Nestor F. Porras-Diaz

Ph.D. Candidate & Researcher

Newark, DE. USA. nestorfe@udel.edu nestorpodi N. Porras-Diaz

Ph.D. candidate specializing in generative AI, deep learning, and remote sensing. Proficient in advanced model design, with research spanning Transformers and Diffusion Models for 3D Earth observation and satellite LiDAR imagery enhancement. Published in leading IEEE journals and conferences, with experience developing and training large-scale neural networks for multimodal sensing systems. Demonstrated leadership in mentoring research teams and coordinating international academic initiatives. Currently collaborating with NASA and the University of Delaware to develop next-generation lidar and hyperspectral imaging systems that improve resolution and reduce power requirements for planetary studies, including enhancing moon LiDAR data.

Education

Ph.D. and M.Sc. in Electrical and Computer Engineering Ongoing
University of Delaware · **GPA:** 3.7

Bachelor of Computer Engineering December 2021
University of La Sabana · Distinguished Student Award

Awards

Distinguished Student Award 2020

- Recognized for outstanding academic achievement with one of the highest GPAs, as well as excellence in extracurricular activities.

Full Scholarship for Undergraduate Studies (Tuition waiver and stipend) 2017

- Awarded a merit-based full scholarship for exceptional performance on the Colombian national exam, covering the entirety of undergraduate studies.

Research & Program Leadership

AI Researcher Jan 2022 to present
University of Delaware

- Developed multimodal Vision Transformers and Diffusion Models that improved 3D resolution of NASA satellite lidar products by up to 18×, enabling finer topographic and vegetation structure analysis.
- Built a scalable simulation platform to generate high-fidelity and configurable satellite lidar datasets, significantly enhancing data availability for remote sensing research and model training.
- Accelerated satellite lidar simulation pipelines by 92% by integrating efficient KD-Tree–based 3D point-cloud querying and memory-optimized processing.
- Applied deep learning techniques for Moon lidar data reconstruction and super-resolution, advancing the quality and scientific usability of lunar topographic measurements.

University of Delaware ECE Summer Program Leader June 2024 to present
University of Delaware

- Mentored students through hands-on research projects, guiding problem formulation, experimental design, and scientific communication.
- Facilitated weekly progress reviews, one-on-one advising meetings, and collaborative lab discussions to ensure steady technical and professional development.
- Cultivated a supportive and academically rigorous research environment, strengthening participants' readiness and motivation to pursue graduate studies at UD.

Grant from the US Department of State, the Colombian Embassy: 100K CLIMA project Mar 2025 to June 2025
University of Delaware

- Delivered invited research seminars at two Colombian universities, presenting advances in satellite LiDAR generative modeling and strengthening international academic collaboration networks.
- Recruited, supervised, and mentored international undergraduate and graduate researchers through a structured research internship program, providing weekly technical meetings, project roadmaps, code reviews, and training in research methodology.
- Guided students in dataset preparation, algorithm evaluation, and scientific communication, producing preliminary results aimed at conference submissions and journal manuscripts.
- Led preparation and submission for the *Open Data Impact Awards 2025*, integrating student results, drafting impact statements, and coordinating multi-institution contributions.
- Established follow-up collaboration plans, including continued mentorship, co-authorship arrangements, and integration of student projects into institutional research workflows.

Experience

Teaching Assistant Jan 2023 to present
University of Delaware

- Teaching assistant in the graduate-level courses *Statistical Learning*, and *Imaging and Deep Learning*. Responsible for teaching, tutoring, and grading.

Software Engineer Internship Apr 2020 to Jun 2021
Universidad de La Sabana

- Designed and implemented an interface for monitoring physiological metrics of critical care patients on open-source operating systems for a low-cost mechanical ventilator for COVID-19 patients.
- Developed an anomaly detection system for time-series physiological data, ensuring reliable performance of medical devices and supporting validation by the Colombian medical court.

