

CURRICULUM VITAE

Claudio URREA



: +56 (2) 2718 33 50

e-mail : claudio.urrea@usach.cl



<https://www.researchgate.net/profile/Claudio-Urrea>

<https://www.scopus.com/authid/detail.uri?authorId=24078008600>

<https://orcid.org/0000-0001-7197-8928>

<https://die.usach.cl/academicos/claudio-urree-onate>

<https://cide.usach.cl/quienes-somos>

<https://www.linkedin.com/in/claudio-urree-prof-titular-dr-ing-a96a10b1/?msgOverlay=true>

Educational and Professional background

- 2005 Post-Doctoral Degree. Research topic: *Diagnostic de Systèmes Tolérants aux Défauts* (Diagnosis of Fault-Tolerant Systems). Université d'Aix-Marseille III, Marseilles, France.
- 2001 - 2003 *Docteur in Automatique et Productique*. Laboratoire d'Automatique de Grenoble (LAG). Institut National Polytechnique de Grenoble (INPG). France.
Specialization in: *Automatique et Productique* (Automation and Production). ★ Distinction: *Très Honorable*. Degree exam passed with maximum grade.
- 1998 - 2003 PhD in Engineering Sciences. Electrical Engineering Department (DIE). University of Santiago of Chile (USACH). Specialization in: Automation. ★ Distinction: Approved with highest honors. Degree exam passed with maximum grade.
- 1997 - 1999 Master in Engineering Sciences. DIE. USACH. Chile. Specialization in: Electrical Engineering. Degree exam passed with maximum grade.
- 1991 - 1999 Diploma of Electrical Engineering. DIE. USACH. Chile. Best grade point average of all the Civil Engineering courses of specialization from the Faculty of Engineering. Degree exam passed with maximum grade.
- 1991 - 1996 BS in Engineering Sciences. DIE. USACH. Chile.
- 1988 - 1989 Diploma of Computer Systems Analyst. Instituto de Enseñanza Superior Gabriela Mistral. Iquique. Chile.

1987 -1988 Diploma of Electrical and Electronics Equipment and Systems Mechanic. Chilean Air Force.

Projects

2021 - 2024 Project: "*Desarrollo de un sistema robotizado autónomo que permita la identificación, seguimiento e impacto selectivo de rocas para el mejoramiento de las operaciones en moliendas mineras*" (Development of an autonomous robot system for identification, trajectory tracking and selective impact of rocks to improve operations in mining grinding). Fund for Promotion of Scientific and Technological Development (FONDEF). FONDEF IDeA I+D ID21I10087. Chile. Position: Alternate Director.

2019 - to date Project: "*Proveedor de Ensayos de Aptitud*" (Proficiency Testing Provider). Code: IGE-5047.USACH. Chile. Position: Director.

2019 Project: "*Programa de Innovación en Manufactura Avanzada*" (Advanced Manufacturing Innovation Program): *Manipulador Robótico Reconfigurable Dotado de Controladores, Tolerante a Fallas*" (Reconfigurable Manipulator Robot Equipped with Fault-Tolerant, Smart Controllers). CORFO 18PTECMA-102646. Chile. Position: Director.

2018 Project: "*Desempeño Basal USA1799*" (Base Performance USA1799). Code: 1799.12. USACH. Chile. Position: Investigator.

2017 - 2019 Project: "*CIDE Capacita*". (CIDE Trains). Code: CAP-IGE-1305. USACH. Chile. Position: Responsible Investigator.

2017 - 2019 Project: "*Plataforma para Investigación Avanzada en Robots Industriales Tolerantes a Fallas Bajo Condiciones Extremas de Funcionamiento y Comunicación*" (Platform for Advanced Research on Fault Tolerant Industrial Robots under Extreme Working and Communication Conditions). Multidisciplinary Program for the Improvement and Creation of Technological Capacities to Enable Innovation and Entrepreneurship. Modality: Research and Development for Innovation. CORFO 14ENI2-26905. Chile. Position: Responsible Investigator.

2017 - 2018 Project: "*Innovaciones Docentes para el “Aprendizaje Inverso” de La Robótica Industrial en Pre- y Post-grado*" (Teaching innovations for the Flipped Learning of Industrial Robotics at Undergraduate and Graduate Levels). Teaching innovation projects for developing subjects

- based on flipped learning. CORFO 14EN12-26905. Chile. Position: Responsible Investigator.
- 2017 - 2018 Project: "*Aprender Inglés Aprendiendo Robótica Industrial*" (Learning English through Industrial Robotics). Program for the Incorporation of English into the Classroom. CORFO 14EN12-26905. Chile. Position: Responsible Investigator.
- 2017 - 2018 Project: "*Aplicando Control Avanzado en Forma Colaborativa*" (Applying Advanced Control Collaboratively). Sheet number: 127-2016. Teaching Innovation Project. *Unidad de Innovación Docente* (Teaching Innovation Unit) (UNIE). USACH. Chile. Responsible Co-Investigator.
- 2017 Project: "*Desempeño Basal USA155*" (Base Performance USA1755). USACH. Chile. Position: Investigator.
- 2016 - 2017 Project: "*Post-Doctorando en Sistemas Tolerantes a Fallas*" (Post-doctorate in Failure-Tolerant Systems). Vicerrectoría de Investigación, Desarrollo e Innovación (VRIDEI). USACH. Chile. Position: Director.
- 2016 Project: "Consortium of Chilean Engineering Faculties to Foster Education Engineering, Applied Research, Innovation and Entrepreneurship", "New Engineering for 2030". Consortium: University of Santiago of Chile, Universidad de Concepción & Pontificia Universidad Católica de Valparaíso. CORFO 14EN12-26905. Chile. Position: Program Academic Director: Technology marketing and Entrepreneurship.
- 2016 Project: "*Desempeño Basal USA1498*" (Base Performance USA1498). Code: 1498.22. USACH. Chile. Position: Investigator.
- 2015 - 2016 Project: "*Evaluación de Impacto de Innovaciones en la Docencia Universitaria: Evaluación de la construcción de conocimiento desarrollado por estudiantes del área de robótica industrial del DIE-USACH mediante el uso de material multimedial*" (Evaluation of the impact of innovation on university teaching: Experiencing Knowledge Construction of Students in the Field of Industrial Robotics of the DIE-USACH using multimedia material). Educational Innovation Unit (UNIE). USACH. Chile. Position: Director.
- 2015 - 2016 Project: "*Fortalecimiento del Programa de Doctorado en Automática*" (Strengthening of the Doctorate in Automation Program). USACH. Chile. Position: Responsible Investigator.

- 2015 Project: "*Desempeño Basal USA1498*" (Base Performance USA1498). Code: 1498.08. USACH. Chile. Position: Investigator.
- 2014 - 2015 Project: "Consortium of Chilean Engineering Faculties to Foster Education Engineering, Applied Research, Innovation and Entrepreneurship", "New Engineering for 2030". Consortium: University of Santiago of Chile, Universidad de Concepción & Pontificia Universidad Católica de Valparaíso. CORFO 14ENI2-26905. Chile. Position: Program Academic Director: Applied R&D, Innovation, Entrepreneurship and Technology transfer.
- 2014 - 2015 Project: "*Pasantía Académica Convenio de Desempeño UBB1203*" (Academic Internship by Performance Agreement UBB1203), USACH. Chile. Position: Responsible Investigator.
- 2014 Project: "*Desempeño Basal USA1298. Hacia una Cultura de Indicadores de Desempeño en Educación Superior*" (Base Performance USA1298. Towards a Culture of Performance Indicators in Higher Education). USACH. Chile. Position: Investigator.
- 2013 - to date Project: "CIDE Metrología" (CIDE Metrology). Code: IGE-4299. USACH. Chile. Position: Responsible investigator.
- 2013 - 2014 Project: "*Post-Doctorando en Sistemas Tolerantes a Fallas*" (Post-doctorate in Failure-Tolerant Systems). VRIDEI. USACH. Chile. Position: Director.
- 2013 - 2014 Project: "*Diseño e Implementación de un Sistema de Comunicaciones Tolerantes a Fallas*" (Design and Implementation of a Fault-tolerant Communication System). Technology Transfer Department (DTT), Code: DTT-701. VRIDEI. USACH. Chile. Position: Director.
- 2013 - 2014 Project: "Design and Implementation of a New 7 DOF Redundant Robotic Manipulator for Fault-Tolerant Industrial and Mining Systems". Fund for Promotion of Scientific and Technological Development (FONDEF). FONDEF CA12I10167. Chile. Position: Director.
- 2013 - 2014 Project: "*Aprendiendo con la Robótica Industrial Entretenida*" (Learning with Entertaining Industrial Robotics). Sheet number: 005-2012. Teaching Innovation Project. USACH. Chile. Position: Responsible investigator.
- 2013 Project: "*Validación del Diseño e Implementación de Nuevas Técnicas de Envío y Recepción de Información para Sistemas de Comunicaciones Tolerantes a Fallas*" (Validation of the Design and

Implementation of New Techniques for Sending and Receiving Information from Failure-tolerant Communication Systems). Chilean Economic Development Agency, "Applied R&D Profile". CORFO 13IDL1-18267. Chile. Position: Director.

