CURRICULUM VITAE
Friedrich Fraundorfer
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PERSONAL INFORMATION

Born December 12, 1975 in Steyr (Austria), Austrian nationality

EDUCATION

2020		Habilitation in the subject "Computer Vision and Robotics", Graz University of Technology, Austria
2002 – 2006	Dr. techn.	Graz University of Technology, Austria (with distinction) Doctoral program with supervisors Franz Leberl and Horst Bischof
1996 – 2001	Dipl.-Ing.	Graz University of Technology, Austria (with distinction) Study program: Telematik (now renamed to Information and Computer Engineering)
1991 – 1995		HTL Steyr, Elektronik/Informatik (with distinction)

PROFESSIONAL EXPERIENCE

1.3.2023 -	Full Professor (Univ.-Prof.) for Robotic Computer Vision, Graz University of Technology, Institute of Computer Graphics and Vision
2022	Offer of a Full Professorship (W3) for Photogrammetry and Remote Sensing at Technische Universität München (TU Munich) (declined)
2015 -	Affiliated Researcher at DLR-Remote Sensing Technology Institute, Oberpfaffenhofen (IMF)

2020 - 2023	Associate Professor, Graz University of Technology, Institute of Computer Graphics and Vision
2014 - 2020	Assistant Professor, Graz University of Technology, Institute of Computer Graphics and Vision
2012 - 2014	Akademischer Rat, Deputy of Remote Sensing Technology Chair, Technische Universität München (Prof. Bamler)
2007 - 2012	Lecturer (Dozent), Institute for Visual Computing, ETH Zürich
2007	Post-doc researcher, University of North Carolina at Chapel Hill
2006 - 2007	Post-doc researcher, University of Kentucky
2002 - 2006	Research assistant, Graz University of Technology

RESEARCH AREAS

Computer Vision, Machine Learning, AI, 3D Reconstruction, Robotics, Unmanned Aerial Vehicles, Remote Sensing

PROFESSIONAL ACTIVITIES

Workshop/Conference organizer

CVPR 2022 5th International Workshop on Visual Odometry and Computer Vision Applications Based on Location Clues

CVPR 2021 4th International Workshop on Visual Odometry and Computer Vision Applications Based on Location Clues

Joint Austrian Computer Vision and Robotics Workshop 2020, Graz, Co-Organizer

CVPR 2020 Joint Workshop on Long-Term Visual Localization, Visual Odometry and Geometric and Learning-based SLAM

CVPR 2019 3rd International Workshop on Visual Odometry and Computer Vision Applications Based on Location Clues

Computer Vision Winter Workshop 2019, Austria, Main Organizer

ECCV 2018, Website Chair

CVPR 2018 2nd International Workshop on Visual Odometry and Computer Vision Applications Based on Location Clues

CVPR 2017 International Workshop on Visual Odometry and Computer Vision Applications Based on Location Clues

ECCV 2014 Workshop on Computer Vision in Vehicle Technology with Special Session on Micro Aerial Vehicles. 2014

IEEE/RSJ IROS'13 International Workshop on Vision-based Closed-Loop Control and Navigation of Micro Helicopters in GPS-denied Environments. 2013. Co-organizer of AAPR 2002, PCV 2002, ECCV 2006

Professional service

Reviewer for CVPR, ECCV, ICCV, ACCV, BMVC, IEEE International Conference on Multimedia&Expo, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE International Conference on Robotics and Automation (ICRA), International Symposium on Robotic Research (ISRR), SIGGRAPH ASIA, EUROGRAPHICS, IGARSS, JURSE, CVPR Workshop EarthVision, ISPRS Photogrammetric Image Analysis, ISPRS Congress

Reviewer for International Journal of Computer Vision (IJCV), International Journal of Robotics Research (IJRR), Image and Vision Computing Journal (IMAVIS), IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), IEEE Robotics and Automation Letters, IEEE Transaction on Robotics, ISPRS Journal of Photogrammetry and Remote Sensing, International Journal of Remote Sensing, IEEE Geoscience and Remote Sensing Letters, IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, IEEE Trans. on Geoscience and Remote Sensing

