Guillermo Cabrera-Vives

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Employment

May 2019 - present	**Associate Professor** Computer Science Department, University of Concepción, Chile.
Mar 2017 - May 2019	**Assistant Professor** Computer Science Department, University of Concepción, Chile.
Nov 2015 - Mar 2017	**Postdoctoral Fellow** FONDECYT, granted by the Chilean Commission for Scientific and Technological Research, Chile.
Apr 2015 - Nov 2015	**Postdoctoral Fellow** Millennium Institute of Astrophysics, Chile.
Aug 2009 - Mar 2017	**Research Engineer** Center for Mathematical Modeling, University of Chile.

Leadership roles

- **Co-founder and P.I., The Automatic Learning for the Rapid Classification of Events (ALeRCE)** `http://alerce.science/`
  Every night, time-domain survey telescopes produce hundreds of thousands of alerts where objects change or appear (e.g. asteroids or supernovae). We have created the Automatic Learning for the Rapid Classification of Events (ALeRCE) system. ALeRCE is an integrated system aiming at the rapid classification of events from time domain surveys for the purpose of automatically selecting relevant candidates for follow–up. I lead the machine learning team who is in charge of developing the machine learning models that currently classify approximately 300.000 alerts per night in real time. This number is expected to grow two orders of magnitudes within the next two years.
  Apr 2017 - present
- **Founder and Director of the University of Concepción COVID-19 Projections Team**
  We provide epidemiology projections of COVID-19 to local authorities.
  Mar 2020 - Dec 2021
- **Founder and Director of the Data Science Unit, University of Concepción**
  Unit focused on transferring Data Science knowledge from the academy to the industry by developing data management and analysis systems, providing advice to organizations, and training their employees.

Mar 2019 - present

- **Co-creator and Director for the MSc. in Data Science for Innovation, University of Concepción**
  Jun 2019 - present
- **Co-creator and Director for the Minor in Data Science, University of Concepción**
  Mar 2018 - present
- **Harvard-Chile Data Science School Faculty**
  2014 - present
- **Founder and Co-Chair, La Serena School for Data Science**
  `http://www.aura-o.aura-astronomy.org/winter_school/`
  2013 - 2015

Interships and visits

- Institute for Applied Computational Science, **Harvard University**, USA.
  With Pavlos Protopapas on deep learning models for astronomical time series.
  Jul 2017, Jan 2019
- Robotics Institute, **Carnegie Mellon University**, USA.
  With Jeff Schneider on training machine learning models using biased labels.
  Jan 2013 - Jul 2013

Education

2015 Ph.D. in Computer Science, University of Chile; Santiago, Chile.
2008 M.Sc. in Computer Science, University of Chile; Santiago, Chile.
2005 Civil Engineer in Computer Science, University of Chile; Santiago, Chile.
2004 B.Sc. in Engineering Science, Computer Science, University of Chile; Santiago, Chile.
2003 B.Sc. in Astronomy, University of Chile; Santiago, Chile.

Grants

- **IDeA I+D, 2023** Cuantificación volumétrica de lesiones tumorales asistida por inteligencia artificial - integrando modelos de mejora continua / human-in-the-loop, Co-P.I., 2023 - 2025.
- **FONDECYT Regular Grant, 2023**: Machine learning tools for a multi-messenger astronomical alert broker system, P.I., Apr 2023 - Mar 2027.
- **Millenium Nucleus, 2021** Millennium Nucleus on Young Exoplanets and their

Moons (YEMS), Principal Investigator, Jan 2022 - Dec 2024.

- **Fondef IDeA I+D, 2021** Deep-hub: platform based on artificial intelligence for the analysis of aerial images of forestry interest, P.I., Jan 2022 - Dec 2023.
- **ANID COVID-19**: IA-TRad Chile: A.I. for Diagnostic Support and Care Processes in Clinical Radiology and Tele-Radiology, co-director,Jul 2020 - Jun 2021.
- **FONDECYT Initiation Grant, 2020**: New deep learning tools for astronomical data streams, P.I., Nov 2019 - Oct 2022.
- **FONDECYT Postdoctoral Grant, 2016.**: New machine learning tools for observational data analysis, P.I., Nov 2015 - Oct 2018.

Interest and Research Areas

- Data Science.
- Machine learning.
- Computer vision.
- Astroinformatics.