- 2012 - to date Project N° 973: "*CIDE: Metrología Eléctrica y Diseño de Instrumentos*" (CIDE: Electrical Metrology and Instrument Design). CC: 11 PG: 75 SUB-PG 4 item: 1.11. USACH. Chile. Position: Responsible investigator.
- 2007 - 2009 Project: "*Desarrollo e Implementación de un Simulador Gráfico de un Robot Bípedo de 12 Grados de Libertad para el estudio de la Estabilidad Orbital de la Caminata Antropomórfica*" (Development and Implementation of a Graphic Simulator for a 12-DOF Biped Robot for the study of Antropomorphic walk orbital stability). Technological and Scientific Research Department (DICYT). Code: 060713UO. USACH. Chile. Position: Responsible investigator.
- 2007 - 2009 Project: "*Desarrollo de Estrategias de Estimación de Parámetros y Control de Estabilidad para Robots Bípedos con Múltiples Grados de Libertad a través de Modelos Conexionistas y Teoría de Conjuntos*" (Development of Strategies for Estimation of Stability Parameters and Control of Multiple-DOF Biped Robots by Connectionist Models and Set Theory". DICYT. Code: 060713JD. USACH. Chile. Position: Co-Investigator.
- 2006 - 2007 Project: "*Vehículos Aéreos Autónomos para Exploración Geofísica y de Recursos Naturales*" (Autonomous Aerial Vehicles for Geophysical and Natural Resources Exploration). FONDEF. Code: D04I1084. Chile. Position: Advanced Control Investigator.
- 2006 - 2007 Project: "*Diseño e Implementación de un Simulador Gráfico de un Robot Bípedo de 12 Grados de Libertad para el estudio de la Estabilidad Orbital de la Caminata Antropomórfica*" (Development and Implementation of a Graphic Simulator for a 12-DOF Biped Robot for the study of Antropomorphic walk orbital stability). DICYT. Code: 060613UO. USACH. Chile. Position: Responsible Investigator.
- 2003 - 2005 Project: "*Diagnosticque de Systèmes Tolérants aux Défauts*" (Diagnostic of Fault-tolerant Systems). *Centre National de la Recherche Scientifique* (CNRS). France. Description: Development of new failure and control diagnosis theories for active suspension of vehicles.
- 2001 - 2003 Project: "*ROBEA. Robotique et Entités Artificielles*" (Robotics and Artificial Entities), "Control de la caminata y de la carrera de robots bípedos". Development of new control theories. Creation of a simulator

to validate scientific research works before implementing control laws in a real biped robot called "Rabbit". CNRS. France. Position: Investigator.

Conceded Patents

- 2026 John Kern, **Claudio Urrea**, Guillermo González, and Harold Potter. "*Sistema Robotizado Autónomo y Método de Identificación, Seguimiento e Impacto de Rocas para Molienda Minera*" (Autonomous Robotic System and Method for Identification, Tracking, and Impact of Rocks for Mining Grinding). Invention patent requested to the National Institute of Industrial Property (INAPI), Chile. Request: 202403413. Register: 72.954. Request Date: November 7, 2024. Concession Date: March 10, 2026. Expiration Date: November 7, 2044.
<https://buscadorpatentes.inapi.cl/UI/MainSearch.aspx?id=SdUUwBA8oqMxpv7PwbTGmTjmOhe1g/IVK+c15mtUcEo=>
- 2019 **Claudio Urrea** and J. Kern "*Método y Sistema Tolerante a Fallas para Controlar un Robot Manipulador SCARA con Redundancia Rotacional y Prismática Combinadas y Robot Manipulador SCARA Utilizado en dicho Método y Sistema*" (Fault-tolerant method and system for controlling a SCARA manipulator robot with combined rotational and prismatic redundancy, and SCARA manipulator robot used in said method and system). Invention patent requested to the National Institute of Industrial Property (INAPI), Chile. Request: CL1829-2016. Register: 58.120. Request Date: July 19, 2016. Concession Date: September 12, 2019. Expiration Date: July 7, 2036.
<http://buscadorpatentes.inapi.cl/UI/MainSearch.aspx?id=v8WAWuiKnmY5EqjL87l5fS0HKd6idbNFSLS2Hp6KQ/A=>

Publications List

Publications in WoS Indexed Journals (Thomson Reuters)

- 2026 **Claudio Urrea**. "A Simulation-Based Framework for Fatigue-Aware Task Reallocation in Human-Robot Collaboration: Software Verification with 1000-Episode Digital Twin", IEEE Access, Early Access, pp. 1-19. Electronic ISSN: 2169-3536.
DOI: 10.1109/ACCESS.2026.3681728
<https://ieeexplore.ieee.org/document/11475718>
- 2026 **Claudio Urrea**. "Industrial Robotics and Adaptive Control Systems in STEM Education: Systematic Review of Technology Transfer from Industry to Classroom and Competency Development Framework",

- Applied Sciences-Basel, Vol. 16(4), 2026, pp. 1-36. Print ISSN: 2076-3417; Electronic ISSN: 2076-3417.
DOI: 10.3390/app16042026
<https://doi.org/10.3390/app16042026>
- 2026 **Claudio Urrea.** "Advancements in the Design and Control of Complex and Intelligent Systems", Processes, Vol. 14(4), 610, pp. 1-7. Print ISSN: 2227-9717; Electronic ISSN: 2227-9717.
DOI: 10.3390/pr14020610
<https://doi.org/10.3390/pr14040610>
- 2026 **Claudio Urrea.** "Probabilistic Safety Guarantees for Learned Control Barrier Functions: Theory and Application to Multi-Objective Human–Robot Collaborative Optimization", Mathematics, Vol. 14(3), 516, pp. 1-30. Print ISSN: 2227-7390; Electronic ISSN: 2227-7390.
DOI: 10.3390/math14030516
<https://doi.org/10.3390/math14030516>
- 2026 G. González, J. Kern, **Claudio Urrea**, and L. Donoso. "Hierarchical Soft Actor-Critic Agent with Automatic Entropy, Twin Critics, and Curriculum Learning for the Autonomy of Rock-Breaking Machinery in Mining Comminution Processes", Processes, Vol. 14(2), 365, pp. 1-40. Print ISSN: 2227-9717; Electronic ISSN: 2227-9717.
DOI: 10.3390/pr14020365
<https://doi.org/10.3390/pr14020365>
- 2025 **Claudio Urrea.** "Adaptive Multi-Objective Reinforcement Learning for Real-Time Manufacturing Robot Control", Machines, Vol. 13(12), 1148, pp. 1-67. Print ISSN: 2075-1702; Electronic ISSN: 2075-1702.
DOI: 10.3390/machines13121148
<https://doi.org/10.3390/machines13121148>
- 2025 J. Kern, L. Donoso, **Claudio Urrea**, and G. González. "Extended Dynamic Model for the UR16e 6-Degree-of-Freedom Robotic Manipulator", Sensors, Vol. 25(24), 7532, pp. 1-30. Print ISSN: 1424-8220; Electronic ISSN: 1424-8220.
DOI: 10.3390/s25247532
<https://doi.org/10.3390/s25247532>
- 2025 **Claudio Urrea.** "Hybrid Adaptive MPC with Edge AI for 6-DoF Industrial Robotic Manipulators", Mathematics, Vol. 13(19), 3066, pp. 1-29. Print ISSN: 2227-7390; Electronic ISSN: 2227-7390.
DOI: 10.3390/math13193066
<https://doi.org/10.3390/math13193066>

- 2025 **Claudio Urrea** and M. Vélez. "Intelligent Systems for Autonomous Mining Operations: Real-Time Robust Road Segmentation", *Systems*, Vol. 13(9), 801, pp. 1-40. Print ISSN: 2079-8954; Electronic ISSN: 2079-8954.
DOI: 10.3390/systems13090801
<https://doi.org/10.3390/systems13090801>
- 2025 **Claudio Urrea**, K. Valencia-Aragón, and J. Kern. "Semantic Priority Navigation for Energy-Aware Mining Robots", *Systems*, Vol. 13(9), 799, pp. 1-40. Print ISSN: 2079-8954; Electronic ISSN: 2079-8954.
DOI: 10.3390/systems13090799
<https://doi.org/10.3390/systems13090799>
- 2025 **Claudio Urrea**. "Fatigue-Aware Sub-Second Combinatorial Auctions for Dynamic Cycle Allocation in Human-Robot Collaborative Assembly", *Mathematics*, Vol. 13(15), 2429, pp. 1-21. Print ISSN: 2227-7390; Electronic ISSN: 2227-7390.
DOI: 10.3390/math13152429
<https://doi.org/10.3390/math13152429>
- 2025 **Claudio Urrea**. "Artificial Intelligence-Driven and Bio-Inspired Control Strategies for Industrial Robotics: A Systematic Review of Trends, Challenges, and Sustainable Innovations Toward Industry 5.0", *Machines*, Vol. 13(8), 666, pp. 1-28. Print ISSN: 2075-1702; Electronic ISSN: 2075-1702.
DOI: 10.3390/machines13080666
<https://doi.org/10.3390/machines13080666>
- 2025 **Claudio Urrea**. "Fatigue-Aware Sub-Second Combinatorial Auctions for Dynamic Cycle Allocation in Human-Robot Collaborative Assembly", *Mathematics*, Vol. 13(5), 2429, pp. 1-27. Print ISSN: 2227-7390; Electronic ISSN: 2227-7390.
DOI: 10.3390/math13152429
<https://doi.org/10.3390/math13152429>
- 2025 **Claudio Urrea**. "Hybrid Deep Learning-Reinforcement Learning for Adaptive Human-Robot Task Allocation in Industry 5.0", *Systems*, Vol. 13(8), 631, pp. 1-27. Print ISSN: 2079-8954; Electronic ISSN: 2079-8954.
DOI: 10.3390/systems13080631
<https://doi.org/10.3390/systems13080631>
- 2025 **Claudio Urrea** and P. Sari. "Symmetry-Driven Fault-Tolerant Synchronization in Multi-Robot Systems: Comparative Simulation of Adaptive Neural and Classical Controllers", *Symmetry-Basel*, Vol. 17(4), 591, pp. 1-49. Print ISSN: 2073-8994; Electronic

