

Manuel Pérez Carrasco

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RESEARCH INTERESTS

My research focuses on environmental monitoring and mapping natural resources using earth observations, as well as characterizing astronomical objects from survey telescopes. I specialize in computer vision, time series analysis, and natural language processing.

EDUCATION

MSc. Computer Science

Concepción, Chile

University of Concepción (GPA: 6.1/7.0)

Mar. 2017 – Oct. 2019

- Thesis: "Semi-supervised Adversarial Variational Domain Adaptation for Image Classification" (Grade: 7.0/7.0)
- Received Best Student Paper Award at Astroinformatics 2019 Conference, Caltech
- Research conducted at Harvard University's Institute for Applied Computational Sciences with Professors Guillermo Cabrera-Vives and Pavlos Protopapas

B.S. Industrial Engineering

Concepción, Chile

University of Concepción (GPA: 5.9/7.0)

Mar. 2013 – Sep. 2018

- Undergraduate honors thesis published in *Publications of the Astronomical Society of the Pacific*
- Focus on data science, machine learning, and optimization

EXPERIENCE

Spark Postbaccalaureate Research Fellow

Cambridge, MA, USA

Center for Astrophysics (CfA), Harvard & Smithsonian

Sept. 2025 – Present

- **MethaneSAT Mission – Atmospheric Remote Sensing:** Developed deep learning algorithms for cloud and shadow segmentation in spectroscopic imagery. Performing research on algorithms for methane plume detection using MethaneSAT satellite and MethaneAIR airborne data.
- **TEMPO Mission – Atmospheric Remote Sensing:** Designing geometry-based labeling system and machine learning models for cloud and shadow detection using spectroscopic data from NASA's Tropospheric Emissions: Monitoring of Pollution (TEMPO) satellite.
- Working under Dr. Cecilia Garraffo (Director, AstroAI at CfA) and Dr. Xiong Liu (PI of TEMPO, SAO Lead of MethaneSAT).

Chief Technology Officer

Concepción, Chile

Center for Data and Artificial Intelligence, University of Concepción

Jul. 2019 – Aug. 2025

- **Deep-Hub Geospatial Platform for Precision Silviculture:** Co-architected cloud-native ML infrastructure for automated tree detection using multi-sensor aerial imagery. Developed and deployed scalable deep learning models (detection, segmentation, land cover classification) processing 300,000+ acres of forest plantations. Led technical team of 5 engineers. Platform spun off as commercial venture from School of Engineering. Published research in *International Journal of Digital Earth*.
- **ALeRCE Anomaly Detector – Astronomical Time Series Analysis:** Designed and implemented deep learning-based anomaly detection algorithms identifying rare transient events in real-time telescope data. Research published in *The Astronomical Journal*. Funded by Millennium Institute of Astrophysics.
- **NLP for Social Science – Large-Scale Text Analysis:** Led development of transformer-based NLP platform for analyzing 500,000+ citizen feedback responses during Chilean social outbreak. Implemented sentiment analysis and topic modeling techniques, providing data-driven insights for policymakers. Platform's statistical outputs informed Chilean constitutional drafting process. Worked with Chilean Ministry of Social Development and Family.

Research Assistant

Cambridge, MA, USA

Institute for Applied Computational Sciences, Harvard University

Dec. 2018 – May. 2021

- Conducted research on semi-supervised domain adaptation for image classification under Prof. Pavlos Protopapas (IACS Scientific Program Director). Developed novel contrastive learning framework (Con²DA) for domain adaptation, published at NeurIPS 2020 Workshop on Distribution Shifts.
- Master's thesis research on adversarial variational domain adaptation. Recipient of IACS financial support (stipend and travel funding) for research development.
- Applied deep learning methods to astronomical image classification problems, transferring network knowledge across different telescope surveys and observing conditions.

