

# DIEGO PATIÑO

ASSISTANT PROFESSOR

*Geometric Computer Vision and Machine Learning*

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## RESEARCH SUMMARY

My academic interests revolve around machine learning, physics-informed neural networks, and geometric approaches to computer vision with applications in robotics. My research focuses on 3D vision, symmetry detection, 3D Reconstruction, graph neural networks, and reinforcement learning. In my research, I explore relevant mathematical concepts such as epipolar geometry, differential geometry, equivariance, deep learning, and graph neural networks to solve fundamental problems in computer vision and engineering. My work has applications in multi-disciplinary fields such as medical imaging, robotics, 3D motion prediction, and 3D reconstruction.

## EDUCATION

- 2014 - 2020**    **National University of Colombia - Medellin, Colombia**  
**Ph.D. in Computer Engineering**  
Advisor: **John W. Branch**  
*Dissertation: "Shape Analysis and Description Based on the Isometric Invariances of Topological Skeletonization."*
- 2010 - 2012**    **National University of Colombia - Medellin, Colombia**  
**M.Sc. in Computer Engineering**  
Advisor: **John W. Branch**  
*Thesis: "Automatic landform classification using texture analysis on satellite images."*
- 2005 - 2010**    **National University of Colombia - Medellin, Colombia**  
**B.S.E. in Computer Engineering**

## RESEARCH EXPERIENCE

- 2024**    -    **Assistant Professor**  
**Present**
- University of Texas - Arlington**  
Department of Computer Science and Engineering
- ◇ Founder and director of the **Perception, Robot Intelligence, and Machine Learning Laboratory (PRIMAL)**.
  - ◇ Teach undergraduate and graduate courses
  - ◇ Conducting research in **machine learning and computer vision**.
  - ◇ Provide academic and administrative service to the CSE department, the outreach office and the university.

2023 - 2024

**Post-Doctoral Fellow**

**Drexel University**

Department of Electrical and Computer Engineering - iMaple Lab

- ◇ Lead independent research on **machine learning-based 3D acoustic localization of underwater targets**.
- ◇ Led a team representing Drexel University at the autonomous aerial robotic competition: **"Defend the Republic"** held at Lehigh University.
- ◇ Managed and **administered computer servers** and other hardware necessary for developing research projects within the iMaple Lab.
- ◇ Mentored and supervised multiple Ph.D., Master's, and undergraduate students.
- ◇ Coordinated group meetings and weekly paper review meetings to discuss the **latest state-of-the-art advances in computer vision, robotics, and machine learning applications in acoustics**.
- ◇ Worked under the supervision of **Prof. David K. Han**.

2020 - 2023

**Post-Doctoral Researcher**

**University of Pennsylvania**

GRASP Lab - General Robotics, Automation, Sensing & Perception Lab

- ◇ Lead independent research on **machine learning and geometric computer vision**.
- ◇ Investigated graph **neural network-based control for Unmanned Aerial Vehicles** navigating in turbulent wind fields.
- ◇ Developed a novel deep learning-based method for **3D reconstruction** from single-image or point clouds.
- ◇ Developed novel **geometry-based pose features** for imitation deficiency in subjects with **Autistic Spectrum Disorder (ASD)**, in collaboration with Philadelphia's Children Hospital.
- ◇ Mentored and supervised research for multiple Ph.D. and Master's students.
- ◇ Coordinated and secured guest speakers for weekly team meetings to discuss the **latest state-of-the-art advances in computer vision**.
- ◇ Worked under the supervision of **Prof. Kostas Daniilidis**.

2018 - 2020

**Visiting Researcher**

**University of Pennsylvania**

GRASP Lab - General Robotics, Automation, Sensing & Perception Lab

- ◇ Conducted research on deep learning and geometric computer vision.
- ◇ Developed computer vision tools for **symmetry detection in 3D objects**.
- ◇ Worked under the supervision of **Prof. Kostas Daniilidis**.

2014 - 2015

**Research Assistant**

**University of Wisconsin-Madison**

Laboratory for Molecular and Computational Genomics

- ◇ Conducted research to develop new computer vision approaches for **detecting, sequencing, and aligning single DNA molecules under confinement**. I worked under the supervision of **Prof. David C. Schwartz**.

2012 - 2012

**Research Assistant**

**Pontifical Catholic University of Chile**

Department of Computer Science

- ◇ Created feature extraction, selection, and classification methods for **computer vision-based automatic quality inspection**. I worked under the supervision of **Prof. Domingo Mery**.

2008 - 2011

**Research Assistant**

**National University of Colombia**

Department of Geo-science and Water Resources

- ◇ Developed **computer vision tools** applied to geo-spatial information and automatic classification of landforms.

