Oscar Andrés Cartagena Villalobos, Ph.D.

Postdoctoral Researcher in Computational Intelligence & Data-Driven Optimization

Department of Electrical Engineering, Universidad de Chile, Santiago, Chile

oscar.cartagena@ug.uchile.cl · +56 9 64696411 · LinkedIn · Google Scholar · ORCID: 0000-0002-5008-4180

Scopus ID: 57205546191 · WoS ID: GVU-1567-2022

Research Interests

Computational Intelligence, Advanced & Robust Control, Evolving Intelligent Systems, Machine Learning for Dynamic Systems & Non-Stationary Environments, Model Predictive Control, Fuzzy Optimization, Smart Microgrids, Renewable Energy Integration, and Data-Driven Optimization.

Education

Ph.D. in Electrical Engineering Jan. 2024
Universidad de Chile, Santiago, Chile *Academic Distinction Award*
Dissertation: Design of evolving fuzzy prediction intervals.

M.Sc. in Engineering Sciences, Mention in Electrical Engineering Jul. 2019
Universidad de Chile, Santiago, Chile

B.Sc. in Electrical Engineering 2017
Universidad de Chile, Santiago, Chile

Academic & Research Appointments

Postdoctoral Researcher Apr. 2025 – Present
Universidad de Chile Santiago, Chile
Project: Fondecyt Postdoctorado N°3250509 – "Optimal planning of smart ports based on computational intelligence and evolving systems."

- Principal Investigator leading research on data-driven predictive optimization, intelligent control, and computational intelligence applied to maritime logistics and smart ports.

Postdoctoral Researcher Mar. 2024 – Mar. 2025
Universidad de Chile Santiago, Chile
Project: ANID/ATE230035 "Sea Harbour Operation with Renewable Energies (SHORE)"

- Formulated robust control models and predictive algorithms for integrating renewable microgrids into port infrastructure operations.

Visiting Ph.D. Scholar Dec. 2022 – Jul. 2023
Politecnico di Milano (Host: Prof. Manuel Roveri) Milan, Italy

- Developed non-stationary evolving fuzzy interval predictors for dynamic adaptive control applications.

Visiting Ph.D. Scholar Apr. 2022 – Jun. 2022
University of Ljubljana (Host: Prof. Igor Škrjanc) Ljubljana, Slovenia

- Researched about evolving fuzzy prediction models and its application for fault detection in thermal exchangers.

Research Grants & Funded Projects

As Principal Investigator

- **ANID FONDECYT Postdoctorado N°3250509** 2025 – 2028
  Project Title: Optimal planning of smart ports based on computational intelligence and evolving systems.
  Role: Principal Investigator (PI) **Funded by ANID Chile**

As Research Associate / Co-Investigator

- **ANID/FONDECYT N°1260354** 2026 – 2030
  Project Title: AI-Based Control Strategies for Water-Energy-Foods Microgrids in Rural Communities.
  Role: Co-Investigator (CI) **Funded by ANID Chile**

PhD Fellowships

- **ANID-PFCHA/Doctorado Nacional/2020-21200709** – Doctoral scholarship 2020 – 2024
- **ANID FONDAP 1522A0006** – Solar Energy Research Center (SERC-Chile) 2022 – 2024
- **ANID/FONDECYT 1220507** – Distributed Predictive Control Strategies based on Evolving Prediction Intervals for Energy-Water Microgrids 2022 – 2024
- **ANID PIA AFB230002** – Instituto Sistemas Complejos de Ingeniería (ISCI) 2019 – 2024

Teaching Experience

University Lecturer / Invited Professor

Invited Professor – Universidad de Chile Mar. 2025 – Present

- *Course:* **EL4105 Advanced Control Systems** (Semester 2026-2)
  Delivered lectures, and evaluated undergraduate students in the Electrical Engineering program.

