Elias **Marks**

PhD Student and Research Assistant · Center for Robotics, University of Bonn

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Skills

Computer Vision: 3D reconstruction · 3D segmentation · 3D point cloud processing · Structure from motion · Neural rendering / NeRF
Robotics: 3D scan registration · 3D Mapping · Motion planning · Embedded systems (Arduino)
Programming Languages: Python · C++ · Bash scripting
Other Skills: Technical writing in LaTeX · Computer-Aided Design (CAD) · UAV piloting (A1,A2,A3 License) · Soldering · Welding
Tools: Pytorch · Open3D · OpenCV · ROS · Git · Docker · LaTeX · Office · CloudCompare · Blender · Fusion360 · CATIA

Education

PhD in agricultural robotics. Advisored by Prof. Dr. Cyrill Stachniss — *University of Bonn* since 2021
Master of Science in Artificial Intelligence and Robotics — *"La Sapienza" University of Rome* 2018 – 2021
Bachelor of Engineering in Automation and Robotics — *Hochschule Heilbronn* 2013 – 2017

Experience

Researcher Computer Vision for Agricultural Robotics — *University of Bonn* since 2021
Supervisor Msc Thesis: Target-Aware Implicit Mapping for Agricultural Crop Inspection — *University of Bonn* 2022 – 2023
Supervisor Msc Thesis: Fruit Tracking Over Time Using High-Precision Point Clouds — *University of Bonn* 2022 – 2023
Student Trainee Localization, Mapping and Navigation for Service Robots — *Fraunhofer IPA* 2016 – 2017
Internship Localization, Mapping and Navigation on Single Board Computers — *Fraunhofer IPA* 2015 – 2016
Internship Basic Engineering Training — *BMW* 2013

Honors & Awards

Winner: Best Poster Award Young Researchers at European Conference on Precision Agriculture 2025
Exploring the potential of 4D plant phenotyping for automated crop genotype differentiation, J. Boemer et al.
Winner: Faculty Award for Geodesy at Faculty of Agricultural, Nutritional and Engineering Sciences, University of Bonn 2024
PhenoBench: A Large Dataset and Benchmarks for Semantic Image Interpretation in the Agricultural Domain, J. Weyler et al.
Winner: Best Agri-Robotics Paper Award at the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS) 2024
BonnBeetClouds3D: A Dataset Towards Point Cloud-Based Organ-Level Phenotyping of Sugar Beet Plants, E. Marks et al.
Winner: Best Paper Award at the IROS Workshop on "Agricultural Robotics for Sustainable Futures" 2024
BonnBeetClouds3D: A Dataset Towards Point Cloud-Based Organ-Level Phenotyping of Sugar Beet Plants, E. Marks et al.
Finalist: Best Service Robotics Paper Award at the IEEE Intl. Conf. on Robotics and Automation (ICRA) 2024
Efficient and Accurate Transformer-Based 3D Shape Completion and Reconstruction of Fruits for Agricultural Robots, F. Magistri et al.
Honorable Mention: Best Paper Award at the IEEE Robotics and Automation Letters (RA-L) 2023
High Precision Leaf Instance Segmentation in Point Clouds Obtained Under Real Field Conditions, E. Marks et al.
Winner: Best Automation Paper Award at the IEEE Intl. Conf. on Robotics and Automation (ICRA) 2023
Target-Aware Implicit Mapping for Agricultural Crop Inspection, S. Kelly et al.
Finalist: Best Agri-Robotics Paper Award at the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS) 2022
Contrastive 3D Shape Completion and Reconstruction for Agricultural Robots using RGB-D Frames, F. Magistri et al.
Winner: Best Automation Paper Award at the IEEE Intl. Conf. on Robotics and Automation (ICRA) 2022
Precise 3D Reconstruction of Plants from UAV Imagery Combining Bundle Adjustment and Template Matching, E. Marks et al.

Academic Services

Teaching

Mobile Sensing and Robotics Project Full year project supervision 2024 – 2025
Sensors and State Estimation Tutorial since 2021
Advanced Techniques for Mobile Sensing and Robotics Tutorial since 2021

Workshop Organization

ECMR Workshop on Deep Learning in Agriculture, Forestry and Field Robotics 2025
ECMR Workshop on Robotics in Agriculture and Forestry 2023
ICRA Workshop on Agricultural Robotics and Automation 2022

Languages

Native: Italian, German **Advanced:** English **Intermediate:** Spanish

Publication List

Peer-reviewed journal articles

[1] R. Marcuzzi, L. Nunes, E. Marks, L. Wiesmann, T. Läbe, J. Behley, and C. Stachniss, "SfmOcc: Vision-Based 3D Semantic Occupancy Prediction in Urban Environments," *IEEE Robotics and Automation Letters (RA-L)*, vol. 10, no. 5, pp. 5074–5081, 2025.

[2] J. Bömer, F. Esser, E. Marks, R. Rosu, S. Behnke, L. Klingbeil, H. Kuhlmann, C. Stachniss, A.-K. Mahlein, and S. Paulus, "A 3D Printed Plant Model for Accurate and Reliable 3D Plant Phenotyping," vol. 13, giae035, 2024.

[3] J. Weyler, F. Magistri, E. Marks, Y. Chong, M. Sodano, G. Roggiolani, N. Chebrolu, C. Stachniss, and J. Behley, "PhenoBench: A Large Dataset and Benchmarks for Semantic Image Interpretation in the Agricultural Domain," *IEEE Trans. on Pattern Analalysis and Machine Intelligence (TPAMI)*, vol. 46, no. 12, pp. 9583–9594, 2024.