ISSN: 2073-8994.
DOI: 10.3390/sym17040591
<https://doi.org/10.3390/sym17040591>

- 2025 **Claudio Urrea**. "Hybrid Fault-Tolerant Control in Cooperative Robotics: Advances in Resilience and Scalability", *Actuators*, Vol. 14(4), 177, pp. 1-17. Print ISSN: 2076-0825; Electronic ISSN: 2076-0825.
DOI: 10.3390/act14040177
<https://doi.org/10.3390/act14040177>
- 2025 **Claudio Urrea**, Y. Garcia-Garcia, J. Kern, and R. Rodriguez-Guillen. "Neuro-Visual Adaptive Control for Precision in Robot-Assisted Surgery", *Technologies*, Vol. 13(4), 135, pp. 1-32. Print ISSN: 2227-7080; Electronic ISSN: 2227-7080.
DOI: 10.3390/technologies13040135
<https://doi.org/10.3390/technologies13040135>
- 2025 **Claudio Urrea** and M. Vélez "Advances in Deep Learning for Semantic Segmentation of Low-Contrast Images: A Systematic Review of Methods, Challenges, and Future Directions", *Sensors*, Vol. 25(7), 2043, pp. 1-29. Print ISSN: 1424-8220; Electronic ISSN: 1424-8220.
DOI: 10.3390/s25072043
<https://doi.org/10.3390/s25072043>
- 2025 C. Domínguez and **Claudio Urrea**. "Intelligent Fault-Tolerant Control of Delta Robots: A Hybrid Optimization Approach for Enhanced Trajectory Tracking", *Sensors*, Vol. 25(6), 1940, pp. 1-34. Print ISSN: 1424-8220; Electronic ISSN: 1424-8220.
DOI: 10.3390/s25061940
<https://doi.org/10.3390/s25061940>
- 2025 **Claudio Urrea** and J. Kern. "Recent Advances and Challenges in Industrial Robotics: A Systematic Review of Technological Trends and Emerging Applications", *Processes*, Vol. 13(3), 832, pp. 1-20. Print ISSN: 2227-9717; Electronic ISSN: 2227-9717.
DOI: 10.3390/pr13030832
<https://doi.org/10.3390/pr13030832>
- 2025 **Claudio Urrea**, P. Sari, and J. Kern "Hybrid System for Fault Tolerance in Selective Compliance Assembly Robot Arm: Integration of Differential Gears and Coordination Algorithms", *Technologies*, Vol. 13(2), 47 pp. 1-36. Print ISSN: 2227-7080; Electronic ISSN: 2227-7080.
DOI: 10.3390/technologies13020047

<https://doi.org/10.3390/technologies13020047>

- 2025 J. Kern, D. Quintero, and **Claudio Urrea**. "Multimodal Data Fusion System for Accurate Identification of Impact Points on Rocks in Mining Comminution Tasks", *Processes*, Vol. 13(1), 87, pp. 1-23. Print ISSN: 2227-9717; Electronic ISSN: 2227-9717.
DOI: 10.3390/pr13010087
<https://doi.org/10.3390/pr13010087>
- 2024 **Claudio Urrea**, J. Kern, and V. Torres. "Design, Simulation, and Comparison of Advanced Control Strategies for a 3-Degree-of-Freedom Robot", *Applied Sciences-Basel*, Vol. 14(23), 11010, pp. 1-36. Print ISSN: 2076-3417; Electronic ISSN: 2076-3417.
DOI: 10.3390/app142311010
<https://doi.org/10.3390/app142311010>
- 2024 **Claudio Urrea** and C. Domínguez. "Fault Diagnosis in a Four-Arm Delta Robot Based on Wavelet Scattering Networks and Artificial Intelligence Techniques", *Technologies*, Vol. 12(11), 225, pp. 1-29. Print ISSN: 2227-7080; Electronic ISSN: 2227-7080.
DOI: 10.3390/technologies12110225
<https://doi.org/10.3390/technologies12110225>
- 2024 **Claudio Urrea** and M. Vélez. "Enhancing Autonomous Visual Perception in Challenging Environments: Bilateral Models with Vision Transformer and Multilayer Perceptron for Traversable Area Detection", *Technologies*, Vol. 12(10), 201, pp. 1-20. Print ISSN: 2227-7080; Electronic ISSN: 2227-7080.
DOI: 10.3390/technologies12100201
<https://doi.org/10.3390/technologies12100201>
- 2024 J. Kern, R. Rodriguez-Guillen, **Claudio Urrea**, and Y. Garcia-Garcia. "Enhancing 3D Rock Localization in Mining Environments Using Bird's-Eye View Images from the Time-of-Flight Blaze 101 Camera", *Technologies*, Vol. 12(9), 162, pp. 1-31. Print ISSN: 2227-7080; Electronic ISSN: 2227-7080.
DOI: 10.3390/technologies12090162
<https://doi.org/10.3390/technologies12090162>
- 2024 **Claudio Urrea**, Y. Garcia-Garcia, and J. Kern. "Closed-Form Continuous-Time Neural Networks for Sliding Mode Control with Neural Gravity Compensation", *Robotics*, Vol. 13(9), 126, pp. 1-25. Print ISSN: N/A; Electronic ISSN: 2218-6581.
DOI: 10.3390/robotics13090126
<https://doi.org/10.3390/robotics13090126>

- 2024 **Claudio Urrea**, P. Sari, J. Kern, and H. Torres. "Enhancing Adaptability and Autonomy in Cooperative Selective Compliance Assembly Robot Arm Robots: Implementation of Coordination and RRT Algorithms for Safe and Efficient Manipulation Tasks", *Applied Sciences-Basel*, Vol. 14(15), 6804, pp. 1-28. Print ISSN: 2076-3417; Electronic ISSN: 2076-3417.
DOI: 10.3390/app14156804
<https://doi.org/10.3390/app14156804>
- 2024 **Claudio Urrea** and D. Benítez. "Optimizing IIoT Performance: Intelligent Selection of SDN Controllers through AHP Analysis", *International Journal of Intelligent Systems*, Vol. 2024, 7908506, pp. 1-15. Print ISSN: 0884-8173; Electronic ISSN: 1098-111X.
DOI: 10.1155/2024/7908506
<https://doi.org/10.1155/2024/7908506>
- 2024 **Claudio Urrea**, Y. Garcia-Garcia, and J. Kern. "Improving Surgical Scene Semantic Segmentation through a Deep Learning Architecture with Attention to Class Imbalance", *Biomedicines*, Vol. 12(6), 1309, pp. 1-30. Print ISSN: 2227-9059; Electronic ISSN: 2227-9059.
DOI: 10.3390/biomedicines12061309
<https://doi.org/10.3390/biomedicines12061309>
- 2024 J. Kern, **Claudio Urrea**, F. Cubillos, and R. Navarrete. "A Bio-Inspired Retinal Model as a Prefiltering Step Applied to Letter and Number Recognition on Chilean Vehicle License Plates", *Applied Sciences-Basel*, Vol. 14(12), 5011, pp. 1-20. Print ISSN: 2076-3417; Electronic ISSN: 2076-3417.
DOI: 10.3390/app14125011
<https://doi.org/10.3390/app14125011>
- 2024 **Claudio Urrea**, D. Saa, and J. Kern. "Automated Symbolic Processes for Dynamic Modeling of Redundant Manipulator Robots", *Processes*, Vol. 12(3), 593, pp. 1-20. Print ISSN: 2227-9717; Electronic ISSN: 2227-9717.
DOI: 10.3390/pr12030593
<https://doi.org/10.3390/pr12030593>
- 2024 J. Kern, **Claudio Urrea**, H. Verdejo, R. Agramonte, and C. Becker. "Trajectory Tracking and Disturbance Rejection Performance Analysis of Classical and Advanced Controllers for a SCORBOT Robot", *Robotics*, Vol. 13(3), 48, pp. 1-19. Print ISSN: N/A; Electronic ISSN: 2218-6581.
DOI: 10.3390/robotics13030048