Area Chair for ECCV 2022, ICCV 2021, ECCV 2020

Associate Editor ICRA 2023, 2022, 2021, 2020, 2019, ICPR 2018, IROS 2016

Area Chair for IJCAI 2022

Senior PC member for IJCAI 2023, 2021, 2020, 2019

Reviewer for the Netherlands Organisation for Scientific Research (NWO)

Guest editor MDPI Remote Sensing 2019

Guest editor International Journal of Micro Aerial Vehicles 2017

Associate Editor for IEEE Robotics and Automation Letters (RA-L) and the Journal of Artificial Intelligence Research.

FUNDING AND PROJECTS

Tablescope, FFG, (2022-2023)

3D-Recon IV, Industrial Research Project, Sony, Principal Investigator (2022-2023)

City Modeling, Industrial Research Project, Blackshark AI, VRVIS (2021-2022)

AIFlight, FFG Take Off, Consortium Leader (2021-2022)

CityGML, Industrial Research Project, Blackshark AI (2020)

3D-Shape continuum, SFG Project, (2020-2022)

SafeTrack, Industrial Research Project, P2F, D-ARIA, RotoFrank, PI (2020)

DroneNAV, Industrial Research Project, D-ARIA, PI (2020)

Streetview4VI, FFG Mobility of the Future, PI (2019-2021)

3D-Recon III, Industrial Research Project, Sony, Principal Investigator (2021-2022)

3D-Recon II, Industrial Research Project, Sony, Principal Investigator (2020-2021)

3D-Recon, Industrial Research Project, Sony, Principal Investigator (2019-2020)

Holomine, EIT KIC Project, Principal Investigator (2019-2022)

Resist, EU-H2020 Project, Principal Investigator (2018-2021)

Core3D, IARPA Grant, Principal Investigator (2017-2019)

Auto-LOG, FFG, Principal Investigator (2018-2021)

UAV Inspection, Industrial Research Project, Principal Investigator, Dimetor (2018)

Inventory Drone, Industrial Research Project, Principal Investigator, Magna (2018)

SemanticSFM, Industrial Research Project, Sony, Principal Investigator (2018-2019)

Walkassist 3, Industrial Research Project, Tec-Innovation, Principal Investigator (2018)

Parkplatzüberwachung, Industrial Research Project, Principal Investigator, Swarco (2017)

Delivery Drone, Industrial Research Project, Principal Investigator, Post (2017)

Walkassist 2, Industrial Research Project, Tec-Innovation, Principal Investigator (2017-2018)

SLIM, EU-H2020 Project, Principal Investigator (2016-2020)

Walkassist, Industrial Research Project, Tec-Innovation, Principal Investigator (2016-2017)

Inventory Drones, Industrial Research Project, Magna, Principal Investigator (2017)

UAV Semantic 3D, Industry project, Principal Investigator (2016), 80kEUR

CSISmartScan3D - Integrierte 3D-Tatortaufnahme und Dokumentation, Kiras Project (FFG), Principal Investigator (2015-2017), 155kEUR

VMAV - Cooperative micro aerial vehicles using onboard visual sensors, DACH Project (SNF, FWF, DFG), Principal Investigator (2014-2016), 274kEUR (DFG)

sFly – Swarm of Micro Flying Robots, EU STREP Grant, Work package leader, Co-authored with Marc Pollefeys

Autonomous vision-based micro-helicopter,SNF Individual Project, Project leader, Co-authored with Marc Pollefeys

Autonomous vision controlled micro aerial vehicle, SNF Individual Project Project leader, Co-authored with Marc Pollefeys

V-Charge - Autonomous Valet Parking and Charging for e-Mobility,EU IP Grant,
Co-authored with Marc Pollefeys

Visual-Inertial 3D Navigation and Mapping Sensor, KTI Project, Co-author

TEACHING

Robot Vision (CS, ICE Master program, TUG, 2018, 2019, 2020, 2021, 2022, 2023)

Camera Drones (CS, ICE Master program, TUG 2016, 2017, 2018, 2019, 2020, 2021, 2022)

