

Philippe Ambrozio Dias

Curriculum Vitae

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Education

- 2016–2020 **Doctor of Philosophy in Electrical and Computer Engineering**, *Marquette University*, Milwaukee, WI (USA).
- 2014–2015 **Master of Science in Electrical and Computer Engineering***, *Federal University of Technology (UTFPR)*, Curitiba (Brazil).
- 2013–2014 **Master of Science in Information Technology***, *Mannheim University of Applied Sciences (HS Mannheim)*, Mannheim (Germany).
- 2007–2013 **Bachelor of Engineering in Electronics Engineering**, *Federal University of Technology (UTFPR)*, Curitiba (Brazil).

* Double Masters Degree obtained as result of a partnership between both universities.

Research Interests/Skills

Design and application of machine learning and deep learning methods for computer vision

- Research experience ranging from image annotation tools, to unsupervised/supervised machine learning for semantic image analysis, as well as post-processing refinement algorithms.

Supervised/unsupervised machine learning, probability theory, stochastic simulation and uncertainty estimation concepts for computer vision, with emphasis on image segmentation

- Previous work has found applications on agricultural automation, healthcare-related scenarios, image annotation, and currently analysis of satellite/aerial images.

Experience with HPC-tools using NVIDIA DGXs machines and the Summit supercomputer for analysis of geospatial data

- Currently working on data characterization, domain adaptation, protocols of evaluation, and semi-supervised/active learning with geospatial imagery.
- Applications include building footprint extraction and object counting from overhead imagery.

Interest on R&D involving topics of explainability, interpretability and ethics in AI

Research Experience

- March 2021–
current **Postdoctoral Research Associate in Machine Learning and Computer Vision**, Oak Ridge National Laboratory (ORNL).
 - Investigation of domain adaptation, semi-supervised learning, object counting and uncertainty estimation techniques for analysis of remote sensing imagery;
 - Collaboration with the Scalability team as part of the AI Initiative during FY21. Activities related to HPC included large-scale experiments on building footprint extraction leveraging NVIDIA DGXs machines and the Summit supercomputer;
 - Initial efforts towards explainable, interpretable and trustworthy AI methods for geospatial domains, which have included mentoring of interns during the Summer/FY21 and the Invention Disclosure for *GeoQuAnteX: A visual Q&A framework for eXplainable object counting with geospatial data*;
 - Participation on research proposals targeting funding agencies internal as well as external to ORNL.

- 2016–2020 **Graduate Research Assistant**, *Support from U.S. Department of Agriculture (USDA)*, Marquette University (USA).
- Application of deep learning techniques for visual quantification of multispecies fruit flowers;
 - Investigation of unsupervised clustering mechanisms for image annotation, refinement of semantic segmentation masks and uncertainty estimation;
 - Active learning and uncertainty estimation for building segmentation in satellite imagery.
- Spring 2019 **Visiting Research Assistant (Erasmus+)**, University of Genoa (Italy).
- Application of deep learning and uncertainty estimation techniques for automatized Gaze Estimation for assisted living environments.
- Summer 2017 **Visiting Research Assistant**, University of Genoa (Italy).
- Deep learning techniques for image segmentation towards smart environments for assisted living.
- 2013–2014 **Working Student**, *Partial support from INEOS KÖLN GMBH, HS Mannheim (Germany)*.
- Changes in the design of an In-Situ Microscope (ISM) and development of an image processing algorithm for quantification of filamentous bacteria in activated sludge plants.

Professional Experience

- 2009–2011 **System Analyst**, GLOBAL VILLAGE TELECOM (GVT) , Curitiba - Brazil.

Computer skills

- C/C++, Python, MATLAB, Shell, JavaScript/HTML
- Caffe, TensorFlow, Keras, PyTorch, Horovod
- Linux, L^AT_EX, Git/GitLab, Docker, scikit-learn, OpenCV
- Sample Codes: coviss.org/codes

Languages proficiency

- Portuguese: Mother tongue
- English: Full Professional
- German: Professional
- Italian: Professional
- Spanish: Professional
- French: Limited

Honors and Awards

- 2019 **Outstanding Research Assistant Award (EECE Engineering Department)**, Marquette University, Milwaukee, WI.
- 2018 **Forward Thinking “Jump Start” Award**, Marquette University, Milwaukee, WI.
- 2018 **IROS-SDC Student Travel Award**, IEEE/RSJ International Conference on Intelligent Robots and Systems.
- 2016-2017 **Opus College of Engineering Research Leaders Fellowship**, Marquette University, Milwaukee, WI.
- 2013 **Baden-Württemberg Stipendium**, BADEN-WÜRTTEMBERG STIFTUNG GMBH.

