

Thainara Munhoz Alexandre de Lima

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Research Interests: Remote Sensing, GPU computing, accelerated AI, computer vision for Earth observation, deep learning optimization, and domain-specific foundational models.

PERSONAL PROFILE

Thainara Lima is a PhD student in Biosystems Engineering at Mississippi State University and a NASA Early Career Research Fellow. Her PhD project develops scalable AI pipelines for large-scale geospatial data on HPC/GPU infrastructure, with a focus on global algal bloom detection in coastal waters. She explores Vision Transformers, semantic segmentation, and self-supervised learning for Earth observation, while advancing domain-aware foundational models tailored to aquatic environments. Her broader research interests span AI-driven innovation, multimodal learning, and sustainable monitoring solutions that integrate satellite data, computer vision, and high-performance computing for planetary-scale environmental challenges.

EDUCATION

[Aug/2024 – current] Mississippi State University - MSU, U.S.A.

Doctor of Philosophy, Biosystems Engineering – project funded by NASA Early Career Research program

[Feb/2021 – Mar/2023] Brazilian Institute for Space Research - INPE, Earth Observation and Geoinformatics Division, Brazil

M.Sc., Remote Sensing

[Feb/2016 – Jan/2021] University of São Paulo State – UNESP, Brazil

B.Sc., Cartography and Surveying Engineering/Geomatics Engineering, GPA: 3.61/4.00

TECHNICAL SKILLS

Programming & Data Science: Proficient in Python (NumPy, Pandas, Scikit-learn), R, SQL, and MATLAB for data analysis, modeling, and automation.

Deep Learning & AI: Experienced with PyTorch, TensorFlow, Keras, and Hugging Face Transformers for computer vision, semantic segmentation, and self-supervised learning in remote sensing.

Remote Sensing & GIS: Skilled in processing large-scale Earth observation data with Google Earth Engine, QGIS, and ArcGIS; expertise in spectral indices, atmospheric correction, and multi-sensor harmonization.

High-Performance & GPU Computing: Hands-on experience with HPC clusters and parallelized workflows for large geospatial datasets; exposure to CUDA-enabled GPU acceleration for deep learning model training and optimization.

HONORS AND AWARDS

AGU Fall Meeting Travel Grant – Selected and awarded financial support for presenting research at the AGU Fall Meeting (2020).

Crea-SP Professional Training Award – Regional Council of Engineering and Agronomy of the State of São Paulo, recognizing excellence in professional development (2022).

SPONSORED RESEARCH PROJECT ENGAGEMENT

[2024-2028] Global Algal Bloom Detection System for Nearshore Coastal Waters using Harmonized Landsat-Sentinel-2 data. Period: 2024 – 2028. Source: *NASA Early Career Research (ECR) Program*. (Role: PhD

- Research Fellow). PI: Dr. Vitor Martins, Mississippi State University (MSU), USA.
- [2021-2023] MAPAQUALI - Satellite monitoring of inland water quality. Period: 2021 – 2023. Source: *Sao Paulo Research Foundation (FAPESP)*. (Role: Collaborator). PI: Dr. Cláudio Clemente Faria Barbosa, Brazilian Institute for Space Research (INPE), Brazil.
- [2021-2023] Cyanobacteria mapping in Promissão reservoir by hybrid algorithms and images from OLCI/Sentinel-3 sensor. Period: 2021 – 2023. Source: *Sao Paulo Research Foundation (FAPESP)*. (Role: Master Student Fellow). PI: Dr. Cláudio Clemente Faria Barbosa, Brazilian Institute for Space Research (INPE), Brazil.
- [Jun/2022 – Nov/2022] Water quality analysis from hyperspectral observations. Period: June 2022 – November 2022. Source: *Sao Paulo Research Foundation (FAPESP)*. (Role: Master Student Fellow). PI: Dr. Cláudio Clemente Faria Barbosa, Brazilian Institute for Space Research (INPE) and National Research Council of Italy - Electromagnetic Sensing of the Environment (CNR-IREA).
- [2017-2020] Tropospheric Modeling: Study and Analysis of Different Models. Period: 2017 – 2020. Source: *Sao Paulo Research Foundation (FAPESP)*. (Role: Scientific Initiation Fellow). PI: Dra. Daniele Barroca Marra Alves, Sao Paulo State University (UNESP), Brazil.
- [Dec/2018 – Mar/2019] Analysis of different tropospheric models considering different regions. Period: December 2018 – March 2019. Source: *Sao Paulo Research Foundation (FAPESP)*. (Role: Scientific Initiation Fellow). PI: Dra. Daniele Barroca Marra Alves, Sao Paulo State University (UNESP) and University of New Brunswick.

