



Pedro Marco Achancaray Diaz

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 *Science without Borders* from CAPES, for visiting researcher at IPI, LUH (Germany) 2016
- Scholarship from CNPq for the Ph.D. program at PUC-Rio 2014-2018
- Scholarship *Bolsa Nota 10* from FAPERJ 2013
- Scholarship from CAPES for the M.Sc. program at PUC-Rio 2012

Professional/Research Experience: **[Mass monument industrial hall - C3](#)** 2021-2024
Researcher
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).

MANNTIS - Semantic Segmentation of Subsea Images using Deep Learning 2020-2021
Researcher/ Developer
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.

BIG-OIL - Data Science for the Oil & Gas Industry 2019-2021
Researcher/ Developer
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)

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	• Deep learning (IGP/TU BS), <i>Lecturer – Master program</i>	2022, 2023
Experience	• Deep learning for social sciences and public administration (PUCP), <i>Lecturer – Specialization course</i>	2022, 2023
	• Machine learning for social sciences (PUCP), <i>Lecturer – Specialization course</i>	Jan – Feb 2021
Invited Talks	<ul style="list-style-type: none"> • <i>Interpretando el mundo a través de imágenes y deep learning</i>, XI Electronic Week International Conference, 2022. • <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. • <i>Deep Learning</i>, Summer School – IBT TU Braunschweig, 2022. • <i>Aplicaciones de Deep Learning en Procesamiento Digital de Imágenes: desde el fondo del océano hasta el espacio exterior</i>, Capitulo de Ingeniería Electrónica CIP Cusco, 2022. • <i>Segmentación de tipos de cultivos agrícolas con herramientas de machine learning e imágenes de teledetección</i>, Pontificia Universidad Católica del Perú PUCP, 2021. • <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. 	
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	<p><i>Co-advisor</i>, M.Sc., Friedrich Hellweg (graduated April 2024)</p> <p><i>Co-advisor</i>, M.Sc., David Hunkemöller (graduated March 2024)</p> <p><i>Co-advisor</i>, M.Sc., William Alberto Ramirez Ruiz (graduated April 2021)</p>	
Publications	<p>A. Alamouri, J. Backhaus, V. De Arriba López, P. M. Achancaray Diaz, M. Gerke. <i>High-Resolution Data Capture and Interpretation in Support of Port Infrastructure Maintenance</i>, DGPF-Jahrestagung, 2024.</p> <p>M. Gerke, P. M. Achancaray Diaz, S. Fekete, M. Figge, N. Fohrer, S. Giutronich, P. Keldenich, S. Lutz, M. Perk, A. Reinhardt, C. Richter, C. Rieck, B. Riedel, T. Riedemann, F. Saba, K. Schrader, A. Schröter, D. Szafranski, A. Taghavi, P. Wagner. <i>Extremwettermanagement mit digitalen Multiskalen-Methoden: Das EXDIMUM-Projekt</i>, DGPF-Jahrestagung, 2024.</p> <p>De Arriba López, V., Maboudi, M., Achancaray, P., Gerke, M. <i>Automatic non-destructive UAV-based structural health monitoring of steel container cranes</i>. Applied Geomatics (2023), DOI: 10.1007/s12518-023-00542-7</p> <p>Achancaray, P., Gerke, M., Wesche, L., Hoyer, S., Thiele, K., Knufinke, U., and Krafczyk, C.: <i>On the assessment of instance segmentation for the automatic detection of specific constructions from very high resolution</i></p>	