Selected Publications

Journal Papers

- 2019 Primpke, S.; **Dias, P.A.**; Gerdts, G. *Automated identification and quantification of microfibrils and microplastics*. Analytical Methods, 11(16), pp. 2138-2147.
- 2018 **Dias, P.A.**; Tabb, A.; Medeiros, H. *Multispecies Fruit Flower Detection Using a Refined Semantic Segmentation Network*. IEEE Robotics and Automation Letters, 3(4), pp.3003-3010.

- 2018 **Dias, P.A.**; Tabb, A.; Medeiros, H. *Apple flower detection using deep convolutional networks*. Computers in Industry, 99, pp.17-28.
- 2016 **Dias, P.A.**; Dunkel, T.; Fajado, D.A.; de Leon Gallegos, E.; Denecke, M.; Wiedemann, P.; Schneider, F.K.; Suhr, H. *Image processing for identification and quantification of filamentous bacteria in in situ acquired images*. Biomedical Engineering OnLine, 15(1), pp.64.
- 2015 Dunkel, T.; **Dias, P.A.**; Leon, E.; Tacke, V.; Schielke, A.; Hesse, T.; Sierra, D.A.F.; Suhr, H.; Wiedemann, P.; Denecke, M. *In situ Microscopy as a tool for the monitoring of filamentous bacteria: a case study in an industrial activated sludge system dominated by M. parvicella*. Journal of Water Science and Technology
- Under review* **Dias, P.A.**; Lunga, D.; Tian, Y.; Newsam, S.; Tsaris, A.; Hinkle, J. *Model Assumptions and Data Characteristics: impacts on Domain Adaptation in Building Segmentation*. Submitted to IEEE Transactions on Geoscience and Remote Sensing.
- Under review* Her, P.; Manderle, L; **Dias, P.A.**; Medeiros, H.; Odone, F. *Uncertainty-aware gaze tracking for assisted living environment*. Submitted to IEEE Transactions on Image Processing.
- Pre-print* **Dias, P.A.**; Medeiros, H. *Probabilistic Semantic Segmentation Refinement by Monte Carlo Region Growing*. Available at [arXiv preprint arXiv:2005.05856](https://arxiv.org/abs/2005.05856)

Conference Papers

- 2021 Tsaris, A.; Hinkle, J.; Lunga, D.; **Dias, P.A.** *Distributed Training for High Resolution Images: A Domain and Spatial Decomposition Approach*. International Conference for High Performance Computing, Networking, Storage, and Analysis (SC21).
- 2021 Her, P.; Manderle, L; **Dias, P.A.**; Medeiros, H.; Odone, F. *Keypoint-based gaze tracking*. International Conference on Pattern Recognition (ICPR).
- 2021 **Dias, P.A.**, Medeiros, H., Lunga, D., Singh, N., and Devarakonda, R. *Semi-automated Design of Artificial Intelligence Earth Systems Models*. DOE White Papers to Advance an Integrative Artificial Intelligence Framework for Earth System Predictability. Web. doi:10.2172/1769777
- 2020 **Dias, P.A.**; Malafronte, D.; Medeiros, H.; Odone, F. *Gaze Estimation for Assisted Living Environments*. Winter Conference on Applications of Computer Vision (WACV).
- 2019 **Dias, P.A.**; Shen, Z.; Tabb, A.; Medeiros, H. *FreeLabel: A Publicly Available Annotation Tool based on Freehand Traces*. Winter Conference on Applications of Computer Vision (WACV).
- 2018 **Dias, P.A.**; Medeiros, H. *Semantic segmentation refinement by Monte Carlo region growing of high confidence detections..* Asian Conference on Computer Vision (ACCV).
- 2017 **Dias, P.A.**; Medeiros, H.; Odone, F. *Fine segmentation for Activity of Daily Living analysis in a wide-angle multi-camera set-up*. 5th Activity Monitoring by Multiple Distributed Sensing Workshop (AMMDS) in conjunction with British Machine Vision Conference (BMVC).

Invited Talks

- 11/2021 **Addressing generalization and scalability challenges in satellite imagery analysis using NVIDIA GPUs and Deep Learning**, *NVIDIA GPU Technology Conference (GTC)*.
- 10/2021 **Towards generalizable and scalable AI-methods for remote sensing image analysis**, *Colloquium at the Department of Electrical and Computer Engineering, Marquette University*.

