

Andres Ramirez-Jaime

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Summary

Ph.D. candidate in Electrical and Computer Engineering specializing in machine learning, generative models, and large language models for remote sensing and computer vision, with a focus on diffusion models for imaging inverse problems (e.g., super-resolution, denoising, and reconstruction). Proven experience at Apple and Vertex delivering production-grade LLM and computer vision systems, including RAG pipelines, LoRA-based fine-tuning, and medical image segmentation. Track record of leading cross-functional research with NASA and industry partners, publishing in top IEEE venues, and mentoring junior researchers. Actively seeking Machine Learning / Applied Scientist / Research Scientist roles.

Technical Skills

- **Programming & Scripting:** Python, C, MATLAB, LabVIEW
- **ML & Deep Learning:** PyTorch, TensorFlow, Keras, GANs, Diffusion Models, Transformers, LLMs, multimodal neural networks
- **Domains:** Computer vision, large language models, remote sensing, LiDAR, hyperspectral imaging, biomedical signal processing, robotics
- **Tools & Platforms:** Linux, Git, GIS, \LaTeX

Experience

Apple Inc.

Cupertino, CA, USA

Large Language Models and Generative AI Engineering Intern

Summer 2024

- Developed and implemented a retrieval-augmented generation (RAG) system to enhance metadata for internal tools, improving in-context learning and performance of Apple Intelligence LLMs.
- Fine-tuned Apple Intelligence LLMs for iPhone-specific use cases by curating task-focused datasets and applying LoRA adapters for efficient parameter-efficient fine-tuning.
- Designed and maintained evaluation datasets and hand-crafted test suites targeting edge cases and complex queries to rigorously stress-test model behavior.
- Created and optimized the LLM testing pipeline, increasing the iteration rate from 1 to over 4 training/evaluation cycles per day, accelerating experimentation and deployment.
- Analyzed hallucination patterns in Apple Intelligence, contributing to mitigation strategies that improved reliability and user trust in model outputs.

Vertex Pharmaceuticals

San Diego, CA, USA

Computer Vision and Machine Learning Engineer

Summer 2023

- Contributed to early drug discovery projects for pulmonary fibrosis (IPF) and polycystic kidney disease (ADPKD) in close collaboration with biologists, physicians, and chemists.
- Built a U-Net-based semantic segmentation model for medical gigapixel images achieving over 90% accuracy, helping histopathologists assess compound efficacy for pulmonary fibrosis.
- Developed an automatic computer vision pipeline to segment kidney organoids in whole slide images and estimate physiological properties (size, wall thickness) with errors below 3%.

University of Delaware

Newark, DE, USA

Research and Teaching Assistant

Feb 2022 – Present

- Conduct research on machine learning for LiDAR and hyperspectral data using Transformers, Diffusion Models, GANs, and multimodal neural networks as part of the NASA CASALS project.
- Developed algorithms to enhance the accuracy and resolution of LiDAR and hyperspectral analysis, achieving satellite height estimation errors of less than 1 m.
- Co-authored multiple peer-reviewed papers and presented work at international conferences on remote sensing and computational imaging.
- Collaborated with interdisciplinary teams (ecology, physics, engineering) and implemented ML pipelines in Python and MATLAB for large-scale data processing.

- Mentored two Ph.D. students, one master's student, and several visiting researchers; served as TA for Statistical Learning, Imaging and Deep Learning, and Probability/Statistics courses.

University of Delaware

Visiting Scholar

Newark, DE, USA

Jul 2021 – Dec 2021

- Designed the HyperHeight Data Cube (HHDC) representation for efficient storage and processing of compressed 3D satellite LiDAR data.
- Implemented a 3D convolutional autoencoder to reconstruct compressed HHDCs, significantly improving reconstruction accuracy and efficiency for remote sensing workflows.

University of La Sabana

Mechanical Engineering Professor

Chia, Colombia

Jan 2018 – Dec 2021

- Taught in the Department of Prototypes and Manufacturing (Mechanical Engineering) and supervised 12 undergraduate thesis projects.
- Designed and programmed the embedded system for the UNISABANA Herons mechanical ventilator used in intensive care units for COVID-19 patients across Colombia.
- Automated respiratory control and data collection using C and LabVIEW, and built analysis tools that supported regulatory approval by the Colombian FDA.
- Led the university robotics group; developed embedded Linux applications and ML-based perception to recognize the soccer ball and referee whistle in real time for RoboCup competitions, achieving runner-up in category.

Education

University of Delaware

Ph.D. in Electrical and Computer Engineering

Newark, DE, USA

July 2026

- GPA: 3.92; 2022 George W. Laird Fellow; 2024 ECE Signal Processing Award; 2024 Doctoral Fellowship for Excellence.

University of Los Andes

Master in Computer and Electronic Engineering

Bogota, Colombia

March 2016

- Graduated *Cum Laude*.

