2025 IEEE CHILEAN CONFERENCE ON ELECTRICAL, ELECTRONIC ENGINEERING, INFORMATICS AND COMMUNICATIONS TECHNOLOGY

IEEE CHILECON2025

Valparaíso, Chile, October 28-30, 2025

Celebrating 50 years of research and innovation

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IEEE Chile Centro Section

ASOCIACIÓN CHILENA DE CONTROL AUTOMÁTICO

IEEE Chilean Chapter on Control Systems

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Conference President
Claudio Cubillos, PUCV Profesor

Welcome to
IEEE CHILECON2025

This IEEE Chilecon Conference is the continuation of the Chilean Congress of Electrical Engineering, founded in 1975 by Dr. Guillermo González Rees, and was the first conference held at the University of Chile. For 37 years, it was held every two years in odd-numbered years, in agreement with the Chilean Automatic Control Association, which holds its conferences in even-numbered years. In 1987, a cooperative alliance was signed between ACCA and the IEEE Chilean Control Chapter to co-organize these conferences. In 2012, the IEEE Chilean Section assumed co-organization, changing the name to IEEE Chilecon.

Today marks the 50th anniversary of this IEEE Chilecon Conference, just as ACCA celebrated its 50th anniversary last year. Throughout its history, IEEE Chilecon has grown to encompass all of the Americas and all continents in this edition. More than 400 papers have been received from 72 countries. I would like to pay tribute to the people who have been crucial to this successful conference model, as they have managed to attract a growing number of people. One of them is Dr. Mario Fernández, from the University of Talca, for his ideas for the Conference, his enthusiasm, responsibility, and effort. He is the current president of ACCA. Dr. Karina Barbosa from USACH and the IEEE Chile Chapter of Control. The other is my brother, Etienne Lefranc, who collaborated anonymously. And of course, the presidents of IEEE Chile Centro and IEEE ChileSur, who always support this Conference.

We would like to thank the keynote speakers: Dr. Ismael López Juarez from Mexico, Dr. Fernando Passold from Brazil, Dr. Karina Barbosa from USACH, Dr. Rodrigo Palma from the University of Chile, and Dr. José Ceroni from PUCV. I would also like to thank the organizers of the special sessions and photojournalism: Gabriel Gatica and Fernando Fuentes. All of them enrich the objective of this Conference: to show attendees new paths. The main objective is these Technical Sessions, where researchers' work is presented and defended, showcasing what is being done in our countries. A growing cooperation among Latin American engineers can be seen, which shows that we are aware of our common destiny and must support each other. Another objective is to promote camaraderie and dialogue among participants, and I hope you will appreciate it.

Gastón Lefranc

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Conference Track Sessions - Paper ID Organization

Track	IDs de Papers
AI (Artificial Intelligence)	200, 202, 346, 424, 505, 541, 579, 627, 634, 635,640, 692, 787, 840, 843, 861, 881, 884, 903, 906, 925, 938, 946, 952, 957, 961
Biomedical Engineering	49, 566, 567, 582, 654, 771, 845, 963
Computer Intelligence	215, 219, 535, 544, 804, 841, 869, 897
Computer Science, Software & Information Systems	139, 199, 551, 687, 716, 778, 813, 829, 832, 855, 874, 908, 919, 926, 974
Control Systems & Processes	251, 354, 400, 425, 428, 429, 548, 609, 617, 630, 657, 662, 730, 759, 764, 769, 805, 871, 872, 920, 930, 956
Control Theory	717, 842,435
Ecological Technology & Digital Agriculture	543, 564, 613, 667, 710, 798, 802, 821, 858, 885, 894, 900, 915, 924, 929, 960
Energy & Power	46, 465, 513, 545, 556, 562, 568, 577, 615, 621, 641, 650, 665, 674, 694, 750, 766, 773, 781, 793, 794, 799, 800, 820, 824, 836, 849, 851, 857, 864, 867, 870, 876, 878, 887, 890, 892, 893, 901, 911, 918, 944, 954, 958, 969, 1003, 1004, 1005, 1006, 1022, 1033, 1034
Engineering Education	151, 369, 601, 677, 758, 779, 809, 816, 844, 868, 873, 883, 902, 921
Geosciences & Remote Sensing	493, 574, 796, 797, 922, 962
Information Technology & Communication Systems	152, 430, 439, 468, 529, 572, 576, 595, 664, 690, 775, 776, 791, 801, 803, 807, 818, 822, 846, 852, 880
IoT & Mechatronics	166, 557, 631, 707, 754, 755, 834, 899
Power Electronics	14, 474, 515, 534, 540, 555, 583, 594, 602, 605, 606, 610, 697, 704, 718, 721, 751, 762, 770, 774, 786, 788, 811, 825, 826, 853, 854, 859, 860, 877, 882, 937
Production & Industry 4.0	443, 528, 558, 614, 712, 785, 831, 838, 865
Robotics & Computer Vision	475, 492, 519, 522, 524, 542, 549, 560, 643, 746, 789, 815, 833, 837, 856, 863, 875, 905, 914, 948, 949
Smart Industry	584, 723, 806, 827, 895, 923
Videogames	132, 191,162, 434, 461, 563, 830, 971, 991, 909, 1016
Invited Session Computer Science	12, 15, 99, 128, 210, 211, 258, 260, 268, 282, 288, 293, 295, 297, 352, 380, 382, 388, 402

Track Sessions by ID

Tuesday 28 October

Horario	IBC4-5	IBC4-4	IBC4-3	IBC2-6	IBC2-12	IBC2-13
9:00–10:30	Ener. & Pow. S1 (6) 1003+, 1004+, 556, 799, 793, 674+	Pow. Electro. S1 (6) 14, 540+, 788, 853, 859, 762	AI S1 (6) 200*, 202*, 346, 505, 961+, 687	Robo & CV S1 (6) 522, 549+, 746, 856, 948, 949	Inf. Tech. S1 (6) 152, 468+, 529, 595+, 801, 807	Control Sys S1 (6) 251*, 400, 428, 429, 730*,435
10:30–11:00	**Coffee Break**					
11:00–12:00	**AULA IBC (subSuelo)** **Keynote Speaker:** Dr. Rodrigo Palma Challenges of the energy transition for the integration of decentralized energy solutions	**IBC4-4** **Keynote Speaker:** Gastón Lefranc, Artificial Intelligence for Social Well-being in Latin America: Innovation, Ethics, and Opportunities for Inclusive Development				
12:00–13:00	**AULA IBC (subSuelo)** **Keynote Speaker:** Dr. Ricardo Baeza-Yates Human-AI co-evolution					
13:15–14:15	**Almuerzo**					
14:30–16:00	Ener. & Pow. S2 (6) 1022, 1033, 1034, 773, 781, 794	Pow. Electro. S2 (6) 515, 534*, 555, 602, 605, 786	AI S2 (7) 424, 541, 579+, 634+, 635, 640, 627+	Robo & CV S2 (6) 837, 789, 524*, 914, 863+, 875*	Inf. Tech. S2 (6) 776, 791, 775, 803, 880	Control Sys S2 (6) 425, 662, 956, 930, 842, 717
16:00–16:30	**Coffee Break**					
16:30–18:00	Ener. & Pow. S3 (5) 1005+, 46, 513, 577, 694*	Pow. Electro. S3 (6) 594, 751, 825*, 826*, 877, 937*	AI S3 (6) 787, 840, 843, 861, 881*, 884*	Robo & CV S3 (6) 815*, 833, 643, 905*, 542+	Inf. Tech. S3 (5) 430*, 572, 576, 818+, 852	Control Sys S3 (7) 354, 609, 630, 657, 759, 769, 920
19:30	Inauguration and cocktail					

*** Online Presentation; + Not Confirmed Presentation**

Track Sessions by ID

Wednesday 29 October

Horario	IBC4-5	IBC4-4	IBC4-3	IBC2-6	IBC2-12	IBC2-13
9:00–10:30	Ener. & Pow. S4 (5) 824, 851*, 836, 465, 545	Pow. Electro. S4 (6) 583*, 718*, 721*, 770, 854, 882	AI S4 (6) 903*, 906+, 925, 938, 946+, 692*+	Robo & CV S4 (4) 475*, 519, 492, 560	Inf. Tech. S4 (5) 439, 690, 822*, 664, 846, 352	Control Sys S4 (6) 548, 617, 764, 805, 871, 872
10:30–11:00	**Coffee Break**					
11:00–12:00		Special Session (S1) Supercomputo e IA 952, 957 Gabriel Gatica et al: AI-Enhanced Supercomputing Centers. Roberto Muñoz: A Semantic Ontology Framework for AI-Enhanced Supercomputing Centers	**Auditorio UV** (calle Gral. Cruz 222) **Keynote Speaker:** Dr. José Ceroni PUCV, Collaborative systems information sharing for container clearing scheduling in the case of Port Valparaiso			
12:00–13:00	**Keynote Speaker:** Dra. Ana B. Ruiz, Metaheristics for Multi objective Optimization	Special Session (S2) Forum on Supercomputing +IA Director fro CENIA, Dr León USM , moderator Gabriel Gatica	**Auditorio UV** (calle Gral. Cruz 222) **Keynote Speaker:** Dr Ismael Lopez Juarez Cinvestav Mexico, From Low-Cost Platforms to Agentic Manufacturing: Toward AI-Driven Autonomous Robotics			
13:15–14:15	**Lunch**					
14:30–16:00	Ener. & Pow. S5 (6) 621*, 766+, 849, 887+, 911, 958	Pow. Electro. S5 (5) 474, 606, 610, 697	CS SW S1 (6) 139, 199, 551, 716+	Eco. Tech. S1 (6) 543+, 798+, 667, 564, 960, 613	Eng. Edu. S1 (6) 151, 369, 601, 677, 758+, 921	Biomedical Eng. S1 (5) 49+, 566*, 567, 582, 654
16:00–16:30	**Coffee Break**					
16:30–18:00	Ener. & Pow. S6 (6) 562, 665, 944, 568*, 750, 864+	Pow. Electro. S6 (3) 704, 811, 860, 774+	CS SW S2 (6) 778, 813+, 829, 832, 855, 874+	Eco. Tech. S2 (6) 802, 885+, 929+, 915, 924, 900	Eng. Edu. S2(5) 809, 816, 844, 868, 873	Comp. Intell. S1 (3) 215, 219, 544
19:45	Banquet in Club Español Recreo Viña del mar					