WORK EXPERIENCE

- [Jun/2025 – Aug/2025] MSU/USDA Graduate Summer Research Experience in High-Performance Computing and Agriculture, *High Performance Computing Collaboratory at MSU*.
- [Aug/2024 - now] Graduate Assistant, *Department of Agricultural and Biological Engineering, Mississippi State University, USA*
- [Oct/2023 – Jun/2024] GIS Analyst, *Agrotools, Brazil*
- [Mar/2023 – Sep/2023] Crop Intelligence Analysis, *MERX, Brazil*
- [2021 – 2023] Research Student, *Instrumentation Laboratory for Aquatic Systems – LabISA, Brazil*
- [06/2022 – 11/2022] Research Student, *National Research Council of Italy - Electromagnetic Sensing of the Environment (CNR-IREA), Italy*
- [2019 – 2020] Intern, *AYA Engineering Company, Brazil*
- [2019 – 2020] Volunteer Work - Leader in Executive Presidency, *Núcleo Bauru, Brazil*
- [2019-2020] Volunteer Work - Project Manager, *EJECart - Junior Cartographic Engineering Company, Brazil*
- [2018-2019] Research Student, *University of New Brunswick – UNB, Canada*

TRAINING

- [2025] Introduction to Machine Learning – *Computer Science Engineering, MSU*
- [2024] Artificial Intelligence applied to Geotechnologies - *AmbGEO*
- [2024] TensorFlow 2.0: Deep Learning and Artificial Intelligence - *Udemy*
- [2022] Neural Network: Deep Learning with PyTorch – *Alura*
- [2022] Machine Learning: Classification with SKLearn – *Alura Courses*
- [2022] Decision Trees: Diving deeper into Machine Learning models – *Alura Courses*
- [2022] Atmospheric Correction of Satellite Images – *RadarGeo*
- [2021] Digital Image Processing in R – *RadarGeo*
- [2020] Advanced Webinar: Forest Mapping and Monitoring with SAR Data – *NASA-Applied Remote Sensing Training - ARSET*
- [2020] Understanding Phenology with Remote Sensing - *NASA-Applied Remote Sensing Training – ARSET*
- [2019] Complete Google Earth Engine for Remote Sensing and GIS - *Udemy*

PUBLICATIONS

- [2025] Hester, D.; Martins, V.S.; Ferreira, L.B.; Lima, T.M.A. On the use of deep learning semantic segmentation for land use and land cover classification at very high spatial resolution – a review of data sources, algorithms, and future directions, 2025. *In progress*.
- [2025] Lima, T.M.A.; Martins, V.S. Landsat-Sentinel-2 algal bloom mapping using Vision Transformers: model

description, implementation, and examples, 2025. *In progress*.