<https://doi.org/10.3390/robotics13030048>

- 2024 **Claudio Urrea**, C. Domínguez, and J. Kern. "Modeling, design and control of a 4-arm delta parallel manipulator employing type-1 and interval type-2 fuzzy logic-based techniques for precision applications", *Robotics and Autonomous Systems*, Vol. 175, 104661, pp. 1-20. Print ISSN: 0921-8890; Electronic ISSN: 1872-793X.
DOI: 10.1016/j.robot.2024.104661
<https://doi.org/10.1016/j.robot.2024.104661>
- 2024 D. Quintero, J. Kern, and **Claudio Urrea**. "A Multimodal Fusion System for Object Identification in Point Clouds with Density and Coverage Differences", *Processes*, Vol. 12(2), 3248, pp. 1-16. Print ISSN: 2227-9717; Electronic ISSN: 2227-9717.
DOI: 10.3390/pr12020248
<https://doi.org/10.3390/pr12020248>
- 2024 R. Rodriguez-Guillen, J. Kern, and **Claudio Urrea**. "Fast Rock Detection in Visually Contaminated Mining Environments Using Machine Learning and Deep Learning Techniques", *Applied Sciences-Basel*, Vol. 14(2), 731, pp. 1-19. Print ISSN: 2076-3417; Electronic ISSN: 2076-3417.
DOI: 10.3390/app14020731
<https://doi.org/10.3390/app14020731>
- 2024 D. Marrero, J. Kern, and **Claudio Urrea**. "A Novel Robotic Controller Using Neural Engineering Framework-Based Spiking Neural Networks", *Sensors*, Vol. 24(2), 491, pp. 1-21. Print ISSN: 1424-8220; Electronic ISSN: 1424-8220.
DOI: 10.3390/s24020491
<https://doi.org/10.3390/s24020491>
- 2024 H. Torres, P. Cordero, B. Torres, **Claudio Urrea**, and J. Kern. "Model Development and Simulation of a 3-DoF Manipulator Robot for Trajectory Control Using Artificial Intelligence", bi-annual Conference of the Andean Council of the IEEE, 2024 IEEE ANDESCON, September 11 to 13, Cusco, Peru.
Electronic ISBN:979-8-3503-5528-4
Print on Demand(PoD) ISBN:979-8-3503-5529-1
Electronic ISSN: 2996-895X
Print on Demand(PoD) ISSN: 2377-021X
DOI: 10.1109/ANDESCON61840.2024.10755808
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- 2000 **Claudio Urrea** and I. Mahla. "*Nuevo Modelo de un Manipulador de n G.D.L. con Integración de Actuadores y Otros Efectos Considerados*" (New n -DOF Manipulator model with Actuators Integration and Other Effects Considered), XIV Automatic Control Chilean Association Congress, Universidad del Bio-Bio, Concepción, pp. 130-135, Chile.
- 1999 **Claudio Urrea** and I. Mahla. "Simulations of a Two D.O.F. Planar Robot Model Including Driving, Coulomb Friction and Non-Linear Stiffness", XIII National Congress of Electrical Engineering, USACH, pp. 3-8, Chile.
- 1999 M. Jamett, I. Mahla, **Claudio Urrea**, and H. Latorre. "*Diseño de un Ambiente Integrado de Programación Visual para un Manipulador Robótico*" (Design of an Integrated Visual Programming Environment for a Manipulator Robot), XIII National Congress of Electrical Engineering, USACH, pp. 184-189, Chile.

Publications in Other Periodical Journals

- 2018 **Claudio Urrea et al.** "Fault Tolerant Robotized System Based on Joint Blockage for Uninterrupted Production Processes", 6th International Congress on Automation in Mining. June.
- 2013 **Claudio Urrea et al.** "Design and Development of an Automaton System for the Spatial Location of Chilean Vehicle License Plates in Complex Environment", Presencia Universitaria, UNICIT Annual publications magazine. October, pp. 22- 25.
- 2013 **Claudio Urrea et al.** "Design and Implementation of an Indicator for Selecting Chilean Golden Apples by Computer Vision", Presencia Universitaria, UNICIT Annual publications magazine. October, pp. 52-53.
- 2013 **Claudio Urrea et al.** "Modeling and Simulation of a Redundant Robot Manipulator SCARA Type", Presencia Universitaria, UNICIT Annual publications magazine. October, pp. 54.
- 2013 **Claudio Urrea et al.** "Design and Implementation of Digital Filters in a DSP Processor tms320c50", Presencia Universitaria, UNICIT Annual

publications magazine. October, pp. 56.

- 2013 **Claudio Urrea et al.** "Performance Evaluation of Fault-Tolerance Controllers in Robotic Manipulators", Presencia Universitaria, UNICIT Annual publications magazine. October, pp. 57.
- 2013 **Claudio Urrea.** "*La Robotización en la Minería Nacional*" (Automation in the National Mining Industry) Revista Ingenieros & Profesionales del Cobre. 38, June, pp. 26.
- 2012 **Claudio Urrea.** "*Investigador de la U. de Santiago Creará Robot Industrial Tolerante a Fallas*" (Researcher from Universidad de Santiago will create a Fault-Tolerant System) Portal Minero (Interview), November 23.
- 2011 **Claudio Urrea.** "*Centro de Instrumentación y Desarrollo Electrónico de la USACH*" (Instrumentation and Electronic Development Center), Revista Electroindustria. ISSN: 0718-3445, 124, August.
- 2011 J. Kern and **Claudio Urrea.** "*Modelamiento y Simulación de un Robot Redundante de Tipo Manipulador SCARA*" (Modelling and Simulation of a Redundant SCARA Manipulator Robot), LAJPE. Revista Latinoamericana de Física Educativa, Vol. 5(4), pp. 824-838.
- 2011 **Claudio Urrea.** "Robótica "Made" in Chile", Revista Electroindustria. ISSN: 0718-3445, 120, Abril, pp. 58-59.
- 2009 **Claudio Urrea, et al.** "Robótica en Chile cada vez más cerca de la Automatización Total" (Robotics in Chile: moving closer to Total Automation), Revista Electroindustria. ISSN: 0718-3445, 103, September, pp. 32-36.

Working Experience

- 2023 - 2025 Academic Advisor of the University of Santiago of Chile, representative of the Full Professors. Resolution N°4148, June 8, 2023.
- 2022 - 2022 Postgraduate Vice-Chancellor from the Vice-Rectorate of Postgraduate at the University of Santiago of Chile.
<https://postgrado.usach.cl/es/perfiles-personas/equipo-vice-rectoria-de-postgrado>
- 2022 - 2022 President of the Postgraduation Superior Council (Former Postgraduation Executive Committee) at the University of Santiago of Chile.

<https://www.postgrados.usach.cl/>

- 2022 - 2022 President of the Assessment Commission for Postgraduate Programs at the University of Santiago of Chile.
<https://www.postgrados.usach.cl/>
- 2020 - 2023 President of the Academic Performance Evaluation and Qualification Committee at the Electrical Engineering Department of the University of Santiago of Chile.
- 2019 - to date Director of Proficiency Testing Provider at the University of Santiago of Chile.
<http://cide.usach.cl/>
- 2018 - 2022 Postgraduate Director –Academic Programs– from the Vice-Rector of Postgraduate at the University of Santiago of Chile.
<https://postgrado.usach.cl/es/perfiles-personas/equipo-vice-rectoria-de-postgrado>
- 2018 - 2022 Member of the Postgraduation Superior Council (Former Postgraduation Executive Committee) at the University of Santiago of Chile.
<https://www.postgrados.usach.cl/>
- 2018 - 2022 Member of the Assessment Commission for Postgraduate Programs at the University of Santiago of Chile.
<https://www.postgrados.usach.cl/>
- 2016 - to date Coordination Head for the Electrical Engineering Program, specialization in Industrial Automation, night program from the Electrical Engineering Department at the University of Santiago of Chile.
<https://die.usach.cl/pregrado>
- 2016 - 2021 Head of the "Control of Industrial Processes" Area from the Electrical Engineering Department at the University of Santiago of Chile.
<https://die.usach.cl/pregrado/>
- 2016 - 2017 Deputy Director of Research and Postgraduate Studies at the Electrical Engineering Department at University of Santiago of Chile.
<https://die.usach.cl/>
- 2015 - to date Specialized evaluator CNA-Chile.
<https://www.cnachile.cl/Paginas/Registro-Pares-Evaluadores-Nuevo.aspx>

- 2013 - 2021 Director of the Doctorate in Engineering Sciences Program, specialization in Automation from the Faculty of Engineering at the University of Santiago of Chile.
<https://doctoradoautomatica.usach.cl/>
- 2011 - to date Manager of "*Centro de Instrumentación y Desarrollo Electrónico*" (CIDE), (Instrumentation Center and Electronic Development), at the University of Santiago of Chile. <http://cide.usach.cl/>
- 2010 - 2012 Coordinator of the Laboratory of "Electrical Circuits I" subject in the BS in Electrical Engineering from University of Santiago of Chile.
<https://die.usach.cl/>
- 2007 - to date Director of the Robotics Laboratory from the Electrical Engineering Department at the University of Santiago of Chile.
<https://die.usach.cl/>
- 2007 - 2009 Director of the "Industrial Modelling and Computational Simulation Program" from the Faculty of Engineering at the University of Santiago of Chile.
<https://www.fing.usach.cl/>
- 2006 - to date Full time lecturer for the following subjects: "Industrial Robots Control", "Nonlinear Control", "Design of Hardware and Software for Robots", "Fundamentals of Robotics", "Control Seminar", "Advanced Topics in Automatic Control", " Advanced Topics in Robotics, Production and Manufacturing", "Thesis Seminar I", "Thesis Seminar II", "Thesis Seminar III" and "Thesis Seminar IV" for students of the Doctorate in Engineering Sciences Program, Specialization in Automation, USACH. Chile. "Robotics and Artificial Intelligence", "Special Topics in Automation", "Nonlinear Control", "Control of Industrial Robots", " Industrial Robotics", "Thesis Seminar I", "Thesis Seminar II", and "Thesis Seminar III" " for students of the Master in Engineering Sciences Program, specialization in Electrical Engineering, DIE. USACH. Chile. "Fundamentals of Industrial Robotics", "Intelligent Control", and "Laboratory on Projects in Electrical Engineering Systems" for Civil Engineering in Electricity students, DIE. USACH. Chile. "Electrical Circuits I" for Electrical Engineering students, DIE. USACH. Chile.
- 2003 - 2005 Lecturer of the subjects: "Automatic Control", "Industrial Regulation", "Continuous Control", "Discontinuous Control", "Modelling in the State Space", "Identification of Systems", "Synthesis of Control Systems" and "Control Laboratory" for students of: Electrical, Informatics, and Industrial Engineering. Université d'Aix-Marseille III, Marseille. France.

