Lucas **Nunes**

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

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Research Interests

Generative models · **Representation learning** · **3D scene understanding** · **Perception**

Education

Ph.D. Student — *University of Bonn*

Thesis: "Learning Discriminative Representations and Generative Approaches for Outdoor 3D LiDAR Data" — *Nov/2020 – Present*

(Supervisor: Prof. Dr. Cyrill Stachniss)

M.Sc. in Computer Science — *University of São Paulo*

Thesis: "Environment Reconstruction on Disparity Images using Surface Features and Generative Adversarial Networks" — *Mar/2020*

(Supervisor: Prof. Dr. Denis F. Wolf)

Bachelor in Computer Science — *University of São Paulo*

Degree in Computer Science — *Jan/2018*

Academic Positions

Ph.D. Student and Research Assistant — *University of Bonn*

Photogrammetry & Robotics Lab, Institute of Geodesy and Geoinformation — *since Nov/2020*

Intern Researcher — *Karlsruhe Institute of Technology*

Institut für Mess- und Regelungstechnik — *Aug/2018 – Nov/2018*

Master Student and Research Assistant — *University of São Paulo*

Mobile Robotics Laboratory, Institute of Mathematics and Computer Science — *Feb/2018 – Mar/2020*

Junior Research Assistant — *University of São Paulo*

Mobile Robotics Laboratory, Institute of Mathematics and Computer Science — *Ago/2014 – Jun/2017*

Teaching

From Perceptron to Generative Adversarial Networks: The Evolution of Neural Networks — 2019
University of São Paulo, 8h mini course

Machine Learning for Robotics and Computer Vision — 2021
University of Bonn, MSc, 2h/week, tutoring, summer semester

Machine Learning for Robotics and Computer Vision — 2022
University of Bonn, MSc, 2h/week, tutoring, summer semester

Techniques for Self-Driving Cars — 2023
University of Bonn, MSc, 2h/week, single lecture, winter semester

Open-World Panoptic Segmentation of Traffic Participants — 2023
University of Bonn, MSc, master project, winter and summer semesters

Advanced Techniques for Mobile Sensing and Robotics — 2024
University of Bonn, MSc, 2h/week, shared teaching, summer semester

Advanced Techniques for Mobile Sensing and Robotics — 2025
University of Bonn, MSc, 2h/week, lecturer, summer semester

Online Teaching Examples (Links to Youtube Videos)

Self-Driving Cars: Unsupervised Learning for Vehicles Perception — 2023
Link: `https://www.youtube.com/watch?v=9KA04ayP2P4`

Supervision

Novel View Synthesis of Indoor Dynamic Scenes 2024
University of Zurich, MSc thesis

Fruits 3D Reconstruction for Agricultural Robotics with Diffusion Models 2025
University of Bonn, MSc thesis

Invited Talks

How Autonomous Vehicles can perceive what is happening around and make decisions?
Data Science Sanca Meetup. São Carlos, Brazil. *Mar/2018*

The Autonomous Vehicles Revolution: A New Relation Between User and Vehicle.
4CORP Meetup, Futurecom. São Paulo, Brazil. *Out/2019*

Academic Services

Editorial Services & Reviewing

Reviewer for conferences: IROS, ICRA, IV, ICCV, NeurIPS
Reviewer for Journals: RA-L, T-RO, T-PAMI

Professional Experience

Software Engineer *IVEX*
Development of front and back-end for safety assessment tool and urban simulated environments in the context of autonomous vehicles. *Apr/2020 – Nov/2020*

Technical Leader *Juristec+*
Coordination of a web crawler programming team for data collection and development/maintenance of a back-end database server. *Jan/2019 – Apr/2020*

Python Developer *Juristec+*
Development of web crawler python scripts for data collection. *Jan/2018 – Aug/2018*

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)*, 2025.

[2] L. Wiesmann, T. Läbe, L. Nunes, J. Behley, and C. Stachniss, "Joint Intrinsic and Extrinsic Calibration of Perception Systems Utilizing a Calibration Environment," *IEEE Robotics and Automation Letters (RA-L)*, vol. 9, no. 10, pp. 9103–9110, 2024.

[3] R. Marcuzzi, L. Nunes, L. Wiesmann, J. Behley, and C. Stachniss, "Mask-Based Panoptic LiDAR Segmentation for Autonomous Driving," *IEEE Robotics and Automation Letters (RA-L)*, vol. 8, no. 2, pp. 1141–1148, 2023.

[4] 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.

[5] L. Wiesmann, L. Nunes, J. Behley, and C. Stachniss, "KPPR: Exploiting Momentum Contrast for Point Cloud-Based Place Recognition," *IEEE Robotics and Automation Letters (RA-L)*, vol. 8, no. 2, pp. 592–599, 2023.

[6] X. Chen, B. Mersch, L. Nunes, R. Marcuzzi, I. Vizzo, J. Behley, and C. Stachniss, "Automatic Labeling to Generate Training Data for Online LiDAR-Based Moving Object Segmentation," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, no. 3, pp. 6107–6114, 2022.

