
Nelson E. Díaz-Díaz

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Av. Brasil 2147, 2362804 Valparaíso, Chile

Bio: Received the B. Sc. and M. Sc. degrees in Computer Science from the Universidad Industrial de Santander, Colombia, in 2012 and 2015, respectively, and Ph. D. degree in Engineering from the Universidad Industrial de Santander, Bucaramanga, Colombia in 2020, sponsored by a 727 Colciencias scholarship. Currently, he holds a Postdoctoral position with the Pontificia Universidad Católica de Valparaíso (PUCV), Valparaíso, Chile, under the supervision of Prof. Esteban Vera. Nelson's research interests include high-dimensional signal processing, sparse image representation and implicit representation, adaptive sensing, compressive video, ultrahigh-speed imaging and spectral image classification. Please click on the bold text to access to my academic web page **Academic WebPage**.

SKILLS

- Languages: Spanish (Native), English (B2), French (B2)
- Programming: Python (NumPy, SciPy, Matplotlib), MATLAB
- Document Creation: Office tools, LATEX

PROFESSIONAL EDUCATION

Doctor of Philosophy in Engineering 2016-2020

Department of Electrical and Computer Engineering
Universidad Industrial de Santander, Bucaramanga, Santander, Colombia
GPA: 4.55/5.00

Advisor: Ph.D. Henry Arguello

Doctoral thesis: "Coded Aperture Design for Adaptive Compressive Spectral Imaging"

Master of Science in Computer Science 2013-2015

Department of Computer Science
Universidad Industrial de Santander, Bucaramanga, Colombia.
GPA: 4.72/5.00

Advisor: Ph.D. Henry Arguello.

Master thesis: "High-dynamic range compressive spectral imaging by adaptive filtering"

Bachelor of Science in Computer Science 2006-2012

Department of Computer Science
Universidad Industrial de Santander, Bucaramanga, Colombia.
GPA: 3.88/5.00

Advisor: Ph.D. Lola Xiomara.

Graduate project: "Immune algorithm to solve job shop scheduling".

GRANTS

Postdoctoral grant 2023-2026

A novel end-to-end approach to design adaptive coding patterns in compressive spectral video sensing

ANID FONDECYT Postdoctorado 3230489

Pontificia Universidad Católica de Valparaíso

Valparaiso, Chile

PROFESSIONAL EXPERIENCE

Postdoctoral Research Associate - School of Electrical Engineering Project: Advanced coding for computational imaging Pontificia Universidad Católica de Valparaíso, Chile	<i>August 2020 - Present</i>
Assistant Professor in Computer Science Courses: Data Structures, Fundamentals of programming, Technology of the Information and Communication TIC Department of Computer Science Universidad de Investigación y Desarrollo, Bucaramanga, Colombia	<i>February 2020 - July 2020</i>
Research Intern in Ultrasound Imaging Project: Convolutional Sparse Coding for Motion Estimation in Ultrasound Imaging TéSA, Telecommunications for Space and Aeronautics, Toulouse, France	<i>Fall-winter 2018-2019</i>
Lecturer in Computer Engineering Course: Digital Image Processing Department of Electrical and Computer Engineering Universidad Industrial de Santander, Bucaramanga, Colombia	<i>2016-2017</i>
Research Intern in Computational Imaging Project: Adaptive Grayscale Coded Aperture Design for High Dynamic Range Department of Electrical and Computer Engineering University of Texas A&M, College Station, TX, USA	<i>Summer 2015</i>
Adjunct Researcher on Computational Optical Image Processing High-dimensional signal processing research group (HDSP) Department of Computer Science Universidad Industrial de Santander, Bucaramanga, Colombia	<i>2013-Present</i>
Research Assistant on Operation Research Research Group in Biomedical Engineering Department of Computer Science Universidad Industrial de Santander, Bucaramanga, Colombia	<i>2011-2012</i>