- [2025] Lima, T.M.A.; Martins, V.S.; Paulino, R.; Caballero, C.; Barbose, C.C.F.; Ashapure, A. AQUAVis: Landsat-Sentinel Virtual Constellation of Remote Sensing Reflectance (Rrs) Product for Coastal and Inland Waters. *Science of Remote Sensing*, 2025. *Under review*.
- [2025] Caballero, C.; Martins, V.S.; Paulino, R.; Lima, T.M.A.; Butler, E.; Sparks, E. Sentinel-3 Coastal Analysis Ready Data (S3CARD): An Operational Framework for Coastal Water Applications. *Water Research*, 2025.
- [2025] Maciel, D.A.; et al. A bio-optical database for the remote sensing of water quality in BRAZil coastal and inland waters (BRAZA). *Scientific Data*, v. 12, 2025. <https://doi.org/10.1038/s41597-025-05609-1>
- [2025] Chasles, R.G.; et al. Accuracy assessment of PlanetScope SuperDove products for aquatic reflectance retrieval over Brazilian inland and coastal waters. *ISPRS Journal of Photogrammetry and Remote Sensing*, v/ 227, 2025. <https://doi.org/10.1016/j.isprsjprs.2025.06.036>
- [2025] Lima, T.M.A.; Martins, V.S.; Paulino, R.S.; Caballero, C.B.; Maciel, D.A.; Giardino, C. A general bandpass adjustment function (SBAF) for harmonizing Landsat-Sentinel over inland and coastal waters. *Science of Remote Sensing*, v. 11, 100225, 2025. <https://doi.org/10.1016/j.srs.2025.100225>
- [2025] Lima, T.M.A.; Barbosa, C.F.C.; Nordi, C.S.F.; Begliomini, F.N.; Martins, V.S.; Watanabe, F.S.Y.; Wanderley, R.L.N.; Paulino, R.S. A novel hybrid approach cyanobacteria mapping approach for inland reservoirs using Sentinel-3 imagery. *Harmful Algae*, v. 144, 102836, 2025.
- [2025] Paulino, R.S.; Martins, V.S.; Novo, E.M.L.M.; Barbosa, C.C.F.; Maciel, D.A.; Wanderley, .L.N.; Portela, C.I.; Caballero, C.B.; Lima, T.M.A. Generation of robust 10-m Sentinel-2/# synthetic aquatic reflectance bands over inland waters. *Remote Sensing of Environment*, v. 318, 114593, 2025. <https://doi.org/10.1016/j.rse.2024.114593>
- [2025] Caballero, C.B.; Martins, V.S.; Paulino, R.S.; Butler, E.; Sparks, E.; Lima, T.M.A.; Novo, E.M.L.M. The need for advancing algal bloom forecasting using remote sensing and modeling: Progress and future directions. *Ecological Indicators*, v. 172, 113244, 2025. <https://doi.org/10.1016/j.ecolind.2025.113244>
- [2023] Begliomini, F.N.; Barbosa, C.C.F.; Martins, V.S.; Novo, E.M.L.M.; Paulino, R.S.; Maciel, D.A.; Lima, T.M.A.; O'Shea, R.E.; Pahlevan, N.; Lamparelli, M.C. Machine Learning for cyanobacteria mapping on tropical urban reservoirs using PRISMA hyperspectral data. *ISPRS Journal of Photogrammetry and Remote Sensing*. <https://doi.org/10.1016/j.isprsjprs.2023.09.019>
- [2023] Pellegrino, A.; Fabbretto, A.; Bresciani, M.; Lima, T.M.A.; Braga, F.; Pahlevan, N.; Brando, V.; Kratzer, S.; Gianinetto, M.; Giardino, C. Assessing the accuracy of PRISMA L2d reflectance products in globally distributed aquatic sites, *Remote Sensing*. <https://doi.org/10.3390/rs15082163>
- [2023] Lima, T.M.A.; Giardino, C.; Bresciani, M.; Barbosa, C.C.F.; Fabbretto, A.; Pellegrino, A.; Begliomini, F.N. Assessment of estimated phycocyanin and chlorophyll-a concentration from PRISMA and OLCI in Brazilian inland waters: A comparison between semi-analytical and machine learning algorithms, *Remote Sensing*. <https://doi.org/10.3390/rs15051299>
- [2022] Lima, T.M.A.; Santos, M.; Alves, D. B. M.; Nikolaidou, T.; Gouveia, T.A.F. Assessing ZWD models in delay and height domains using data from stations in different climate regions, *Applied Geomatics*, <https://doi.org/10.1007/s12518-021-00414-y>.