Thursdays 30 October

Horario	IBC4-5	IBC4-4	IBC4-3	IBC2-6	IBC2-12	IBC2-13	IBC 2-4
9:00–10:30	Ener. & Pow. S7 (6) 650, 820+, 857, 870+, 876+, 641	Eco. Tech. S3 (4) 710, 821, 858+, 894*	Prod. & Ind. S1 (6) 614, 528, 865, 785, 443	Eng. Edu. S3 (3) S3 (3) 779, 883, 902	Biomedical Eng. S2 (3) 771, 845, 963	Comp. Intell. S2 (5) 535, 804, 841+, 869, 897	Invited Session CS Room 7: 9-10:30 S1 (6) 12, 15*, 99, 128, 210, 295
10:30–11:00	**Coffee Break**						
11:00–12:00		**IBC 4-4** **Special Session** (S1) Digital Agriculture. **Keynote Speakers:** Dr. Fernando Fuentes, Dr. Rodrigo Ortega, Dr. Stanley Best	**IBC 4-3** **Keynote Speaker:** Dr. Fernando Passold (Brasil), Smart Traction and Gripping: Machine Learning Innovations for Robots				
12:00–13:00	**Auditorio UV** (calle Gral. Cruz 222) **CLEI Keynote Speaker** Claudio Gutierrez, DCC, U. de Chile.	**IBC 4-4** **Special Session** (S2) Forum . Dr. Fernando Fuentes, Dr. Rodrigo Ortega, Dr. Stanley Best Moderator: Gabriel Gatica	**IBC 4-3** **Keynote Speaker:** Dra. Karina Barbosa (Brasil-Usach), Robust control applied to sustainable energy systems				
13:15–14:15	**Lunch**						
14:30–16:00	Ener. & Pow. S8 (6) 892, 867*, 901, 615, 878*, 890*	Invited Session S2 (6) 211, 258, 268, 282, 288*, 293	Prod. S2(3) 831, 712, 838 SmartInd S1 (2) , 723, 806,	Videogames S1 (5) 132*, 191, 434, 461, 1016+	IoT & Meca. S1 (5) 166+, 557+, 755, 834, 754+	GeoSci. & Rem. Sen S1 (6) 493, 574, 796, 797, 922, 962	
16:00–16:30	**Coffee Break**						
16:30–18:00	Ener. & Pow. S9 (6) 918, 954, 1006+, 800*, 893, 969*	Invited Session S3 (6) 260, 297, 380*, 382, 388+, 402	SmartInd S2(6) 827, 895, 923, 835, 558*, 584	Videogames S2 (5) 563+, 830+, 971, 991+, 909	IoT & Meca. S2 (4) 631, 707*, 899*	Comp. Sc. S3 (4) 908, 919, 926, 974	
18:15	IBC 4-5 Closure						
Fridays 31	**Tours** Consult to Secretary of Conference						

Keynote Speaker

Challenges of the energy transition for the integration of decentralized energy solutions

Rodrigo Palma-Behnke (IEEE M'94, SM'04) recibió su título de Ingeniero Civil de Industrias con Menciónen Electricidad y su Magíster en Ciencias de la Ingeniería de la Pontificia Universidad Católica de Chile, yobtuvo su título de Doctor en Ingeniería (Dr.-Ing.) en la Universidad de Dortmund, Alemania (becario DAAD).

Es profesor titular del Departamento de Ingeniería Eléctrica de la Universidad de Chile.Su campo de investigación incluye laplanificación y operación de sistemas eléctricosen mercados eléctricos competitivos, energíarenovable, soluciones solares, cambio climático,redes inteligentes (smartgrids), educación ensistemas eléctricos y el desarrollo de solucionesde microrredes.

Es miembro del Centro deEnergía de la Facultad de Ciencias Físicas yMatemáticas de la Universidad de Chile(www.centroenergia.cl) y es director del CentroFONDAP para la Investigación en Energía SolarSERC-Chile (www.sercchile.cl). Fue presidente de la Sección Chile del IEEE durante los períodos 2019-2020,2011-2012, 2007-2008 y 2003-2004.

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Challenges of the energy transition for the integration of decentralized energy solutions

Junto con entregar un marco teórico y experiencia internacional en torno a las soluciones energéticas descentralizadas, la presentación explora los desafíos que tenemos a nivel nacional para su integración. Se presentan aspectos técnicos, económicos y socio-ambientales.

Se presentan distintas iniciativas concretadas y proceso de consolidación. Concretamente, se presentan desafíos en el ámbito de la operación eléctrica en régimen permanente/transitorio, estrategias de control, EMS y criterios de planificación. Adicionalmente, se presentan los desafíos inter y transdisciplinarios que enfrentan estas soluciones en distintos contextos locales.

Desde el punto de vista de tecnologías, se presentan aplicaciones de generación distribuida, soluciones agrivoltaicas, microrredes , generadores virtuales, agregadores de consumo y aplicaciones de hidrógeno.

Keynote Speaker

Collaborative systems information sharing for container clearing scheduling in the case of Port Valparaiso

JOSÉ CERONI-DÍAZ is Professor of the School of Industrial Engineering at Pontificia Universidad Católica de Valparaíso, Chile and received the B.S. degree in Industrial Engineering at Pontificia Universidad Católica de Valparaíso, Chile, in 1988. He received the M.S. degree, and in 1999 the Ph.D. degree in Industrial Engineering at Purdue University, West Lafayette, Indiana, USA. From 2014 to 2020, he held the position of Dean of the Faculty of Engineering at Pontificia Universidad Católica de Valparaíso, Chile. His research interests include collaborative models for production systems, integration in manufacturing systems, robotics systems, production planning, and control systems.

Collaborative systems information sharing for container clearing scheduling in the case of Port Valparaiso

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Abstract: Congestion is a significant challenge in today's container ports. This is particularly the case for Port Valparaiso, Chile, due to its geographical limitations, such as the surrounding mountains and its location within a densely populated urban area, expansion is not a viable option. Therefore, the port can only be competitive by optimizingits throughput. This research is to assess the existing level of collaboration and how incenting information sharing, by leveraging a digital twin to simulate alternative port operations and optimize container handling processes, can improve collaboration and reduce container throughput time. This research aims to enhance Port Valparaiso's operational capacity and service quality by implementing a digital twin in a virtual reality environment integrated with collaborative systems and incentive mechanisms. The digital twin of the dock processes will simulate alternative port operations to decrease the time that import-destined containers spend in the stacking area. These measures will increase the port customers' quality of service, retain and incent collaboration of the customers. Four key components integrate into a unified system designed to enhance operational efficiency and service quality at Port Valparaíso: (1) Digital twin in a virtual reality environment, (2)collaborative information sharing, (3) Hub-CI for collaborative intelligence, and (4) Reinforcement Learning. The digital twin will collect data and communicate important (partial) information to the stakeholders. A collaborative information-sharing protocol was designed to enable timely information exchange, reducing shipment delays and improving the quality of service. A reinforcement learning algorithm is applied to optimize container stacking schedule and calculate a personalized incentive for information sharing by each stakeholder. The proposed protocol enables the Port of Valparaiso to better customize its services and the willingness to share information. Preliminary work has identified the stakeholders' main objectives, established the proposed methods, and identified DDPG as the reinforcement algorithm to be applied in this research. Competing against ports with larger container yards requires highly optimized operational efficiency. Integrating collaborative information sharing enables Port Valparaiso to stay competitive and improve its operation for future growth by reducing the allocated space for imports. This work's outcome will enhance knowledge about container movements and ultimately improve container storage and accessibility.

Keywords: systems collaboration, information sharing, multi-agent systems, port congestion, digital twin, virtual reality.

Keynote Speaker

From Low-Cost Platforms to Agentic Manufacturing: Toward AI-Driven Autonomous Robotics

Dr. Ismael López-Juárez holds a degree in Mechanical and Electrical Engineering from UNAM (1991), a Master's in Instrumentation from the University of Manchester (UMIST, 1996), and a Ph.D. in Intelligent Robotics from Nottingham Trent University (2000), United Kingdom. His research interests include artificial intelligence, electronic instrumentation, industrial robotics, neural networks, and computer vision. He has published over 200 articles and 13 book chapters, supervised 44 theses (13 at the doctoral level), holds 2 patents, and has led technological and industry-transfer projects. He is a member of the National System of Researchers (SNI), Level II, and a member of the Mexican Academy of Sciences (AMC). He founded the Mechatronics and Intelligent Manufacturing Group at CIATEQ (2000–2006) and the Robotic Welding Laboratory at COMIMSA (2008–2010). He has been a visiting researcher at Sheffield Hallam University (UK), a visiting professor at École Centrale de Lille (France) and the Autonomous University of Yucatán. Since 2006, he has led the Intelligent Manufacturing Laboratory at Cinvestav, where he also coordinated the Graduate Program in Robotics (2016–2018). He is a regular reviewer for international journals, he hast been Guest Editor at Springer, member of the Editorial Board of IEEE Latin America Transactions, and currently Member Board Editor of *Discover Robotics* (Springer). [ORCID: https://orcid.org/0000-0001-6405-5519]

From Low-Cost Platforms to Agentic Manufacturing: Toward AI-Driven Autonomous Robotics

Dr. Ismael Lopez-Juarez

Robotics is undergoing a transformative shift, driven by advances in artificial intelligence, simulation, and foundation models. This keynote presents an integrative perspective on how these technologies converge to enable the next generation of autonomous and intelligent robotic systems. We begin by examining the development of low-cost, vision-guided robotic platforms, which make advanced manipulation research accessible, flexible, and extensible—providing a testbed for AI-enhanced robotics and education. Building on this foundation, the concept of Agentic Manufacturing is introduced, where embodied agents trained with deep reinforcement learning in simulation acquire adaptive behaviors that can transfer reliably to real-world tasks. A case study in robotic welding demonstrates how domain randomization and Sim2Real strategies improve policy robustness, efficiency, and reliability in industrial contexts.

Finally, the keynote explores the emerging role of large language models (LLMs) as robot control agents, capable of translating high-level natural language instructions into executable actions. By combining document-grounded prompting with lightweight, locally-deployed AI, these agents enable intuitive human-robot interaction and rapid prototyping using edge computing.

Together, these lines of research illustrate a unified trajectory toward affordable, adaptive, and AI-driven agentic manufacturing robotic systems, where low-cost platforms, reinforcement learning, and language-enabled intelligence converge to expand the frontiers of autonomous robotics in manufacturing, research, and education.

Keynote Speaker

Robust Control of Sustainable Systems with Synthetic Inertia

Dr. Karina A. Barbosa is currently the Vicedecana de Docencia y Formación Profesional at the Faculty of Engineering, Universidad de Santiago de Chile (USACH), Associate Professor in the Department of Electrical Engineering at USACH, and mother of two teenagers.

She holds a B.Sc. in Applied and Computational Mathematics (1997) from the Federal University of Rio Grande do Sul (UFRGS), and a M.Sc. (1999) and Ph.D. (2003) in Electrical Engineering from the Federal University of Santa Catarina (UFSC), Brazil. Dr. Barbosa currently serves as Chair of the IEEE Chile Control Chapter, is a board member of the Chilean Association of Automatic Control (ACCA), and has been an IEEE Senior Member since 2017.

Her research focuses on **robust control theory**, particularly on the development of control and state estimation methods based on Linear Matrix Inequalities (LMI) and parameter-dependent Lyapunov functions for uncertain and LPV systems, with applications to energy systems.

She has published in several high-impact journals and has served as principal investigator and co-investigator of Fondecyt, Dicyt, and Fondef projects, spanning both control theory and its applications to energy systems. In 2024, she served as General Chair of the IEEE ICA ACCA 2024 conference and led the organizing committee of the first **IFAC Latin American Women in Control Engineering (IFAC LA-WICE)** meeting, both held in Santiago, Chile.

Robust Control of Sustainable Systems with Synthetic Inertia

Dra. Ing. Karina A. Barbosa
Universidad de Santiago de Chile

Abstract:
This talk presents the application of robust control strategies to sustainable systems with synthetic inertia, a key feature for maintaining the stability of power grids with high penetration of renewable energy sources. The discussion focuses on methodologies based on linear matrix inequalities (LMI) that ensure stability and performance under uncertainties and disturbances, highlighting the role of robust control as an essential tool for the reliable and sustainable operation of modern dynamic systems.