- 2001 - 2003 Lecturer of the subject's laboratory: "Automatic Control" for students of Electrical Engineering, LAG. Grenoble. France.
- 2001 - 2003 Lecturer of the subject: "Numerical Analysis" for students of Electrical Engineering, Polytech Grenoble. Grenoble. France.
- 1999 - 2000 Lecturer of the subject's laboratory: "Automatic Control" for students of Aeronautical Engineering. Aeronautical Polytechnic Academy (APA), Chilean Air Force. Chile.
- 1998 - 2000 Lecturer of the subject: "Dynamic Systems" for students of Civil Engineering in Electricity, specialization in Control of Industrial Processes, DIE. USACH. Chile.
- 1998 - 2000 Lecturer of the subject's laboratory: "Control Seminar" for students of Civil Engineering in Electricity, specialization in Control of Industrial Processes, DIE. USACH. Chile.
- 1998 - 2000 Lecturer of the subject's laboratory: "Digital Control" for students of Civil Engineering in Electricity, specialization in Control of Industrial Processes, DIE. USACH. Chile.
- 1996 - 1997 Assistant Teacher of the subject: "Theory of Systems and Research on Operations" from the Industrial Engineering Department. USACH. Chile.

Postdoctoral Supervisor

- 2016 - 2017 Dr. José Muñoz Galdames. Title: Design and Implementation of Fault Tolerant Control Systems for Redundant Industrial Robots. USACH. Chile.
- 2013 - 2014 Dr. John Kern Molina. Title: Design and Implementation of new Fault Tolerant Control Algorithms for a new 7 DoF Overactuated Industrial Robotic Arm. USACH. Chile.

Thesis Supervisor

- 2013 - to date 17 PhD Dissertations from the Engineering Sciences, Specialization in Automation, DIE. USACH. Chile.
- 2009 - to date 20 theses from the Master's in Engineering Sciences, Specialization in Electrical Engineering, DIE. USACH. Chile.

Thesis Supervisor for Undergraduate Programs

- 2008 - to date 28 Theses from the Civil Engineering in Electricity program, DIE. USACH. Chile.
- 2008 - to date 19 Theses from the Execution Engineering in Electricity program, DIE. USACH. Chile.
- 2016 1 Thesis from the Engineering in Mathematics program, Department of Mathematics and Computer Science. USACH. Chile.

Thesis Reviewer for Undergraduate Programs

- 2006 - to date 54 Theses from the Civil Engineering in Electricity, DIE. USACH. Chile.
- 2006 - to date 14 Theses from the Execution Engineering in Electricity program, DIE. USACH. Chile.

Teaching Upskilling

Specialization course

Title: *Interpretación de la Norma Internacional ISO-IEC 17043* (Interpretation of the International Standard *ISO-IEC 17043*).

Date: June-July, 2023 (5 weeks equivalent to 16 chronological contact hours).

Imparted by: Sergio Chesniuk, Metroquimica.net.

Place: Online, Argentina.

Specialization course

Title: *Evaluación Estadística de Ensayos de Intercomparación (ISO 13528:2022)* (Statistical Evaluation of Intercomparison Tests (ISO 13528:2015)).

Date: October 26, 2022 (9 chronological contact hours).

Imparted by: Carlos J. Gómez, Mg. en Estadística. <https://www.analytical.cl/>

Place: CIDE-USACH, Santiago, Chile.

Specialization course

Title: *Métodos Estadísticos para Programas de Ensayos de Aptitud Mediante Comparaciones Interlaboratorios (ISO 13528:2015)* (Statistical Methods for Proficiency Testing Programs Through Interlaboratory Comparisons (ISO 13528:2015)).

Date: January-February, 2022 (8 weeks equivalent to 24 chronological contact hours).

Imparted by: Sergio Chesniuk, Metroquimica.net.

Place: Online, Argentina.

Specialization course

Title: *Evaluación de la Conformidad – Requisitos Generales para los Ensayos de Aptitud* (Conformity Assessment – General Requirements for Proficiency Testing).

Date: May 10-12, 2021 (online course on NCh-ISO 17043:2011; 16 pedagogical hours).

Imparted by: Ruth Villagrán.

Place: Online (Zoom), Chile.

Specialization course

Title: *Ensayos de Aptitud* (Proficiency Testing).

Date: January 22-23, 2018 (18 chronological contact hours).

Imparted by: MINECOM from Cuba.

Place: INN, Santiago, Chile.

Diploma

Title: *Inglés para Desarrollar Habilidades Comunicativas en el Área Laboral* (English for the Development of Communicative Skills in the Workplace).

Date: April 22 to July 29, 2017 (40 chronological contact hours).

Delivered by: Modern Languages Training Program.

Place: CELEM. Universidad de Santiago de Chile.

Research symposium

Title: Management Research Trends: Nurturing Innovation.

Date: June 13-17, 2016 (40 chronological contact hours).

Place: Harvard University, Cambridge, Massachusetts, EEUU.

Specialization course

Title: IP Marketing and Valuation.

Date: April 19-22, 2016 (36 chronological contact hours).

Place: INAPI, Santiago, Chile.

Specialization course

Title: Research and Innovation in University Teaching.

Date: January, 2015 (16 chronological contact hours).

Place: UNIE/CITECAMP. University of Santiago of Chile.

PGDip

Title: *Investigación e Innovación en Docencia Universitaria* (Research and Innovation in University Teaching).

Date: October 11, 2012 to December 2013.

Place: UNIE/CITECAMP. University of Santiago of Chile.

Course 1: Research on University Teaching (36 chronological contact hours). Sence code: 12-37-8985-11.

Lecturers: Dr. Paloma Miranda and Dr. Jorge Chávez.

Course 2: Research Project and Innovation in University Teaching (42 chronological,

18 contact and 24 virtual hours). Sence code: 12-37-8985-11.

Lecturers: Dr. Paloma Miranda, Dr. Jorge Marchant, Dr. Jorge Chávez and Dr. Felipe Kong.

Course 3: Design of Processes to Assess the Impact of Educational Innovation on University Teaching (24 chronological contact hours). Sence code: 12-37-9146-35.

Lecturer: Dr. Jorge Marchant.

Specialization course

Title: *Jornada de Reflexión y Acción Pedagógica DIE-USACH* (DIE-USACH Teaching and Pedagogical Action Encounter).

Date: December 6, 2013.

Place: Hotel Plaza San Francisco, Santiago.

Duration: 9 chronological contact hours.

Lecturers: PhDs in Education Alfonso Padilla and José Muñoz.

PGDip

Title: *Impostación de la voz Usando Tecnología* (Voice projection using technology)

Date: August 27 to October 1, 2013.

Place: CITECAMP. University of Santiago of Chile.

Duration: 20 chronological contact hours.

Sence code: 12-37-8371-00.

Lecturer: Ms. Marta Gajardo Pinto.

Specialization course

Name: *Metrología de Base y Cálculo de la Incertidumbre de las Mediciones* (Basic Metrology and Calculation of Measurement Uncertainty)

Date: October 25 to 27, 2011 (24 chronological contact hours).

Place: Soluciones Metrológicas Especializadas, Santiago, Chile.

Specialization course

Name: *Implementación de Sistemas de Gestión de Calidad en Laboratorios/NCh-ISO 17025* (Implementation of Quality Management Systems in Laboratories /NCh-ISO 17025).

Date: October 17 and 18, 2011 (16 chronological contact hours).

Place: Bureau Veritas, Santiago, Chile.

PGDip

Qualification: *Docencia Universitaria* (University Teaching).

Date: March 2009 to August 2010.

Place: CITECAMP. University of Santiago of Chile.

Subject 1: Learning achievements in University Teaching (30 chronological contact hours).

Lecturer: Dr. Jorge Marchant.

Subject 2: Learning Assessment in University Teaching (40 chronological contact

hours).

Lecturer: Dr. Jorge Marchant.

Subject 3: Use of ICTs in University Teaching (40 chronological contact hours).

Lecturer: Evelyn Herrera.

Subject 4: Teaching approach in University Teaching (60 chronological contact hours).

Lecturer: PhD Ximena Vildósola.

PGDip

Title: *Desarrollo Curricular Basado en Competencias* (Competency-based Curriculum Development).

Date: July 3, 2006 to January 15, 2007.

Place: CENI. University of Santiago of Chile.

Lecturer: Patricio Montero *et. al.*

Seminar

Name: *Escuela de Verano en Automatización* (Automation Summer School).

Date: January 8-19, 2007.

Subjects: 1. Diagnosis and Monitoring of Complex Industrial Systems
(January 8 to 12, Dr. Sylviane Gentil).

2. Nonlinear control (January 15 to 19. PhD Nicolás Marchand).

Place: DIE. University of Santiago of Chile.

Lecturers: Dr. Sylviane Gentil, Dr. Mazen Alamir, Dr. Nicolás Marchand, Dr. Gonzalo Acuña, Dr. Marcela Jamett, Félix Fernández, Rubén Leiva, Ademar Acevedo, Rodrigo Elgueta, Edgardo Herrera.