Refereed Publications

- "A Novel Two-Phase Approach to Forest Harvesting Optimization Using Cable Logging", Rey C., Sandoval S, **Cabrera-Vives G.**, Seco D., Cerulo P, Li Z., 2023, Forests, 14(11), 2133.
- "Alert Classification for the ALeRCE Broker System: The Anomaly Detector", Perez-Carrasco M., **Cabrera-Vives G.**, Hernandez-García L., Förster F., Sanchez-Saez P., Muñoz Arancibia A.M., Arredondo J., A., Bauer F.E., Bayo A., Catelan M., Dastidar R., Estévez P.A., Lira P., Pignata G., 2023, The Astronomical Journal, 166(4), 151.
- "Domain Adaptation via Minimax Entropy for Real/Bogus Classification of Astronomical Alerts", **Cabrera-Vives G.**, Bolivar C., Förster F., Munoz Arancibia A., Pérez-Carrasco M., and Reyes E., 2023, ICML Workshop on Machine Learning for Astrophysics.
- "Positional Encodings for Light Curve Transformers: Playing with Positions and Attention", Moreno-Cartagena, D, **Cabrera-Vives G.**, Protopapas P., Donoso-Oliva C., Pérez-Carrasco M., Cádiz-Leyton M., 2023, ICML Workshop on Machine Learning for Astrophysics.
- "Multi-Class Deep SVDD: Anomaly Detection Approach in Astronomy with Distinct Inlier Categories"Pérez-Carrasco M., **Cabrera-Vives G.**, Hernández-García L., Förster F., Sánchez-Sáez P., Muñoz Arancibia A., Astorga N., Bauer F., Bayo A., Cádiz-Leyton M., Catelan M., 2023, ICML Workshop on Machine Learning for Astrophysics.
- "Persistent and occasional: searching for the variable population of the ZTF/4MOST sky using ZTF data release 11"Sánchez-Sáez, P., Arredondo, J., Bayo, A., Arévalo, P.,

Bauer, F. E., **Cabrera-Vives, G.**, et.al. 2023, Astronomy & Astrophysics 675, A195.

- "Multi-scale stamps for real-time classification of alert streams", Reyes-Jainaga, I., Förster, F., Arancibia, A. M. M., **Cabrera-Vives, G.**, Bayo, A., Bauer, F. E., et.al., 2023, The Astrophysical Journal Letters, 952 L43.
- "Precision silviculture: use of UAVs and comparison of deep learning models for the identification and segmentation of tree crowns in pine crops", Pérez-Carrasco, M., Karelovic, B., Molina, R., Saavedra, R., Cerulo, P., and **Cabrera-Vives, G.** 2022, International Journal of Digital Earth, 15(1), 2223-2238.
- "DELIGHT: Deep Learning Identification of Galaxy Hosts of Transients using Multi-resolution Images", F. Förster, A. M. Muñoz-Arancibia, I. Reyes, A. Gagliano, D. Britt, S. Cuellar-Carrillo, F. Figueroa-Tapia, A. Polzin, Y. Yousef, J. Arredondo, D. Rodríguez-Mancini, J. Correa-Orellana, A. Bayo, F. E. Bauer, M. Catelan, **G. Cabrera-Vives**, et.al. 2022, The Astronomical Journal 164 (5), 195.
- "Managing the Root Causes of "Internal API Hell": An Experience Report", **G. Cabrera-Vives**, Z. Li, A. Rainer, D. Athanasopoulos, D. Rodríguez-Mancini and F. Förster, 2022, International Conference on Product-Focused Software Process Improvement (PROFES 2022), 21-36.
- "Toward Fractal Development of Data Processing-Intensive Artificial Intelligence Systems", D. Rodriguez-Mancini, Z. Li, C. Valenzuela-Carrasco, **G. Cabrera-Vives**, F. Forster, 2022, IEEE Software.
- "Analysis of Tumor-Infiltrating T-Cell Transcriptomes Reveal a Unique Genetic Signature across Different Types of Cancer", M. Vidal, M. Fraga, F. Llerena, A. Vera, M. Hernández, E. Koch, F. Reyes-López, E. Vallejos-Vidal, **G. Cabrera-Vives**, E. Nova-Lamperti, 2022, International Journal of Molecular Sciences, 23(19), 11065.
- "Bonus computing: towards free-of-charge metacomputing in the public cloud", Z. Li, P. Pinacho-Davidson, M. Martínez-Marin, **G. Cabrera-Vives**, Y. Chen, M. A. Rodríguez, A. Y. Zomaya, R. Ranjan, 2022, Computing, 104(1), 123.
- "Secretome from human mesenchymal stem cells-derived endothelial cells promotes wound healing in a type-2 diabetes mouse model", C. Aguayo, V. Ormazabal, E. Nova-Lampeti, D. Rojas, P. Guzman, F. A. Zuñiga, C. Escudero, C. Reyes, M. Yañez, M. Vidal, **G. Cabrera**, K. Oporto, 2022, International Journal of Molecular Sciences, 23(2), 941.
- "Con^{2}DA: Simplifying Semi-supervised Domain Adaptation by Learning Consistent and Contrastive Feature Representations", M. Pérez-Carrasco, **G. Cabrera-Vives**, P. Protopapas, 2021, NeurIPS workshop on Distribution shifts: connecting methods and applications.
- "Towards dynamic ground glass opacity and consolidation voxel classification in COVID-19 CT using Gaussian Mixture Model", C. Vásquez-Venegas, V. Fuentealba, R. Jara, C. G. Sotomayor, V. Castañeda, G. Pereira, S. Härtel, **G. Cabrera-Vives**, 2021, NeurIPS workshop: Medical Imaging meets NeurIPS.
- "Amortized Variational Inference for Type Ia Supernova Light Curves", A. Sánchez, F. Förster, P. Huijse, **G. Cabrera-Vives**, 2021, NeurIPS workshop on Machine Learning and the Physical Sciences.