- *Course:* **EL7012 Intelligent Control** (Semester 2025-1)
  Adapted and modernized existing syllabus, delivered lectures, and evaluated undergraduate and graduate students in the Electrical Engineering & Master of Data Science programs.

K-12 Outreach & Specialized Instruction

- **Professor**, 4th Indigenous Summer School, Universidad de Tarapacá Jan. 2026
  Course: Renewable Energy and the Internet of Things
  (High school level).
- **Professor**, PentaUC Program, Pontificia Universidad Católica de Chile Aug. 2022 – Dec. 2022
  Course: Statistics and Probability for Decision Making
  (High school level).
- **Professor**, Summer School, Universidad de Chile Jan. 2021 – Jul. 2022
  Course: Applied Engineering
  (Delivered 5 consecutive terms: Summer 2021, May 2021, Oct 2021, Summer 2022, and Winter 2022).

Teaching Assistantships

Teaching Assistant & Laboratory Instructor – Universidad de Chile 2016 – 2022

- *Advanced Control Laboratory* (Semesters 2017-1, 2017-2, 2018-1, 2018-2, 2019-1)
- *Predictive Control* (Semesters 2019-2, 2020-2, 2021-2)
- *Intelligent Control* (Semester 2020-1)
- *Seminar on Automatic Control* (Semester 2019-2)
- *Advanced Control Systems* (Semesters 2016-2, 2017-1)

Research Mentorship – Student Guidance & Thesis Advisory

Ph.D. Students

- **Co-Advisory** **2025 – Present**
  Thesis Project: Karina Montaluisa – A predictive modeling strategy for estimating deviations in ship arrival times at seaports using deep learning, and its application to a robust energy management system. (Formal Advisor: Prof. Doris Sáez)
- **Co-Advisory** **2024 – Present**
  Thesis Project: Alvaro Endo – User Information Capture based AI for Control Design and Decision Making. (Formal Advisor: Prof. Doris Sáez)
  *Outcome:*Co-Advisory resulted in the publications of 1 conference article.
- **Student Mentorship** **2025 – Present**
  Thesis Project: Luis Jiménez – Energy Management System based on Model Predictive Control and Reinforcement Learning for Seaport Microgrids. (Formal Advisor: Prof. Doris Sáez)
- **Student Mentorship** **2024 – Present**
  Thesis Project: Javier Ocaranza – Designing energy-water management systems: Sustainable, coordinated, and explainable strategies. (Formal Advisor: Prof. Doris Sáez)
  Outcome: Mentorship resulted in the publications of 1 journal article.

M.Sc. Students

- **Co-Advisory** **2025 – Present**
  Thesis Project: Thomas Aguilera – Uncertainty Quantification based on Neuromorphic Models. (Formal Advisor: Prof. Doris Sáez)
  Outcome: Co-Advisory resulted in the publications of 1 conference article.
- **Student Mentorship** **2025 – Present**
  Thesis Project: Hayter Cortes – Explainable Artificial Intelligence for the Coordinated Management of Energy-Water Microgrids. (Formal Advisor: Prof. Alex Navas-Fonseca)
  Outcome: Mentorship resulted in the publication of 1 conference article.
- **Student Mentorship** **2024 – 2026**
  Thesis Project: Kevin Chamorro – Hierarchical predictive energy and demand management for multiple networked microgrids with green hydrogen storage and local energy trading. (Formal Advisor: Prof. Alex Navas-Fonseca)
  Outcome: Mentorship resulted in the publications of 1 conference article.
- **Student Mentorship** **2024 – 2025**
  Thesis Project: Claudio Zuñiga – A Water-Energy-Food Management System Based on Reinforcement Learning Algorithms. (Formal Advisor: Prof. Doris Sáez)
  Outcome: Mentorship resulted in the publications of 1 conference article.
- **Student Mentorship** **2023 – 2024**
  Thesis Project: Benjamín Moreno – Tuning Strategies and Stability Analysis for Distributed Predictive Secondary Control for Microgrids. (Formal Advisor: Prof. Doris Sáez)
  Outcome: Mentorship resulted in the publications of 1 conference article.
- **Student Mentorship** **2023 – 2024**
  Thesis Project: Luis Jiménez – Energy-Water Management and Coordination for Energy-Water Microgrids. (Formal Advisor: Prof. Doris Sáez)
  Outcome: Mentorship resulted in the publications of 1 conference proceeding and 1 journal article.
- **Student Mentorship** **2023 – 2024**
  Thesis Project: Javier Ocaranza – Water and Energy Management System for Open-Field Crops Using Robust Predictive Control. (Formal Advisor: Prof. Doris Sáez)
  Outcome: Mentorship resulted in the publications of 2 conference articles.
- **Student Mentorship** **2023 – 2024**
  Thesis Project: Felipe Meyer – Robust Fuzzy Predictive Control of Heat Transfer Fluid Temperature in Solar Power Plant Receivers. (Formal Advisor: Prof. Doris Sáez)
- **Student Mentorship** **2020 – 2022**
  Thesis Project: Alvaro Endo – Water-Energy Management System for a Greenhouse of Rural Indigenous Communities. (Formal Advisor: Prof. Doris Sáez)
  Outcome: Mentorship resulted in the publications of 2 conference proceedings and 1 journal article.