Keynote Speaker

Smart Traction and Gripping: Machine Learning Innovations for Robots

Fernando Passold is a Full Professor of Electrical Engineering (Electronics fied) at the University of Passo Fundo, Brazil, with a research career dedicated to intelligent systems and robotics. He holds a PhD and a master's degree in Electrical Engineering from the Federal University of Santa Catarina (UFSC), Brazil. His doctoral research used MLP and RBF neural networks for real-time position and force control of a SCARA robot manipulator, achieving trajectory tracking errors of less than 0,18 degrees or 0.8 mm (compared with 0,28 degrees or 1 mm error obtained with conventional PID controller).

His research interests lie at the intersection of traditional control theory and modern artificial intelligence, including mobile robotics, machine learning, and computer vision. He has a publication history, with articles in international journals such as *International Journal of Computers, Communications & Control*, *Studies in Informatics and Control*, as well as several papers presented at IEEE and IFAC conferences.

His teaching and research consistently aim to bridge the gap between theoretical concepts and real engineering applications (from embedded systems to AI-based robotics), exploring how techniques such as neural networks and reinforcement learning can solve complex problems in automation and robotics. His practical experience is demonstrated by successful mentoring of award-winning competitive robotics teams and supervision of undergraduate and graduate projects such as a computer vision system for MIG-MAG welding robots and dynamic weighing systems using MLP neural networks.

He has experience in robotics programming (C, C++, Python, ROS) and simulation (MATLAB/Simulink), with a current focus on deep learning libraries using TensorFlow and Keras. He has dedicated his career to connecting theoretical innovation with practical applications in the areas of control, signal processing and robotics.

Smart Traction and Gripping: Machine Learning Innovations for Robots

The field of robotics is undergoing a profound transformation, moving beyond conventional wheels and tracks towards bio-inspired and adaptive mechanisms for locomotion and manipulation. However, controlling these novel, often unconventional, designs—such as multi-articulated legs, fin-like propulsors, or soft grippers—presents a significant control paradigm challenge. Traditional programming methods fall short, making these configurations seem intractably complex for widespread adoption.

This keynote addresses this frontier, exploring how machine learning (ML) is revolutionizing the control of innovative traction and gripping systems. It will demonstrate how ML algorithms, particularly reinforcement learning, can autonomously discover optimal control strategies within simulated environments, enabling robots to learn how to navigate complex terrains or manipulate delicate objects with unprecedented adaptability.

The session will attempt to bridge the gap between theoretical research and practical application by showcasing compelling video case studies from industry and academia.

These include soft robotic grippers for surgery and agriculture, mobile robots with adaptive traction for uneven terrain, and the integration of these systems within the broader context of Industry 4.0 and sustainable automation.

By examining the computational challenges, accessible simulation tools, this talk aims to demystify the development process. It will highlight how these innovations are not just laboratory curiosities but are paving the way for more versatile, efficient, and intelligent robots, ultimately inspiring a new generation of engineers and entrepreneurs to push the boundaries of what is possible in robotics.

Keynote Speaker

Artificial Intelligence for Social Well-being in Latin America: Innovation, Ethics, and Opportunities for Inclusive Development

He obtained the title of Electrical Engineer (Bachelor) at Universidad Técnica Federico Santa María in Valparaíso, Chile (1969). Then, he obtained the title of Civil Electrical Engineer at Universidad de Chile (1976). He obtained master's degree at Northwestern University in Evanston, USA (1979) and PhD (c) (Theses approved) 1982. He received the Title of Professor Honoris Causa at Agora University, Rumania (2022From 1968 to 1974 he worked as a full-time researcher and professor in the Electrical Engineering Department of the University of Chile. There he held the positions of Head of the Laboratories of Automatic Control and Digital Systems, participating in Research Projects, and dictating courses.

He worked at Electrical Eng Dpt at Universidad de Chile from 1965-1974. From 1974 to 2018 he was a full professor and researcher at the School of Electrical Engineering of the Pontificia Universidad Católica de Valparaíso, where he has reached the position of Full Professor (1984). Coordinator of the Academic Group of Robotics and Artificial Intelligence and Advanced Automation (1996 to 2012). Head of the Laboratory of Robotics and Artificial Intelligence, since its creation in 1998. Researcher of Fondecyt Projects, PUCV, United Nations UNIDO (1991-1996), Joint project with UNAM Mexico (1990 to 2018).

Visiting Professo**r:** México 15 times (UNAM; Monterrey, Toluca, Aguas Calientes, etc); Perú 5 times; Argentina 6 times; Brazil 2 times; Panamá 3 times. Visitant Professor of Ecole Centrale de Lille, France, for research and member of PhD Thesis commission 2011, 2017, 2018, 2019.

Recognitions and Awards: IEEE Latin America Eminent Engineer, 1998; IEEE Millenium Medals Prize awarded to Outstanding Engineer. 2000; Chilean Association of Automatic Control in its 30 years. 2004; Medal of Academic Merit, Pontifical Catholic University of Valparaíso. 2012; Professor Honoris Causa of Agora University, Rumania 2022; IEEE Oustanding Chapter Award from the IEEE Control Systems Society. 2019; Best Paper ITQM Conference, Bucharest, 2024; Honorary President of IEEE ICA ACCA2024, 50th celebration of ACCA.He has publications in ISI Journals and others since(89) and 194 papers on Conferences

Artificial Intelligence for Social Well-being in Latin America: Innovation, Ethics, and Opportunities for Inclusive Development

Artificial Intelligence (AI) is emerging as a key factor in addressing social and economic challenges in Latin America. In public health, AI facilitates early disease detection, resource optimization, and improved access to diagnostics for rural populations. In education, intelligent systems promote digital literacy and personalized learning, helping to reduce inequality gaps. In social services, automation improves efficiency and transparency in the implementation of public policies. Chile presents success stories such as predictive models for chronic diseases and AI-based educational inclusion platforms. Furthermore, the growing establishment of supercomputing centers in the region provides the computational infrastructure necessary to train large-scale AI models for research and social innovation. However, this progress raises ethical concerns regarding data privacy, bias, and equitable access to technology. The limited regulatory frameworks in developing countries highlight the need for policies that balance innovation with human rights. This conference examines the transformative potential of AI and supercomputing in Latin America, proposing strategies to promote sustainable, inclusive, and ethically guided development.

Keynote Speaker

Special Session on Digital Agriculture

Precision Agriculture Technologies for Efficient and Sustainable Production

RODRIGO ORTEGA BLU

He is Agronomist, University of Concepción, Chile, Master of Science (MS), Colorado State University, USA, Doctor of Philosophy (PhD), Colorado State University, USA, Specialist in soil fertility, plant nutrition, and precision agriculture.

Professor at Federico Santa María Technical University, Chile. Founding member of the International Society of Precision Agriculture. Founding member and first president (2018-2022) of the Latin American Association of Precision Agriculture. Actual vice-president (2024-2026).

Co-owner and Technical Manager of Neoag Precision Agriculture, Chile.

Owner and General Director of Agriservice Laboratory, Chile.

International and national advisor on soils and precision agriculture.Director of the Research Group on Soil, Plant, Water and Environment (GISPA)

Researcher in the areas of: Integrated Nutrition Management, Precision Agriculture, Modeling in Agriculture, Agricultural Sustainability

Author or co-author of more than 180 scientific and extension publications.

Precision Agriculture Technologies for Efficient and Sustainable Production

Abstract

Precision Agriculture (PA) could be defined as good agronomy with timely and quality information. Digital Agriculture (DA), considered an integral part of PA, has strongly contributed to its development, in areas such as geographic information systems, remote sensing, monitoring of diverse agronomic variables, and process automation, among others. An area of great relevance is advanced data analysis, where different *machine learning* tools have contributed to the development of models for different applications, such as the identification and management of weeds, pests and diseases and the early estimation of yields, among others.

Precision agriculture allows for better management decision-making, which makes it key to increasing the efficiency and sustainability of agricultural systems, under the concept of regenerative agriculture. Despite the growing technological offer, adoption is still low, mainly explained by the low critical mass within agricultural companies and on the other hand, because, in many cases, the proposed solutions are not good enough to replace traditional management.

Keynote Speaker

Special Session on Digital Agriculture

Effective Integration of Agriculture into the Digital and Artificial Intelligence Era

STANLEY C. BEST SEPULVEDA, Ing. Agrónomo, MSc en Ingeniería Agrícola y PhD in Bioresources and Agri. Enginnering, Colorado State University, USA.

Researcher at the Agricultural Research Institute and Leader of INIA's Digital Agriculture Program. President of IberoAmerica Network of Digital Agriculture (RIDAG). Chilean Representative of PROCISUR-MERCOSUR Platforms for Digital Agriculture. Member of the International Commission of Agricultural Engineering (CIGR) in the area of Equipment Engineering for Plants. Member of the Bologna Club. Editorial board member of the Journal of Information Technology in Agriculture (JITAG) and the International Journal of Food Engineering and Technology. Also, Judge at the Gerdau Best of the Land Award at Agrishow - Brazil, for more than two years. He has participated as a Member of the Scientific Committee in world-class conferences such as the FRUTIC International Symposium, 7th World Congress of Computers in Agriculture and Natural Resources, Reno, USA; Fourth Asian Conference on Precision Agriculture, Hokkaido, Japan, XX CIGR World Congress: Sustainable Agricultural Production - Water, Land, Energy and Food, Kyoto, Japan, as well as in more than 20 others. On the other hand, he has participated as a Keynote Speaker in different international conferences in America, Asia and Europe. It has more than 70 scientific and informative publications. Finally, he has participated as a Lead Researcher in more than 30 national and international projects.

"Effective Integration of Agriculture into the Digital and Artificial Intelligence Era: Developing a Public-Private Ecosystem of Technological Solutions for Modern and Sustainable Production in the Face of Global Challenges".

Abstract

Agriculture faces challenges from climate change, global competition, and increasing sustainability demands, which require solutions to improve efficiency and resilience. Digital transformation emerges as a key tool to optimize decision-making and foster innovation. However, adoption gaps persist, mainly related to access and training. Digital solutions must consider scale, timing, and the diversity of users. The complexity of agriculture requires prioritizing variables that generate significant productive impact and perceived benefits. This approach helps users adopt new technologies more quickly. In response, INIA's Digital Agriculture Program is driving the modernization of Chilean agriculture. Agriculture 4.0 technologies are being used to enhance productivity, efficiency, and sustainability, which is the central theme of this seminar.

Keynote Speaker

Special Session on Digital Agriculture

Biosystems Engineering for the Digital Transformation of Agriculture: Integrating Hardware, Software, and Global Collaboration

DR. FERNANDO FUENTES
Investigador de Instituto de Investigación.Interdisciplinaria (I3-VRA), líder del equipo de Biosistemas.
Dr. en Ciencias Agrarias, Universidad de Talca, Magister en Horticultura, Magister en Educación,Ingeniero Agrónomo

Dr. Fernando Fuentes is a researcher and academic in the field of Agrifood Biosystems Engineering, specializing in horticultural production and smart agriculture. He holds a PhD in Agricultural Sciences and a Master's degree in Horticulture and Education. His research focuses on the integration of digital technologies to improve resource management and horticultural productivity. Their efforts have improved methods of efficient water management and sustainable agriculture in controlled environments. As an educator, Dr. Fuentes teaches courses in Automatic Control Systems and Biosystems Engineering, preparing students to overcome modern agricultural challenges. He is an active member of the international academic community and a frequent speaker at academic and industrial events. He has recently been appointed as a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE) for his outstanding contributions in the field of R+D+i+E in Engineering.

