YESID ROMARIO GUALDRON HURTADO

Systems Engineer & Junior Researcher in Computational Imaging and Vision

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Systems Engineer (equivalent to Computer Science) and Junior Researcher with expertise in computational imaging, computer vision, signal processing, and deep learning. Graduated Cum Laude in 2023 from Universidad Industrial de Santander, earning the Outstanding Undergraduate Thesis Award. Recipient of the IEEE Signal Processing Society (SPS) Scholarship in 2023 and 2024. Currently pursuing a Master's degree in Systems Engineering, focusing on computational imaging, inverse problems, signal processing, numerical optimization, and algorithms. Author of two journal papers (one published, one near submission) and seven conference papers (three published, three recently accepted, one under review).

EDUCATION

M.Sc. in Systems Engineering

Universidad Industrial de Santander

Aug 2023 – Jun 2025

B.Sc. in Systems Engineering

Universidad Industrial de Santander

Jan 2019 – Apr 2023

JOB EXPERIENCE

Engineer with Expertise in Computational Optics

Universidad Industrial de Santander

May 2023 – Jul 2023 | Bucaramanga, COL

Responsible for developing state-of-the-art computational-optical architectures and privacy protection metrics and selecting optical materials for light modulation.

- **Literature Review**: Conducted a comprehensive search of computational-optical architectures for privacy protection through image distortion in acquired images.
- **Optical Materials and Methods Selection**: Identified and selected optical materials and computational techniques to design the light modulation element.
- **Privacy Metrics Research**: Investigated metrics to quantify the level of privacy protection in images, focusing on clinical settings.
- **Global Metric Selection**: Chose a global visual privacy metric based on attributes relevant to clinical environments to ensure effective privacy measurement.

RESEARCH EXPERIENCE

Junior Research Scientist

Universidad Industrial de Santander

Aug 2023 – Ongoing | Bucaramanga, COL

Conduct research in computational imaging on the HDSP research group, focusing on developing Deep Learning models for optical system design and computer vision solutions. I am actively working on five research projects: three in the early stages and two nearing completion.

- **Research and Technical Development**: Stay updated on advancements in computer vision, inverse problems, and deep learning through literature reviews, conferences, and webinars. I am currently working on my Master's thesis, titled: "A Deep Distillation Algorithm for Non-linear Gradient Preconditioning in Inverse Problems."
- **Development of Deep Learning Models**: Design and implement models using CNNs, Transformers, RNNs, Unrolling, and Diffusion techniques. Tasks include data preprocessing, training, and evaluation, aiming for state-of-the-art performance and high-impact publications.
- **Optical System Design**: Conduct simulations and evaluate binary-coded apertures, diffractive optical elements, and spectral imaging systems. Focus on solving inverse problems, optimizing designs, and calibrating optical systems for real-world performance.
- **Grant Writing**: Contributed to three successful grant proposals, securing nearly USD $230,000 in funding for the HDSP research group. Proposals detailed objectives, methodologies, and outcomes for projects in computer vision, inverse problems, and privacy preservation.
- **Mentorship of Young Researchers**: Guided junior researchers in Deep Learning, Optimization, Image Processing, and Computational Optics, fostering growth in technical and soft skills.
- **Teaching Assistant**: Supported undergraduate Numerical Methods courses through practical sessions and clarifying key concepts, helping students develop strong problem-solving abilities.
- **Scientific Writing**: Produce research papers, reports, and presentations for journals, conferences, and stakeholders.

STRENGTHS

Python | Pytorch | Tensorflow | Matlab | Git | Weights & Biases | Matplotlib | C++ | Bash | R

Self-motivated | Collaborative in Multidisciplinary Teams | Resilient under Pressure | Adaptable to New Challenges

LANGUAGES

Spanish (Native Language)
English (C1 TOEFL score: 103/120)

RESEARCH PROJECTS

Actively contributing to five research projects to be published in journals the following year (three related to my master's thesis using preconditioning operators, unrolling algorithm, and diffusion models for different tasks such as MRI, X-ray CT, and Single Pixel Camera, and two related to wavefront coding for signal reconstruction and extended depth of field with diffractive optics) with national and international collaborators in the High Dimensional Signal Processing (HDSP) research group.

AWARDS

IEEE-SPS scholarship

IEEE Signal Processing Society

2023 – 2024

Selected as one of only 45 recipients worldwide of the prestigious IEEE-SPS Scholarship, an internationally competitive award in the field of signal processing.

Cum Laude Systems Engineer

Universidad Industrial de Santander (UIS)

2023

Graduated Cum Laude with a GPA of 4.72/5.0 which secured full funding for my Master's studies.

Outstanding Undergraduate Thesis Award

Universidad Industrial de Santander (UIS)

2023

Awarded for my thesis, "Iterative Algorithm for Spectral Image Reconstruction Considering Optical System Mismatch Using a Reinforcement Regularizer."

National Distinction for Excellence

Ministry of Education of Colombia

2019 – 2023

Grant winner to fund its Undergrad's studies with the National Distinction for Excellence for top students.