Publications

Peer-Reviewed Journal Articles

1. J. Ocaranza, **O. Cartagena**, A. Endo, L. Daniele, C. Wagner, D. Sáez, "Fuzzy-optimisation-based water salinity management for crop irrigation in water-energy-food microgrids," *Applied Soft Computing*, vol. 204, part B, 116474, 2026. DOI: 10.1016/j.asoc.2026.116474 **[JIF 7.8, Q1 in Computer Science]**

2. D. Sosa, L. G. Marín, J. L. Uribe, **O. Cartagena**, A. Navas-Fonseca, J. Gómez, C. Burgos-Mellado, H. K. Morales Paredes, L. De Oro Arenas, J. C. Cebrian, A. Llor, J. Vuelvas, "Transactive microgrid with distributed energy resources based on blockchain technology," *Sustainable Energy, Grids and Networks*, vol. 48, 102520, 2026. DOI: 10.1016/j.segan.2026.102520 **[JIF 5.7, Q1 in Engineering, Electrical & Electronic]**

3. L. Jiménez-Verdugo, **O. Cartagena**, J. Ocaranza, A. Navas-Fonseca, R. Cárdenas-Dobson, C. Ahumada, D. Sáez, "Coordination and management of multiple energy-water microgrids based on a fuzzy predictive control strategy," *Journal of Cleaner Production*, vol. 538, 147410, 2026. DOI: 10.1016/j.jclepro.2025.147410 **[JIF 10.7, Q1 in Engineering, Environmental]**

4. R. Canessa, R. Santibañez, C. Ahumada, P. Mendoza-Araya, **O. Cartagena**, D. Sáez, "Renewable Energies Integration in Electrification for Chilean Smartports – Challenges and Case Study," *IEEE Access*, vol. 13, pp. 94437–94452, 2025. DOI: 10.1109/ACCESS.2025.3574632 **[JIF 4.2, Q2 in Computer Science]**

5. **O. Cartagena**, F. Trovò, D. Sáez, "A multivariate approach for fuzzy prediction interval design and its application for a climatization system forecasting," *Expert Systems with Applications*, vol. 255, part C, 124715,

2024. DOI: 10.1016/j.eswa.2024.124715 [**JIF 9.4, Q1 in Computer Science**]

6. **O. Cartagena**, F. Trovò, M. Roveri, D. Sáez, "Evolving Fuzzy Prediction Intervals in Nonstationary Environments," *IEEE Transactions on Emerging Topics in Computational Intelligence*, vol. 8, no. 1, pp. 903–916, 2024. DOI: 10.1109/TETCI.2023.3296486 [**JIF 6.0, Q2 in Computer Science**]