- "A debiasing framework for deep learning applied to the morphological classification of galaxies", E. Medina, **G. Cabrera-Vives**, 2021, NeurIPS workshop on Machine Learning and the Physical Sciences.
- "Alert Classification for the ALeRCE Broker System: The Real-time Stamp Classifier", R. Carrasco-Davis, E. Reyes, C. Valenzuela, F. Förster, P. A. Estévez, G. Pignata, F. E. Bauer, I. Reyes, P. Sánchez-Sáez, **G. Cabrera-Vives**, S. Eyheramendy, M. Catelan, J. Arredondo, E. Castillo-Navarrete, D. Rodríguez-Mancini, D. Ruz-Mieres, A. Moya, L. Sabatini-Gacitúa, C. Sepúlveda-Cobo, A. A. Mahabal, J. Silva-Farfán, E. Camacho-Iñiquez, L. Galbany, 2021, The Astronomical Journal, 162, 231.
- "Searching for Changing-state AGNs in Massive Data Sets. I. Applying Deep Learning and Anomaly-detection Techniques to Find AGNs with Anomalous Variability Behaviors", P. Sánchez-Sáez, H. Lira, L. Martí, N. Sánchez-Pi, J. Arredondo, F. E. Bauer, A. Bayo, **G. Cabrera-Vives**, C. Donoso-Oliva, P. A. Estévez, S. Eyheramendy, F. Förster, L. Hernández-García, A. M. Muñoz Arancibia, M. Pérez-Carrasco, M. Sepúlveda, and J. R. Vergara, 2021, The Astronomical Journal, 162, 206.
- "The effect of phased recurrent units in the classification of multiple catalogs of astronomical lightcurves", C. Donoso, **G. Cabrera**, P. Protopapas, R. Carrasco-Davis, P. Estévez, 2021, Monthly Notices of the Royal Astronomical Society, 504 (4), 6069.
- "The Automatic Learning for the Rapid Classification of Events (ALeRCE) Alert Broker", F. Förster, **G. Cabrera-Vives**, et.al., 2021, The Astronomical Journal, 161 (5), 242.
- "Alert Classification for the ALeRCE Broker System: The Light Curve Classifier", P. Sánchez-Sáez, I. Reyes, C. Valenzuela, F. Förster, S. Eyheramendy, F. Elorrieta, F. E. Bauer, **G. Cabrera-Vives**, P. A. Estévez, M. Catelan, G. Pignata, P. Huijse, D. De Cicco, P. Arévalo, R. Carrasco-Davis, J. Abril, R. Kurtev, J. Borissova, J. Arredondo, E. Castillo-Navarrete, D. Rodriguez, D. Ruz-Mieres, A. Moya, L. Sabatini-Gacitúa, C. Sepúlveda-Cobo, 2020, The Astronomical Journal, 161 (3), 141.
- "Asteroids' Size Distribution and Colors from HITS", J. Peña, C Fuentes, F Förster, J Martínez-Palomera, **G. Cabrera-Vives**, J.C. Maureira, P. Huijse, P.A. Estévez, L. Galbany, S González-Gaitán, Th. de Jaeger, 2020, The Astronomical Journal, 159 (4), 148.
- "Deep Learning for Image Sequence Classification of Astronomical Events", R.Carrasco-Davis, **G. Cabrera-Vives**, F. Förster, P. Huijse, P. Protopapas, I. Reyes, J. Martínez, and C. Donoso, 2018, Publications of the Astronomical Society of the Pacific, 131 (1004), 108006.
- "Multiband galaxy morphologies for CLASH: a convolutional neural network transferred from CANDELS", M. Pérez-Carrasco, **G. Cabrera-Vives**, M. Martinez-Marin, P. Cerulo, R. Demarco, P. Protopapas, J. Godoy, and M. Huertas-Company, 2018, Publications of the Astronomical Society of the Pacific, 131 (1004), 108002.
- "Systematic Labeling Bias in Galaxy Morphologies", **G. Cabrera-Vives**, C. J. Miller, J. Schneider, 2018, The Astronomical Journal, 156 (6).
- "The delay of shock breakout due to circumstellar material evident in most type II supernovae", F. Förster, T. J. Moriya, J. C. Maureira, J. P. Anderson, S. Blinnikov, F. Bufano, **G. Cabrera-Vives**, et.al., 2018, Nature Astronomy, 2, p. 808-818.

