

Timo Hinzmann

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Current location: Sunnyvale, CA, USA ▪ Citizenship: German ▪ US Permanent Resident (Greencard)

PROFILE

Senior Computer Vision and Machine Learning Engineer with expertise in geometric vision, large-scale AI systems, and computational imaging. My work spans multi-sensor calibration, 3D perception, optimization, and modern generative AI, combining geometric methods (camera calibration, multi-view geometry, factor graphs, nonlinear optimization) with deep learning for object detection, pose estimation, neural rendering, and vision-language models. I received my PhD from ETH Zurich (Autonomous Systems Lab, Prof. Roland Siegwart), following master's thesis research at NASA JPL on vision-based navigation systems that contributed to the Mars Ingenuity helicopter program. My software has been deployed in production systems, including autonomous warehouse navigation (SevenSense, acquired by ABB) and search-and-rescue operations for Swiss Air Rescue (Rega). At Apple, I developed computer vision and calibration algorithms for Apple Vision Pro and have more recently worked on differential ray tracing through complex optical systems, Gaussian splatting, and diffusion models. My research has been cited more than 1,500 times. I have served as Associate Editor for IROS (2021–2026) and as a reviewer for CVPR, ICCV, BMVC, ICRA, RA-L, and IEEE Transactions on Robotics.

WORK EXPERIENCE

	Senior Computer Vision Algorithm Engineer · Apple Inc. – Diffusion models, Gaussian splatting, 6DOF object pose estimation, sensor calibration, numerical optimization, factor graphs, differential raytracing through complex optics – WWDC 2026: Spatial Reframing – WWDC 2025: Object Capture improvements	 10/2023 – today  Sunnyvale, CA, USA
	Computer Vision Algorithm Engineer · Apple Inc. – Device in-factory calibration of outward facing cameras, cover-glass, depth sensors, IMUs, device poses, and calibration targets for Apple Vision Pro and beyond. – DRI for differential ray-tracing through complex multi-surface optics & feature detector – WWDC 2023: Shipped sensor calibration for Apple Vision Pro	 10/2022 – 10/2023  Sunnyvale, CA, USA  05/2021 – 10/2022  Zurich, Switzerland
	PostDoc · Autonomous Systems Lab, ETH Zurich – Continued teaching, student supervision, and research & industry projects (depth estimation, DL object detection, visual-inertial state estimation, DL feature detection) started as PhD.	 09/2020 – 04/2021  Zurich, Switzerland  R. Siegwart
	Doctoral Researcher · Autonomous Systems Lab, ETH Zurich – Published in top conferences (e.g., ICRA, IROS) and journals (e.g., RA-L, JFR) – Involved in the research/industry projects: ICARUS , SHERPA , AtlantikSolar , SolAIR , arma-suisse (Depth estimation), Rega (Human detection), Microsoft SJRC , Google Tango (SLAM) – Teaching: Perception & Learning for Robotics (Ex. 2018, 2019), Autonomous Mobile Robots (Ex. 2015-2018), AI for Robotics (Ex. 2017), Robot Dynamics (Ex. 2015)	 12/2014 – 08/2020  Zurich, Switzerland  R. Siegwart
	Visiting Student · NASA Jet Propulsion Laboratory – JPL's Visiting Student Researchers Program (JVSRP) in Larry Matthies' Group (Perception) – Implemented feature tracking front-end and Multi-State Constraint Kalman Filter (MSCKF) . – Integrated into Multi-Sensor EKF Framework on AscTec Hummingbird in C/C++. – Embedded in JPL's Mars helicopter project.	 04/2014 – 10/2014  Pasadena, CA, USA  S. Weiss, R. Brockers
	Intern · BMW Group Research & Development (Project Connected Drive) – Integrated advanced driver-assistance systems into a unified hazard-anticipation system, implemented in BMW's driving simulator , validated in vehicle on test track.	 01/2012 – 09/2012  Munich, Germany  P. Reinisch, M. Werling
	Research Assistant · Institute of Optimization (ITE), KIT – Design of printed circuit boards (PCB) for indoor pedestrian navigation systems	 09/2010 – 04/2011  Karlsruhe, Germany
	Research Assistant · Fraunhofer IOSB Karlsruhe – Contributed to the project “Model predictive control for fuel consumption reduction of heavy trucks”: Literature review of existing software and hardware systems and components.	 09/2009 – 07/2011  Karlsruhe, Germany  M. Heizmann
	Teaching Assistant · Institute of Measurement and Control Systems (MRT), KIT – Teaching assistant for lab course on measurement and control systems (“Messtechnisches Praktikum”): Signal Analysis using (Fast) Fourier Transformation (FFT)	 03/2010 – 08/2010  Karlsruhe, Germany  C. Stiller

