



# Pedro Marco Achanccaray Diaz

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Postdoctoral Researcher at IGP/TU Braunschweig

Ph.D. and M.Sc. in Electrical Engineering, with focus on digital image processing of satellite imagery, from Pontifical Catholic University of Rio de Janeiro (PUC-Rio) in 2019 and 2014, respectively. Graduated in Mechanical and Electrical Engineering at the National University of Engineering (UNI) in 2010. I have a vast experience in research projects in the areas of machine learning, deep learning, computer vision and remote sensing applied to agriculture, oil & gas, and building heritage preservation.

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Research Interests      Computer vision, Machine learning, Deep learning, Remote sensing

Education      **Pontifical Catholic University of Rio de Janeiro (PUC-Rio)**  
Ph.D. in Electrical Engineering, 2019

**Pontifical Catholic University of Rio de Janeiro (PUC-Rio)**  
M.Sc. in Electrical Engineering, 2014

**National University of Engineering (UNI)**  
B.Sc. in Mechanical-Electrical Engineering, 2010

Achievements, Honors and Awards	• Scholarship <i>Science without Borders</i> from CAPES, for visiting researcher at IPI, LUH (Germany)	2016
	• Scholarship from CNPq for the Ph.D. program at PUC-Rio	2014-2018
	• Scholarship <i>Bolsa Nota 10</i> from FAPERJ	2013
	• Scholarship from CAPES for the M.Sc. program at PUC-Rio	2012

Professional/ Research Experience	<b><u>Mass monument industrial hall – C3</u></b> <i>Researcher</i> Research focus on the development of methodologies to find system halls of the High Modernism period using aerial imagery and deep learning methods for semantic segmentation. The project belongs to the priority program SPP2255 from the “Deutsche Forschungsgemeinschaft” (DFG).	2021-2024
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	<b>MANNTIS – Semantic Segmentation of Subsea Images using Deep Learning</b> <i>Researcher/ Developer</i> Development of deep learning methods for object detection and image classification from ROV photos/videos. The project’s goal is to automatically detect objects/events that may influence/affect equipment, pipelines, or a reservoir’s surrounding ecosystem.	2020-2021
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	<b>BIG-OIL – Data Science for the Oil &amp; Gas Industry</b> <i>Researcher/ Developer</i> Development of methods for semantic segmentation, object detection and image classification from images/videos using deep learning. The project’s goal is to detect objects/events in the sea (from ROV videos), sea surface (from SAR images)	2019-2021
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and sea floor (from seismic data). These objects/events are related to the tasks of exploration, extraction, and monitoring in the Oil & Gas industry.

**Campo Verde / LEM**

*Researcher*

2015-2017

2017-2018

Development of public benchmarks for agricultural applications. My activities involved the pre-processing of sequences of multitemporal Sentinel-1 (SAR) images for agricultural monitoring in two municipalities in Brazil: Campo Verde and Luis Eduardo Magalhães (LEM). These projects were in cooperation with the National Institute for Space Research – INPE. LEM received financial support from the ISPRS Scientific Initiatives.

Teaching Experience	<ul style="list-style-type: none"> <li>• Deep learning (IGP/TU BS), <i>Lecturer – Master program</i></li> <li>• Deep learning for social sciences and public administration (PUCP), <i>Lecturer – Specialization course</i></li> <li>• Machine learning for social sciences (PUCP), <i>Lecturer – Specialization course</i></li> </ul>	<p>2022, 2023</p> <p>July 2022</p> <p>Jan – Feb 2021</p>
Invited Talks	<ul style="list-style-type: none"> <li>• <i>Interpretando el mundo a través de imágenes y deep learning</i>, XI Electronic Week International Conference, 2022.</li> <li>• <i>Desafíos del aprendizaje profundo en la visión por computador: Introducción al aprendizaje profundo y aplicaciones en teledetección</i>, V International Conference on Systems Engineering, 2022.</li> <li>• <i>Deep Learning</i>, Summer School – IBT TU Braunschweig, 2022.</li> <li>• <i>Aplicaciones de Deep Learning en Procesamiento Digital de Imágenes: desde el fondo del océano hasta el espacio exterior</i>, Capítulo de Ingeniería Electrónica CIP Cusco, 2022.</li> <li>• <i>Segmentación de tipos de cultivos agrícolas con herramientas de machine learning e imágenes de teledetección</i>, Pontificia Universidad Católica del Perú PUCP, 2021.</li> <li>• <i>Reconocimiento de cultivos agrícolas en regiones tropicales usando secuencias de imágenes de teledetección de sensores activos y pasivos</i>, International Conference on Computer Systems and Sciences, 2020.</li> </ul>	
Key Skills and Experience	<p><i>Programming:</i> Python, MATLAB, C++, C#, R, Bash Script</p> <p><i>Frameworks:</i> TensorFlow, Keras, PyTorch</p> <p><i>Version Control:</i> Git, GitLab, GitHub</p> <p><i>Containerization Tools:</i> Docker, Singularity</p> <p><i>Software:</i> QGIS, ESA SNAP, MS Office</p>	
Languages	Spanish, English, Portuguese	
Students	Co-advisor, M.Sc., William Alberto Ramirez Ruiz (graduated April 2021)	
Publications	<p>Wesche, L., <b>Achanccaray, P.</b>, Hoyer, S. (2023). <i>Serielle Gebäude und wie man sie findet - Eine Methodik der Künstlichen Intelligenz zur Gebäudeerfassung</i>. In Gisbertz, O., Escherich, M., Hoyer, S., Putz, A., Weber, C. &amp; DFG-Netzwerk Bauforschung Jüngere Baubestände 1945+ (Ed.). Reallabor Nachkriegsmoderne: Zum Umgang mit jüngeren Denkmälern. JOVIS Verlag GmbH.</p> <p><b>Achanccaray, P.</b>, Gerke, M., Wesche, L., Hoyer, S., Thiele, K., Knufinke, U., Krafczyk, C. <i>Automatic Detection of Specific Constructions on a Large Scale Using Deep Learning in Very High Resolution Airborne Imagery</i>. PFG (2023), DOI:10.1007/s41064-023-00237-z</p> <p><b>Achanccaray, Pedro</b>, Gerke, Markus, Hoyer, Sebastian, Knufinke, Ulrich, Krafczyk, Christina, Thiele, Klaus and Wesche, Leonhard. "Deep Learning in der Denkmal-Inventarisierung: Zur automatisierten luftbildbasierten Erfassung von Systembauwerken" <i>Die Denkmalpflege</i>, 80, no. 2, 2022, pp. 162-16. DOI:10.1515/DKP-2022-2013</p> <p>Heinrich, A., Mende, V., Wesche, L., &amp; <b>Achanccaray, P.</b> (2022). <i>Database of recorded serial manufactured MLK-buildings (GDR) (Release 1) [Data set]</i>, DOI:10.24355/dbbs.084-202206080745-0</p>	