HONORS AND AWARDS

Meritorious doctoral thesis Meritorious degree work Universidad Industrial de Santander Bucaramanga, Colombia	<i>March 10th, 2020</i>
Colciencias Scholarship Scholarship to pursue Ph.D. studies in Colombia. Francisco Jose de Caldas Institute for the Development of Science and Technology Colciencias, Bogotá D.C., Colombia	<i>2016 - 2019</i>

STUDENT CO-SUPERVISION

Diego Armando Pinzon Bachelor of Science in Computer Science Universidad Industrial de Santander, Bucaramanga, Colombia	<i>2012 - 2013</i>
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JOURNAL REVIEWER

Optics Express Optica (Formerly Optical Society of America), USA	<i>2019 - Present</i>
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Applied Optics Optica (Formerly Optical Society of America), USA	2019 - Present
Journal of Electronic Imaging (JEI) The International Society for Optics and Photonics, SPIE	2021 - Present
Journal of Selected Topics in Signal Processing (J-STSP) Institute of Electrical and Electronics Engineers, IEEE	2021 - Present
Transactions on Computational Imaging (TCI) Institute of Electrical and Electronics Engineers, IEEE	2022 - Present
IEEE Open Journal of Signal Processing (OJSP) Institute of Electrical and Electronics Engineers, IEEE	2024 - Present

ACADEMIC COLLABORATIONS

Pontificia Universidad Católica de Valparaíso, (Valparaíso, Chile) Collaboration with Dr. Esteban Vera Project: Snapshot video sensing with application in space surveillance and satellite instrumentation Role: Main researcher Other activities: Joint development of grants and application to The National Fund for Scientific and Technological Development, FONDECYT (Chile), and Pontificia Universidad Católica de Valparaíso (PUCV) Valparaíso, Chile.	2020 - Present
Universidad Industrial de Santander, (Bucaramanga, Colombia) Collaboration with Dr. Henry Arguello Project: Adaptive grayscale coded aperture design Role: Master and PhD student Other activities: Joint development of grants and application to the Colombian Institute of Development of Science and Technology - Colciencias	2013 - Present

PROJECTS WITH COLOMBIAN RESEARCH GROUPS

Universidad de Investigación Y Desarrollo, (Bucaramanga, Colombia) Project: Procesamiento de nube de puntos adquiridas con un escáner laser terrestre mediante técnicas de aprendizaje de máquina (machine learning) (2021) Project: Arquitectura óptica de imágenes espectrales comprimidas para clasificación en agricultura usando deep learning (2020) Role: Main researcher Other activities: master's and undergraduate's project evaluator.	2020 - present
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JOURNAL PAPERS

1. Exequiel Olivia, Diaz Nelson, Pinilla Samuel, and Esteban Vera. Multispectral extended depth-of-field imaging via stochastic wavefront optimization. In review IEEE Open Journal of Signal Processing, 2025
2. Felipe Guzmán, Nelson Díaz, Bastian Romero, and Esteban Vera. Scalable coding for high-resolution, high-compression ratio snapshot compressive video. *IEEE Transactions on Image Processing*, pages 1–1, 2025 DOI: <https://doi.org/10.1109/TIP.2025.3579208>
3. Nelson Diaz, Madhu Beniwal, Miguel Marquez, Felipe Guzman, Cheng Jiang, Jinyang Liang, and Esteban Vera. Single-mask sphere-packing with implicit neural representation reconstruction for ultrahigh-speed imaging. *Opt. Express*, 33(11):24027–24038, Jun 2025 DOI:10.1364/OE.561323

