Gustavo **Pérez**

Machine Learning Researcher (Computer Vision & Statistical ML)

Expert in large-scale image analysis, uncertainty estimation, and AI for real-world decision systems

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About me: I develop machine learning and computer vision methods for large-scale image analysis and decision-making under uncertainty, combining statistical modeling with human-in-the-loop systems. My work spans applications in climate, ecology, and scientific imaging, with a focus on scalable, interpretable solutions for real-world data.

Selected Impact

- **AAAI-AISI'24 Best Paper Award** for DISCount : an importance sampling framework for scalable counting in large datasets.
- **Invited Area Chair (to serve), NeurIPS 2026**, recognizing contributions to machine learning research.
- Publications in top-tier venues including **NeurIPS, ECCV, and AAAI**, spanning computer vision and scientific machine learning.
- Developed machine learning methods for **large-scale image analysis across multiple domains**, including ecology (radar), astronomy (HST/JWST), medical imaging (MRI/CT), and materials science.
- Designed **human-in-the-loop and uncertainty-aware models** for learning from limited or noisy annotations.
- Built end-to-end ML pipelines using **HPC clusters and cloud infrastructure (AWS)** for large-scale data processing.

Professional & Research Experience

Postdoctoral Researcher, UC Berkeley (BAIR Lab) (Profs. Stella Yu & Miki Lustig) 2024 – 2026

- Developed **core computer vision methods**, including normalized filter representations for deep networks (NeurIPS 2025) and ViTs.
- Built a **sequence-agnostic MRI motion correction pipeline** using RF-based sensing; collected and processed **20+ in-vivo scans**.
- Designed ML models for **RF motion signal analysis** to improve robustness in MRI reconstruction under motion.
- Developed **zero-shot building attribute extraction methods** using foundation models, including a new evaluation benchmark.

Machine Learning Researcher (PhD), UMass Amherst (CICS) (Prof. Subhransu Maji) 2019 – 2024

- Developed **DISCount** (AAAI'24 Best Paper), an importance sampling framework for scalable visual counting, now used for ecological monitoring across the U.S.
- Built ML systems for **continental-scale radar analysis**, processing **1M+ scans** from 20+ years of data; contributed to **6+ scientific studies**.
- Developed computer vision methods for **astronomical image analysis** (HST/JWST), supporting downstream astrophysics research.
- Designed deep learning models for **3D volumetric data** in materials science using large-scale simulated datasets.
- Built end-to-end pipelines for **large-scale image processing** with human-in-the-loop learning.

Machine Learning Researcher (MSc), Universidad de los Andes (Prof. Pablo Arbeláez) 2016 – 2018

- Developed deep learning models for **3D medical image analysis** for lung cancer detection in CT scans.
- Built pipelines for **volumetric data processing**, achieving 1st place in the ISBI 2018 Lung Nodule Malignancy Prediction Challenge.

Project Manager, HORMESA America Ltd. 2010 – 2016

- Led engineering projects across multiple countries, overseeing **system deployment and technical operations**.
- Managed **cross-functional workflows**, including system integration and client coordination.

Selected Publications

- **DISCount : Counting in Large Image Collections with Detector-Based Importance Sampling.** *AAAI'24* **(Best Paper Award AISI)**
  Gustavo Perez, Subhransu Maji, Dan Sheldon
  Description : Developed a statistically grounded framework for scalable visual counting under limited annotation.
- **Normalize Filters ! Classical Wisdom for Deep Vision.** *NeurIPS'25*
  Gustavo Perez, Stella X. Yu
  Description : Proposed normalized filter representations to improve learning dynamics in deep vision models.
- **Human-in-the-Loop Visual Re-ID for Population Size Estimation.** *ECCV'24*
  Gustavo Perez, Dan Sheldon, Grant Van Horn, Subhransu Maji
  Description : Combined human-in-the-loop annotation with ML for scalable population estimation.
- **Using Spatio-Temporal Radar Data to Detect Communal Roosts.** *Remote Sensing in Ecology and Conservation, 2024*
  Gustavo Perez, Wenlong Zhao, Zezhou Cheng, Maria Belotti, Yuting Deng, Victoria Simons, Elske Tielens, Jeffrey Kelly, Kyle Horton, Subhransu Maji, Dan Sheldon
  Description : Enabled large-scale ecological monitoring across continental radar datasets.
- **ZeoNet : 3D CNNs for Predicting Adsorption in Nanoporous Materials.** *Journal of Materials Chemistry A, 2023*
  Yachan Liu†, Gustavo Perez†, Zezhou Cheng, Aaron Sun, Samuel Hoover, Wei Fan, Subhransu Maji and Peng Bai (†equal contribution)
  Description : Applied deep learning to 3D scientific data for materials prediction tasks.

Scholarships & Awards

February 2024	**Best Paper Award for the AI for Social Impact track** at AAAI 2024, Vancouver, Canada
November 2023	**Best Paper Award 1st Runner-Up** at BuildSys 2023, Istanbul, Turkey
October 2021	**CICS Outstanding Synthesis Project Award.** UMass Amherst, MA
April 2018	**1st place at the ISBI 2018 Lung Nodule Malignancy Prediction Challenge.** ISBI 2018, Washington DC
September 2017	**Fulbright scholarship.** Colciencias-Fulbright Cohort 2018, Bogota, Colombia. Funding awarded : $330.000.000 COP ∼$110.000 USD
December 2016	**Best project of the faculty award.** EEII 2016, Universidad de los Andes, Bogota, Colombia

Skills

Programming	Python, MATLAB, JavaScript, Shell, Git
Machine Learning	PyTorch, TensorFlow, scikit-learn, NumPy, Pandas, Detectron2
Areas of Expertise	Computer Vision, Deep Learning, Transformers, Vision Transformers (ViTs), Visual Counting, Image Segmentation, Object Detection, Large-Scale Image Analysis, Uncertainty Modeling, Human-in-the-Loop Learning
ML Systems	AWS (EC2, S3), HPC (Slurm), Linux, Distributed Training, Large-Scale Data Processing

Education

University of Massachusetts Amherst 2018 – 2023
Ph.D. in Computer Science **(Fulbright Scholar)**
Thesis : From Data to Science with AI and Human-in-the-Loop (with Prof. Subhransu Maji)

Universidad de los Andes, Colombia 2016 – 2018
M.Sc. in Biomedical Engineering

Universidad del Norte, Colombia 2004 – 2008
B.Sc. in Electronic Engineering