7. **O. Cartagena**, M. Ožbot, D. Sáez, I. Škrjanc, "Evolving fuzzy prediction interval for fault detection in a heat exchanger," *Applied Soft Computing*, vol. 145, 110625, 2023. DOI: 10.1016/j.asoc.2023.110625 [**JIF 7.8, Q1 in Computer Science**]

8. A. Endo, S. Parra, **O. Cartagena**, D. Sáez, C. Muñoz, J.I. Huircan, "Energy-Water Management System Based on MPC for a Greenhouse in a Mapuche Indigenous Community," *Applied Sciences*, vol. 13, no. 8, 4734, 2023. DOI: 10.3390/app13084734 [**JIF 2.9, Q2 in Engineering, Multidisciplinary**]

9. **O. Cartagena**, S. Parra, D. Muñoz-Carpintero, L. G. Marín, D. Sáez, "Review on Fuzzy and Neural Prediction Interval Modelling for Nonlinear Dynamical Systems," *IEEE Access*, vol. 9, pp. 23357–23384, 2021. DOI: 10.1109/ACCESS.2021.3056003 [**JIF 4.2, Q2 in Computer Science**]

Peer-Reviewed International Conference Proceedings

1. V. Cala, L. Martinez Z., **O. Cartagena**, L. G. Marin, J. Vuelvas, "Model Predictive Control-Based Energy Management for Hybrid Microgrids with Battery Storage and Green Hydrogen Integration," *2026 IEEE International Conference on Automation/XXVII Congress of the Chilean Association of Automatic Control (ICA-ACCA)*, Concepción, Chile, 2026, pp. 1-6.

2. H. Cortés, J. Ocaranza, **O. Cartagena**, A. Navas-Fonseca, D. Sáez, "Explainable Artificial Intelligence for the Coordinated Management of Energy-Water Microgrids," *2026 IEEE Latin American Conference on Computational Intelligence (LA-CCI)*, Lima, Peru, 2026, pp. 1-6.

3. T. Aguilera, **O. Cartagena**, A. Navas-Fonseca, A. Núñez, D. Sáez, "Two-Stage Prediction Intervals via Spiking Neural Network-Gated State-Specific Residual Models for Solar Power Generation," *2026 International Joint Conference on Neural Networks (IJCNN)*, Maastricht, Netherlands, 2026, pp. 1-6.

4. A. Endo, **O. Cartagena**, C. Wagner, D. Sáez, "User Preference based Fuzzy Predictive Control for Multi-room Climate Control Systems," *2026 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, Maastricht, Netherlands, 2026, pp. 1-7.

5. C. Zúñiga-Bauerle, **O. Cartagena**, J. Ocaranza, L. Daniele, M. Orchard, D. Sáez, "A novel sustainable approach of reinforcement learning control for a water-energy-food microgrid," *2025 IEEE Latin American Conference on Computational Intelligence (LA-CCI)*, Mexico City, Mexico, 2025, pp. 1–6.

6. K. Chamorro-Cáceres, A. Navas-Fonseca, J. S. Gomez, C. Ahumada, **O. Cartagena**, L. G. Marín, D. Sáez, G. Aguila, "Hierarchical energy management system with demand side management for green hydrogen-based microgrids," *2024 IEEE 42nd Central America and Panama Convention (CONCAPAN XLII)*, San Jose, Costa Rica, 2024, pp. 1–6.

7. B. Moreno Vásquez, **O. Cartagena**, J. Ocaranza, A. Navas-Fonseca, D. Sáez Hueichapan, R. Cardenas Dobson, "Multi-Objective Distributed Predictive Secondary Control Design for Frequency Restoration and Active Power Sharing of Microgrids," *IECON 2024 - 50th Annual Conference of the IEEE Industrial Electronics Society*, Chicago, IL, USA, 2024, pp. 1–6.