Humanoid Robotics Researcher Apr 2018 to Oct 2019
Universidad de La Sabana

- Developed genetic algorithms for the NAO humanoid robotics platform, enhancing defensive strategies and contributing to the team's runner-up finish at the RoboCup SPL, with research recognized by the RoboCup Committee.
- Led the Sabana Herons Team in RoboCup SPL, one of the world's most prestigious robotics competitions, driving technical innovation and team performance. Runner-up certificate.

Publications

[1] **Porras-Diaz, N.**, Ramirez-Jaime, A., Arce, G. R., Stephen, M., Toward Sub-Meter Satellite Surface Topography and Vegetation Mapping Using LiDAR/RGB Constrained Generative Diffusion, IEEE Transactions on Geoscience and Remote Sensing, 2025.

[2] Makarichev, V., Ramirez-Jaime, A., **Porras-Diaz, N.**, Vasilyeva, I., Lukin, V., Arce, G. R., Okarma, K., On the Lossless Compression of HyperHeight LiDAR Forested Landscape Data, Remote Sensing, 2025.

[3] Ramirez-Jaime, A., **Porras-Diaz, N.**, Arce, G. R., Stephen, M., Denoising and Super-Resolution of Satellite Lidars Using Diffusion Generative Models, IEEE Statistical Signal Processing Workshop (SSP), 2025.

[4] Newman-Sanders, C., Ramirez-Jaime, A., **Porras-Diaz, N.**, Arce, G. R., Stephen, M., Optimal Illumination Pattern for Satellite Compressive LiDAR Using Generative AI, SPIE Machine Learning from Challenging Data Conference, 2025.

[5] Huang, C., Ma, X., Zhang, S., Lin, M., **Porras-Díaz, N.**, Arce, G. R., Block-Based Inverse Lithography

Technology with Adaptive Level-Set Algorithm, Optics & Laser Technology, 2025.

[6] Ramirez-Jaime, A., Arce, G. R., **Porras-Diaz, N.**, Ieremeiev, O., Rubel, A., Lukin, V., Kopytek, M., Lech, P., Fastowicz, J., Okarma, K., Generative Diffusion Models for Compressed Sensing of Satellite LiDAR Data: Evaluating Image Quality Metrics in Forest Landscape Reconstruction, Remote Sensing, 2025.

[7] Ramirez-Jaime, A., **Porras-Diaz, N.**, Arce, G. R., Stephen, M., Super-Resolved 3-D Satellite LiDAR Imaging of Earth via Generative Diffusion Models, IEEE Transactions on Geoscience and Remote Sensing, 2025.

[8] **Porras-Diaz, N.**, Ramirez-Jaime, A., Arce, G. R., Stephen, M., Harding, D., MacKinnon, J., Vargas, R., Multi-Modal Transformer for Compressive LiDARs Using Hyperspectral Imaging Side-Information, IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 2024.

[9] Ramirez-Jaime, A., **Porras-Diaz, N.**, Arce, G. R., Harding, D., Stephen, M., MacKinnon, J., Super-Resolution of Satellite Lidars for Forest Studies via Generative Adversarial Networks, IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 2024.

[10] Arce, G. R., Ramirez-Jaime, A., **Porras-Diaz, N.**, High Altitude Computational LiDAR Emulation and Machine Learning Reconstruction for Earth Sciences, SPIE Big Data VI: Learning, Analytics, and Applications, 2024.

[11] **Porras-Diaz, N.**, Ramirez-Jaime, A., Arce, G. R., Stephen, M., Harding, D., MacKinnon, J., Vargas, R., Transformer End-to-End Optimization of Compressive LiDARs Using Imaging Spectroscopy Side Information, IEEE Transactions on Geoscience and Remote Sensing, 2024.

Skills

Technical skills: Python, Pytorch Library, C++, C, Java, SQL, MySQL, SQL Server
Soft skills: Critical thinking, problem-solving, fast learning, time management, and hard work.

Research Interests

Transformer models, Artificial General Intelligence (AGI), Generative Artificial Intelligence (Gen. AI), Denoising Diffusion Probabilistic Models (DDPM), Diffusion Models, Large Language Models (LLMs), Natural Language Processing (NLP), and exploring ways to create real-world value through AI.