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4. Bastián Romero, Pablo Scherz, Nelson Díaz, Jorge Tapia, Aarón Cofré, Eduardo Peters, Esteban Vera, and Darío G. Pérez. Phase retrieval by designed hadamard complementary coded apertures. *Optics Laser Technology*, 191:113311, 2025 DOI: <https://doi.org/10.1016/j.optlastec.2025.113311>
 5. Nelson Diaz, Alejandro Alvarado, Pablo Meza, Felipe Guzmán, and Esteban Vera. Multispectral filter array design by optimal sphere packing. *IEEE Transactions on Image Processing*, 32:3634–3649, 2023 DOI: <https://doi.org/10.1109/TIP.2023.3288414>
 6. Esteban Vera, Felipe Guzmán, and Nelson Díaz. Shuffled rolling shutter for snapshot temporal imaging. *Opt. Express*, 30(2):887–901, Jan 2022 DOI: 10.1364/OE.444864
 7. Nelson Diaz, Omar Gallo, Jhon Caceres, and Hernan Porras. Real-time ground filtering algorithm of cloud points acquired using terrestrial laser scanner (tls). *International Journal of Applied Earth Observation and Geoinformation*, 105:102629, 2021 DOI: <https://doi.org/10.1016/j.jag.2021.102629>
 8. N. Diaz, J. M. Ramirez, E. Vera, and H. Arguello. Adaptive classification via spatial contextual information in multisensor compressive spectral imaging. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 14:9254–9266, 2021 DOI: [10.1109/JSTARS.2021.3111508](https://doi.org/10.1109/JSTARS.2021.3111508)
 9. Nelson Diaz, Carlos Hinojosa, and Henry Arguello. Adaptive grayscale compressive spectral imaging using optimal blue noise coding patterns. *Optics & Laser Technology*, 117:147–157, September 2019 DOI: <https://doi.org/10.1016/j.optlastec.2019.03.038>
 10. Nelson Diaz, Hoover Rueda, and Henry Arguello. Adaptive filter design via a gradient thresholding algorithm for compressive spectral imaging. *Applied Optics*, 57(17):4890–4900, June 2018 DOI: <https://doi.org/10.1364/AO.57.004890>
 11. Edson Flórez, Nelson Díaz, Wilfredo Gómez, Lola Bautista, and Darío Delgado. Evaluación de algoritmos bioinspirados para la solución del problema de planificación de trabajos. *I+ D Revista de Investigaciones*, 11(1):133–143, 2018 Open access
 12. Nelson Diaz, Hoover Rueda Chacon, and Henry Arguello Fuentes. High-dynamic range compressive spectral imaging by grayscale coded aperture adaptive filtering. *Ingeniería e Investigación*, 35(3):53–60, 2015 DOI: <http://dx.doi.org/10.15446/ing.investig.v35n3.49868>

BOOK CHAPTERS

1. Esteban Vera, Felipe Guzman, and Nelson Diaz. *Shuffled Rolling Shutter Camera*, pages 499–513. Springer International Publishing, Cham, 2024 DOI: [10.1007/978-3-031-39062-3_27](https://doi.org/10.1007/978-3-031-39062-3_27)

CONFERENCE PAPERS

1. Alejandro Alvarado, Nelson Díaz, Pablo Meza, and Esteban Vera. Multiplexed multispectral filter array by 3d sphere packing design. In *Optica Imaging Congress 2024 (3D, AOMS, COSI, ISA, pcAOP)*, page JF2A.8. Optica Publishing Group, 2024
2. Bastián Romero, Nelson Díaz, Jorge Tapia, and Esteban Vera. Phase retrieval of elongated laser guide star by sphere packing coded apertures. In Kathryn J. Jackson, Dirk Schmidt, and Elise Vernet, editors, *Adaptive Optics Systems IX*, volume 13097, page 130973L. International Society for Optics and Photonics, SPIE, 2024
3. Nelson Díaz, Madhu Beniwal, Felipe Guzmán, Miguel Marquez, Jinyang Liang, and Esteban Vera. Binary coded aperture design by sphere packing in compressive ultrafast photography. In *Optica Sensing Congress 2024 (AIS, LACSEA, Sensors, QSM)*, page JF3A.4. Optica Publishing Group, 2024
4. Nelson Díaz, Alejandro Alvarado, Pablo Meza, and Esteban Vera. Compressive spectral video by optimal 4d-sphere packing. In *Optica Imaging Congress (3D, COSI, DH, FLatOptics, IS, pcAOP)*, page CM1E.4. Optica Publishing Group, 2023