8. J. Ocaranza, **O. Cartagena**, D. Sáez, A. Navas-Fonseca, "Robust Predictive Control based on Evolving Intervals for Greenhouse Energy Management," *IECON 2024 - 50th Annual Conference of the IEEE Industrial Electronics Society*, Chicago, IL, USA, 2024, pp. 1–7.

9. L. Jiménez, **O. Cartagena**, J. Ocaranza, A. Navas-Fonseca, D. Sáez, "Fuzzy Interval-Based Fault Detection for Water Consumption Profiles From Isolated Communities," *2024 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, Yokohama, Japan, 2024, pp. 1–8.

10. **O. Cartagena**, D. Sáez, I. Škrjanc, "Two-Stages Interval Fuzzy Model for Forecasting Wind Power in Microgrids," *2024 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, Yokohama, Japan, 2024, pp. 1–8.

11. L. Rojas, J. Ocaranza, **O. Cartagena**, D. Sáez, L. Daniele, C. Ahumada, "Robust Energy-Water Management System with Prediction Interval Based on Deep Learning," *2023 International Joint Conference on Neural Networks (IJCNN)*, Gold Coast, Australia, 2023, pp. 1–9.

12. A. Endo, **O. Cartagena**, J. Ocaranza, D. Sáez, C. Muñoz, "Fuzzy and Neural Prediction Intervals for Robust Control of a Greenhouse," *2022 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, Padua, Italy, 2022, pp. 1–8.

13. A. Endo, **O. Cartagena**, D. Sáez, D. Muñoz-Carpintero, "Predictive Control based on Fuzzy Optimization for Multi-Room HVAC Systems," *2020 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, Glasgow, UK, 2020, pp. 1–8.

14. D. Muñoz-Carpintero, S. Parra, **O. Cartagena**, D. Sáez, L. G. Marín, I. Škrjanc, "Fuzzy Interval Modelling based on Joint Supervision," *2020 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, Glasgow, UK, 2020, pp. 1–8.

15. T. Lara, **O. Cartagena**, S. Céspedes, D. Sáez, "Robust Model-based Predictive Control for a Cooperative Cycling Cyber-physical System," *2019 IEEE CHILECON*, Valparaiso, Chile, 2019, pp. 1–6.

16. **O. Cartagena**, D. Muñoz-Carpintero, D. Sáez, "A Robust Predictive Control Strategy for Building HVAC Systems Based on Interval Fuzzy Models," *2018 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE)*, Rio de Janeiro, Brazil, 2018, pp. 1–8.

Honors & Awards

- **Academic Distinction Award (Ph.D. Program)**,
  Escuela de Postgrado y Educación Continua, FCFM, Universidad de Chile 2024
- **2nd Place in Poster Competition**,
  XIII IEEE Latin American Summer School on Computational Intelligence (EVIC), Valparaiso, Chile 2017
- **Outstanding Engineering Student Award**, Escuela de Ingeniería y Ciencias, Universidad de Chile 2017
- **Outstanding Engineering Student Award**, Escuela de Ingeniería y Ciencias, Universidad de Chile 2016

Academic Service & Professional Activities

Journal Ad-Hoc Reviewer

Applied Soft Computing, *Knowledge-Based Systems*, *IEEE Transactions on Smart Grid*, *Journal of Cleaner Production*, *Smart Agricultural Technology*, *Heliyon*, *World Electric Vehicle Journal*, *Aerospace Science and Technology*, *Agriculture*, *Systems and Soft Computing*, *Energies*, *Sustainability*, *Applied Sciences*.

Conference Peer Reviewer

IEEE International Joint Conference on Neural Networks (IJCNN 2024, 2025, 2026), *IEEE CHILECON* (2021, 2023, 2025), *European Control Conference* (ECC 2020).

Technical Skills

- **Programming & Simulation:** MATLAB, Simulink, Python.
- **Languages:** Spanish (Native), English (Full Professional Proficiency).