Einführung in das wissenschaftliche Arbeiten (CS Bachelor, TUG 2015,2016,2017, 2018, 2019)

Mathematical Principles in Vision and Graphics (CS Master, TUG 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023)

Bildverstehen – Vertiefte Methoden (Master program), TUM, 2013, 2014

Image Processing (bachelor program) ETH D-BAUG 2012

Computer Vision Laboratory (graduate project course) ETH D-INFK 2011

Signal and Image Processing (graduate course) ETH D-BAUG 2008, 2010

Image Processing and Pattern Recognition (graduate course) TUG 2004, 2005

Advisor to 24 PhD students (14 completed)

Advisor/Supervisor of 25+ Bachelors and Masters Thesis

ACHIEVEMENTS

2021	**AI 2000. Most Influential Scholar Award Honorable Mention in the Field of Robotics.**
2020	**IEEE Geoscience and Remote Sensing Society 2020 Symposium Prize Paper Award**
	For our paper "Regularization of Building Boundaries in Satellite Images using adversarial and regularized losses" together with Stefano Zorzi.
2019	**Outstanding Reviewer Award CVPR 2019**
	CVPR is one of the top-tier conferences in the area of computer vision.
2018	**Amazon Gift awarded**
	Monetary gift of 10kEUR for continuing drone research activities granted by Amazon.
2018	**OCG Best Paper Award ÖAGM 2018**
	For our paper "Globally consistent dense real-time 3D reconstruction from RGBD data" with my students Rafael Weilharter and Fabian Schenk

2018	**Idea Competition Winner**
	Winner of the Idea Competition of Science Park Graz
2017	**Amazon Gift awarded**
	Monetary gift of 10kEUR for continuing drone research activities granted by Amazon.
2016	**Best paper award VISAPP 2016**
	For our paper "Direct Stereo Visual Odometry Based on Lines" with Thomas Holzmann and Horst Bischof.
2015	**Outstanding Reviewer Award CVPR 2015**
	CVPR is one of the top-tier conferences in the area of computer vision.
2012	**Nomination for Best Paper Award IROS 2012**
	Our paper "Vision-based Autonomous Mapping and Exploration Using a Quadrotor MAV" was awarded with a Best Paper Finalist certificate.
2010	**1st Place IMAGECLEF Robot Localization Competition (2010/07)**
	In the international competition IMAGECLEF Robot Localization Competition our contribution achieved the 1st place.
2010	**2nd Place IMAV 2010 Flight competition - Indoor Autonomy**
	Our Pixhawk team achieved the 2nd place in the 2010 International Flight Competition in the category Indoor Autonomy.
2009	**1st Place EMAV 2009 Flight competition - Indoor Autonomy**
	Our Pixhawk team achieved the 1st place in the 2009 European Micro Air Vehicle Flight Competition.International Flight Competition in the category Indoor Autonomy.

INTERNATIONAL COOPERATION

École des Ponts ParisTech (Prof. Vincent Lepetit)
Université de Picardie Jules Verne (Prof. Pascal Vasseur)
University of Bourgogne (Prof. Cedric Demonceux)
ETH Zürich (Prof. Marc Pollefeys, Prof. Roland Siegwart)
Technische Universität München (Prof. Richard Bamler, Prof. Xiaoxiang Zhu)
Deutsches Zentrum für Luft und Raumfahrt (DLR), Oberpfaffenhofen (Prof. Peter Reinartz)
University of North Carolina at Chapel Hill, US (Prof. Jan-Michael Frahm)

TALKS

- Photogrammetry and Remote Sensing in the age of deep learning. TU München. (2022)
- Perception systems for autonomous, flying robots. JKU Linz. (2022)
- Machine learning for Stereo/Multi-View Stereo (3D data generation). Virtual Vehicle Summer School "Beyond AI". (2021)