PUBLICATIONS

- Pérez-Carrasco, M.**, Nasr, M., Roche, S., Chan Miller, C., Zhang, Z., Park, C. F., Walker, E., Garraffo, C., Finkbeiner, D., Gautam, R., & Wofsy, S. (2025). Deep learning for clouds and cloud shadow segmentation in methane satellite and airborne imaging spectroscopy. *Under review*.
- Pérez-Carrasco, M.**, Karelovic, B., Molina, R., Saavedra-Passache, R., Cerulo, P., & Cabrera-Vives, G. (2022). Precision silviculture: Use of UAVs and comparison of deep learning models for the identification and segmentation of tree crowns in pine crops. *International Journal of Digital Earth*, 15(1), 2223-2238.
- Pérez-Carrasco, M.**, Cabrera-Vives, G., Hernandez-García, L., Förster, F., Sanchez-Saez, P., Muñoz Arancibia, A. M., et al. (2023). Alert classification for the ALERCE broker system: The anomaly detector. *The Astronomical Journal*, 166(4), 151.
- Sanchez-Saez, P., et al. (2021). Searching for changing-state AGNs in massive data sets. I. Applying deep learning and anomaly-detection techniques. *The Astronomical Journal*, 162(5), 206.
- Förster, F., et al. (2021). The automatic learning for the rapid classification of events (ALERCE) alert broker. *The Astronomical Journal*, 161(5), 242.
- Pérez-Carrasco, M.**, Cabrera-Vives, G., Martinez-Marín, M., Cerulo, P., Demarco, R., Protopapas, P., Godoy, J., & Huertas-Company, M. (2019). Multiband galaxy morphologies for CLASH: A convolutional neural network transferred from CANDELS. *Publications of the Astronomical Society of the Pacific*, 131(1004), 108002.

CONFERENCE PRESENTATIONS & SERVICE

- NeurIPS 2025:** Climate Change ML Workshop – Poster Presenter
- NeurIPS 2024:** LatinX in AI Workshop – Finance/Sponsorship Co-Chair
- NeurIPS 2023:** Climate Change ML Workshop – Poster Presenter
- ICML 2023:** Machine Learning for Astrophysics Workshop – (3) Poster Presentations
- NeurIPS 2021:** Workshop on Distribution Shifts – Poster Presenter
- Astroinformatics 2019:** Oral. Best Student Paper Award, Caltech

TEACHING EXPERIENCE

- Lecturer** Concepción, Chile
School of Engineering, University of Concepción *Jul. 2019 – Present*
- Taught graduate and undergraduate courses including Deep Learning (2022-2024), Introduction to Data Science (2021-2022), Machine Learning (2019-2020), and Data Analysis (2024). Co-designed curriculum, lectures, and assessments for classes of ~30 students. Worked with professor Guillermo Cabrera-Vives.
 - Topics covered: supervised/unsupervised learning, cross-validation, convolutional neural networks, recurrent architectures, transformers, computer vision, NLP and time series analysis.
- Teaching Fellow** Cambridge, MA, USA
Institute for Applied Computational Sciences, Harvard University *Feb. 2019 – May 2019*
- Teaching fellow for CS109b: Advanced Topics in Data Science, a required course for the Data Science Master's program. Conducted office hours, graded assessments, and mentored students on applied ML projects under Prof. Pavlos Protopapas.

TECHNICAL SKILLS

- Programming:** Python (Expert: PyTorch, TensorFlow/Keras, scikit-learn, NumPy, pandas), SQL, Bash.
- Machine Learning:** Deep learning, computer vision, time series analysis, NLP, anomaly detection, domain adaptation.
- Cloud & Engineering:** AWS, GCP, Docker, Git.
- Data Visualization:** Matplotlib, Seaborn, Plotly, scientific visualization
- Languages:** Spanish (Native), English (Fluent)

HONORS & AWARDS

- SPARK Postbaccalaureate Fellowship, Center for Astrophysics, Harvard & Smithsonian (2025)
- AstroAI/EarthAI affiliate, Center for Astrophysics, Harvard & Smithsonian (2023-2025)
- Best Student Paper Award, Astroinformatics 2019 Conference, Caltech
- Harvard-Chile Research Internship, Institute for Applied Computational Sciences at Harvard University (2018-2019)
- UdeC Scholarship for Master studies (2017-2019)