- airborne imagery*, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLVIII-1/W2-2023, 1303–1309, DOI: 10.5194/isprs-archives-XLVIII-1-W2-2023-1303-2023, 2023
- Wesche, L., **Achancarray Diaz, P. M.**, Hoyer, S., Knufinke, U., Gerke, M., Krafczyk, C., & Thiele, K. (2023). *Dataset of german steel system halls from the period of high modernism [Data set]*. DOI: 10.24355/dbbs.084-202305261242-0
- Leonhard Wesche, Sebastian Hoyer, Ulrich Knufinke, **Pedro Achancarray**, Christina Krafczyk, Markus Gerke and Klaus Thiele. *Technologien für die Baudenkmalpflege: Erfassung und Analyse von Systemhallen der Hochmoderne*, in: Berichte zur Denkmalpflege in Niedersachsen 43 (2023), 2, pp. 61-65
- Wesche, L., **Achancarray, P.**, Hoyer, S. (2023). *Serielle Gebäude und wie man sie findet - Eine Methodik der Künstlichen Intelligenz zur Gebäudeerfassung*. In Gisbertz, O., Escherich, M., Hoyer, S., Putz, A., Weber, C. & DFG-Netzwerk Bauforschung Jüngere Baubestände 1945+ (Ed.). Reallabor Nachkriegsmoderne: Zum Umgang mit jüngeren Denkmälern. JOVIS Verlag GmbH
- Achancarray, P.**, Gerke, M., Wesche, L., Hoyer, S., Thiele, K., Knufinke, U., Krafczyk, C. *Automatic Detection of Specific Constructions on a Large Scale Using Deep Learning in Very High Resolution Airborne Imagery*. Journal of Photogrammetry, Remote Sensing and Geoinformation science – PFG 91, pp. 189-209 (2023), DOI:10.1007/s41064-023-00237-z
- Achancarray, Pedro**, 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" Die Denkmalpflege, 80, no. 2, 2022, pp. 162-16. DOI:10.1515/DKP-2022-2013
- Heinrich, A., Mende, V., Wesche, L., & **Achancarray, P.** (2022). *Database of recorded serial manufactured MLK-buildings (GDR) (Release 1) [Data set]*, DOI:10.24355/dbbs.084-202206080745-0
- Ramirez, W., **Achancarray, P.** & Pacheco, M.A. *A comparative study of Deep Learning architectures for Classification of Natural and Human-made Sea Events in SAR images*. Discov Artif Intell 2, 1 (2022). DOI:10.1007/s44163-022-00017-5
- 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., **Achancarray 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., **Achancarray, 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, Camille, Cláudia Maria De Almeida, Marcos Benedito Schimalski, Veraldo Liesenberg, and **Pedro Achancarray 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. Achancarray**, 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 Achancarray 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
- Cué, L. E.; Bermudez, J. D.; **Achancarray, P.**; Sanches, I. D.; Happ, P. N.; Feitosa, R. Q. *A comparative analysis of deep learning techniques for crop type recognition in temperate and tropical regions from multitemporal SAR image sequences*. Anais do XXVII Congresso Brasileiro de Cartografia e XXVI Exposicarta 6 a 9 de novembro de 2017, SBC, Rio de Janeiro – RJ, p. 730-734
- Bermúdez, J. D.; **Achancarray, P.**; Sanches, I. D.; Cue, L.; Happ, P.; Feitosa, R. Q. *Evaluation of recurrent neural networks for crop recognition from multitemporal remote sensing images*. Anais do XXVII Congresso Brasileiro de Cartografia e XXVI Exposicarta 6 a 9 de novembro de 2017, SBC, Rio de Janeiro – RJ, p. 800-804
- Bermudez, J.; Feitosa, Raul Q.; Cue, L.; **Achancarray, 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
- Achancarray, 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
- Achancarray, P.;** Feitosa, R. Q.; Rottensteiner, F.; Sanches, I. A.; Heipke, C. *Spatio-temporal Conditional Random Fields for recognition of sub-tropical crop types from multi-temporal images*. In: XVIII Simpósio Brasileiro de Sensoriamento Remoto SBSR, 2017, Santos. p. 2539-2546
- Vega, Pedro J. Soto; Quirita, Victor A. Ayma; **Achancarray, 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
- Happ, P. N.; Ferreira, R. S.; Costa, G. A. O. P.; Feitosa, R. Q.; Bentes, C.; Farias, R.; **Achancarray, P. M.** *InterSeg: A Distributed Image Segmentation Tool*. In: GEOBIA 2016: Solutions and Synergies, Enschede. Netherlands. University of Twente Faculty of Geo-Information and Earth Observation, 2016, DOI: 10.3990/2.450
- Ayma Quirita, Victor Andres; **Achancarray Diaz, Pedro;** Feitosa, Raul Q.; Happ, Patrick N.; Costa, Gilson A. O. P.; Klinger, Tobias; Heipke, Christian. *Metaheuristics for Supervised Parameter Tuning of Multiresolution Segmentation*. IEEE Geoscience and Remote Sensing Letters (Print), v. 13(9), p. 1364-1368, 2016, DOI:10.1109/LGRS.2016.2586499
- Diaz, P. M. A.,** Feitosa, R. Q., Sanches, I. D., and Costa, G. A. O. P.: *A Method to estimate temporal interaction in a conditional random field based approach for crop recognition*, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLI-B7, 205-211, DOI:10.5194/isprs-archives-XLI-B7-205-2016, 2016
- Jimenez, Luis Ignacio; Plaza, Antonio; Ayma, Victor Andres; **Achancarray, Pedro;** Costa, Gilson A.O.P.; Queiroz Feitosa, Raul. *Segmentation as postprocessing for hyperspectral image classification*. In: IEEE EUROCON 2015 International Conference on Computer as a Tool (EUROCON), 2015, Salamanca, Spain. p. 1-4, DOI:10.1109/EUROCON.2015.7313746
- Achancarray, P.;** Ayma, V. A.; Jimenez, L. I.; Garcia, S. B.; Happ, P. N.; Costa, G. A. O. P.; Feitosa, R. Q.; Plaza, A. *SPT 3.1: A free software for automatic tuning of segmentation parameters in Optical, Hyperspectral and SAR images*. In: International Geoscience and Remote Sensing Symposium 2015 (IGARSS 2015), Milan, Italy. p. 4332-4335, DOI:10.1109/IGARSS.2015.7326785
- Jimenez, L. I.; Ayma, V. A.; **Achancarray, P.;** Costa, G. A. O. P.; Feitosa, R. Q.; Plaza, A. *Segmentation as post processing for hyperspectral image classification*. In: International Geoscience and Remote Sensing Symposium 2015 (IGARSS 2015), Milan, Italy. p. 3723-3726; DOI:10.1109/IGARSS.2015.7326632
- Achancarray, P.;** Ayma, V. A.; Jimenez, L. I.; Garcia, S. B.; Happ, P. N.; Feitosa, R. Q.; Plaza, A. *SPT 3.0: A free software for automatic segmentation parameters tuning*. In: Simposio Brasileiro De Sensoriamento Remoto, 17. (SBSR), 2015, João Pessoa, PB. Anais do 17mo Simpósio Brasileiro de Sensoriamento Remoto, João Pessoa, PB: INPE, 2015. p. 5578-5581
- Achancarray, P.;** Ayma, V. A.; Jimenez, L.; Garcia, S.; Happ, P.; Feitosa, R. Q.; Plaza, A., *A free software tool for Automatic Tuning of Segmentation Parameters*. South-Eastern European Journal of Earth Observation and Geomatics, vol. 3, pp. 707-712, 2014

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*