Manuel Pérez Carrasco

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Portfolio GitHub Profile

Research Interests

Machine Learning Researcher specializing in computer vision, time series analysis, and natural language processing with applications in astrophysics and environmental monitoring. Experience in deep learning models for anomaly detection, domain adaptation, and semi-supervised learning approaches. Passionate about developing novel algorithms that address real-world scientific challenges.

Education

University of Concepción Concepción, Chile
MSc. Computer Science (GPA: 6.1/7.0) *Mar. 2017 – Oct. 2019*

- Thesis: "Semi-supervised Adversarial Variational Domain Adaptation for Image Classification" (Grade: 7.0/7.0)
- Thesis research received Best Student Paper Award at Astroinformatics 2019 conference, Caltech

University of Concepción Concepción, Chile
B.S. Industrial Engineering (GPA: 5.9/7.0) *Mar. 2013 – Sep. 2018*

- Undergraduate honor research thesis published in Publications of the Astronomical Society of the Pacific

Professional Experience

Chief Technology Officer Concepción, Chile
Center for Data and Artificial Intelligence at University of Concepción *Jul. 2019 – Present*

- **Deep-Hub Geospatial Platform**: Co-developed cloud based platform for interactive labeling and automatic tree detection using high-dimensional geospatial data. Implemented scalable computer vision models for detection, segmentation and land cover mapping.
- **ALeRCE Anomaly Detector**: Led the design and implementation of astronomical light curves anomaly detection algorithms for the Zwicky Transient Facility data stream within the ALeRCE broker framework. Work published at The Astronomical Journal. Project funded by the Millennium Institute of Astrophysics.
- **Predictive Maintenance for Pulp Mills - CMPC**: Designed ML-powered predictive maintenance system for industrial cellulose drying machines.
- **Natural Language Analysis for the Chilean Outbreak**: Led development of advanced NLP platform for processing citizen feedback during Chilean social outbreak. Implemented classical and transformer-based sentiment analysis and topic modeling architectures, enabling rapid insights for policymakers. Platform used as an statistical basis for the writing of the proposed chilean constitution.

Consultant Boston, USA
Environmental Defense Fund *Jul. 2024 – Present*

- **MethaneSAT Project**: Developing and integrating machine learning models for cloud, shadow, and methane plume detection in hyperspectral satellite imagery from MethaneAIR and MethaneSAT missions. Work done in collaboration with the EarthAI initiative of the Center for Astrophysics | Harvard & Smithsonian.

Research Assistant Cambridge, MA, USA
Institute for Applied Computational Sciences, Harvard University *Dec. 2018 – May. 2021*

- Developed master's thesis focused on semi-supervised domain adaptation algorithms for image classification (2019-1). Recipient of IACS financial aid for research development (stipend and flight tickets).
- Development a second research focused on semi-supervised domain adaptation (2020-2/2021-1). Work published at Neurips 2020 Workshop on Distribution Shifts.
- Working under Professor Pavlos Protopapas, IACS Scientific Program Director.

Publications

M. Pérez-Carrasco, G. Cabrera-Vives, L. Hernandez-García, et al. (2023) "Alert Classification for the ALeRCE Broker System: The Anomaly Detector". *The Astronomical Journal*, 166(4), 151.

M. Pérez-Carrasco, B. Karelovic, R. Molina, et al. (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.

P. Sanchez-Saez, et al. (Contributing author) (2021). "Searching for Changing-state AGNs in Massive Data Sets. I. Applying Deep Learning and Anomaly-detection Techniques to Find AGNs with Anomalous Variability Behaviors". *Astronomical Journal*, 162(5), 206.
F. Förster, et al. (Contributing author) (2021) "The Automatic Learning for the Rapid Classification of Events (ALeRCE) Alert Broker". *The Astronomical Journal*, 161(5), 242.

M. Pérez-Carrasco, G. Cabrera-Vives, M. Martinez-Marín, et al. (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 Contributions

NeurIPS 2023: Workshop on Tackling Climate Change with Machine Learning Dec. 2023
New Orleans, LA, USA

- "Hyperspectral shadow removal with Iterative Logistic Regression and latent Parametric Linear Combination of Gaussians" - Contributing Author, Poster Presentation

ICML 2023: Workshop on Machine Learning for Astrophysics July 2023
Honolulu, HI, USA

- "Multi-Class Deep SVDD: Anomaly Detection Approach in Astronomy with Distinct Inlier Categories" - Poster Presentation
- "Domain adaptation via minimax entropy for real/bogus classification of astronomical alerts" - Contributing Author, Poster Presentation
- "Positional encodings for light curve transformers: Playing with positions and attention" - Contributing Author, Oral Presentation

NeurIPS 2021: Workshop on Distribution Shift Dec. 2021
Virtual conference

- "Con^{2}DA: Simplifying Semi-supervised Domain Adaptation by Learning Consistent and Contrastive Feature Representations" - Poster Presentation

Astroinformatics 2019 Sept. 2019
Caltech, Pasadena, CA, USA

- "Adversarial Variational Transfer for Semi-Supervised Domain Adaptation" - Oral Presentation. **Best Student Paper Award**

Teaching Experience

Lecturer Concepción, Chile
School of Engineering, University of Concepción *2019 – Present*

- Data Analysis (2024-2): Designed curriculum, lectures, assessments, and labs for 40 students
- Deep Learning (2022-1, 2023-1, 2024-1): Co-designed and taught curriculum for 30 students per semester
- Introduction to Data Science (2021-2, 2022-2): Developed lectures, labs, and homework assignments
- Advanced Topics in Machine Learning (2020-1): Co-taught graduate-level course on deep learning fundamentals
- Introduction to Machine Learning (2019-2): Taught fundamentals of supervised and unsupervised learning

Teaching Fellow Cambridge, MA, USA
Institute for Applied Computational Sciences, Harvard University *Feb. 2019 – May 2019*

- Data Science 2: Advanced Topics in Data Science - Responsible for office hours, grading, and guiding student projects

Academic Service & Leadership

AstroAI / EarthAI Affiliate Oct. 2023 - Present
Center for Astrophysics | Harvard & Smithsonian

Finance and Sponsorship Co-Chair December 2024
NeurIPS 2024: LatinX in AI Workshop

Volunteer December 2023
NeurIPS 2023: LatinX in AI Workshop

Trainer January 2019
ComputeFest 2019, Harvard University *Boston, MA, USA*