[7] R. Marcuzzi, L. Nunes, L. Wiesmann, I. Vizzo, J. Behley, and C. Stachniss, "Contrastive Instance Association for 4D Panoptic Segmentation using Sequences of 3D LiDAR Scans," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, no. 2, pp. 1550–1557, 2022.

[8] B. Mersch, X. Chen, I. Vizzo, L. Nunes, J. Behley, and C. Stachniss, "Receding Moving Object Segmentation in 3D LiDAR Data Using Sparse 4D Convolutions," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, no. 3, pp. 7503–7510, 2022.

[9] L. Nunes, R. Marcuzzi, X. Chen, J. Behley, and C. Stachniss, "SegContrast: 3D Point Cloud Feature Representation Learning through Self-supervised Segment Discrimination," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, no. 2, pp. 2116–2123, 2022.

[10] L. Nunes, X. Chen, R. Marcuzzi, A. Osep, L. Leal-Taixé, C. Stachniss, and J. Behley, "Unsupervised Class-Agnostic Instance Segmentation of 3D LiDAR Data for Autonomous Vehicles," *IEEE Robotics and Automation Letters (RA-L)*, 2022.

Peer-reviewed conference papers

[1] Y. Chong, L. Nunes, F. Magistri, X. Zhong, J. Behley, and C. Stachniss, "Zero-Shot Semantic Segmentation for Robots in Agriculture," in *Proceedings of the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*, 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 *Proceedings of the IEEE/CVF Int. Conf. on Computer Vision (ICCV)*, 2025.

[3] L. Nunes, R. Marcuzzi, B. Mersch, J. Behley, and C. Stachniss, "Scaling Diffusion Models to Real-World 3D LiDAR Scene Completion," in *Proceedings of the IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR)*, 2024.

[4] M. Sodano, F. Magistri, L. Nunes, J. Behley, and C. Stachniss, "Open-World Semantic Segmentation Including Class Similarity," in *Proceedings of the IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR)*, 2024.

[5] H. Lim, L. Nunes, B. Mersch, X. Chen, J. Behley, H. Myung, and C. Stachniss, "ERASOR2: Instance-Aware Robust 3D Mapping of the Static World in Dynamic Scenes," in *Proceedings of Robotics: Science and Systems (RSS)*, 2023.

[6] L. Nunes, L. Wiesmann, R. Marcuzzi, X. Chen, J. Behley, and C. Stachniss, "Temporal Consistent 3D LiDAR Representation Learning for Semantic Perception in Autonomous Driving," in *Proceedings of the IEEE/CVF Conf. on Computer Vision and Pattern Recognition (CVPR)*, 2023.

[7] I. Vizzo, B. Mersch, L. Nunes, L. Wiesmann, T. Guadagnino, and C. Stachniss, "Toward Reproducible Version-Controlled Perception Platforms: Embracing Simplicity in Autonomous Vehicle Dataset Acquisition," in *Proc. of the Intl. Conf. on Intelligent Transportation Systems Workshops*, accepted, 2023.

[8] D. Bruno, L. P. N. Matias, J. Amaro, F. S. Osório, and D. Wolf, "Computer Vision System with 2D and 3D Data Fusion for Detection of Possible Auxiliaries Routes in Stretches of Interdicted Roads," in *Proceedings of the Annual Hawaii International Conference on System Sciences (HICSS)*, 2019, pp. 7372–7381.

[9] L. P. N. Matias, M. Sons, J. R. Souza, D. F. Wolf, and C. Stiller, "VeIGAN: Vectorial Inpainting Generative Adversarial Network for Depth Maps Object Removal," in *2019 IEEE Intelligent Vehicles Symposium (IV)*, 2019, pp. 310–316.

[10] L. P. N. Matias, T. C. Santos, D. F. Wolf, and J. R. Souza, "Trajectory Planning for UGV Using Clothoids," in *Robotics*, F. Santos Osório and R. Sales Gonçalves, Eds., Springer International Publishing, 2016, pp. 281–298.

[11] L. P. N. Matias, T. C. Santos, D. F. Wolf, and J. R. Souza, "Path Planning and Autonomous Navigation using AMCL and AD," in *2015 12th Latin American Robotics Symposium and 2015 3rd Brazilian Symposium on Robotics (LARS-SBR)*, 2015, pp. 320–324.

Preprint papers

[1] L. Nunes, R. Marcuzzi, J. Behley, and C. Stachniss, "Towards Generating Realistic 3D Semantic Training Data for Autonomous Driving," *arXiv Preprint*, vol. arXiv:2503.21449, 2025.

[2] L. P. N. Matias, J. R. Souza, and D. F. Wolf, "Environment reconstruction on depth images using Generative Adversarial Networks," *arXiv Preprint*, vol. arxiv:1912.03992, 2019.

Thesis

[1] L. Nunes, “Environment reconstruction on disparity images using surface features and Generative Adversarial Networks,” M.S. thesis, University of São Paulo, 2020.