University of Los Andes

Bachelor in Electronic Engineering

Bogota, Colombia

October 2013

Publications

- **On the Lossless Compression of HyperHeight LiDAR Forested Landscape Data.** Makarichev, V., Ramirez-Jaime, A. et al., *Remote Sensing*, 2025.
- **Lossless Compression of Hyperheight LiDAR Forested Landscapes Data.** Makarichev, V., Ramirez-Jaime, A. et al., in *Proc. 29th International Conference on Methods and Models in Automation and Robotics (MMAR)*, 2025.
- **Denoising and Super-Resolution of Satellite Lidars Using Diffusion Generative Models.** Ramirez-Jaime, A., Porras-Diaz, N., Arce, G. R., Stephen, M., in *Proc. 2025 IEEE Statistical Signal Processing Workshop (SSP)*, 2025.
- **Optimal Illumination Pattern for Satellite Compressive LiDAR Using Generative AI.** Newman-Sanders, C., Ramirez-Jaime, A. et al., in *Proc. SPIE Machine Learning from Challenging Data*, 2025.
- **SpectralCam: High-Resolution Low-Cost Spectral Imaging Using DSLR Cameras.** Paruchuri, A., Ramirez-Jaime, A. et al., in *Proc. IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2025.
- **Generative Diffusion Models for Compressed Sensing of Satellite LiDAR Data: Evaluating Image Quality Metrics in Forest Landscape Reconstruction.** Ramirez-Jaime, A., Arce, G. R., Porras-Diaz, N. et al., *Remote Sensing*, 2025.
- **Super-Resolved 3D Satellite LiDAR Imaging of Earth Via Generative Diffusion Models.** Ramirez-Jaime, A., Porras-Diaz, N., Arce, G. R., Stephen, M., *IEEE Transactions on Geoscience and Remote Sensing*, 2025.
- **Toward Sub-Meter Satellite Surface Topography and Vegetation Mapping Using LiDAR/RGB Constrained Generative Diffusion.** Porras-Diaz, N., Ramirez-Jaime, A., Arce, G. R., Stephen, M., *IEEE Transactions on Geoscience and Remote Sensing*, 2025.
- **Multi-Modal Transformer for Compressive LiDARs Using Hyperspectral Imaging Side-Information.** Porras-Diaz, N., Ramirez-Jaime, A. et al., in *Proc. IGARSS 2024 – IEEE International Geoscience and Remote Sensing Symposium*, 2024.

- **Super-Resolution of Satellite Lidars for Forest Studies Via Generative Adversarial Networks.** Ramirez-Jaime, A., Porras-Diaz, N., Arce, G. R. et al., in *Proc. IGARSS 2024 – IEEE International Geoscience and Remote Sensing Symposium*, 2024.
- **High Altitude Computational LiDAR Emulation and Machine Learning Reconstruction for Earth Sciences.** Arce, G. R., Ramirez-Jaime, A., Porras-Diaz, N., in *Proc. SPIE Big Data VI: Learning, Analytics, and Applications*, 2024.
- **Super-Resolution of Satellite Lidars for Forest Studies Using Diffusion Generative Models.** Ramirez-Jaime, A., Arce, G. R., Stephen, M., MacKinnon, J., in *Proc. 2024 IEEE Conference on Computational Imaging Using Synthetic Apertures (CISA)*, 2024.
- **The Development and Implementation of a Low-Cost Mechanical Ventilator in a Low-Middle-Income Country During the COVID-19 Pandemic: The Unisabana-HERONS.** Giraldo-Cadavid, L. F., Echeverry, J., Varón, F., Ramirez-Jaime, A. et al., *Heliyon*, 2024.
- **HyperHeight LiDAR Compressive Sampling and Machine Learning Reconstruction of Forested Landscapes.** Ramirez-Jaime, A., Peña-Peña, K., Arce, G. R. et al., *IEEE Transactions on Geoscience and Remote Sensing*, 2024.
- **Transformer End-to-End Optimization of Compressive LiDARs Using Imaging Spectroscopy Side Information.** Porras-Diaz, N., Ramirez-Jaime, A., Arce, G. R. et al., *IEEE Transactions on Geoscience and Remote Sensing*, 2024.
- **HyperHeight LiDAR Compressive Sampling and Machine Learning Reconstruction of Forested Landscapes.** Ramirez-Jaime, A., Peña-Peña, K., Arce, G. R. et al., in *Proc. IGARSS 2023 – IEEE International Geoscience and Remote Sensing Symposium*, 2023.
- **Compressive Spectral Imaging Via Misalignment Induced Equivalent Grayscale Coded Aperture.** Zhang, T., Zhao, S., Ma, X., Ramirez-Jaime, A., Zhao, Q., *IEEE Geoscience and Remote Sensing Letters*, 2023.
- **Positive-Pressure Ventilation: Modeling, Validation, and Stochastic Control of Mean-Field Type.** Ramirez-Jaime, A., Barreiro-Gomez, J., Longas, L. et al., *Automatica*, 2022.
- **Nonlinear Model Predictive Control with Constraint Satisfaction for a Quadcopter.** Wang, Y., Ramirez-Jaime, A., Xu, F., Puig, V., *Journal of Physics: Conference Series*, vol. 783, 2017.
- **MatSWMM – An Open-Source Toolbox for Designing Real-Time Control of Urban Drainage Systems.** Riaño-Briceño, G. A., Barreiro-Gomez, J., Ramirez-Jaime, A., Quijano, N., Ocampo-Martínez, C., *Environmental Modelling & Software*, 2016.
- **A Differential Game Approach to Urban Drainage Systems Control.** Ramirez-Jaime, A., Quijano, N., Ocampo-Martínez, C., in *Proc. 2016 American Control Conference (ACC)*, 2016.
- **Co-Simulation for the Design of Controllers in Urban Drainage Systems.** Riaño-Briceño, G. A., Ramirez-Jaime, A., Barreiro-Gomez, J., Quijano, N., Ocampo-Martínez, C., in *Proc. 2015 IEEE 2nd Colombian Conference on Automatic Control (CCAC)*, 2015.

Leadership & Service

- Board Member, Hispanic/Latino Graduate Student Association (2021–2023).
- Board Member, SACNAS – Society for Advancement of Chicanos/Hispanics and Native Americans in Science (2023–2024).
- First Point of Contact, University of Delaware Summer Research Program (2021–2023).
- International Volunteer, World Youth Day (2019); Volunteer Staff, Opus Dei (2018–2021).