- 08/2020 **Active learning for image segmentation (satellite imagery)**, Presentation to the ORNL AI Initiative Team, Oak Ridge National Laboratory (ORNL).
- 07/2019 **Lecture on Image Segmentation Networks and Uncertainty Estimation**, "*Deep Learning: a hands-on introduction*", Organized by Machine Learning Genoa Center (MaLGa), University of Genoa.
- 12/2018 **Towards automated bloom intensity estimation: (un)supervised learning, datasets and annotation tool for fruit flower segmentation**, *Webinar organized by the Agricultural Robotics and Automation technical committee*, IEEE Robotics and Automation Society.
- 03/2018 **(Un)supervised Learning for Fine Image Segmentation: Applications in Flower Detection and Activity of Daily Living Analysis**, *Colloquium at the Department of Electrical and Computer Engineering*, Marquette University.

Mentorships/Teaching Assistantships (TA)

- 07/2021- **Mentorship of summer intern from the NNSA MSI Program.**
- 08/2021
 - Two-month mentoring of an intern student selected through the National Nuclear Security Administration Minority Serving Institutions (NNSA MSI) Internship Program. Student was mentored on topics of basic machine-learning/AI, and literature review on eXplainable AI (XAI).
- 03/2021- **Mentorship LatinX in AI (LXAI).**
- 06/2021
 - Three-month mentoring program intended to connect mentors and mentees to support the careers of researchers/students who identify themselves as LatinX in fields related to AI.
- 07/2019 **Organization of summer course**, "*Deep learning: a hands-on introduction*", University of Genoa (Italy).
 - Laboratory activities and supervision of students for a one-week introductory course on deep learning.
- Summer 2020 **Mentoring of undergraduate student**, *Computer Vision and Sensing Systems (COVISS) Lab*, Marquette University.
 - Guided undergraduate student in research activities related to data loading and conversion for an active learning system.
- Summer & Fall 2018 **Mentoring of undergraduate student**, *Computer Vision and Sensing Systems (COVISS) Lab*, Marquette University.
 - Guided undergraduate student for development of a user-interface for an image annotation tool.
- Fall 2018 **Linear Systems (TA), Digital Circuits Lab (TA)**, Marquette University.
- Spring 2018 **Digital Electronics (TA), Algorithms (TA)**, Marquette University.

Invited Peer Reviews & Program Committees

Journals:

- Journal of Field Robotics (Wiley)
- Biomedical Engineering OnLine (Springer Nature)
- Computer and Electronics in Agriculture (Elsevier)
- Biosystems Engineering (Elsevier)
- IEEE Robotics and Automation Letters (RA-L)
- IEEE Transactions on Automation Science and Engineering
- IEEE Transactions on Geoscience and Remote Sensing

Conferences:

- IROS 2018, 2019
- ICSC 2019
- ICRA 2019, 2020
- WACV 2020
- SMC 2021

Program Committees:

- 13th IEEE International Conference on Semantic Computing (IEEE ICSC 2019)

- CARE2020 Workshop on pattern recognition for positive teChnology And eldeRly wEllbeing at ICPR
- KDD2021 Workshop on Data-driven Humanitarian Mapping
- GeoSearch2021 International Workshop on Searching and Mining Large Collections of Geospatial Data at ACM SIGSPATIAL

References

Dr. Dalton Lunga, *Oak Ridge National Laboratory*, Geospatial Science and Human Security Division (GSHS), GeoAI group leader.

- Supervisor. Contact: lungadd@ornl.gov; +1 (865) 574-8444

Dr. Henry Medeiros, *Marquette University*, Department of Electrical and Computer Engineering (EECE).

- PhD Supervisor. Contact: henry.medeiros@marquette.edu; +1 (414) 288-7080

Dr. Francesca Odone, *University of Genoa*, Machine Learning Genoa Center (MaLGa).

- Collaborator and co-advisor for PhD (Erasmus+ period at the University of Genoa). Contact: francesca.odone@unige.it; +39 010 353 6667

Dr. Amy Tabb, *U.S. Department of Agriculture (USDA)*, Research Agricultural Engineer.

- Collaborator/co-advisor for PhD. Contact: Amy.Tabb@ars.usda.gov; +1 (304) 725-3451 ext. 386

Dr. Hajo Suhr, *Mannheim University of Applied Sciences*, Institute for Digital Technique.

- Master's Thesis Supervisor. Contact: h.suhr@hs-mannheim.de; +49 0621-292-6557