## INDUSTRY EXPERIENCE

- 2016 - 2018**     **Software Engineer**  
**Gotta Ingenieria**  
<https://gottaingenieria.com>  
◇ Designed and developed several **python-based hydro-morphology simulation** plugins for the ArcGIS platform.
- 2016 - 2016**     **Software Engineer**  
**Launchpad**  
<https://www.launchpadapps.com.au>  
◇ Designed and developed client/server apps for the iOS platform in **Objective C and Swift** programming languages.
- 2012 - 2014**     **Software Engineer**  
**Early Warning System of the City of Medellín**  
<https://siata.gov.co>  
◇ Developed software to support **geo-spatial data visualization** for weather forecasting.  
◇ Implemented **computer vision tools** to process images generated from Doppler microwave weather radars.

## TEACHING EXPERIENCE

- ◇ **Computer Vision.**  
Fall 25, Spring 25, Fall 24, Spring 17, Fall 16, Spring 16.
- ◇ **Algorithms**  
(Teaching assistant). Fall 10 - Fall 11.
- ◇ **Databases.**  
Spring 11.
- ◇ **Introduction to Programming.**  
Spring 13.
- ◇ **Web Development.**  
Spring 13.
- ◇ **Physics Simulations and Software Engineering for Instrumentation.**  
Fall 13.
- ◇ **Algorithms.**  
Fall 16.

## SKILLS

Python/Numpy/SciPy/Matplotlib	13+ yrs	Matlab	4+ yrs
Pytorch/Tensorflow/Jax/OpenCV	7+ yrs	Java	4+ yrs
Git/CSV/SVN	12+ yrs	C++/CUDA	7+ yrs
Linux/Unix	20+ yrs	Scientific writing/L <sup>A</sup> T <sub>E</sub> X	16+ yrs
Slurm/Docker/Kubernetes	6+ yrs		

## LANGUAGES

- ◇ **Spanish** Native
- ◇ **English**  
Fluent
- ◇ **Portuguese**  
Good

## HONORS AND AWARDS

- ◇ Ministry of Science Doctoral Scholarship, Colombia, 2015.
- ◇ Enlazamundos Scholarship, Medellín - Colombia, 2012.

- ◇ Full Tuition Fellowship Award (Masters program), Faculty of Mines, National University of Colombia, 2012.

## SERVICE

### Journals

- ◇ **Reviewer for IEEE Robotics and Automation Letters, 2023,2024.**
- ◇ **Reviewer for IEEE Transactions on Medical Imaging, 2023.**
- ◇ **Reviewer for Elsevier's Pattern Recognition Journal.**
- ◇ **Reviewer for Canadian Journal of Forest Research, 2023.**
- ◇ **Reviewer for Revista DYNA, 2023.** Engineering journal edited by the National University of Colombia.

### Conferences

- ◇ **Reviewer for ICRA'26.** IEEE International Conference on Robotics and Automation.
- ◇ **Reviewer for CVPR'26.** IEEE/CVF Conference on Computer Vision and Pattern Recognition.
- ◇ **Reviewer for ECCV'24.** IEEE/CVF European Conference on Computer Vision.
- ◇ **Session Co-chair for IROS'23.** IEEE/RSJ International Conference on Intelligent Robots and Systems.
- ◇ **Reviewer for WACV'24.** IEEE/CVF Winter Conference on Applications of Computer Vision.
- ◇ **Reviewer for ICPR'22.** 26th International Conference on Pattern Recognition.
- ◇ **Regular reviewer for MICCAI 21 - 23.** International Conference on Medical Image and Computing and Computer-Assisted Intervention.

## MENTORING & COLLABORATIONS

### Master's Thesis Supervision

- ◇ **Asmin Pothula**, Reinforcement Learning for Stroke-based Painting, University of Texas - Arlington, Fall 2025.
- ◇ **Ganesh Gupta**, Car Lane Detection with Event-based Cameras, University of Pennsylvania, Spring 2025.
- ◇ **Shiyani Patel**, Vector Graph Neural Network: Point Cloud Prediction into the Future, University of Pennsylvania, Fall 2021.
- ◇ **Alberto Ceballos-Arroyo**, Computational Methodology for the Generation of Genomic Maps from Fluorescence Images, National University of Colombia, Fall 2022.

### PhD's Dissertation Supervision

- ◇ **Angel Solis**, TBD, University of Texas - Arlington, Spring 2029.
- ◇ **Tahsin Mostafiz**, Physics-inspired methods for computer vision on Event-based Data, Fall 2029.

