey of Robust 3D Object Detection Methods in Point Clouds," *[Under Review]*, doi: 10.48550/arXiv.2204.00106.

[12] **Walter Zimmer**, Marcus Grabler, Alois Knoll, "Real-time and Robust 3D Object Detection Within Road-side LiDARs Using Domain Adaptation," *[Under Review]*, doi: 10.48550/arXiv.2204.00132.

[13] **Walter Zimmer**, Ramandika Pranamulia, Xingcheng Zhou, Mingyu Liu, Alois C. Knoll, "PointCompress3D – A Point Cloud Compression Framework for Roadside LiDARs in Intelligent Transportation Systems," *Accepted for IEEE Int. Conf. on Intelligent Transportation Systems (ITSC)*, 2025, doi: 10.48550/arXiv.2405.01750.