- "Enhanced Rotational Invariant Convolutional Neural Network for Supernovae Detection"; E. Reyes, P. Estévez, I. Reyes, **G. Cabrera-Vives**, P. Huijse, R. Carrasco and F. Förster, 2018 International Joint Conference on Neural Networks, p. 1-8.
- "THE HIGH CADENCE TRANSIENT SURVEY (HITS): Compilation and characterization of light-curve catalogs", J. Martínez, F. Förster, P. Protopapas, J. C. Maureira, P. Lira, **G. Cabrera-Vives**, P. Huijse, L. Galbany, Th. de Jaeger, S. González-Gaitán, G. Medina, G. Pignata, J. San Martín, M. Hamuy, R. R. Muñoz, 2018, The Astronomical Journal, 156 (5), 186.
- "Asteroids in the High Cadence Transient Survey"; J. Peña, C. Fuentes, F. Förster, J.C. Maureira, J. San Martín, J. Littín, P. Huijse, **G. Cabrera-Vives**, P.A. Estévez, L. Galbany, S. González-Gaitán, J. artínez, Th. de Jaeger, M. Hamuy, 2018, The Astronomical Journal, 155(3), 135.
- "Deep-HiTS: Rotation Invariant Convolutional Neural Network for Transient Detection"; **G. Cabrera-Vives**, Ignacio Reyes, Francisco Förster, Pablo Estévez, Juan-Carlos Maureira, 2017, The Astrophysical Journal, 836, 97.
- "The High Cadence Transient Survey (HiTS). I. Survey Design and Supernovae Shock Breakout Constraints"; F. Förster, J. C. Maureira, J. San Martín, M. Hamuy, J. Martínez, P. Huijse, **G. Cabrera-Vives**, L. Galbany, Th. de Jaeger, S. González-Gaitán, J. P. Anderson, H. Kunkarayakti, G. Pignata, F. Bufano, J. Littín, F. Olivares, G. Medina, R. C. Smith, A. K. Vivas, P. A. Estévez, R. Muñoz, and E. Vera, 2016, The Astrophysical Journal, 832, 155.
- "Supernovae detection by using convolutional neural networks"; **G. Cabrera-Vives**, Ignacio Reyes, Francisco Förster, Pablo Estévez, Juan-Carlos Maureira, 2016 International Joint Conference on Neural Networks, p. 251.
- "A Catalog of Visual-like Morphologies in the 5 CANDELS Fields Using Deep Learning"; M. Huertas-Company, R. Gravet, **G. Cabrera-Vives**, P. G. Pérez-González, J. S. Kartaltepe, G. Barro, M. Bernardi, S. Mei, F. Shankar, P. Dimauro, E. F. Bell, D. Kocevski, D. C. Koo, S. M. Faber, D. H. Mcintosh, 2015, The Astrophysical Journal Supplement Series, 221, 8.
- "The morphologies of massive galaxies from z$\sim$3 - Witnessing the 2 channels of bulge growth", M. Huertas-Company, P. G. Pérez-González, S. Mei, F. Shankar, M. Bernardi, E. Daddi, G. Barro, **G. Cabrera-Vives**, A. Cattaneo, P. Dimauro, R. Gravet, 2015, The Astrophysical Journal, 809, 95.
- "Systematic Labeling Bias: De-biasing where Everyone is Wrong"; **G. F. Cabrera**, C. J. Miller, J. Schneider, 2014, 22nd International Conference on Pattern Recognition, p. 4417.
- "Dust-correlated cm wavelength continuum emission from translucent clouds ζ Oph and LDN 1780"; M. Vidal, S. Casassus, C. Dickinson, A. N. Witt, P. Castellanos, R. D. Davies, R. J. Davis, **G. F. Cabrera**, K. Cleary, J. R. Allison, J. R. Bond, L. Bronfman, R. Bustos, M. E. Jones, R. Paladini, T. J. Pearson, A. C. S. Readhead, R. Reeves, J. L. Sievers, A. C. Taylor, 2011, Monthly Notices of the Royal Astronomical Society, 414, 2424.
- "Bayesian Image Reconstruction Based on Voronoi Diagrams"; **G. F. Cabrera**, S. Casassus, N. Hitschfeld, 2008, Astrophysical Journal, 672, 1272.