- AI and computer vision for autonomous drones and robots. JKU Linz. ICG Lab Talk Series. (2020)
- AI for autonomous drones and robots. DLR Oberpfaffenhofen. DLR-Workshop "Machine Learning". (2019)
- Computer vision for drones. University of Maryland. Lockheed Martin Robotics Seminar. (2019)
- Computer vision for drones. Queensland University of Technology. RAS seminar. (2019)
- Computer Vision for Drones. Pattern Recognition and Computer Vision Colloquium. Czech Technical University. (2018)
- Perceiving things. TU Graz. Colloquium talk (2018)
- Computer Vision for Drones. University of Rouen. Colloquium talk (2017)
- Kameradrohnen im Einsatz. Navigation Get-together TU Graz (2017)
- Computer Vision for Camera Drones. CVPR Embedded Vision Workshop. Invited talk (2017)
- 3D reconstructions from camera drones and mobile devices and their usage in forensics. Vortragsreihe "Die interdisziplinäre Welt der forensischen Bildgebung". Ludwig Boltzmann Gesellschaft GmbH. Graz (2017)
- Camera drones – techniques, applications and possibilities. Munich Aerospace Summer School. Invited talk. (2016)
- New possibilities through unmanned aerial vehicles (UAV's). DLR-TUM summer school. Invited talk (2015)
- Computer vision algorithms for robotics systems. Colloquium "Perspectives in Computer Vision and Pattern Recognition". Universität Siegen. 2015
- Drone Vision – Computer vision algorithms for drones. Aerial Robotics Workshop. ENSAM-Paris. Colloquium talk (2015)
- Drone Vision – Computer vision algorithms for drones. IROS workshop. Invited talk. (2015)
- Building and site reconstruction from small scale unmanned aerial vehicles (UAV's). JURSE. Conference talk. (2015)
- Computer vision algorithms for autonomous drones. University of Ljubljana. Invited talk (2015)
- Computer Vision for autonomous Micro Aerial Vehicles (MAV's). ECCV Workshop Computer vision in vehicle technology. Invited talk. (2014)
- The Pixhawk MAV – 3D computer vision for autonomous micro aerial vehicles (MAV's). TU Graz. Colloquium talk. (2014)
- Methoden zur automatisierten und autonomen 3D-Datengenerierung aus Bildern. Universität Bonn. Colloquium talk (2013)
- The role of computer vision in autonomous self-contained MAVs. IROS workshop. Invited talk (2013)
- Vision-based autonomous mapping and exploration using a quadrotor MAV. IROS conference talk. (2012)
- Vision-based autonomous mapping and exploration using a quadrotor MAV. University of Zurich. Invited talk. (2012)
- 3D computer vision for 3D mapping and interactive virtual tour applications. Hasselt University. Colloquium talk. (2011)

- Onboard computer vision for autonomous flight, environment mapping and obstacle avoidance for micro aerial vehicles. Robotics Innovation Center, DFKI Bremen. Invited talk (2011)
- Autonomous Micro Aerial Vehicles. NASA Jet Propulsion Laboratory, Pasadena. Invited talk (2011)
- Autonomous Micro Aerial Vehicles. Institute for Software Technology, Technische Universität Graz. Invited talk (2011)
- Visual localization – Computing where you are from images. Visualization Research Center, Universität Stuttgart. Invited talk (2010)
- Visual localization. Virtual Reality Systems Group, Bauhaus-Universität Weimar. Invited talk (2010)
- Combining monocular and stereo cues for mobile robot localization using visual words. ICPR conference talk (2010)
- Methods for combined monocular and stereo mobile robot localization. ICPR workshop talk (2010)
- 3D city models and applications. Colloquium Future Photogrammetry, ETH Zürich (2009)
- Piece-wise planar 3D reconstructions. Microsoft Live-Labs, Redmond. Invited talk (2007)
- Centerbot: A kidnapping-proof mobile robot. Department of Computer Science, University of North Carolina in Chapel Hill. Colloquium talk (2007)
- Vocabulary tree based recognition using hard drives. Computer Vision Laboratory, ETH Zürich. Colloquium talk (2007)
- Vocabulary tree based recognition for loop closing and place recognition. Autonomous Systems Lab, ETH Zürich. Colloquium talk (2007)
- MSCCs: Maximally Stable Corner Clusters. University of Ljubljana, Faculty of Computer and Information Science. Colloquium talk (2004)
- Localization with Salient Image Features. Massachusetts Institute of Technology (MIT), Computer Science and Artificial Intelligence Laboratory. Colloquium talk (2003)