Seminar

Title: *2^{do} Seminario Avance TICs Aplicadas a la Docencia* (CITs Advances Applied to Teaching 2nd Seminar).

Date: July 31 to August 2, 2007.

Place: CITECAMP. University of Santiago of Chile.

Theme: "CITs advances in Engineering 2007".

Course

Title: *Manejo de Moodle* (Moodle training).

Date: April 23 to May 23, 2007.

Place: CITECAMP. University of Santiago of Chile.

Workshop

Title: *Desarrollo de un Proyecto TICs en Docencia* (Development of a Project on CITs in Teaching).

Date: October 17 to October 26, 2006.

Place: DIE Auditorium. University of Santiago of Chile.

Lecturer: Florece Michau.

Seminar

Title: *El Ingeniero en una Sociedad Global: Competencias y Acreditación* (The Engineer in a Global Society: Competences and Qualifications).

Date: July 14 to July 20, 2006, between 9:00 and 12:30.

Place: DIE. University of Santiago of Chile.

Speakers: Dr. Tom Cain, Engineer Jorge Yutronic, Dr. Mario Letelier and Dra. Felisa Córdova.

Academic and Cultural Outreach

WoS Indexed Journal Editor

Journal: Processes (ISSN: 2227-9717, Q2).

Date: March 3, 2023 to December 31, 2025.

Journal section: "Design and Control of Complex and Intelligent Systems".

https://www.mdpi.com/journal/processes/special_issues/3A15K9VV0S

Seminar

Title: *Modelado, Simulación y Control de Robots Industriales Redundantes Tolerantes a Fallas* (Modeling, Simulation and Control of Fault Tolerant Redundant Industrial Robots).

Date: June 24 to July 4, 2018.

Place: Universidad Tecnológica de Bolívar, Colombia.

Participation: Main speaker.

Congress

Name: 6th International Congress on Automation in Mining.

Date: June 6, 7 and 8, 2018.

Place: Hotel Santiago, Chile.

Participation: USACH Co-organizer, Moderator and Speaker.

International Evaluation of Graduate Program

Program name: *Doctorado en Ingeniería-Automática* (Doctorate in Engineering-Automation).

Date: November 28, 29 and 30, 2017.

Place: Universidad Nacional de Colombia.

Participation: Peer Evaluator, International Scholar, CNA-Colombia.

Congress

Name: *Congreso de Robótica y Neurociencia* (Congress of Robotics and Neuroscience).

Title: Robotics made in DIE-UdeSantiago.

Date: October 27, 28 and 29, 2016.

Place: Universidad Técnica Federico Santa María (UTFSM).

Participation: Speaker.

Talk

Title: *Universidad, Ciencia y Tecnología y su Relación con la Metrología* (University, Science and Technology and its Relationship with Metrology).

Date: July 17, 2016.

Place: National Normalization Institute (INN).

Participation: Speaker.

Congress

Title: *I Congreso de Innovación Tecnología y Aprendizaje en Educación Superior* (INTEA) (I Congress of Technological Innovation and Learning in Higher Education).

Date: May 12 and 13, 2016.

Place: University of Santiago of Chile.

Participation: Member of the Scientific Committee.

Talk

Title: *Sistemas Robotizados. Actuales Líneas de Investigación y Aplicaciones* (Robotic Systems. Current Research Lines and Applications).

Date: April 8, 2016.

Place: Universidad Metropolitana de Ciencias de la Educación (UMCE).

Participation: Main speaker.

Forum

Title: *IX Foro Internacional en Ciencia e Ingeniería, Categoría Supranivel* (IX International Forum in Science and Engineering, Supralevel).

Date: August 26, 27 and 28, 2015.

Place: Centro Cultural Club de Ciencias Chile and Museo de la Educación Gabriela Mistral (DIBAM).

Participation: International Jury Member.

Evaluation of National Graduate Programs

Program name: *Doctorado en Ciencias de la Ingeniería Área Ingeniería Eléctrica* (Doctorate in Engineering Sciences, Electrical Engineering field).

Date: August 18, 2015.

Place: Universidad Católica de Chile.

Participation: Peer evaluator for CNA-Chile.

Evaluation

Position: *Evaluador de forma Comparada de los Proyectos IDeA de FONDEF e I+D Aplicada de InnovaChile* (Comparative evaluation for FONDEF's IDeA project and InnovaChile's Applied R&D project).

Date: November 26, 2014.

Place: Ministry of Economy, Development and Tourism. Chile.

Participation: Evaluator.

Talk

Title: *Robótica en Chile y su Impacto en: Formación de Ingenieros, Sector Productivo e Investigación* (Robotics in Chile and its impact on Engineer's Education, Productive Sector and Research).

Date: August 13, 2014, V International Congress of Computer Science and Informatics of the North of Chile. INFONOR 2014.

Place: Universidad Arturo Prat, Iquique.

Participation: Speaker.

Forum

Title: *VII Foro Internacional en Ciencia e Ingeniería, Categoría Supranivel* (VII International Forum in Science and Engineering, Supralevel).

Date: August 21, 22 and 23, 2013.

Place: Centro Cultural Club de Ciencias Chile and Museo de la Educación Gabriela Mistral (DIBAM).

Participation: International Jury Member.

Talk

Title: *Robótica "Made in Chile"* (Robotics "Made in Chile").

Date: August 21, 2013.

Place: Centro Cultural Club de Ciencias Chile and Museo de la Educación Gabriela Mistral (DIBAM).

Participation: Speaker.

Forum

Title: *VI Foro Internacional en Ciencia e Ingeniería, Categoría Supranivel* (VI International Forum in Science and Engineering, Supralevel).

Date: August 22, 23 and 24, 2012.

Place: Centro Cultural Club de Ciencias Chile and Museo de la Educación Gabriela Mistral (DIBAM).

Participation: International Jury Member.

Talk

Title: *Sistemas Robotizados. Aprender Haciendo* (Robotized Systems. Learning by Doing).

Date: August 24, 2011.

Place: Centro Cultural Club de Ciencias Chile y Museo de la Educación Gabriela Mistral (DIBAM).

Participation: Speaker.

Forum

Title: *V Foro Internacional en Ciencia e Ingeniería, Categoría Supranivel* (V International Forum of Science and Engineering, Supralevel).

Date: August 24, 25 and 26, 2011.

Place: Centro Cultural Club de Ciencias Chile and Museo de la Educación Gabriela Mistral (DIBAM).

Participation: International Jury Member.

Talk

Talk title: *Sistemas Robotizados Hechos en Chile* (Robotized systems made in Chile).

Date: May 25, 2011.

Place: Universidad Iberoamericana de Ciencias y Tecnología.

Participation: Speaker.

Seminar

Title: *Experiencia de profesores del DIE en el uso de la plataforma de MOODLE* (DIE Lecturers experience of the use of MOODLE platform).

Date: March 3, 2009.

Place: DIE Auditorium. University of Santiago of Chile.

Theme: “Course: Fundamentals of Industrial Robotics via e-learning”.

Participation: Speaker.

Seminar

Title: *Concurso TIC's 2008. Desarrollo de Aplicaciones TIC's en la Docencia* (CIT's Contest 2008. Development of CITs in Teaching).

Date: November 25 to 27, 2008.

Place: E. Fröemel Auditorium. University of Santiago of Chile.

Theme: “Course: Fundamentals of Industrial Robotics via e-learning”.

Participation: Speaker.

Seminar

Postgraduate Seminar:

Title: *5^{ta} Semana de la Electrónica y la Computación* (Fifth Electronics and Computer Science week).

Date: November 7 to 9, 2007.

Place: Universidad Iberoamericana de Ciencias y Tecnología.

Theme: “Current scene for Robotics”.

Participation: Speaker.

Seminar

Postgraduate Seminar:

Title: *Sistemas de Control Robotizados con Inteligencia* (Intelligent Robotized Control Systems).

Date: October 30, 2007.

Place: CENI. University of Santiago of Chile.

Theme: “Robotized Systems”.

Participation: Speaker and Organization Committee Member.

Seminar

Title: “*Yo lo ICE*” (I did it).

Date: October 25, 2007.

Place: E. Fröemel Auditorium. University of Santiago of Chile.

Theme: “Yo lo ICE Innovation – Competitiveness – Entrepreneurship”.

Participation: Organization Committee Member.

Seminar

Title: *Concurso TICs* (CITs Contest).

Date: October 12, 2007.

Place: CITECAMP. University of Santiago of Chile.

Theme: “Course: Fundamentals of Industrial Robotics via e-learning”.

Participation: Speaker.

Seminar

Title: *2^{do} Seminario Avance TICs Aplicadas a la Docencia* (2nd Seminar Advances in CIT's Applied to Teaching).

Date: July 31 to August 2, 2007.

Place: E. Fröemel Auditorium. University of Santiago of Chile.

Theme: “Use of CITs at DIE-USACH”.

Participation: Speaker.

Talk

Programa *Explora Conicyt. XII Semana Nacional de la Ciencia y la Tecnología*. (Explora Conicyt Program. XII International Week of Science and Technology). October 2 to 8, 2006.

Title: 1000 Scientists, 1000 Classrooms.

Date: October 3, 2006.

Place: Los Bosquinos School.

Talk title: Robots will remain with us.

Participation: Speaker.