### PhD Student Collaborations

- ◇ **Karl Schmeckpeper** (Penn CIS PhD, Spring 2020-2023).

### External Collaborations

- ◇ **Computational Scientist, Center for Autism Research.** Pose-based computer vision features for Autistic Spectrum Disorder diagnosis, 2021-2024.

## FUNDING

**2025 - 2026**    **UR2PHD Undergraduate Research Grant**  
**Computing Research Association (CRA)**  
Award total: \$ 12,000

**2025 - 2026 Undergraduate Research Grant**  
**College of Engineering at the University of Texas - Arlington**  
Award total: \$ 2,000

## **PUBLICATIONS**

- 2025 Vankuri, R., Khan, S.U., Sari T.T., Secinti G., Patino D., and Roy D.**, "Waves of Imagination: Unconditional Spectrogram Generation Using Diffusion Architectures", IEEE Military Communications Conference (MILCOM), 2025.
- Acharjee S., Ratul A. K., Patino D., and Sakib N.**, "Data-Driven Safety: Leveraging Historical Accident Data and Generative AI for Proactive Workplace Hazard Mitigation", ASCE International Conference on Computing in Civil Engineering (i3CE), 2025.
- 2024 Rouhi, A., Patiño, D., and Han, D. K.**, "Enhancing Object detection by Leveraging Large Language Models for Contextual Knowledge", 27th International Conference on Pattern Recognition (ICPR), 2024.
- 2023 Patiño, D., Mayya, S., Calderon, J., Daniilidis, K., and Saldaña, D.**, "Learning to Compensate Wind Turbulence with a Team of Robots: A Reinforcement Learning Approach", IEEE Robotics and Automation Letters, 2023.
- 2022 Patiño, D., Schmeckpeper, K., Gupta, H., Georgakis, G., and Daniilidis, K.**, "Self-supervised implicit shape reconstruction and pose estimation for video prediction", ICRA Workshop on Motion Planning with Implicit Neural Representations of Geometry, 2022.
- Patiño, D., Esteves, C., and Daniilidis, K.**, "Level Set Mesher: Single-image to 3D reconstruction by following the level sets of the signed distance function", International Conference on Pattern Recognition (ICPR), 2022, <https://ieeexplore.ieee.org/document/9956132>.
- 2021 Patiño, D., and Branch, J.W.**, "Cosine-Pruned Medial Axis: A New Method for Iso-metric Equivariant and Noise-Free Medial Axis Extraction", IEEE Access, 2021, <https://doi.org/10.1109/ACCESS.2021.3072933>.
- 2020 Patiño, D., Ceballos-Arroyo, A. M., Rodriguez-Rodriguez, J. A., Sanchez-Torres, G., and Branch-Bedoya, J. W.**, "Melanoma detection on dermoscopic images using superpixels segmentation and shape-based features", 15th International Symposium on Medical Information Processing and Analysis, <https://doi.org/10.1117/12.2545300>.
- 2018 Patiño, D., Avendaño, J., and Branch, J.W.**, "Automatic skin lesion segmentation on dermoscopic images by the means of superpixel merging", International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), [https://doi.org/10.1007/978-3-030-00937-3\\_83](https://doi.org/10.1007/978-3-030-00937-3_83).
- Goez-Mora, J. E., Londoño-Lopera, J. C., and Patiño, D.**, "Automatic Visual Classification of Parking Lot Spaces: A Comparison Between BoF and CNN Approaches", Workshop on Engineering Applications, [https://link.springer.com/chapter/10.1007/978-3-030-00350-0\\_14](https://link.springer.com/chapter/10.1007/978-3-030-00350-0_14).
- 2017 de León, J.C.B., Patiño, D., Restrepo, A., and Branch, J.W.**, "Computational Detection of Salient Information to Identify High Stress and Ambiguity Regions in Digital Photoelasticity Images", Image Processing and Applications (IM4E), <https://doi.org/10.1364/ISA.2017.IM4E.2>.
- 2015 Zhou, S., Goldstein, S., Place, M., Bechner, M., Patiño, D., Potamousis, K., Ravindran, P., Pape, L., Rincon, G., Hernandez-Ortiz, J., Medrano, J. F. and Schwartz, D. C.**, "A clone-free, single molecule map of the domestic cow (*Bos taurus*) genome", BMC Genomics, <https://doi.org/10.1186/s12864-015-1823-7>.
- 2012 Patiño, D., Mery, D., Fernandez, B.V., Branch, J.W.**, "Automatic Landform Classification of Uplands Based on Haralick's Texture", CLEI XXXVIII - Latin-American Informatics Conference, IEEE, DOI:10.1109/CLEI.2012.6427164.