Biosystems Engineering for the Digital Transformation of Agriculture:
Integrating Hardware, Software, and Global Collaboration

Abstract
Biosystems Engineering has evolved into a multidisciplinary field that connects engineering, life sciences, and data technologies to address global challenges in sustainability, climate adaptation, and resource efficiency. This presentation highlights the development of integrated hardware and software systems designed to monitor, automate, and optimize biological and environmental processes in collaboration with both the public and private sectors.
Led by teams from the University of Talca and partner institutions in Chile, the United States, and the Dominican Republic, this work exemplifies how collaborative innovation bridges research and application through IoT networks, cloud platforms, and intelligent control systems.
Beyond technological advances, the presentation discusses the institutional and organizational frameworks that enable cooperation among academia, industry, and government agencies.
By integrating engineering design, data analytics, and international partnerships, Biosystems Engineering emerges as a key driver for the digital transformation of agriculture and environmental management, providing scalable solutions for sustainable development in Chile and Latin America.

Keynote Speaker

Human-AI Co-Evolution

Ricardo Baeza-Yates, KTH, Sweden; UPF, Spain; U. de Chile

He has been Director of Research at the Institute for Experiential AI of Northeastern University since 2021. He is also a part-time Professor at Universitat Pompeu Fabra in Barcelona and at Universidad de Chile in Santiago. Before he was the CTO of NTENT, a semantic search technology company based in California and prior to these roles, he was VP of Research at Yahoo Labs, based in Barcelona, Spain, and later in Sunnyvale, California, from 2006 to 2016. He is co-author of the best-seller Modern Information Retrieval textbook published by Addison-Wesley in 1999 and 2011 (2nd ed), which won the ASIST 2012 Book of the Year award. From 2002 to 2004 he was elected to the Board of Governors of the IEEE Computer Society and between 2012 and 2016 was elected to the ACM Council. Since 2010 he has been a founding member of the Chilean Academy of Engineering. In 2009 he was named ACM Fellow and in 2011 IEEE Fellow. He obtained the Spanish National Research Award Ángela Ruiz Robles for applied research and technology transfer given by the Scientific Computing Societies of Spain and the BBVA Foundation in 2018 and the Chilean National Award on Applied and Technological Sciences in 2024, among other distinctions. He obtained a Ph.D. in CS from the University of Waterloo, Canada, and his areas of expertise are web search and data mining, information retrieval, bias and ethics on AI, data science and algorithms in general.

Human-AI Co-Evolution

Abstract:
Human-AI co-evolution, defined as a process in which humans and AI algorithms continuously influence each other, increasingly characterizes our society, but is understudied in artificial intelligence and complexity science literature. Recommender systems and assistants play a prominent role in human-AI co-evolution, as they permeate many facets of daily life and influence human choices through online platforms. The interaction between users and AI results in a potentially endless feedback loop, wherein users' choices generate data to train AI models,
which, in turn, shape subsequent user preferences. This human-AI feedback loop has peculiar characteristics compared to traditional human-machine interaction and gives rise to complex and often "unintended" systemic outcomes. This paper introduces human-AI co-evolution as the cornerstone for a new field of study at the intersection between AI and complexity science, focused on the theoretical, empirical, and mathematical investigation of the human-AI feedback loop. In doing so, we: (i) outline the pros and cons of existing methodologies and highlight shortcomings and potential ways for capturing feedback loop mechanisms; (ii) propose a reflection at the intersection between complexity science, AI and society; (iii) provide real-world examples for different human-AI ecosystems; and (iv) illustrate challenges to the creation of such a field of study, conceptualising them at increasing levels of abstraction, i.e., scientific, legal and socio-political.

Keynote Speaker

Metaheristics for Multiobjective Optimization: Introducing the Decision Maker in the Process

Ana Belén Ruiz Mora (Ana B. Ruiz) is a Lecturer at the Department of Applied Economics (Mathematics), of the University of Málaga (Spain), where she has developed her career since 2009. She holds a BA and MSc degrees in Mathematics (2006 and 2007, respectively) from the University of Malaga. In 2012, she received her PhD in Mathematics also at the University of Málaga, and her doctoral thesis was recognized with the PhD Extraordinary Award of the Doctoral Program in Economics and Business, in 2012-2013. She is a researcher in the field of Operations Research, more specifically, in Furthermore, Ana B. Ruiz has applied these methodologies to solve real-life problems arising in different fields, such as the economics of education, portfolio selection, sustainable development, or engineering. She has made several research visits to the University of Jyvaskyla (Finland) to collaborate with well-recognized international researchers, such as Prof. Kaisa Miettinen, where she has given several seminar talks.

Metaheristics for Multiobjective Optimization: Introducing the Decision Maker in the Process

This conference explores the integration of metaheuristic techniques and interactive decision-making approaches within the field of multiobjective optimization. It emphasizes how modern optimization problems often involve conflicting objectives that cannot be addressed through a single optimal solution, requiring a balance between competing criteria. The presentation highlights the relevance of Multiple Criteria Decision Making (MCDM) and its connection to evolutionary algorithms, which are capable of generating a diverse set of trade-off solutions known as Pareto fronts.

The research presented focuses on interactive methods that incorporate the decision maker (DM) directly into the optimization process. By introducing human preferences—expressed through reference points or aspiration levels—the algorithm can dynamically guide the search toward the most preferred regions of the solution space. This collaboration between algorithmic intelligence and human judgment enhances both the efficiency and practical relevance of the optimization process.

The conference also discusses the development and application of reference-point-based evolutionary algorithms, which enable flexible and user-driven exploration of complex multiobjective landscapes. Examples from engineering, logistics, and data-driven systems illustrate how these methods can improve real-world decision support. Ultimately, the session emphasizes that incorporating the decision maker transforms multiobjective optimization from a purely computational task into a collaborative and adaptive learning process, bridging the gap between mathematical models and human values in complex decision environments.

Technical Sessions By Track with Abstract
Track Artificial Intelligence

Track Artificial Intelligence		Session 1: Medical/Healthcare Diagnosis and Monitoring		Chair Session:	
Tuesday october 28, 2025.		ROOM 3. 9:00–10:30.		Papers: S1 (6) 200, 202, 346, 505, 961, 687	
#	ID	Title	Authors	Abstract	Country
1	200*	A Data-Driven Approach to Forecasting Emergency Attendance During Easter and Labour Day Holidays	Adan Somoza, Hugo Álvarez Chaves, Ana Carrero Fernández and Maria D. R-Moreno	Study conducted at Hospital Príncipe de Asturias (Madrid) to predict emergency attendance during 2025 holidays. Compares ML models (XGBoost, Random Forest, Elastic Net) and time series algorithms (ARIMA, Prophet) using 2015-2025 data. Models trained on post-pandemic data (2022-2025) consistently outperform those trained on full range. Calendar variables are strongest predictors, but meteorological, pollution, and pollen data improve short-term accuracy. Provides actionable insights for hospital managers to optimize resources during high-variability periods.	España
2	202*	Emergency Department Forecasting: COVID-19 Impact on Machine Learning Models	Adán Somoza López, Hugo Álvarez Chaves, Ana Carrero Fernández and María D. R-Moreno	Analyzes emergency department arrival data from two Spanish hospitals to assess pandemic impact on ML model performance. Applies ML techniques (XGBoost, Random Forest, Elastic Net) and time-series algorithms with daily and work-shift aggregations. Models trained exclusively on post-pandemic data consistently outperform those including pandemic data. Work-shift aggregation significantly enhances performance compared to daily aggregation (R^2=0.92 vs 0.64). SHAP analysis reveals recent patient arrivals and calendar-related features serve as most important predictors across all scenarios.	España
3	346	Hybrid Architectures with Attention Mechanisms and Evolutionary Hyperparameter Optimization for Robust Pneumonia Detection	Marco Fidel Mayta Quispe, Leonid Aleman Gonzales, Charles Ignacio Mendoza Mollocondo and Juan Carlos Juarez Vargas	Integrates CNNs, hybrid CNN-Transformer architectures, and visual attention mechanisms (Grad-CAM, CBAM) for automated pneumonia detection. Uses stratified and evolutionary (Bayesian and genetic) cross-validation techniques to tune hyperparameters. Employs various public datasets to evaluate model generalization, interpretability, and accuracy. Results demonstrate statistically significant increases in accuracy, sensitivity, and AUC compared to traditional models. Facilitates development of explainable and flexible clinical decision support systems in practical contexts.	Perú
4	505	Personalized Makeup Look Generation Using Evolutionary Algorithm Based on Skin Tone and Desired Intensity	Scarleth Alejandra Bazaes Mancilla and Nicolás Rojas Morales	Develops algorithm based on simulated annealing capable of generating makeup look given skin color provided by user and desired makeup intensity. Simulates creative process makeup users perform every time they create new style. Expected results are templates of artificially created makeup looks for users to use as application guide. These makeup looks aim to be considered creative by humans. To understand how creativity concept applies to algorithm in question, each component was mapped to Markov Decision Process.	Chile
5	961+	Facial emotion recognition in simulated educational environments: Quantitative analysis using DeepFace	Gonzalo Garcia Canete, Gabriel Gatica Casanova and Cristian Molina Pedernera	Validates facial emotion recognition (FER) system for detecting potential cognitive load indicators in controlled educational settings. Using DeepFace model, system captured and analyzed 29,834 emotional data points from eight participants in controlled, simulated environment. Descriptive analysis revealed high prevalence of neutral (27%) and sad (26%) states with significant differences confirmed by ANOVA. Time series analysis showed consistent ascending trend and significant temporal dependency in sadness probabilities. Study validates sadness as reliable proxy for cognitive load in controlled environments and establishes functional prototype at Technology Readiness Level 3.	Chile
6	687	Data Science and Privacy in Secure Predictive Analysis with Homomorphic Encryption and Partial Anonymization	Alan Corini and Juan Pablo Vásconez	Presents advanced cryptographic technique allowing algebraic operations on encrypted data without decryption, ensuring data confidentiality throughout computation. Combines homomorphic encryption with partial anonymization techniques for secure predictive analytics paradigm. Enables training machine learning models and performing inference on protected data without exposure. Preserves data utility for analytical tasks while maintaining subject privacy and identity protection.	Bolivia Chile