- "Morphological analysis of the cm-wave continuum in the dark cloud LDN 1622"; S. Casassus, **G. F. Cabrera**, F. Förster, T.J. Pearson, A.C.S. Readhead, C. Dickinson, 2006, Astrophysical Journal, 639, 951.

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Teaching Experience

- Deep Learning, University of Concepción (2021, 2022, 2023)
- Data Science 2: Advanced Topics, University of Concepción (2018, 2019, 2020)
- Fundamentals in Data Science, University of Concepción (2021, 2022, 2023)
- Data Science 1: Introduction to Data Science, University of Concepción (2017, 2018, 2019, 2020, 2021, 2022, 2023)
- Research Methods, University of Concepción (2017, 2018, 2019).
- Discrete Math, University of Concepción (2018, 2019, 2020)
- Creator of the Astroinformatics course at University of Chile (2011, 2012, 2014).

Mentorship

Current Students

- Jorge Saavedra, PhD. in Computer Science. Working on out-of-domain detection for astronomy data. University of Concepción, estimated graduation date: 2028.
- Luis González, PhD. in Computer Science. Working on foundational models for astronomy data. University of Concepción, estimated graduation date: 2027.
- Alejandra Fernández, PhD. in Computer Science. Working on detection of exomoons using direct imaging. University of Concepción, estimated graduation date: 2026.
- Joaquín Cárdenas, M. Sc. in Astronomy. Working on debiasing algorithms for space telescope surveys. University of Concepción, estimated graduation date: 2025.
- Martina Cádiz, M. Sc. in Computer Science. Working on Bayesian deep attention mechanisms. University of Concepción, estimated graduation date: 2023.
- Daniel Moreno, M. Sc. in Computer Science. Working on machine learning methods for real time multi-stream processing. University of Concepción, estimated graduation date: 2023.

Alumni

- Esteban Medina, "A Debiasing Framework for Deep Learning Applied to the Morphological Classification of Galaxies", thesis for M.Sc. in Computer Science, University of Concepción, 2023.

