

# Lucas Nunes

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## Research Interests

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

## Education

### Ph.D. Student

THESIS: "LEARNING DISCRIMINATIVE REPRESENTATIONS AND GENERATIVE APPROACHES FOR OUTDOOR 3D LIDAR DATA"  
(SUPERVISOR: PROF. DR. CYRILL STACHNISS)

University of Bonn

Nov/2020 – Present

### M.Sc. in Computer Science

THESIS: "ENVIRONMENT RECONSTRUCTION ON DISPARITY IMAGES USING SURFACE FEATURES AND GENERATIVE ADVERSARIAL NETWORKS"

(SUPERVISOR: PROF. DR. DENIS F. WOLF)

University of São Paulo

Mar/2020

### Bachelor in Computer Science

DEGREE IN COMPUTER SCIENCE

University of São Paulo

Jan/2018

## Academic Positions

### Ph.D. Student and Research Assistant

PHOTOGRAMMETRY & ROBOTICS LAB, INSTITUTE OF GEODESY AND GEOINFORMATION

University of Bonn

since Nov/2020

### Intern Researcher

INSTITUT FÜR MESS- UND REGELUNGSTECHNIK

Karlsruhe Institute of Technology

Aug/2018 – Nov/2018

### Master Student and Research Assistant

MOBILE ROBOTICS LABORATORY, INSTITUTE OF MATHEMATICS AND COMPUTER SCIENCE

University of São Paulo

Feb/2018 – Mar/2020

### Junior Research Assistant

MOBILE ROBOTICS LABORATORY, INSTITUTE OF MATHEMATICS AND COMPUTER SCIENCE

University of São Paulo

Ago/2014 – Jun/2017

## Teaching

### From Perceptron to Generative Adversarial Networks: The Evolution of Neural Networks

University of São Paulo, 8h mini course

2019

### Machine Learning for Robotics and Computer Vision

University of Bonn, MSc, 2h/week, tutoring, summer semester

2021

### Machine Learning for Robotics and Computer Vision

University of Bonn, MSc, 2h/week, tutoring, summer semester

2022

### Techniques for Self-Driving Cars

University of Bonn, MSc, 2h/week, single lecture, winter semester

2023

### Open-World Panoptic Segmentation of Traffic Participants

University of Bonn, MSc, master project, winter and summer semesters

2023

### Advanced Techniques for Mobile Sensing and Robotics

University of Bonn, MSc, 2h/week, shared teaching, summer semester

2024

### Advanced Techniques for Mobile Sensing and Robotics

University of Bonn, MSc, 2h/week, lecturer, summer semester

2025

### Introduction to Mobile Robotics

University of Bonn, MSc, 2h/week, shared teaching, winter semester

2025

## Online Teaching Examples (Links to Youtube Videos)

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### Self-Driving Cars: Unsupervised Learning for Vehicles Perception

Link: <https://www.youtube.com/watch?v=9KA04ayP2P4>

2023

## Supervision

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### Novel View Synthesis of Indoor Dynamic Scenes

University of Zurich, MSc thesis

2024

### Fruits 3D Reconstruction for Agricultural Robotics with Diffusion Models

University of Bonn, MSc thesis

2025

## Invited Talks

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### 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

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### EDITORIAL SERVICES & REVIEWING

**Reviewer for conferences:** IROS, ICRA, IV, ICCV, NeurIPS

**Reviewer for Journals:** RA-L, T-RO, T-PAMI

## Professional Experience

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### Software Engineer

DEVELOPMENT OF FRONT AND BACK-END FOR SAFETY ASSESSMENT TOOL AND URBAN SIMULATED ENVIRONMENTS IN THE CONTEXT OF AUTONOMOUS VEHICLES.

IVEX

Apr/2020 – Nov/2020

### Technical Leader

COORDINATION OF A WEB CRAWLER PROGRAMMING TEAM FOR DATA COLLECTION AND DEVELOPMENT/MAINTENANCE OF A BACK-END DATABASE SERVER.

Juristec+

Jan/2019 – Apr/2020

### Python Developer

DEVELOPMENT OF WEB CRAWLER PYTHON SCRIPTS FOR DATA COLLECTION.

Juristec+

Jan/2018 – Aug/2018

## 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, “VelGAN: 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.