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- Bento, V., Kohler, M., **Diaz, P.** et al. Improving deep learning performance by using Explainable Artificial Intelligence (XAI) approaches. *Discov Artif Intell* 1, 9 (2021). DOI:10.1007/s44163-021-00008-y
- Sanches, I. D., Feitosa, R. Q., Montibeller, B., **Achanccaray Diaz, P. M.**, Luiz, A. J. B., Soares, M. D., Prudente, V. H. R., Vieira, D. C., Maurano, L. E. P., Happ, P. N., Chamorro, J., and Oldoni, L. V.: *First results of the LEM benchmark database for agricultural applications*, *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLIII-B5-2020, 251–256, DOI:10.5194/isprs-archives-XLIII-B5-2020-251-2020, 2020
- Ramirez, W., **Achanccaray, P.**, Mendoza, L. F., and Pacheco, M. A. C.: *Deep convolutional neural networks for weed detection in agricultural crops using optical aerial images*, *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.*, XLII-3/W12-2020, 551–555, DOI:10.5194/isprs-archives-XLII-3-W12-2020-551-2020, 2020
- Soares, Marinalva Dias, Luciano Vieira Dutra, Gilson Alexandre Ostwald Pedro da Costa, Raul Queiroz Feitosa, Rogério Galante Negri, and **Pedro Diaz**. *A Meta-Methodology for Improving Land Cover and Land Use Classification with SAR Imagery*. *Remote Sensing* 12, no. 6 (2020): 961, DOI:10.3390/rs12060961
- Sothe, Camile, Cláudia Maria De Almeida, Marcos Benedito Schimalski, Veraldo Liesenberg, and **Pedro Achanccaray Diaz**. *Automatic tuning of segmentation parameters for tree crown delineation with VHR imagery*. *Geocarto International* (2019): 1-19, DOI:10.1080/10106049.2019.1690056
- Sanches, I. D., R. Q. Feitosa, **P. Achanccaray**, B. Montibeller, A. J. B. Luiz, M. D. Soares, V. H. R. Prudente, D. C. Vieira, and L. E. P. Maurano. *LEM benchmark database for tropical agricultural remote sensing application*. *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences* 42, no. 1 (2018), DOI: 10.5194/isprs-archives-XLII-1-387-2018
- Sanches, Ieda Del'Arco, Raul Queiroz Feitosa, **Pedro Marco Achanccaray Diaz**, Marinalva Dias Soares, Alfredo José Barreto Luiz, Bruno Schultz, and Luis Eduardo Pinheiro Maurano. *Campo verde database: Seeking to improve agricultural remote sensing of tropical areas*. *IEEE Geoscience and Remote Sensing Letters* 15, no. 3 (2018): 369-373, DOI: 10.1109/LGRS.2017.2789120
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- Bermudez, J.; Feitosa, Raul Q.; Cue, L.; **Achanccaray, P.**; Sanches, I. D. *A comparative analysis of deep learning techniques for sub-tropical crop types recognition from multitemporal Optical/SAR image sequences*. In: 2017 30TH SIBGRAPI Conference on Graphics, Patterns and Images (SIBGRAPI), p. 382–389, Oct 2017, DOI: 10.1109/SIBGRAPI.2017.57
- Achanccaray, P.**; Feitosa, R. Q.; Rottensteiner, F.; Sanches, I. A.; Heipke, C. *Spatial-temporal conditional random field based model for crop recognition in tropical regions*. In: *IEEE International Geoscience and Remote Sensing Symposium IGARSS, 2017, Fort Worth. IGARSS 2017 Proceedings, 2017*. p. 3007-3010, DOI: 10.1109/IGARSS.2017.8127631
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- Vega, Pedro J. Soto; Quirita, Victor A. Ayma; **Achanccaray, Pedro M.**; Tanscheit, Ricardo; Vellasco, Marley. *A fuzzy inference system for multispectral image classification*. In: *2016 IEEE ANDESCON, 2016, Arequipa*. 2016 IEEE ANDESCON, 2016. p. 1-4, DOI:10.1109/ANDESCON.2016.7836268
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#### Service

Mentor, [SISAY mentoring program](#) (2017, 2022, 2023).  
 General Secretary, [IEEE Geoscience and Remote Sensing Society Brazil's Chapter](#) (2015-2016).  
 Co-organizer, IEEE GRSS Young Professionals and ISPRS Summer School 2015.  
 Reviewer of Journals: IJRS, PFG, TGRS, J-STARS, GRSL.  
 Reviewer of Conferences: SIBGRAPI, SIMBig

#### Contact Reference

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