- Valentina Fuentealba, “Domain Adaptation Applied To The Classification Of Covid-19 Chest CT Images”, thesis for M. Sc. in Electrical Engineering, University of Concepción, 2023.
- Alejandra Fernández, ”Generative Adversarial Neural Networks for the generation of High Resolution Galaxy Images”, thesis for M.Sc. in Computer Science, University of Concepción, 2023.
- Pablo Meza, ”Location and count of trees in areas of forest interest through georeferenced multispectral aerial images”, thesis for Industrial Engineering degree, University of Concepción, 2022.
- Ricardo Hernández, Çomparison of deep learning models for the classification and segmentation of areas of forest interest”, thesis for Industrial Engineering degree, University of Concepción, 2022.
- Mabel Vidal, “Machine learning classification of single cell RNA-seq across different types of cancer”, thesis for Ph.D. in Computer Science, University of Concepción, 2022.
- César Bolivar, “Deep domain adaptation for astronomical images”, thesis for M.Sc. in Computer Science, University of Concepción, 2022.
- Alexis Sánchez, “Bayesian parameter estimation in light curves using amortized variational inference”, thesis for M.Sc. in Computer Science, University of Concepción, 2021.
- Constanza Vásquez, “Deep image inpainting for automatic brain tumor extraction using weak levels”, thesis for M.Sc. in Computer Science, University of Concepción, 2021.
- Monserrat Martínez, “Galaxy population identification with a phylogenetic approach”, thesis for M.Sc. in Astronomy, University of Concepción, 2020.
- Manuel Pérez, “Adversarial variational domain adaptation for semi-supervised image classification”, thesis for M.Sc. in Computer Science, University of Concepción, 2019.
- Cristóbal Donoso, “An hybrid unsupervised model to detect anomalous light curves”, thesis for M.Sc. in Computer Science, University of Concepción, 2019.
- Aldo Concha, “Customer rating of a financial institution using data mining techniques on an incomplete dataset”, thesis for M.Sc. in Computer Science, University of Concepción, 2019.
- Rodrigo Carrasco, “Image sequence simulation and deep learning for astronomical object classification”, thesis for M.Sc. in Electrical Engineer thesis, University of Chile, 2019.
- Ignacio Reyes, “Monitoring and learning of neural networks using information measures and their application in the detection of transient astronomical events”, thesis for M.Sc. in Electrical Engineer thesis, University of Chile, 2019.
- Éric Fernández, “Development of framework to query light curves of astronomic objects from different data sources” thesis for Computer Engineering degree, University of Concepción, Chile, 2020.
- Joaquín Cárdenas, “Prediction of Potential Real Estate Customers for Aitué, Based on Historical Data of its Clients”, thesis for Computer Engineer degree, University of

Concepción, Chile, 2018.

- Diego Mesa, "Design and implementation of a prototype of a non-relational database with efficient flow management in the context of astronomical alerts", thesis for Computer Engineer degree, University of Concepción, Chile, 2018.
- Fernando Caro, "Algorithms for superresolution in astronomical images", thesis for M.Sc. in Computer Science, University of Chile, 2016.
- Nicolás Miranda, "Molecular line association rules", thesis for Computer Engineering, University of Chile, 2014.

Program Committees

- Unveiling the dynamic universe: cosmic streams in the era of Rubin, 2023.
- International Astroinformatics Conference, 2019.
- Astronomical Data Analysis Software and Systems (ADASS), 2017.
- La Serena School for Data Science: Applied Tools for Data-driven Sciences, 2017.
- Third La Serena School for Data Science: Applied Tools for Astronomy, 2015 (SOC co-chair)
- Astroinformatics 2014
- Second La Serena School for Data Science: Applied Tools for Astronomy, 2014 (SOC co-chair)
- Third CMM Pucón Symposium 2013: Advanced Tools Applied to Frontier Astronomy, BioMedicine and Massive Data-driven Sciences
- First La Serena School for Data Science: Applied Tools for Astronomy, 2013 (SOC chair)
- Pucón Symposium 2011: Advanced Mathematical Tools for Frontier Astronomy and other Massive Data-driven Sciences

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Awards

- **Klaus Tschira Guest Professorship Program Heidelberg Institute for Theoretical Studies (HITS), 2024**
- **University of Concepcion Academic Excellence Award, 2018, 2023.** Award given to the best faculty at University of Concepción.
- **CONICYT Doctoral Internship Grant, 2012.**
- **CONICYT Scholarship for Ph.D. Studies in Chile, 2011.**
- **SCAT Mobility Grant, 2008.** Funding for working on a research project at an international institution (University of Bristol, UK).

Languages

Spanish	Native
English	Fluent
Portuguese	Intermediate