National Professional Exams

Colombian Institute for Educational Evaluation

2023

100th percentile in "Scientific Thinking - Mathematics and Statistics," 99th in "Quantitative Reasoning," 98th in "Engineering Project Formulation," and 97th in English.

Young Researcher

Universidad Industrial de Santander

Oct 2021 – April 2023 Bucaramanga, COL

As an undergraduate student, I was a member of the HDSP research group, where I actively contributed to research and development in computational imaging.

- **Undergraduate Thesis**: Focused on compressive spectral imaging, which earned the Outstanding Undergraduate Thesis Award.
- **Research Project**: Worked on a project involving infrared spectral imaging, applying advanced techniques in computational imaging.
- **Skill Development**: Strengthened my expertise in computational imaging, including inverse problems, optical system calibration, and deep learning models.

PUBLICATIONS

Journal Articles

- **R. Gualdrón-Hurtado**, H. Arguello, and J. Bacca, "Deep learned non-linear propagation model regularizer for compressive spectral imaging," *IEEE Transactions on Computational Imaging*, vol. 10, pp. 1016–1025, 2024. DOI: 10.1109/TCI.2024.3422900

  Abstract: This work proposes a deep non-linear propagation model for spectral image reconstruction in CASSI, addressing sensor variability and improving optical system calibration. Integrated into a plug-and-play optimization framework, it outperforms traditional models in simulations and experiments. The methodology is versatile, extending to other optical systems and reconstruction algorithms.

Published Conference Proceedings

- **R. Gualdrón-Hurtado**, R. Jacome, S. Urrea, H. Arguello, and L. Gonzalez, "Learning point spread function invertibility assessment for image deconvolution," in *2024 32nd European Signal Processing Conference (EUSIPCO)*, 2024, pp. 501–505. DOI: 10.23919/EUSIPCO63174.2024.10715342

  Abstract: This work proposes a neural network metric to evaluate PSF invertibility by mapping PSFs to unit impulses, predicting recovery performance, reducing computational complexity, and enabling end-to-end PSF design.

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- **R. Gualdrón-Hurtado**, H. Garcia, H. Arguello, and J. Bacca, "Learning a spatially-variant propagation model for compressive spectral imaging," in *Optica Imaging Congress (3D, COSI, DH, FLatOptics, IS, pcAOP)*, Optica Publishing Group, 2023, CTh3B.2. DOI: 10.1364/COSI.2023.CTh3B.2

  Abstract: This work proposes a learned propagation model as a regularizer for compressive imaging, enhancing reconstruction from uncalibrated optical systems.

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- **R. Gualdrón-Hurtado**, J. Bacca, and H. Arguello, "Compressive spectral image reconstruction by using a deep image prior with a mismatch regularizer," in *Imaging and Applied Optics Congress 2022 (3D, AOA, COSI, ISA, pcAOP)*, Optica Publishing Group, 2022, CW4B.3. DOI: 10.1364/COSI.2022.CW4B.3

  Abstract: This work proposes a compressive recovery method using a regularized deep image prior to address sensing model mismatch.

Accepted Conference Papers (Pending Publication)

- **R. Gualdrón-Hurtado**, R. Jacome, L. Suarez, E. Martinez, and H. Arguello, Improving compressive imaging recovery via measurement augmentation, 2025 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).

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- R. Jacome, L. Suarez, **R. Gualdrón-Hurtado**, L. Gonzalez, and H. Arguello, Learning to reconstruct signals with inexact sensing operator via knowledge distillation, 2025 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).

  .
- E. Martinez, L. Suarez, **R. Gualdrón-Hurtado**, R. Jacome, and H. Arguello, Compressive imaging reconstruction via conditional diffusion model with augmented measurements, 2025 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).

Conference Submissions Under Review

- Anonymous authors, KD-PnP: Distilling the Knowledge of Plug-and-Play Algorithms via Preconditioning Matrix Design, IEEE CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2025

Journal Articles Near Submission

- **R. Gualdrón-Hurtado**, F. B. da Silva, J. Bacca, and H. Arguello, Patch-based deep coded aperture design for the near-infrared spectral range, Appl. Opt., 2024

Recognition for Academic Excellence

HDSP Research Group, UIS

2022

Acknowledged for outstanding academic performance as a research student in the HDSP group.

Distinguished Student

Universidad Industrial de Santander

2019 – 2022

Recognized for consistent academic excellence throughout my undergraduate studies.

National PISA Test Competition

Programme for International Student Assessment (PISA)

2017

Awarded first place among 31 top students during the launch of the PISA test presentation platform, in Colombia.

VOLUNTEER WORK

Active contributor

Computational Optics Learning Library (Colibri)

Jun 2023 – Ongoing

pycolibri/pycolibri pycolibri.github.io/

Colibri, an open-source PyTorch library for computational imaging. I focus on developing optical systems, neural networks, and mathematical models, while collaborating with a multidisciplinary team of researchers.

Scientific Committee Member

International Symposium on Image, Signal Processing and Artificial Vision (STSIVA 2024).

Feb 2024 – Jul 2024

https://easychair.org/cfp/STSIVA2024

Contributed to STSIVA, a key event in signal processing and machine learning, as a peer reviewer, ensuring high-quality submissions.

REFEREES

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