Tatiana Acero-Cuellar

Contact Information

email: taceroc@udel.edu
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Current Position

Ph.D. candidate at the University of Delaware (Unidel Distinguished Graduate Scholars Fellow)
Department of Physics and Astronomy, Sharp Laboratory, 104 The Green, Newark, DE 19716

Education

Ph.D. Physics, Department of Physics and Astronomy, University of Delaware, Newark, DE | GPA: 3.9/4.0 — **August 2022 - present**

Geospatial Data Science Certificate, Department of Geography and Spatial Science, University of Delaware, Newark, DE — **August 2024 – December 2025**

B.Sc., Physics — August 2015 - April 2021
Universidad Nacional de Colombia, Bogotá, D.C| GPA: 4.5/5.0

Research Experience

Research Fellow, Department of Physics and Astronomy — July 2020 - **present**
University of Delaware, Newark, DE
Advisor: Federica B. Bianco.

Research Fellow, Department of Geography and Spatial Sciences — May 2024 - **present**
University of Delaware, Newark, DE
Advisor: Kyle Davis & Federica B. Bianco

Work Experience

Junior BI Analyst, Minister of Mines and Energy — March - August 2021
Ministerio Minas y Energía, Colombia, Bogotá
Supervisor: Julian Paéz.

Ph.D. Research

1. Implementing **Deep Learning** techniques that improve the efficiency of astronomical events

classification using images from telescopes. I developed a **CNN** that classified an image as containing a true astrophysical object or not. Implemented using **TensorFlow/Keras on Python.**

2. Leveraging **model interpretability** by developing and training different types of models. One that maximizes similarity between similar objects on the **latent space,** by using **contrastive learning (CL/BYOL).** Also models whose inner layers allow some level of interpretation, e.g. **attention maps**, **autoencoders, normalizing flows**. The interpretation and exploration of the latent space is done by applying different techniques: dimensionality reduction (**UMAP, T-SNE), mutual information content** calculation, the latter may help to link latent space features with physical/human understandable features. Implementation done with **PyTorch**.
3. Developing a pipeline to simulate realistic images that contain scattered light from astronomical events. Implementation done with **Python, pandas, numpy, astropy, multiprocessing**.
4. Developing a Machine Learning workflow to find and segment fish ponds in Nigeria using RGB Google Satellite Images. Implementation using **computer vision** pre-trained model **YOLOv7,** and **geopandas, shapely, folium, QGIS, gdal, rasterio.**

Personal Profile and Strengths

I have extended experience in coding and solid knowledge of the **Python** language, including **Numpy, Keras, Seaborn, Sklearn, Scikit-learn, Pandas, Tensorflow, Pytorch**, **Geopandas, rasterio**. I have specific expertise in Computer Vision using both traditional and machine learning methods and libraries including **OpenCV** and **SciPy**. I am familiar with **ArcGIS** and **QGIS**. I have implemented supervised and unsupervised machine learning models for applications in Astrophysics and Earth Sciences. All the projects that I have developed were stored and versioned using **Github**.

I have a strong background in analytical thinking, and problem solving acquired through my studies in Physics. I have research experience as well as experience working in small and large teams; I am eager and enthusiastic to learn new skills and gain new experiences; I am self-motivated and driven to research and develop solutions to new problems. I am responsible, disciplined, and determined, always giving 100% for everything.

I have a deep interest in using my abilities, and the ones that I will acquire through my path as a Ph.D. student in helping to create solutions to real-world problems. I have the background knowledge necessary to apply machine learning techniques to different fields and make interpretations out of them.

Scholarships and Fellowships

- **Unidel Distinguished Grad Scholar Fellowship from the Graduate College, University of Delaware; 2022-2027** (competitive, 5-year funding)
- Deep Learning for Science School; Berkeley; California, USA; June 2025 (competitive)
- LSST Data Science Fellowship Program 2022-2024 (competitive, full scholarship)
- La Serena School for Data Science 2023; NOIRLab; La Serena; Chile; August 2023 (competitive, full scholarship)
- International HPC Summer School 2023; Atlanta, Georgia, USA; July 2023 (competitive, full scholarship)
- Bayesian Deep Learning for Cosmology and Time Domain Astrophysics; Paris, France; June 2022