Track Artificial Intelligence		Session 2: Visual Detection and Recognition		Chair Session:	
Tuesday october 28, 2025.		ROOM 3. 14:30–16:00.		Papers: S2 (7) 424, 541, 579, 634, 635, 640, 627	
#	ID	Title	Authors	Abstract	Country
1	424	Multi-Class Disease Identification in Cauliflower Plants Using YOLOv11 and DINOv2	Viviana Moya, Juan Pablo Vásconez, Luis A. Córdova T., Juan Pablo Vaca F., William Chamorro and Andrea Pilco	Proposes deep learning framework for automated disease recognition in cauliflower crops using YOLOv11 for real-time object detection and DINOv2 for robust image classification. VegNet dataset consisted of four classes: disease-free, bacterial spot, black rot, and downy mildew. DINOv2 operating with AdamW and learning rate 1e-5 during ten epochs reaches perfection in all metrics with scores of 1.00. Research comparison demonstrates DINOv2 enables precise diagnoses at optimal speed while creating foundations for intelligent farming systems. Creates foundations for intelligent farming systems in underprivileged agricultural settings.	Ecuador, Chile
2	541	Classification of COVID-19 from Chest X-rays Using Convolutional Neural Networks	Juan Pablo Vasconez, Diana Parra Meléndez, Alvaro Prado, Pablo Torres, Ingrid Nicole Vásconez Hurtado and Oscar Gonzales-Zurita	Trains and evaluates 16 high-performance CNNs on chest X-rays for COVID-19 classification. Proposed CNNs include AlexNet, DarkNet-19, DenseNet-201, GoogLeNet, ResNet-50, VGG-19, among others. Dataset comprises 809 images for training (95%) and 42 for testing (5%). ResNet-50 emerges as top-performing model, achieving highest accuracy (83%), precision (94%), and specificity (95%). Demonstrates that ResNet-50 CNN model is best fit for proposed dataset distribution, contributing to accurate diagnostic technology development.	Chile, Ecuador
3	579+	A Novel Adaptive Framework for Hybrid NLP in B2B Product Matching	Martin Burgos, Christian Fernández-Campusano, Ernesto Pastén and Alejandro Rivero Santamaria	Addresses product matching challenge in business-to-business (B2B) environments for NLP tools, particularly with non-English text. Focuses on Spanish-language product descriptions, where approaches divide between semantic models like MPNet and lexical algorithms like BM25. Demonstrates that simple hybridizations of these NLP tools can be detrimental. Proposes hybrid system using XGBoost ML classifier as intelligent arbitrator that learns to weigh score and ranking signals. Evaluated on real-world transactions, supervised arbitration approach significantly outperforms individual models and unsupervised baselines.	Chile, Francia
4	634+	Detección de Contenido Pornográfico en Videos de Redes Sociales Utilizando Video Swin Transformer	Berly Joel Diaz Castro	Proposes computer vision and deep learning approach for pornographic content detection in videos using Video Swin Transformer architecture. Uses NPDI-2k dataset containing 2,000 balanced videos between pornographic and non-pornographic classes, segmented into 12-second clips. Model fine-tuned through transfer learning, freezing pre-trained backbone on Kinetics-400 and training only classifier. Strategy achieves 89.12% accuracy, surpassing various traditional CNN-based approaches. Results demonstrate viability of transformer models for explicit content detection, preserving computational efficiency without sacrificing performance.	Perú
5	635	Bidirectional Encoder Representations from Transformers in Brazilian News Classification of a Public Security Agency	Thiago Lobo, Karla Silva, Claudia Martins, Raphael Gomes and Anderson Oliveira	Investigates application of BERT models pre-trained in Portuguese to classify and evaluate news headlines about public security institution. Classification performed in three positions: neutral, negative, and positive as part of institution's 2024-2027 strategic plan. Seeks to collaborate with organization's strategic objectives by presenting model with highest metrics during analysis. BERT-Large stands out with F1 Score of 91.62% in model's general metrics. Equally high result compared to others during classification of headlines into classes, strengthening institutional public image.	Brasil
6	640	Sound-to-Image Synesthesia: Generative Painting using an Emotion-guided Metaheuristic algorithm	Carlos Bracamonte and Nicolas Rojas-Morales	Develops system capable of transforming song into colored digital paintings based on neurological phenomenon of synesthesia. Proposal uses lyrics recognized on track to generate image through well-known generative models such as Stable Diffusion. Image is black and white painted using evolutionary brushstroke-based algorithm, then colored using emotion rule-based system considering spectral characteristics. Experimental results show grayscale approximation converges effectively within limited number of evolutionary iterations. Coloring process produces consistent emotional interpretations for similar songs, reinforcing expressive link between sound and image.	Chile
7	627+	Martina Mardones-Bernal, Juan Pedro Sepulveda Rojas, Carolina Lagos, Eduardo Viera, Raúl Carrasco and Hugo Gonzalez	Use of Artificial Intelligence in everyday life	This research analyses the impact of artificial intelligence on people's daily lives, how it affects different areas such as health, education, transport, commerce and housing. AI has transformed the simplest and most everyday activities into something simple, fast and automatic, being able to help in various activities, both personal and work, but this brings significant problems, concerning the ethics of its use, and how this can impact on work areas. Through a review of relevant sources, both advantages and disadvantages of this technology were identified.	Chile

Track Artificial Intelligence

Track Artificial Intelligence	Session 3: Natural Language Processing and Text Classification	Chair Session:			
Tuesday october 28, 2025.	ROOM 3. 16:30–18:00.	Papers: S3(6) 787, 840, 843, 861, 881, 884,			
#	ID	Title	Authors	Abstract	Countr
1	787	Randomly Initialized Networks Can Learn from Peer-to-Peer Consensus	Esteban Rodríguez Betancourt and Edgar E. Casasola Murillo	Explores role of self-distillation within learning dynamics in self-supervised learning. Isolates effect of self-distillation by training group of randomly initialized networks, removing all other common components such as projectors, predictors, and pretext tasks. Findings show even this minimal setup can lead to learned representations with non-trivial improvements over random baseline on downstream tasks. Demonstrates how this effect varies with different hyperparameters and presents short analysis of what models learn under this setup. Self-distilled methods have shown impressive performance learning useful representations for downstream tasks and displaying emergent properties.	Costa Rica
2	840	Development of a Supervisory System and use of Neural Networks for stability monitoring in bearingless permanent magnet machines	Andres Ortiz Salazar, Adson Emanuel Santos Amaral, Valberio Gonzaga de Araujo, Rodrigo de Andrade Teixeira and de Souza Ferreira Jossana Maria	Presents development of system designed for monitoring stability of bearingless permanent magnet machine using supervisory interface and artificial neural network (ANN). Supervisory system enables visualization of rotor radial position and speed signals, providing visual alerts under critical conditions. Multilayer Perceptron (MLP) type ANN was trained with experimental data to classify stability states based on radial position deviations. Tests conducted on experimental test bench indicate supervisory system provides effective support for visual analysis. MLP performs well in detecting instabilities, highlighting potential of proposed solution for intelligent monitoring applications.	Brasil, Perú
3	843	Explainable Artificial Intelligence (XAI) for Voltage Prediction in a Molten Carbonate Fuel Cell	Valeria Barra Pradenas, Andrés Escalona Inzunza, Hugo Garcés Hernández and Jaroslaw Milewski	Combines explainable AI (XAI) models with physical knowledge of molten carbonate fuel cells (MCFCs) to improve comprehension, reliability, and diagnostic capabilities. Develops predictive models using ML techniques and applies explainability methods such as SHAP and LIME to identify most influential variables. Integration of XAI allows transparent interpretation of process, facilitating cross-validation between data-driven models and theory. Demonstrates explainable models can play key role in transition towards safer, more sustainable, and understandable energy technologies. Establishes replicable methodology for other energy conversion systems in decarbonization process.	Chile, Polonia
4	861	XAI-driven Root Cause Analysis (XAI + RCA)	Grinda Natalia Sierra Gonzalez, Raymi Antonio Vasquez Moreno and Werner Kristjanpoller	Presents XAI-RCA, novel approach designed to enhance predictive maintenance through integration of Explainable Artificial Intelligence (XAI) into Root Cause Analysis (RCA). Embeds explainability insights generated using SHAP analysis into traditional RCA framework, enabling both failure forecasting and deeper understanding of contributing factors. Transformer-based model employed to estimate Remaining Useful Life (RUL), leveraging ability to handle complex sensor data. SHAP explanations applied to highlight most influential variables in model decisions, providing practical insights into asset behavior prior to failure. Validated using NASA's CMAPSS dataset, improving interpretability and trustworthiness of AI-driven maintenance systems.	Chile
5	881 *	A Novel Metric Based on Linear Probes to Analyze Learning Progression in Deep Neural Networks	José Luis Vázquez, Carlos Ulises Valdez, Miguel García Torres and Sebastian Alberto Grillo	Deep neural networks achieve remarkable results but remain difficult to interpret due to black box nature. Understanding learning progression within these models is critical for improving design and reliability. Linear probes offer way to assess feature separability without retraining. Proposes new metric based on multiple support vector machines to measure linear separability more realistically. Methodology tracks evolution of separability across layers and training epochs, allowing insights into overfitting and generalization. Experiments on diverse architectures and datasets demonstrate utility of this approach for analyzing deep network training dynamics.	Paraguay, España
6	884 *	A Layer-by-Layer Backpropagation Approach for Image Classification	José Luis Vázquez, Carlos Ulises Valdez, Julio César Mello, Marvin Aguero Torales, José Colbes and Sebastian Grillo	Proposes methodology to apply backpropagation to individual layers of neural network rather than entire network simultaneously. Approach seeks to avoid overfitting by preventing all network parameters from being adjusted simultaneously. Evaluates proposed method on 10 binary classification datasets with LeNet, AlexNet, and VGG-16 architectures. Results show proposed method tends to converge faster than original backpropagation. Additionally, proposed method tends to avoid local minima of error, whereas original backpropagation fails despite use of hyperparameter search.	Paraguay, España