Development of Teaching Material

I have developed teaching material in both electronic and multimedia formats for a variety of subjects corresponding to study programs from the Faculty of Engineering of USACH. The material is the following:

- **Doctorate in Engineering Sciences, specialization in Automation Program:**
 1. Control of Industrial Robots
 2. Design of Software and Hardware for Robots
 3. Nonlinear Control
 4. Advances Topics in Automatic Control
 5. Advanced Control Seminar
- **Master in Engineering Sciences, specialization in Electrical Engineering Program:**

1. Industrial Robotics
 2. Fundamentals of Industrial Robotics
 3. Special Topics in Automation
- **Civil Engineering in Electricity**
 1. Fundamentals of Industrial Robotics

Languages and IT Skills

Spanish:	Mother tongue.
English:	Fluent in reading, writing and speaking.
French:	Fluent in reading, writing and speaking.
Italian:	Fluent in reading, writing and speaking.
Mandarin Chinese:	Basic reading, writing and speaking.
Programs:	Python, LaTeX, MOODLE, M.S. Office, MatLab/Simulink, Maple, Mathematica, Macromedia Dreamweaver, NS IBM PC's software and compatible software.

Awards and Scholarships

2026	Prestigious "Disruptive Researcher with Trajectory" award ("Investigador Disruptivo con Trayectoria") at the IV edition of the ICONO Awards: Engineering that Inspires the Future (<i>Premios ICONO: Ingeniería que inspira futuro</i>) from the Faculty of Engineering at the University of Santiago de Chile. This recognition honors his outstanding trajectory and valuable contribution to the Research, Development, Innovation and Entrepreneurship (R&D&I&E) ecosystem, acknowledging his high productivity in research and innovation, basic and applied research projects, high-impact scientific articles, project evaluations, and conferences.
2021	Notation of Merit for performance in the re-accreditation of USACH. " <i>Por su participación en el proceso de Autoevaluación y Acreditación 2020</i> " (Participation in 2020 self-evaluation and accreditation). Universidad de Santiago de Chile. Chile.
2017	"Best Scholar/Researcher 2017" Award. Granted by "Electric Engineering Department Community of University of Santiago of Chile" in recognition of my outstanding work and dedication during 2017. Chile.

- 2001 - 2002 "French Government" Scholarship. Awarded by: "Embassy of France in Chile" to doctorate students. Chile-France.
- 2001 "Engineers' Association and BHIF Bank" Scholarship. Awarded by: "Banco BHIF" to doctorate students from Chilean universities. Chile.
- 1999 "Marcos Orrego Puelma" Award. Granted by: "Instituto de Ingenieros de Chile" to the best Civil Engineering students in all specializations of the principal universities of Chile. Chile.
- 1998 - 2000 "Armando Quezada" Scholarship. Awarded by: "University of Santiago of Chile" to Engineering Sciences doctorate students. Chile.
- 1993 - 1997 "Enrique Froëmel" Scholarship. Awarded by: "University of Santiago of Chile" to undergraduate students.
- 1991 - 1998 "Presidente de la República" Scholarship. Awarded by: "Chilean Government" to undergraduate students. Chile.

Project Evaluation

- 2025 03 CORFO projects: "*Crea y Valida Neutral*" (Neutral Creation and Validation). Chile.
- 2025 02 CORFO projects: "*Ley I+D*" (R+D Law). Chile.
- 2024 03 CORFO projects: "*Innova Alta Tecnología*" (Innovation in High Technology). Chile.
- 2022 01 COPEC-UC Fund project. Chile.
- 2022 05 CORFO projects: "*Crea y Valida Innovación Empresarial*" (Create and Validate Business Innovation). Chile.
- 2022 01 FONDEF project: "*IDeA +D*" (IDeA R&D). Chile.
- 2021 01 FONDEF project: "*IDeA I+D*" (IDeA R&D). Chile.
- 2020 08 CORFO projects: "*Crea y Valida Innovación Empresarial*" (Create and Validate Business Innovation). Chile.
- 2020 01 FONDEF project: "*IX Concurso Investigación Tecnológica – IDeA*

	2020” (9th Technological Innovation Contest – IdeA 2020). Chile.
2020	02 CORFO projects: " <i>Ley de Incentivo Tributario a la I+D</i> " (Tax Incentive Law for R&D). Chile.
2020	02 CORFO projects: " <i>Escala Innovación 2020 Región de Antofagasta</i> " (Innovation Scale 2020, Antofagasta Región). Chile.
2020	02 FONDEF projects: " <i>IDeA I+D</i> " (IDeA R&D). Chile.
2020	01 CORFO project: " <i>Innova Alta Tecnología</i> " (Innovation in High Technology). Chile.
2020	04 CORFO projects: " <i>Innova Alta Tecnología – Componente de I+D</i> " (Innovation in High Technology – R&D Component). Chile.
2020	04 CORFO projects: " <i>Crea y Valida Innovación</i> " (Create and Validate Business Innovation). Chile.
2020	05 CORFO projects: " <i>Crea y Valida Empresarial – Componente de I+D</i> " (Create and Validate Business Innovation – R&D component). Chile.
2019	02 CORFO projects: " <i>Ley I+D</i> " (R+D Law). Chile.
2019	02 CORFO projects: " <i>Innova Región Antofagasta</i> " (Innovation in Antofagasta Region). Chile.
2019	06 CORFO projects: " <i>Crea y Valida Colaborativo</i> " (Collaborative Creation and Validation). Chile.
2019	10 CORFO projects: " <i>Crea y Valida Empresarial</i> " (Business Creation and Validation). Chile.
2019	05 CORFO projects: " <i>Innova Alta Tecnología</i> " (Innovation in High Technology). Chile.
2019	01 FONDEF proyect: "IT". Chile.
2018	03 CORFO projects: " <i>Contratos Tecnológicos</i> " (Technological Contracts). Chile.
2018	01 FONDEF project: " <i>Investigación y Desarrollo</i> " (Research and development). Chile.
2018	02 CORFO projects: " <i>I+D Aplicada en Empresas</i> " (R&D applied to

- Businesses). Chile.
- 2018 01 CORFO project: "*Validación y Empaquetamiento*" (Validation and Packaging. Chile.
- 2018 04 FONDEF projects: "*IDeA I+D*" (IDeA R&D). Chile.
- 2017 Project: "*Diseño y Construcción de Sistema para el Entrenamiento de la Visión Periférica de Basquetbolistas en Movimiento*" ("Design and Development of a System for Training Peripheral Vision in Basketball Players in Motion ") (Code: CIP 2017024). Research and Development Project, 2017. Universidad Central. Chile.
- 2017 02 CORFO projects: "*I+D Sectores Estratégicos*" (R&D Strategic Areas). Chile.
- 2017 10 FONDEF projects: "*IDeA en dos Etapas*" (IDeA in two Stages). Chile.
- 2016 02 projects: "*Contratación de Post-Doctorandos, 2017-2018*" (Post-doctorate Students' Recruitment, 2017-2018). DICYT. VRIDEI. USACH. Chile.
- 2016 Project: "*Comprendiendo Sistemas a través de una Mano Robótica*" ("Understanding Systems through a robot hand"), Sheet number: 086-2016. Teaching Innovation Project. UNIE. USACH. Chile.
- 2016 09 FONDEF projects: "*Primer Concurso de Investigación Tecnológica en Minería*" (First Technology Research on Mining Contest). Chile.
- 2016 05 FONDEF projects: "*IDeA en dos Etapas*" (IDeA in two Stages). Chile.
- 2015 03 projects: "*Contratación de Post-Doctorandos, 2016-2017*" (Post-doctorate Students' Recruitment, 2016-2017). DICYT. VRIDEI. USACH. Chile.
- 2015 07 FONDEF projects: "*IDeA en dos Etapas*" (IDeA in two Stages). Chile.
- 2015 Project: "*Construyendo el Hacer desde el Comprender*" (Building Doing from Understanding), Sheet number: 018-2014. Teaching Innovation Project. UNIE. USACH. Chile.
- 2014 Project: "*Incorporación de TIC, Renovación del Programa y Prácticas de Laboratorio en la Asignatura Técnicas de Laboratorio Químico,*

Basado en el Estudio de Casos a Alumnos de Ingeniería" (Incorporation of CITs, Update of Program and Laboratory Practices in the Subject "Chemistry Laboratory Techniques", based on case studies on Engineering students), Sheet number: 031-2014. Teaching Innovation Project. UNIE. USACH. Chile.

- 2014 Project: "PCI-CONICYT – *Apoyo al Desarrollo de Proyectos de Investigación*" (PCI-CONICYT - Support to the Development of Research Projects). Chile.

- 2014 05 projects: "*Contratación de Post-Doctorandos, 2015-2016*" (Post-doctorate Students' Recruitment, 2015-2016). DICyT. VRIDEI. USACH. Chile.

- 2014 03 FONDEF projects: "*IDeA en dos Etapas*" (IDeA in two Stages). Chile.

- 2013 Project: "*La Robótica como Herramienta Metodológica en Redes de Datos*" (Robotics as a Methodological Tool in Data Networks), Sheet number: 030-2013. Teaching Innovation Project. UNIE. USACH. Chile.

- 2012 Project: "*Diseño e Implementación de Nuevas Tecnologías Didácticas para los Cursos de Electromagnetismo*" (Design and Implementation of New Didactic Techniques for Electromagnetism Subjects), Sheet number: 006-2012. Teaching Innovation Project. USACH. Chile.

- 2012 Project: "*Un Enfoque Innovativo de Enseñanza de la Ingeniería: Diseño de Ambientes de Aprendizaje Activo y Colaborativo para la Asignatura MBI-Introducción a la Ingeniería*" (An innovative approach to Teaching in Engineering: Design of active and collaborative learning environments for the MBI Subject Introduction to Engineering), Sheet number: 040-2012. Teaching Innovation Project. UNIE. USACH. Chile.