- LSST Corporation and the Enabling Science Grant program partially supported TAC through Grant No. 2021-040 (Artificial Intelligence Solutions to Transient Discovery in Rubin LSST)
- University of Delaware's Summer Research Program; July 2020 - December 2021 (competitive)

Training: Schools and Workshops

- Deep Learning for Science School; Berkeley; California, USA; June 2025
- Foundation Models for Astronomy Conference (Simons Foundation - Flatiron Institute); New York City, New York; May 2025
- LSST Data Science Fellowship Program 2022-2024
- La Serena School for Data Science 2023; NOIRLab; La Serena; Chile; August 2023
- International HPC Summer School 2023; Atlanta, Georgia, USA; July 2023
- Bayesian Deep Learning for Cosmology and Time Domain Astrophysics; Paris, France; June 2022

Services

- 2025-2026, President – Hispanic/Latin Graduate Student Association @ UD
- 2024-2026, Membership Committee – Informatics and Statistics Science Collaboration @ LSST-Rubin
- 2023-2024, Treasurer - Physics and Astronomy Graduate Student Society @ UD

Posters and talks

- Data Science Symposium; Newark, DE USA; October 2025; Poster title: *Automatic Delineation of Fish Ponds across Nigeria with Machine Learning Image Segmentation Models*.
- LSST@Europe7*; Poznan, Poland; September 2025; Talk title: Creating a Light Echoes dataset with the LSST Science Pipelines.*
- Rubin Community Workshop 2025 – LSST; Tucson, AZ, USA; July 2025; Talk Title Creating a Light Echoes dataset with the LSST Science Pipelines*.*
- American Geophysics Union (AGU) Fall Meeting 2024*; Washington DC, USA; December 2024; eLightning Presentation Title: Automatic Delineation of Fish Ponds across Nigeria with Machine Learning Image Segmentation Models.*
- Rubin Community Workshop 2024 – LSST; SLAC, Menlo Park, CA, USA; July 2024; Poster Title: *A comparative study of different Deep Learning image-based models for Real-Bogus classification.*
- 2023 Annual Meeting of the APS Mid-Atlantic Section; Newark, DE, USA; November 2023; Talk title: *Forward modeling of dust and transients - a method for the generation of synthetic Light Echoes.*
- LSST@Europe5: Towards LSST Science, together!; Poreč, Croatia; September 2023; Poster title: *Forward modeling of dust and transients - a method for the generation of synthetic Light Echoes.*
- Data Science Symposium; Newark, DE USA; September 2023; Poster title: *Detangling the Mysteries of a CNN Used to Separate Astrophysical Transients from Artifacts.*
- International HPC Summer School; Atlanta, Georgia, USA; July 2023*;* Poster title: *The potential for Convolutional Neural Networks for transient detection without template subtraction.*
- Bayesian Deep Learning for Cosmology and Time Domain Astrophysics; Paris, France; June 2022; Poster title: *There's no difference: Convolutional Neural Networks for transient detection without template subtraction.*

- Data Science Symposium; Newark, DE USA; November 2021; Poster title: *There's no difference: CNN for transient detection without template subtraction.*

Publications

- Inada, Adi, Masao Sako, **Tatiana Acero-Cuellar**, and Federica Bianco. **2025**. "Transformer-Based Neural Network for Transient Detection without Image Subtraction." ArXiv.org. 2025. https://arxiv.org/abs/2508.16844.
- Vera C. Rubin Observatory Team, **Acero-Cuellar, Tatiana**, Acosta, Emily, et al., "RTN-095: The Vera C. Rubin Observatory Data Preview 1," (**2025**), https://doi.org/10.71929/rubin/2570536
- **Acero-Cuellar, Tatiana**, Federica Bianco, Gregory Dobler, Masao Sako, and Helen Qu. **2023**. "What's the Difference? The Potential for Convolutional Neural Networks for Transient Detection without Template Subtraction." The Astronomical Journal 166 (3): 115. https://doi.org/10.3847/1538-3881/ace9d8.

Languages

Spanish: Mother Language
English: Fluent

Links

www.linkedin.com/in/tatiana-acero-cuellar-69416914b
https://github.com/taceroc
https://scholar.google.com/citations?hl=en&user=nSY3tQQAAAAJ