EDUCATION

	Dr. Sc. · Autonomous Systems Lab, ETH Zurich – Ph.D. Thesis “Perception and Learning for Autonomous UAV Missions”  – Thesis covers 1) Localization and Mapping 2) Long-range depth estimation 3) UAV Missions – Courses: Deep Learning; 3D Vision; Artificial Intelligence for Robotics.	 12/2014 – 08/2020  Zurich, Switzerland  Siegwart, Gilitschenski
	M. Sc. Robotics, Systems and Control · ETH Zurich – Semester Project “Adaptive control of multirotor aerial vehicles” (6.0/6.0)  – M.Sc. Thesis “Robust Vision-based Navigation for Micro Air Vehicles” (5.75/6.0)  – Courses (selection): Machine Learning; Recursive Estimation; Image Analysis and CV	 10/2012 – 11/2014  Zurich, Switzerland  R. Siegwart, M. Burri
	B. Sc. Information Technology and Electrical Engineering · KIT – B.Sc. Thesis “Path planning and state estimation for a differential drive ground robot” (1.0/1.0)  – Thesis covers EKF-based state estimation, path planning, and obstacle avoidance. – Courses (selection): Advanced Mathematics I-III; Information Technology; Sensors	 10/2008 – 10/2011  Karlsruhe, Germany  G. Trommer, J. Seibold
	Abitur · Kepler Gymnasium Pforzheim (High School of Natural Sciences) – Final grade: 1.0/1.0 (Highest achievable grade): Received several school awards. – Exchange student at High School in Holliday, TX, USA. Graduated with Honorary Diploma.	 07/1999 – 07/2008  Pforzheim, Germany  Holliday, TX, USA

SKILLS

- **Programming:** C/C++, Python/PyTorch, CUDA, MATLAB
- **Deep Learning:** Large-scale distributed training, Vision-Language Models (VLMs), Diffusion Models, NeRF, Gaussian Splatting, Vision-Language-Action (VLA) Models
- **Geometric Computer Vision:** Camera calibration, state estimation, visual-inertial odometry (VIO), SLAM, multi-view geometry, 3D reconstruction, feature detection
- **Optimization:** Nonlinear numerical optimization, factor graphs, bundle adjustment
- **Software Engineering:** Linux, Git, Docker, CI/CD, Jenkins
- **Hardware Platforms:** From NVIDIA Jetson to B200 GPU clusters, Apple Vision Pro, Pixhawk Autopilot, Arduino
- **Graphics & Rendering:** Differential ray tracing, surface representations, OpenGL, Unreal Engine
- **Robotics:** ROS, Gazebo, RViz, robotic simulation
- **Open-source tools:** [Kalibr](#), [maplab](#), [GTSAM](#), [ceres](#), [colmap](#)

AWARDS & RECOGNITIONS & MEDIA

- Associate Editor for IROS 2021-2026
- Reviewer: CVPR, ICCV, IROS, ICRA, BMVC, RA-L, T-RO, JFR
- News: “[Rega drones as saviours in times of need](#)”, SRF
- News: “[Artificial Intelligence – Intelligent drones will soon be our lifesavers](#)”, higgs.ch
- News: “[A milestone for drones in Switzerland](#)”, Swisscom
- Accepted to [JPL's Visiting Student Researchers Program](#)
- Ranked best 8.1% for final B.Sc. GPA
- Award from the German Mathematician Society
- Nominated for a scholarship of the German National Academic Foundation
- Several school awards for final High School GPA of 1.0/1.0
- Finalist at Airbus Scholarship Program in Hamburg, Germany.

LICENSED SOFTWARE

- The visual-inertial estimator [2] has been licensed by ETH spin-off [sevensense](#) for commercial applications ([recently acquired by ABB](#)).
- The DL-based optical-infrared human detection system has been licensed by the [Swiss Air Rescue Organization REGA](#).

PUBLICATIONS (SELECTION) [Google Scholar](#): Citations: 1517, h-index: 14, i10-index: 17

- [1] J. Rehder, J. Nikolic, T. Schneider, T. Hinzmann, and R. Siegwart. Extending kalibr: Calibrating the extrinsics of multiple IMUs and of individual axes. In *2016 IEEE International Conference on Robotics and Automation (ICRA)*, pages 4304–4311. IEEE, 2016 
- [2] T. Hinzmann, T. Schneider, M. Dymczyk, A. Schaffner, S. Lynen, R. Siegwart, and I. Gilitschenski. Monocular visual-inertial SLAM for fixed-wing UAVs using sliding window based nonlinear optimization. In *International Symposium on Visual Computing*, pages 569–581. Springer, 2016 
- [3] T. Hinzmann, J. Schönberger, M. Pollefeys, and R. Siegwart. Mapping on the fly: Real-time 3d dense reconstruction, digital surface map and incremental orthomosaic generation for unmanned aerial vehicles. In *Field and Service Robotics*, pages 383–396. Springer, 2018 
- [4] T. Hinzmann, T. Stastny, G. Conte, P. Doherty, and et al. Collaborative 3D reconstruction using heterogeneous UAVs: System and experiments. In *International Symposium on Experimental Robotics*, pages 43–56. Springer, 2016 
- [5] R. Mascaro, L. Teixeira, T. Hinzmann, R. Siegwart, and M. Chli. GOMSF: Graph-optimization based multi-sensor fusion for robust UAV pose estimation. In *2018 IEEE International Conference on Robotics and Automation (ICRA)*, pages 1421–1428. IEEE, 2018 
- [6] T. Hinzmann, T. Taubner, and R. Siegwart. Flexible stereo: Constrained, non-rigid, wide-baseline stereo vision for fixed-wing aerial platforms. In *2018 IEEE International Conference on Robotics and Automation (ICRA)*, pages 2550–2557. IEEE, 2018 