Evaluation of Periodical Magazines and Books

- 2014 - 2015 Evaluation Committee Member of periodical magazine. Title: "Gerencia Tecnológica Informática (GTI)". Universidad Industrial de Santander, Bucaramanga, Colombia.

- 2013 Title: "Lyapunov-stable Position/Force Control Based on Dual Nature in Constraint Motion", 2013 IEEE/RSJ International Conference on Intelligent Robots and Systems. November 3-7, 2013, Tokyo Big Sight, Tokyo, Japan.

2011 Title: "*Robótica. Control de Robots Manipuladores*" (Robotics. Control of Manipulator Robots).
Editorial: Alfaomega Grupo Editor.

Evaluation of Indexed WoS Papers (Former ISI)

2021 Título: "The Synthesis of Planar Four-bar Linkage for Mixed Motion and Function Generation", Sensors. 1424-8220.

2021 Title: "Control synthesis for multiple mobile robot systems", Transactions of the Institute of Measurement and Control. ISSN: 0142-3312.

2020 Title: "In silico Analysis of Non-coding RNAs and Putative Target Genes Implicated in Metabolic Syndrome", Computers in Biology and Medicine. ISSN: 0010-4825.

2020 Title: "ROS-NetSim: A Framework for the Integration of Robotic and Network Simulators", IEEE Robotics and Automation Letters. ISSN: 2377-3766.

2020 Title: "Robotic Grasp Manipulation Using Evolutionary Computing and Deep Reinforcement Learning", Intelligent Service Robotics. ISSN: 1861-2776.

2019 Title: "Prediction of Human Voluntary Torques Based on Collaborative Neuromusculoskeletal Modeling and Adaptive Learning", IEEE Transactions on Industrial Electronics. ISSN: 0278-0046.

2019 Title: "A Linear Equation Constrained Optimization Approach for Optimal Robust Controller of Bipedal Robots", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.

2018 Title: "A Simscape Based Design of a Dual Maximum Power Point Tracker of a Stand-alone Photovoltaic System", Computers & Electrical Engineering. ISSN: 0045-7906.

2018 Title: "Robust Fixed-Time Adaptive Control for Robot Manipulators with Asymmetric Output Constraints Using Universal Barrier Function", IEEE Transactions on Industrial Electronics. ISSN: 0278-0046.

2017 Title: "Adaptive Position/Force control for robot manipulators with

- force and velocity observer", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.
- 2017 Title: "A Methodical Review of Sliding Mode Control Schemes for Robotic Manipulator", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.
- 2017 Title: "A New method to determine the Parameters of a photovoltaic Panel equivalent circuit", Solar Energy. ISSN: 0038-092X.
- 2017 Title: "A new high performance control strategy of Mobile Manipulator using Fuzzy-Flatness approach with gains adjustment in real time", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.
- 2017 Title: "Hexapod Robot Closed-loop Control Autonomous Navigation Based on Fuzzy Neural Network", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.
- 2017 Title: "Double iterative compensation learning control for active training of upper limb rehabilitation robot", International Journal of Control, Automation and Systems. ISSN: 1598-6446.
- 2017 Title: "Research on Folding Suspension of Multi-Constrained Rover Based on the Variation and Fusion of Rods and Pairs", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.
- 2017 Title: "Improved FOC of IPMSM using Finite-state Model Predictive Current Control for EV", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.
- 2017 Title: "Elastodynamics Model of 4-SPS/CU Parallel Mechanism with Flexible Moving Platform Based on Absolute Nodal Coordinate Formulation", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.
- 2016 Title: "Fast Plane Segmentation with Line Primitives for RGB-D Sensor", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.
- 2016 Title: "Comparative Study on the Redundancy of Mobile Single- and Dual-Arm Robots Based on wRMRC Algorithm", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.
- 2016 Title: "Applying the Bi-level HMM for Robust Voice-activity Detection", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.

- 2016 Title: "Study of error modeling in kinematic calibration of parallel manipulators", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.
- 2016 Title: "SOS based Anti-Sway Control of the Overhead Crane System using HOSM Observer", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.
- 2016 Title: "Modelling and Simulation of Multi Spindle Drilling Redundant Scara Robot Using Solid Works and Matlab/Simmechanics", Strojniški vestnik - Journal of Mechanical Engineering. ISSN: 0039-2480.
- 2016 Title: "Fault Tolerant Control of a Compliant Legged Quadruped Robot for Free Swinging Failure", IEEE Transactions on Automation Science and Engineering. ISSN: 1545-5955.
- 2016 Title: "Dynamic Modeling and Solution Algorithm of the Evaporation System for the Ultra-Supercritical Power Plant", Transactions of the Institute of Measurement and Control. ISSN: 0142-3312.
- 2016 Title: "Robot Path Planning Model of Target Gravity Optimal RRT algorithm", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.
- 2015 Title: "Maximal Dexterous Trajectory Generation and Cubic spline optimization for Fully Planar Parallel Manipulators", Computers & Electrical Engineering. ISSN: 0045-7906.
- 2015 Title: "A Coiling Robot for Elevator Compensation Chain", Industrial Robot-An International Journal. ISSN: 0143-991X.
- 2015 Title: "Development of a New Conflict Resolution Method for Multi-Mobile Robots in Cluttered Environments with Guaranteed Motion-Liveness", IEEE Transactions on Industrial Electronics. ISSN: 0278-0046.
- 2015 Title: "Stabilizing Control Algorithm for an Underactuated Surface Vessel Based on Adaptive Sliding Mode Control Approach", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.
- 2015 Title: "Limit Cycle Control Using Energy Function Regulation with Friction Compensation", IEEE Robotics and Automation Letters.
- 2015 Title: "Discrete-Time Circular Walking Pattern for Biped Robots", Journal of Electrical Engineering & Technology. ISSN: 1975-0102.

- 2015 Title: "Designing a Novel 3-Branch 6-DOF Parallel Robot Related to the Specific Workspace", Industrial Robot. ISSN: 0143-991X.
- 2015 Title: "Point Stabilization for an Underactuated AUV in the presence of Ocean Currents International Journal of Advanced Robotic Systems", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.
- 2015 Title: "Fractional Order PID and Application of Its Circuit Model", Journal of the Chinese Institute of Engineers. ISSN: 0253-3839.
- 2015 Title: "Dynamic Conveyor Picking Based on Changeable Pickup Limit Line" has been submitted to the Industrial Robot", Industrial Robot. ISSN: 0143-991X.
- 2015 Title: "Hybrid Diagnosing Techniques for Analyzing Dissolved Gases in Power Transformers", Journal of Engineering and Technology Research. ISSN: 0923-4748.
- 2014 Title: "Quality Function Deployment-based Expert System for Materials Selection", Indian Journal of Engineering & Materials Sciences. ISSN: 0975-1017.
- 2014 Title: "Image-based Robust Hovering Control of Multirotor Aerial Robot in the Presence of Uncertainties", IEEE Transactions on Industrial Electronics. ISSN: 0278-0046.
- 2014 Title: "On orbital stabilization for industrial manipulators: case study in evaluating performances of modified PD+ and Inverse Dynamics controllers", IEEE Transactions on Control Systems Technology. ISSN: 1063-6536.
- 2014 Title: "Mutual Inductances Effect on the Torque of an Axial Magnetic Flux Switched Reluctance Motor", IEEE Latin America Transactions. ISSN: 1548-0992.
- 2014 Title: "Technological Update of an Industrial Didactic Plant Applied to Control and Automation", IEEE Latin America Transactions. ISSN: 1548-0992.
- 2014 Title: "A Cooperative Path Planning Algorithm for Multiple Mobile Robot System under Dynamic Environment", International Journal of Advanced Robotic Systems. ISSN: 1729-8814.
- 2014 Title: "Assembly Line Productivity Assessment by Comparing Optimization-Simulation Algorithms of Trajectory Planning for

Industrial Robots", Industrial Robot. ISSN: 0143-991X.

- 2014 Title: "A Fault-Hiding Approach for the Switching Quasi-LPV Fault Tolerant Control of a Four-Wheeled Omnidirectional Mobile Robot", IEEE Transactions on Industrial Electronics. ISSN: 0278-0046.
- 2013 Title: "Constraint Periodic Trajectory Generation and Tracking Control of Underactuated Mechanical Systems", IEEE Transactions on Control Systems Technology. ISSN: 1558-0865.
- 2013 Title: "Detailed Analysis of Scara-type Serial Manipulator on a Moving Base with Labview", International Journal of Advanced Robotic Systems. ISSN: 1729-8806. e-ISSN: 1729-8814.
- 2011 Title: "Decentralized Formation Control of Multi-Agent Robots Systems Based on Formation Graphs". Studies in Informatics and Control. ISSN: 1220-1766.
- 2011 Title: "Obstacle Avoidance and Task Synchronization of Robot Manipulators". Studies in Informatics and Control. ISSN: 1220-1766.

Interests

- Professional:** Robotics, autonomous vehicles, mathematical modelling, automatic control, nonlinear control, optimal control, robust control, flexible production, dynamic systems (development of dynamic models, analysis, and simulation, among others.).
- Cultural:** Reading, classic music, cinema, and theater, among others.
- Sports:** Swimming, athletics, and yoga, among others.
- Collective:** Excursions, and ballroom, among others.