Track Artificial Intelligence	Session 4: Intelligent Systems and Specialized Applications	Chair Session:			
Wenesday october 29, 2025.	ROOM 3. 09:00–10:30.	Papers: S4 (6) 903, 906, 925, 938, 946, 692			
#	ID	Title	Authors	Abstract	
1	903*	Predictive Modeling of the COVID-19 Reproduction Number Using Auto-ARIMA and Machine Learning Techniques	Pastor Pérez, Ayrton Giménez, Diego Stalder, Hyun Ho Shin, Carlos Sauer and Sebastian Grillo	Evaluates Auto-ARIMA model with exogenous variables for predicting COVID-19 reproduction number (R_0), comparing with multivariable regressor models based on Lasso, Extra Trees, KNN, and Huber Loss. Uses Paraguay data as case study, analyzing different pandemic waves by incorporating exogenous variables and techniques such as Principal Component Analysis (PCA). Results showed high variability, where best-performing models varied across waves. Concludes dynamic model adaptation is key to improving predictive accuracy in changing epidemiological scenarios. No consistently predominant set of exogenous variables identified according to Permutation-based ANOVA analysis.	Paraguay, España
2	906 +	Assessment of Clustering-Based Segmentation Techniques for Multispectral Agricultural Imagery	Lidice Reyes-Hung and Ismael Soto	Presents comparative evaluation of three unsupervised clustering algorithms (K-Means, Mean Shift, BIRCH) applied to sugarcane crop imagery captured using UAV-based multispectral sensors. Segmentation performance evaluated using Calinski-Harabasz Index (CH), Davies-Bouldin Index (DB), and Within-Cluster Sum of Squares (WSS). K-Means yielded highest CH score (1.35×10^7) indicating well-defined clusters, while Mean Shift achieved comparable segmentation quality with greater computational overhead. BIRCH showed lower internal cohesion but best WSS. Results suggest K-Means offers best trade-off between precision and computational efficiency for high-dimensional agricultural data.	Chile
3	925	Triage Level Prediction Using Machine Learning with Tree-Based Gradient Boosting Algorithms	Jonathan Moya Carvajal, Ana Maria Carvajal Silva, Xaviera A. López Cortés and Felipe Tirado Maraboli	Presents ML approach for predicting triage levels using structured data from Chilean regional hospital emergency unit. Filtered dataset includes only adult and dental consultation records, excluding pediatric and obstetric-gynecological cases. Patients categorized into five triage levels (C1 to C5), revealing strong class imbalance with C2 and C3 comprising nearly 90%. Implements three tree-based gradient boosting algorithms: XGBoost, CatBoost, and LightGBM with Bayesian hyperparameter optimization. XGBoost outperforms others in overall accuracy (0.73) and weighted F1-score (0.72), particularly in most frequent categories.	Chile
4	938	PICTOS-AI: Generating Cognitively Accessible Pictograms with Artificial Intelligence for Inclusive Visual Communication	Gabriel Olmos, Ashley Jara, Herbert Spencer and Gabriel Hermosilla	Explores use of generative AI to automate creation of pictograms coherent with PICTOS style for inclusive visual communication. PICTOS project proposes pictographic system structured in three layers: action, element, and context facilitating procedure understanding. Applies fine-tuning using DreamBooth and LoRA techniques to Flux.1-dev diffusion model, training with dataset structured according to PICTOS system logic. Presents specialized training methodology along with exhaustive model evaluation using visual fidelity, perceptual diversity, and subject fidelity metrics. Results show fine-tuning allows generation of stylistically consistent and semantically relevant pictograms for public service domain.	Chile
5	946 +	Machine Learning for Cognitive Assessment in Virtual Reality Environments	Cristian Molina Pedernera, Mauro Mercado Fleiter, Gabriel Gatica Casanova, Alejandra Acuña Villalobos, Claudio Alcota Henríquez and Diego Fernández Barrientos	Proposes supervised learning framework for identifying individuals with suspected Mild Cognitive Impairment (MCI) using dataset of 4,000 simulated records. Four classification algorithms (Logistic Regression, Random Forest, SVM, XGBoost) were trained prioritizing recall to reduce false negatives. Ensemble models (XGBoost and Random Forest) achieved recall scores of 75% and F1-scores above 70%. Individuals classified as MCI will be divided into two groups: one with immersive VR intervention, another with conventional treatment. Methodology establishes groundwork for intelligent diagnostic tools integrating AI with immersive environments for clinical applications.	Chile
6	692* +	Predictive Maintenance in Textile Manufacturing Using Artificial Intelligence	Nelson Chambi, Celso Sanga, Alejandra Sanga and Piero Sanga	Addresses predictive maintenance (PdM) applied to textile machinery using AI as key approach to improving efficiency and reducing operating costs. Objective is optimizing equipment lifespan through early fault detection, avoiding costly repairs and unplanned downtime. Methodology includes continuous monitoring of critical parameters (vibrations, temperature, humidity, yarn tension, component wear) using sensors and real-time data analysis. Data processed with AI and ML techniques to identify patterns preceding failures. Results demonstrate PdM can reduce maintenance costs by 8% and increase equipment availability by 10%, achieving greater productivity and quality.	Perú

Track Artificial Intelligence	Session 5: High-Performance Computing and Infrastructure	Special Session Supercomputing and AI	Chair Session: Gabriel Gatica, Edison Vasquez		
Wennesday october 29	ROOM 3. 11:00–12:00.	Papers: S4 (6) 952, 957, invited			
#	ID	Title	Authors	Abstract	Country
25	952	AI-Enhanced Supercomputing Centers: Architectural Convergence and Scientific Applications in Latin America	Gabriel Gatica, Gaston Lefranc, Edison Vásquez, Roberto Muñoz, Roberto León and Andrés Silva	Presents fusion of artificial intelligence (AI) and high-performance computing (HPC) transforming scientific computing landscape at AI-powered supercomputing centers. Drives advances in climate modeling, genomics, and astrophysics. Provides analysis of HPC+AI centers focusing on architectural innovations, enabling technologies, and scientific applications. Reviews more than 120 peer-reviewed publications and compares global exascale systems with Latin American infrastructure. Despite promising developments such as Brazil's Pegasus (21 PetaFLOPS), region's top systems remain up to 83 times less powerful than leading international counterparts. Proposes route for ecological AI-HPC ecosystem focusing on modular construction and green energy.	Chile
26	957	A Semantic Ontology Framework for AI-Enhanced Supercomputing Centers	Gaston Lefranc, Gabriel Gatica, Edison Vasquez, Roberto León, Roberto Muñoz and Andres Silva	Presents semantic ontology for high-performance computing (HPC) centers powered by AI and embedded in HPC infrastructures. Complex systems require knowledge representation to ensure coherence in design, efficiency in operation, and scalability. Ontological architecture has five domains: computational infrastructure, cognitive systems, data intelligence services, research-driven applications, and innovation ecosystem. Ontology was engineered using established methodologies and validated through deployment in real-world AI-HPC environments. Model developed in OWL 2.0 enabled semantic inferences about cognitive components, network hierarchies, and scientific data traceability. Semantic framework improves cross-system interoperability and lays groundwork for standardized AI-HPC integration.	Chile

Track Artificial Intelligence	Session 6: Forum Special Session Supercomputing and AI	Chair Session: Gabriel Gatica, Edison Vasquez
Wennesday october 29	ROOM 3. 12:00–13:00.	Gabriel., Gatica, Roberto León, CENIA

Track Biomedical Engineering

Track Biomedical Engineering	Session 1: Medical Imaging and Image Enhancement	Chair Session:
Wennesday october 29, 2025.	ROOM 6. 14:30–16:00	Papers: S1 (5) 49, 566, 567, 582, 654

#	ID	Title	Authors	Abstract	Country
1	49+	Process of building 3D models of biomedical equipment	Juliana Velandia, Danna Correa, Oskar Guzmán, Ana Colorado, Alberto Piedrahíta and Grissa Maturana	Addresses need for practical training in biomedical engineering programs where not all universities have access to full range of biomedical technologies. Project focuses on developing three-dimensional models of biomedical technologies using emerging educational tools. 3D modeling serves as fundamental component for innovation and progress across various industries. Aims to strengthen technical competencies and enrich training of future professionals through complementary skills development.	Colombia
2	566*	Determination of Effective Capture Radius at Processes of Cell Uptake with Poisson Equation	Huber Nieto-Chaupis	Calculates effective capture radius using Poisson equation for endocytosis process between cell and nanotube with electric interactions. Proposes theoretical approach where nanotube interacts with cell membrane based on Coulomb-like force adsorption. When nanotube and cell exhibit opposite electric signs, efficient uptake occurs without cell expulsion of incoming nanotube. Investigates effect of nanotube outer and inner radius on capture radius for efficient internalization during endocytosis for drug delivery systems.	Perú
3	567	Desarrollo de Prototipo de Fantoma ECG para Fines Docentes	Togo Arredondo, Antonio Rienzo and Valeria Muñoz	Presents foundation, design and development of ECG phantom prototype for medical education based on previous authors' project. Details ECG signal characteristics and proper electrode placement for accurate cardiac rhythm interpretation. Development included four stages: prototype analysis, mobile solution design, application implementation, and system validation. Electrocardiographic signals extracted from PhysioBank ATM public database with detailed functionality and performance testing results presented.	Chile
4	582	Design of a remote monitoring device for physiological variables for toddlers	Francisca Zamorano, Bruno Fernández and Esteban Pino	Develops non-invasive, portable, low-cost system for measuring physiological variables in children, motivated by COVID-19 telemedicine needs. Uses Max30102 sensor and ESP32 microcontroller with mobile app, Grafana dashboard, and OpenMRS form for data visualization. System demonstrates capability to monitor children at home via Bluetooth and Wi-Fi connectivity with MySQL database storage. Prototype aims to avoid unnecessary ER trips and reduce contagion risk while providing parental peace of mind.	Chile
5	654	Spectrogram-Based EMG Classification Tool for Intraoperative Neurophysiological Monitoring	Valentinna Montoya and Pablo Roncagliolo	Presents EMG spectrogram analysis support system for improving intraoperative interpretation through visual feedback and semi-automatic classification during neurosurgery. Uses STFT to generate high-resolution spectrograms distinguishing signal types like fibrillations, positive sharp waves, and myotonic discharges. Applies texture analysis using GLCM for quantitative classification based on contrast, homogeneity, and energy metrics. System supports surgical decision-making by providing intuitive visualization and facilitating identification of high-risk events for patient safety.	Chile

Track Biomedical Engineering	Session 2: Physiological Monitoring and Signal Processing	Chair Session:
Thursday october 30, 2025.	ROOM 5. 9:00–10:30	Papers: S2 (3) 771, 845, 963

#	ID	Title	Authors	Abstract	Country
1	771	Integration of Augmented Reality for Spatially-Guided Respiratory Auscultation in Clinical Training	Antonio Rienzo, Togo Arredondo, Omar Acevedo, Alvaro Huirimilla, Daniel Ciudad, Maria Rubio, Jose Lorant and Ignacio Carvajal	Develops interactive educational system for clinical auscultation training using augmented reality to enhance student autonomy and spatial accuracy. Integrates wireless stethoscope with mobile application using computer vision and AR overlays displaying real-time anatomical landmarks. Visual guidance allows students to perform maneuvers independently, reducing need for direct supervision. Preliminary validation showed improvements in user orientation, device placement precision, and potential to standardize skill acquisition in medical education.	Chile
2	845	Estimation of Heart Rate and Respiratory Rate from NIRS Signals in Athletes Using Empirical Mode Decomposition and Continuous Wavelet Transform	Selim Echeverría, Raúl Caulier Cisterna, Jorge Vergara Quezada, Felipe Contreras Briceño and Patricio Fuentealba	Explores HR and RR estimation from NIRS signals in elite athletes during incremental exercise using EMD and CWT analysis. Signals from prefrontal cortex and intercostal regions were preprocessed to isolate cardiac and respiratory oscillations. Mean absolute errors were 7.71 cycles/min for HR and 3.38 cycles/min for RR, within acceptable physiological limits. Correlation values exceeded 0.8 in 91.5% of subjects for HR, supporting EMD+CWT as innovative non-invasive monitoring method.	Chile
3	963	A Case Study of Deep Learning-Based Image Enhancement for Skin Disease Detection	Marco Flores, Mauricio Riquelme, Luis Caro, Orietta Nicolis and Billy Peralta	Explores deep learning techniques for enhancing diagnostic accuracy in dermatology by improving image quality for skin disease detection. Enhancement methods like ExcNet, CLAHE, and median filter address issues of poor framing and inadequate lighting. Testing included advanced neural networks such as CNN, RESNET50, and MOBILENET V2. ExcNet deep learning technique showed highest average validation accuracy improvement of 91% among clarification methods.	Chile

Track Computer Intelligence

Track Computer Intelligence	Session 1: Agricultural Applications and Machine Learning Applications	Chair Session:
Wennesday october 29, 2025.	ROOM 6. 16:30–18:00	Papers: S1 (5) 215, 219, 544