[4] L. Wiesmann, E. Marks, S. Gupta, T. Guadagnino, J. Behley, and C. Stachniss, "Efficient LiDAR Bundle Adjustment for Multi-Scan Alignment Utilizing Continuous-Time Trajectories," *arXiv preprint*, vol. arXiv:2412.11760, 2024.

[5] R. Marcuzzi, L. Nunes, L. Wiesmann, E. Marks, J. Behley, and C. Stachniss, "Mask4D: End-to-End Mask-Based 4D Panoptic Segmentation for LiDAR Sequences," *IEEE Robotics and Automation Letters (RA-L)*, vol. 8, no. 11, pp. 7487–7494, 2023.

[6] E. Marks, M. Sodano, F. Magistri, L. Wiesmann, D. Desai, R. Marcuzzi, J. Behley, and C. Stachniss, "High Precision Leaf Instance Segmentation in Point Clouds Obtained Under Real Field Conditions," *IEEE Robotics and Automation Letters (RA-L)*, vol. 8, no. 8, pp. 4791–4798, 2023.

[7] F. Magistri, E. Marks, S. Nagulavancha, I. Vizzo, T. Läbe, J. Behley, M. Halstead, C. McCool, and C. Stachniss, "Contrastive 3d shape completion and reconstruction for agricultural robots using rgb-d frames," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, no. 4, pp. 10 120–10 127, 2022.

[8] F. Görlich, E. Marks, A.-K. Mahlein, K. König, P. Lottes, and C. Stachniss, "UAV-Based Classification of Cercospora Leaf Spot Using RGB Images," *Drones*, vol. 5, no. 2, 2021.

Peer-reviewed conference papers

[1] F. Magistri, T. Läbe, E. Marks, S. Nagulavancha, Y. Pan, C. Smitt, L. Klingbeil, M. Halstead, H. Kuhlmann, C. McCool, J. Behley, and C. Stachniss, "A Dataset and Benchmark for Shape Completion of Fruits for Agricultural Robotics," in *Proc. of the IEEE Intl. Conf. on Robotics & Automation (ICRA)*, 2025.

[2] E. Marks, L. Nunes, F. Magistri, M. Sodano, R. Marcuzzi, L. Zimmermann, J. Behley, and C. Stachniss, "Tree Skeletonization from 3D Point Clouds by Denoising Diffusion," in *Proc. of the IEEE Intl. Conf. on Computer Vision (ICCV)*, 2025.

[3] M. Sodano, F. Magistri, E. Marks, F. Hosn, A. Zurbayev, R. Marcuzzi, M. Malladi, J. Behley, and C. Stachniss, "3D Hierarchical Panoptic Segmentation in Real Orchard Environments Across Different Sensors," in *Proc. of the IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*, 2025.

[4] F. Esser, E. Marks, F. Magistri, J. Weyler, S. Bultmann, T. Zaenker, A. Ahmadi, M. Schreiber, H. Kuhlmann, C. Mccool, M. Popovic, C. Stachniss, S. Behnke, M. Bennewitz, and L. Klingbeil, "Automated leaf-level inspection of crops in agricultural fields by combining aerial and ground robot systems," in *Proc. of the IEEE Intl. Conf. on Robotics & Automation (ICRA)*, Sep. 2024.

[5] F. Magistri, R. Marcuzzi, E. Marks, M. Sodano, J. Behley, and C. Stachniss, "Efficient and Accurate Transformer-Based 3D Shape Completion and Reconstruction of Fruits for Agricultural Robots," in *Proc. of the IEEE Intl. Conf. on Robotics & Automation (ICRA)*, 2024.

[6] E. Marks, J. Bömer, F. Magistri, A. Sah, J. Behley, and C. Stachniss, "BonnBeetClouds3D: A Dataset Towards Point Cloud-Based Organ-Level Phenotyping of Sugar Beet Plants Under Real Field Conditions," in *Proc. of the IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*, 2024.

[7] S. Kelly, A. Riccardi, E. Marks, F. Magistri, T. Guadagnino, M. Chli, and C. Stachniss, "Target-Aware Implicit Mapping for Agricultural Crop Inspection," in *Proc. of the IEEE Intl. Conf. on Robotics & Automation (ICRA)*, 2023.

[8] Y. Pan, F. Magistri, T. Läbe, E. Marks, C. Smitt, C. McCool, J. Behley, and C. Stachniss, "Panoptic Mapping with Fruit Completion and Pose Estimation for Horticultural Robots," in *Proc. of the IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*, 2023.

[9] A. Riccardi, S. Kelly, E. Marks, F. Magistri, T. Guadagnino, J. Behley, M. Bennewitz, and C. Stachniss, "Fruit Tracking Over Time Using High-Precision Point Clouds," in *Proc. of the IEEE Intl. Conf. on Robotics & Automation (ICRA)*, 2023.

[10] N. Zimmerman, M. Sodano, E. Marks, J. Behley, and C. Stachniss, “Constructing Metric-Semantic Maps using Floor Plan Priors for Long-Term Indoor Localization,” in *Proc. of the IEEE/RSJ Intl. Conf. on Intelligent Robots and Systems (IROS)*, 2023.

[11] E. Marks, F. Magistri, and C. Stachniss, “Precise 3D Reconstruction of Plants from UAV Imagery Combining Bundle Adjustment and Template Matching,” in *Proc. of the IEEE Intl. Conf. on Robotics & Automation (ICRA)*, 2022.