

# 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

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- **AAAI-AISI'24 Best Paper Award** for DISCount : an importance sampling framework for scalable counting in large datasets.
- 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

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**Postdoctoral Researcher, UC Berkeley (BAIR Lab)** (Profs. Stella Yu & Miki Lustig) Jan 2024 – Jan 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. Subhansu Maji) Jan 2019 – Jan 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) Jan 2016 – Jun 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.** Mar 2010 – Jan 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

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- **DISCount : Counting in Large Image Collections with Detector-Based Importance Sampling.** *AAAI'24 (Best Paper Award AISI)*  
[Gustavo Perez](#), Subhansu 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, Subhansu 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, Subhansu 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<sup>†</sup>, [Gustavo Perez](#)<sup>†</sup>, Zezhou Cheng, Aaron Sun, Samuel Hoover, Wei Fan, Subhansu Maji and Peng Bai (<sup>†</sup>equal contribution)  
**Description** : Applied deep learning to 3D scientific data for materials prediction tasks.

## SCHOLARSHIPS & AWARDS

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

## SKILLS

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<b>Programming</b>	Python, MATLAB, JavaScript, Shell, Git
<b>Machine Learning</b>	PyTorch, TensorFlow, scikit-learn, NumPy, Pandas, Detectron2
<b>Areas of Expertise</b>	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
<b>ML Systems</b>	AWS (EC2, S3), HPC (Slurm), Linux, Distributed Training, Large-Scale Data Processing

## EDUCATION

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<b>University of Massachusetts Amherst</b> Ph.D. in Computer Science ( <b>Fulbright Scholar</b> ) <b>Thesis</b> : From Data to Science with AI and Human-in-the-Loop (with Prof. Subhansu Maji)	2018 – 2023
<b>Universidad de los Andes, Colombia</b> M.Sc. in Biomedical Engineering	2016 – 2018
<b>Universidad del Norte, Colombia</b> B.Sc. in Electronic Engineering	2004 – 2008