MISCELLINEOUS

TV-Report at ORF about KI-based walking assistant for visually impaired, 2021
TV-Report PM-Wissen on ServusTV about our drone research, 2018
TV-Report ORF-Newton about our drone research, 2016
TV-report „Wissenswert" on ServusTV about our research on Micro Aerial Vehicles, 2012
TV-report about our research on Micro Aerial Vehicles in SF1 Tagesschau, 2012
TV-report „Einstein" on SF1 about our research on Micro Aerial Vehicles, 2011
Founding member of the Pixhawk Team 2008 (responsible for the development of the PX4 autopilot, the PX4Flow sensor, the Pixhawk UAV design and multiple publications on autonomous UAV's)
Creator of the Opensource SfM-software MAVMAP (https://github.com/mavmap)

Google Scholar Citations: **10941** (2.3.2023)

SELECTED PUBLICATIONS

Google Scholar (https://scholar.google.com/citations?user=M0boL5kAAAAJ&hl=de)
ORCID (https://orcid.org/0000-0002-5805-8892)

- Davide Scaramuzza and Friedrich Fraundorfer. Visual odometry: Part I: The first 30 years and fundamentals. Robotics Automation Magazine, IEEE, 18(4):80-92, dec. 2011.
- Friedrich Fraundorfer and Davide Scaramuzza. Visual odometry: Part II: Matching, robustness, optimization, and applications. Robotics Automation Magazine, IEEE, 19(2):78-90, june 2012. DOI: https://doi.org/10.1109/MRA.2011.943233
- L. Doitsidis F. Fraundorfer E.B. Kosmatopoulos A. Martinelli M.W. Achtelik M. Chli S.A.Chatzichristos L. Kneip D. Gurdan L. Heng G.H. Lee S. Lynen L. Meier M. Pollefeys A. Renzaglia, Roland Siegwart J.C. Stumpf P. Tanskanen C. Troiani S.Weiss D. Scaramuzza, M.C. Achtelik. Vision-controlled micro flying robots: from system design to autonomous navigation and mapping in gps-denied environments. IEEE Robotics and Automation Magazine, 21(3), 2014. DOI: https://doi.org/10.1109/MRA.2014.2322295
- Lionel Heng, Dominik Honegger, Gim Hee Lee, Lorenz Meier, Petri Tanskanen, Friedrich Fraundorfer, and Marc Pollefeys. Autonomous visual mapping and exploration with a micro aerial vehicle. Journal of Field Robotics, 31(4):654-675, 2014. DOI: https://doi.org/10.1002/rob.21520
- Lorenz Meier, Petri Tanskanen, Lionel Heng, Gim Hee Lee, Friedrich Fraundorfer, and Marc Pollefeys. Pixhawk: A micro aerial vehicle design for autonomous flight using onboard computer vision. Autonomous Robots, 33(1):21-39, Aug 2012. DOI: https://doi.org/10.1007/s10514-012-9281-4
- Xiaoxiang Zhu, Devis Tuia, Lichao Mou, Gui-Song Xia, Liangpei Zhang, Feng Xu, and Friedrich Fraundorfer. Deep learning in remote sensing: A review. IEEE Geoscience and Remote Sensing Magazine (GRSM), 2017. DOI: 10.1109/MGRS.2017.2762307
- Belief Propagation Reloaded: Learning BP-Layers for Labeling Problems .P Knobelreiter, C Sormann, A Shekhovtsov, F Fraundorfer, T Pock. Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition 2020. DOI: https://doi.org/10.1109/CVPR42600.2020.00792
- DeepC-MVS: Deep confidence prediction for multi-view stereo reconstruction. A Kuhn, C Sormann, M Rossi, O Erdler, F Fraundorfer. International Conference on 3D Vision (3DV), 404-413. 2020. DOI: https://doi.org/10.1109/3DV50981.2020.00050