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5. Alejandro Alvarado, Nelson Díaz, Pablo Meza, and Esteban Vera. A sphere packing approach to design multiplexed multispectral filter arrays. In *Optica Imaging Congress (3D, COSI, DH, FLaOptics, IS, pcAOP)*, page CTh2A.6. Optica Publishing Group, 2023
 6. Nelson Diaz and Esteban Vera. Compressive spectral-video by optimal 3d-sphere packing. In *2023 IEEE Research and Applications of Photonics in Defense Conference (RAPID)*, pages 1–2, 2023
 7. Alejandro Alvarado, Nelson Díaz, Pablo Meza, Felipe Guzmán, and Esteban Vera. Multispectral mosaic design using a sphere packing filter array. In *Imaging and Applied Optics Congress 2022 (3D, AOA, COSI, ISA, pcAOP)*, page CTh4C.1. Optica Publishing Group, 2022
 8. Felipe Guzmán, Nelson Díaz, and Esteban Vera. Improved compressive temporal imaging using a shuffled rolling shutter. In *OSA Optical Sensors and Sensing Congress 2021 (AIS, FTS, HISE, SENSORS, ES)*, page JTh6A.9. Optical Society of America, 2021
 9. J. Bacca, N. Diaz, and H. Arguello. Compressive classification via deep learning using single-pixel measurements. In *2020 Data Compression Conference (DCC)*, pages 359–359, 2020
 10. N. Diaz, C. Noriega-Wandurraga, A. Basarab, J.Y Tournet, and H Arguello. Adaptive coded aperture design by motion estimation using convolutional sparse coding in compressive spectral video sensing. In *2019 IEEE 8th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Guadeloupe, France, pages 1–5, Dec 2019
 11. N. Diaz, A. Basarab, J.Y. Tournet, and H. Arguello. Cardiac motion estimation using convolutional sparse coding. In *2019 27th European Signal Processing Conference (EUSIPCO)*, Coruña, España, Sep 2019
 12. M. Marquez, N. Diaz, J. Bacca, S. Pertuz, and H. Arguello. Compressive light field spectral imaging in a single-sensor device by using coded apertures. In *Imaging and Applied Optics 2017 (3D, AIO, COSI, IS, MATH, pcAOP)*, page CTh1B.5. Optical Society of America, 2017
 13. N. Diaz, J. Bacca, and H. Arguello. Gradient thresholding algorithm for adaptive colored coded aperture design in compressive spectral imaging. In *Imaging and Applied Optics 2017 (3D, AIO, COSI, IS, MATH, pcAOP)*, San Francisco, California, page JTu5A.4. Optical Society of America, 2017
 14. Nelson Diaz, Hoover Rueda, and Henry Arguello. Adaptive uniform grayscale coded aperture design for high dynamic range compressive spectral imaging. In *Hyperspectral Imaging Sensors: Innovative Applications and Sensor Standards*, Baltimore, USA, volume 9860, page 98600A. International Society for Optics and Photonics, 2016
 15. N. Diaz, H. Rueda, and H. Arguello. High-dynamic range compressive spectral imaging by adaptive filtering. In *2015 3rd International Workshop on Compressed Sensing Theory and its Applications to Radar, Sonar and Remote Sensing (CoSeRa)*, pages 89–93, June 2015

MEMBERSHIPS

- IEEE Signal Processing Society, Member
- Optica (Formerly Optical Society of America), Member

ACADEMIC REFERENCES

- Dr. Estevan Vera, professor Pontificia Universidad Católica de Valparaíso, Chile,
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- Dr. Henry Arguello Fuentes, professor Universidad Industrial de Santander, Colombia,
henarfu@uis.edu.co
- Dr. Hoover Fabian Rueda, professor Universidad Industrial de Santander, Colombia,
hoover.rueda@correo.uis.edu.co
- Dr. Pablo Meza, professor Universidad de la Frontera, Chile,
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