#	ID	Title	Authors	Abstract	Country
1	215	Detection of Armillaria Pathogen in Cherry Trees Through Extreme Learning Machine	Patricio Hernández, David Zabala-B. Roberto Ahumada-García, Mary Carmen Jarur, Julio Barzola-M.s and Diego A. Martínez-P.	Focuses on early detection of Armillaria disease in cherry trees using Extreme Learning Machine (ELM) model variants. Uses full images of healthy and diseased trees, avoiding image segmentation workflow. ELM-W1 variant achieved superior performance with 89% accuracy and geometric mean of 0.61, surpassing YOLOv5m. ELM variants proved computationally efficient, making them suitable for practical agricultural applications in precision agriculture.	Chile, Ecuador
2	219	YOLO Approaches in Cherry Color Detection and Classification	Simon Rüffelmacher Rojas, David Zabala-Blanco, Roberto Ahumada-García, Mary Carmen Jarur, Marco Flores-Calero and Patricia Möller-Acuña	Reviews artificial intelligence applications for cherry classification based on size and color to replace subjective manual procedures. Evaluates effectiveness of four YOLO versions using Cherry CO dataset under various climate conditions. YOLO11m model demonstrates best balance between precision and recall for cherry detection and classification. Research enhances detection of cherries in natural environments and classification into ripeness stages based on color.	Chile, Ecuador
3	544	The AIM Triad at Scale: A Microservice Architecture for Context-Aware Cybersecurity Maturity	Julio Fenner, Gemita Escalona, Mauricio Dieguez, Jorge Hochstetter and Belfor Acuña	Introduces scalable, service-oriented platform operationalizing AIM Triad (Awareness, Infrastructure, Management) for cybersecurity maturity improvements. Platform generates standards-compliant assessment reports and customized action plans using microservice architecture with Vue.js, NestJS, and Flask. Incorporates custom prioritization, automated simulation, and PDF reporting with Kubernetes orchestration for scalability. Serves as blueprint for next-generation tools designed for small and medium-sized organizations and public institutions.	Argentina

Track Computer Intelligence	Session 2: System Architecture and Optimization	Chair Session:
Thursday october 30, 2025.	ROOM 6: 09:00–10:30	Papers: S2 (5) 535, 804, 841, 869, 897

#	ID	Title	Authors	Abstract	Country
1	535	Detecting and Tracking of Individuals in Crowded Environments	Josué Endera Revelo, Eduardo Alba Cabrera and Noel Pérez Pérez	Tackles challenge of detecting and tracking individuals in complex environments using computer vision techniques. Proposes pedestrian detection method based on exploration of three pre-trained versions of YOLO models to maximize detection in crowded scenarios. Method trained and validated on private, purpose-built dataset reflecting real-world university surveillance scenarios. Best-selected model based on YOLOv10 with confidence threshold 0.5, yielding mean mAP50 score of 0.9132. Results indicate successful learning capability without overfitting and robust performance detecting individuals under varied campus conditions.	Ecuador
2	804	Leveraging LLMs for Functional Clustering of Microservices	Santiago di Sabatto, Guillermo Rodriguez, Claudia Marcos and Santiago Vidal	Proposes novel approach for functional grouping of microservices using Large Language Models and clustering techniques. Combines semantic and structural analysis based on OpenAPI specifications validated with real-world datasets. Integration of semantic and structural similarities leads to more coherent and manageable groupings. ChatGPT generation of missing endpoint descriptions achieved 60% higher success rate, enhancing maintainability and scalability of architectures.	Argentina
3	841+	Battery Degradation and Reuse with Quantum Optimization: A Data-Driven Approach for the Circular Economy	Sebastián Moya, Ismael Soto, Enrique Espina and Cesar Azurdia	Investigates capacity degradation variability among lithium-ion battery cells highlighting influence of operational and environmental factors. Establishes technical end-of-life threshold for identifying batteries suitable for second-life applications like stationary storage. Implements K-Means clustering to classify retired batteries into distinct groups for optimized reuse strategies. Comparative analysis shows quantum algorithms like QAOA can substantially reduce computational costs in large-scale processing.	Chile
4	869	Data partitioning into homogeneous groups using a Genetic Algorithm	Margarita Ruiz Olazar, Diego Ihara and Benjamín Barán	Addresses problem of dividing datasets into equally sized homogeneous subsets where each element has similar counterpart. Proposes Genetic Algorithm that explores solution space by evolving populations of candidate partitions. Minimizes average sum of squared distances between matched element pairs across subsets. Validated using artificially generated data, Iris dataset, and blood analysis dataset, showing effectiveness in producing homogeneous partitions.	Paraguay
5	897	Comparative Analysis of Machine Learning Models for Misogynistic Hate	Ana Rúbia Ramos Vicente, Jefferson Oliveira Andrade,	Evaluates supervised machine learning models for classifying misogynistic hate speech using MINA-BR dataset with over 2,000 labeled comments. Tests four experimental scenarios including Bag of Words, TF-IDF variants, and BERTimbau with six classifiers. BERTimbau	Brazil

		Speech Detection in Brazilian Portuguese: A Study Using the MINA-BR Dataset	Kelly Assis de Souza Gazolli and Karin Komati	achieved best performance with 87% accuracy and F1-score of 0.58 on test set. Highlights importance of text representation and balancing strategies for effective hate speech detection in Portuguese content.	

Track Computer Science, Software & Information

Track Computer Science, Software & Information	**Session 1: Cybersecurity and Privacy Technologies**	**Chair Session:**
Wennesday october 29, 2025.	**ROOM 3: 14:30–16:000**	**Papers: S1 (6) 139, 161, 199, 551, 716**

#	ID	Title	Authors	Abstract	Country
1	139	Enabling the next Generation of Cybersecurity Professionals in Higher Education	Marbin Pazos Revilla, Sriram Chellappan and Yasna Godoy Perez	Examines challenges in delivering quality cybersecurity education due to cost and complexity of maintaining secure, scalable environments. Based on experience at University of South Florida's Bellini College, highlights obstacles and strategies developed. Emphasizes need for strategic collaboration across stakeholders and sustained investment in higher education capacity. Building robust cybersecurity workforce requires technological advancements and future-ready training approaches.	USA, Chile
2	199	qWard: A Unified Toolkit for Pre- and Post-Runtime Quantum Circuit Metrics	Cristian Daniel Marquez Barrios, Daniel Sierra Sosa and Kelly Johany Garces Pernett	Categorizes quantum metrics into pre-runtime (static circuit analysis) and post-runtime (execution result analysis) addressing evaluation gaps. Introduces qWard Python library bridging gap between native SDK capabilities and broader literature metrics. Provides developers toolkit to generate, collect, and interpret key quantum circuit metrics facilitating analysis. First version runs on Jupyter Notebook with Qiskit SDK and AER simulator support only.	Colombia
3	551	Scalable and Decentralized Urban Traffic Optimization with Verifiable Storage for Smart City Deployments	Kevin M. Galeano, María J. Duarte, Marcos D. Villagra and Derlis O. Gregor	Presents modular decentralized system integrating SUMO real-time simulation, Mamdani fuzzy inference congestion classification, and PSO signal optimization. Leverages IPFS and EVM-compatible smart contracts for tamper-resistant, verifiable data storage unlike centralized platforms. Experimental results show handling optimization tasks with up to 2000 simulated sensors in under 70 seconds. Transaction confirmation times below 1.2 seconds with storage costs less than $0.00002 USD per report.	Colombia
4	716+	IoT-Based Platform for Monitoring, Control, and Intelligent Assistance in Farm Environments	Daniel Pérez-Guzmán, Mario Fernandez, Matías Camilla Godoy, Javier Sánchez-Contreras, Ricardo Pérez Guzmán and Yamisleydi Salgueiro Sicilia	Presents IoT Facilito platform integrating critical functionalities into single environment: multi-user management, contextual automation, and geospatial visualization. Modular architecture uses React, Node.js, MQTT, and InfluxDB enabling secure, scalable agricultural administration. Field validation through automated cherry plantation solar cover control demonstrated real-time agroclimatic variable management. Results show positive impact on microclimate stability and operational efficiency for smart digital agriculture.	Paraguay

Track Computer Science, Software & Information	**Session 2: IoT, Automation and Smart System**	**Chair Session:**
Wennesday october 29, 2025.	**ROOM 3: 16:30–18:00**	**Papers: S2 (6) 778, 813, 829, 832, 855, 874**

#	ID	Title	Authors	Abstract	Country
1	778	Automatic generation of signed networks from argumentative text-based discussions	Fabián Riquelme, Diego Monsalves, Pablo Olivares and Marco Antonio Vivar	Proposes using large language models (LLMs) to automatically generate temporal signed networks from textual discussions. Signed networks represent polarized opinion relationships with binary edge weights for studying social structure clusterability. Each signed relationship linked to specific text excerpts conveying non-neutral polarity for enhanced explainability. Case study examines Spanish Wikipedia talk pages about controversial topics showing effective peer dispute extraction.	Chile
2	813+	Special Points for Montgomery Elliptic Curves	Rodrigo Abarzúa and Álvaro Soto	Analyzes existence of special points (ZPA and SVA) on Montgomery elliptic curves offering excellent performance and security. Found that all cryptographically relevant Montgomery curves contain exploitable special points. These vulnerabilities can be used by attackers to break cryptosystems based on these standardized curves. Study reveals security implications for recently standardized Montgomery curve implementations.	Chile
3	829	Finite State Machine-Based Smart Contracts on Tezos: A Time-Locked Vault Implementation in Jus	Jefferson Andrade, Karin Komati and Larissa Randow	Presents detailed case study demonstrating practical application of Jus functional language through Time-Locked Digital Vault implementation. Jus features explicit finite state machine modeling enhancing contract security, predictability, and formal verification. Integrates functional programming principles with domain-specific constructs including typed transitions and advanced type mechanisms. Results indicate simplified smart contract development and improved reliability through disciplined state management.	Brazil
4	832	Four-Valued Model Checking for Byzantine Fault Tolerant Consensus Verification	Jefferson Andrade	Introduces bilattice-based model checking approach using Belnap's four-valued logic for BFT consensus protocol verification. Addresses inadequacies of classical Boolean model checking in capturing partial information states and explicit conflicts. Demonstrates methodology through Promela/SPIN model of simplified PBFT consensus algorithm with four-valued state variables. Enhanced capacity distinguishes between lack of information and detected inconsistency, improving subtle consensus fault detection.	Brazil
5	855	Clement Torres, Victor Viveros, Diego Stalder, Hans Mersch and Carlos Sauer	Characterization of consumer demand profiles electrico en usuarios residenciales	The methodology for characterizing residential electricity consumption profiles is implemented using time series clustering techniques. Methods such as Dynamic Time Warping (DTW) and Singular Spectrum Analysis (SSA), combined with Kmeans and K-Medoids algorithms, are used to identify demand patterns in hourly records of urban users. Validation is performed using metrics such as the Adjusted Rand Index (ARI), Normalized Mutual Information (NMI), and the Silhouette coefficient. The results demonstrate that the combination of DTW and K-Medoids allows for interpretable segmentation of typical consumption profiles, facilitating their analysis and application in customized energy management strategies.	Paraguay
6	874+	Attribute-Based Consent Management System: A Cryptographic Architecture for Data Privacy Compliance	Gabriela Suntaxi and Julie Galarza	Presents privacy-preserving consent management system enforcing user-defined policies through cryptographic mechanisms for regulatory compliance. Uses Ciphertext-Policy Attribute-Based Encryption (CP-ABE) to technically enforce consent preferences with authorized access control. Offers flexible, open-source alternative adaptable to diverse regulatory contexts including Latin America. Functional validation confirms compliance with consent operations including registration, revocation, and auditability.	Ecuador

Track Computer Science, Software & Information	**Session 3: Data Analysis and Knowledge Systems**	**Chair Session:**
Thursday october 29, 2025.	**ROOM 6: 16:30–18:00**	**Papers: S3 (4) 908, 919, 926, 974**

#	ID	Title	Authors	Abstract	Country
1	908	A LLM-Based Approach for Semantic Extraction and Linking of RDF Triples from Unstructured Text	Jesamin Melissa Zevallos-Quispe, Ana Aguilera and Irvin Dongo	Presents structured pipeline approach for RDF triple extraction from unstructured text transforming raw text into semantically linked knowledge. Uses Large Language Models for entity and relationship extraction with contextualized identification accuracy. Extracted entities linked to global identifiers using Babelfy while predicates linked through Linked Open Vocabularies queries. Combines natural language processing, semantic reasoning, and open data linking for knowledge graph generation precision.	Perú, Chile, Francia
2	919	Hardware-in-the-Loop Validation of a Basic PV Model Using OpenModelica and OPAL-RT	Nadia Yasic, Angel Ulloa, Cristobal Carrasco, Cristobal Parrado and Juan Sebastian Gomez Quintero	Presents HIL test bench for real-time photovoltaic plant simulation validation integrating electrical converter/grid model in OPAL-RT. Photovoltaic model developed in Modelica using single-diode scheme executed on virtual machines with varying configurations. System architecture communicates using IEC 61862 standard with publisher/subscriber scheme for weather station integration. Performance evaluated on computational requirements, communication, execution times, RAM usage, and processor load.	Chile, Colombia
3	926	Quadruped robot prototype based on artificial intelligence using deep reinforcement learning through the ROS framework	Juan Soto, Jesus Izquierdo and Gerson La Rosa	Presents quadruped robot prototype controlled through deep reinforcement learning implemented using Robot Operating System (ROS). System structured into modular nodes for sensor acquisition, control, and actuation with Q-Table and DQN models. Experimental results demonstrate DQN offers better adaptability and performance in complex scenarios than Q-Table. Integration of ROS, reinforcement learning, and visual perception provides scalable solution for autonomous robots.	Perú
4	974	Heurísticas para Construccion de Bloques en Ethereum con Interacciones Semanticas	Jazmín Maria del Luján Gamarra Benitez	Proposes alternative to traditional greedy algorithms for Ethereum block construction considering semantic transaction interactions. Utility model assigns bonuses and penalties to transaction pairs and triplets enabling more valuable block construction. Presents base heuristic identifying useful combinations through bounded search and extended version with greedy filling. Experimental results show superiority over classic greedy algorithm in total block utility and coverage.	Paraguay

Track Control Systems & Processes & Theory

Track Control Systems & Processes & Theory	Session 1: Advanced PID Control and Optimization Techniques	Chair Session:
Tuesday october 28, 2025.	ROOM 6: 09:00–10:30	Papers: S1 (6) 251, 400, 428, 429, 730, 435

#	ID	Title	Authors	Abstract	Country
1	251*	Model-Free Predictive Control for Nonlinear Processes with Variable Delay	Jorge Espin and Oscar Camacho	Presents Model-Free Predictive Control (MFPC) strategy eliminating need for explicit system model using ultra-local model and real-time optimization. Dynamically compensates for disturbances, delays, and setpoint changes while adhering to operational constraints. MFPC outperforms conventional PID and iPID controllers with reduced overshoot, smoother control actions, and lower error metrics. Avoids oscillatory behavior and actuator stress, proving effectiveness for nonlinear processes with variable delay.	USA, Ecuador
2	400	A Brief Overview of PID Control: From Classical to Modern Approaches	Oscar Camacho, Jorge Espin and Alexis Montalvo	Offers comprehensive overview of PID control evolution from classical designs to modern advanced strategies. Categorizes approaches into integer-order, fractional-order, AI-based PID, and data-driven controllers. Presents path from traditional methods to emerging trends emphasizing innovations addressing conventional limitations. Classifications and comparisons support researchers in selecting appropriate PID strategies for increasingly complex industrial systems.	USA; Ecuador
3	428	LEVEL CONTROL USING A VARIABLE PARAMETER SLIDING-MODE CONTROLLER	José Suárez, Matteo Romero and Luis Morales	Presents Variable Parameter Sliding-Mode Control (VPSMC) for liquid level regulation implemented on Siemens LOGO! PLC. Integrates adaptive discontinuous term with dynamically adjusting gain based on control error, reducing effort without compromising accuracy. Node-RED interface facilitates real-time monitoring and visualization with experimental validation. VPSMC shows better accuracy, faster reference tracking, and improved robustness compared to conventional SMC and PID controllers.	Ecuador
4	429	Neural PID-based Speed Control of a Three-phase Induction Motor	Matteo Romero, José Suárez and Luis Morales	Proposes Neural-PID control algorithm with self-tuning gains applied to three-phase induction motor speed tracking. Full implementation within industrial Modicon M580 PLC demonstrates feasibility of intelligent control in real-world environments. Design process, stability analysis, and physical implementation presented with experimental validation. Significant improvements over conventional fixed-gain PID in reference tracking and disturbance rejection tasks.	Ecuador
5	730*	Comparative Analysis of Q-Learning and Deep Q-Learning for PI Speed Control Optimization in DC Motors	Leonardo Elizalde, Boris Rosero and William Montalvo	Focuses on automatic optimization of PI controller parameters for DC motors using reinforcement learning approach. Compares Q-Learning and Deep Q-Learning algorithms with black-box modeling strategy avoiding explicit analytical models. DQL demonstrates superior performance improving settling time, reducing cumulative error, and providing adaptable dynamic control. Results highlight deep learning potential for PI control optimization in high dynamic complexity scenarios.	Ecuador
6	435	Comparison of Nonlinear PI and PID Controllers for DC Motor Speed Regulation with Local Monitoring and IoT-Based Web Interface	Ronald Pillajo, Pablo Proaño, Viviana Moya, Juan Pablo Vásconez, Andrea Pilco and William Chamorro	Describes nonlinear PI controller with special gain modulation feature improving response for both negative and positive errors. Controller adjusted using FOPTD model identified through open-loop step response and Cohen-Coon method refinement. Nonlinear PI shows 37.47% IAE reduction, 33.50% ISE reduction, and 30.27% TVu reduction compared to PID. ESP32 microcontroller integrated with LabVIEW supervision platform and remote web interface for IoT applications.	Chile, Ecuador

Track Control Systems & Processes & Theory	Session 2: Industrial Motor Control and Drive Systems	Chair Session:
Thuesday october 28, 2025.	ROOM 6: 14:30–16:00	Papers: S2 (6) 425, 662, 956, 930, 842, 717

#	ID	Title	Authors	Abstract	Country
1	425	A Reconfigurable Embedded Platform for Accurate Ultrasonic TOF Estimation	Enrique A. Vargas C., Vicente González and Federico Morán	Presents design and evaluation of reconfigurable, low-cost embedded platform integrating analog front end and digital processing. Leverages PSoC 5LP architecture flexibility combining configurable analog blocks with real-time digital processing. Several TOF detection techniques implemented including AIC, cross-correlation, and novel envelope derivative correlation method (CEED). Results demonstrate submillimeter accuracy in real-time confirming potential for smart sensing applications.	Paraguay
2	662	Field-oriented vector control for a synchronous reluctance machine fed by two independent three-phase winding through two converters for EV applicatios	Alberto Said, Felix Llanquileo, Agustin Esper, Matias Mendoza and Nelson Aros	Presents modeling, control, and simulation of six-phase synchronous reluctance motor with dual-winding configuration for EV applications. Independent three-phase stator windings fed by separate converters enable transition between three-phase and six-phase operation. Field-oriented control strategy regulates torque and flux independently with simulation results showing improvements. Enhanced torque production, reduced ripple, and dynamic response especially during load transients and mode switching.	Chile
3	956	Linear Quadratic Integrator & Sliding-Mode Control comparison for a Transfemoral Prosthetic Knee	Antonio Gallardo	Systematically compares discrete-time control strategies (PID, LQI, SMC) for prosthetic knee double-pendulum model. Controllers tuned on identical plant dynamics with 5ms sampling time using MATLAB for 1-radian step input. PID exhibits 20% overshoot and oscillations while LQI reduces settling time but shows model sensitivity. SMC achieves convergence in 2 seconds with zero overshoot, offering high-performance alternative for responsive prostheses.	Chile
4	930	Harmonic Prediction of Load Current via Kalman Filtering for CCS-MPC of a Three-Level NPC UPS	Pablo Jiménez, Cristóbal Duarte and Andres Mora	Implements Continuous Control Set Model Predictive Control (CCS-MPC) with receding horizon for three-phase rectifier. Steady-state Kalman filter estimates harmonic component amplitudes from converter LC filter output current. Spatial phasors of each harmonic rotated to synthesize long-horizon disturbance predictions for grid-forming capabilities. Strategy validated through Simulink/PLECS simulations showing improved control solution optimality with five-step prediction horizon.	Chile
5	842	Reference Tracking in Sampled-Data Systems: A DLMI-Based Purely-Discrete PID Framework	Roberto Fuentes, André Marcorin de Oliveira, Gabriela W. Gabriel, Márcio Lacerda and Jonathan M. Palma	Presents tracking reference design based on purely discrete-time PID controller for sampled-data linear systems. Formulates PID tuning as convex optimization using Differential Linear Matrix Inequalities (DLMIs) minimizing H2 guaranteed cost. Purely discrete PID gains obtained automatically without model reduction or continuous-time transformation. Resulting controller ensures stability and performance by imposing H2 upper limit cost for hybrid systems.	Chile, Brazil
6	717	SNR limited Cascade Control	Alejandro Rojas and Héctor Ramírez	Studies networked control system configuration of cascade control over additive white noise channel models. Characterizes infimal channel input signal-to-noise ratio for single AWN channel and two AWN channels. Effect of dual AWN channels expressed in terms of channel input SNR for inner faster and outer slower loops. NCS configuration results in greater operational efficiency and reduced costs by minimizing energy consumption.	Chile

Track Control Systems & Processes & Theory

Track Control Systems & Processes & Theory	Session 3: Bioprocess Control and Optimization	Chair Session:
Thuesday october 28, 2025.	ROOM 6: 16:30–18:00	Papers: S3 (7) 354, 609, 630, 657, 759, 769, 920

#	ID	Title	Authors	Abstract	Country
1	354	Closed Loop V/F Control Fed Induction Motor under IGBT Open Circuit Fault	Noureddine Horri, Jakson Bonaldo, Ahmed Hamida Boudinar, Marco Rivera, Patrick Wheeler and Sergio Toledo	Presents new fault detection method based on Power Spectral Density (PSD) for diagnosing electrical open circuit faults. Simulation model built in MATLAB/SIMULINK considering scalar speed control (V/F) with Space Vector PWM. Three-phase induction motor tested at different speeds under healthy and faulty inverter conditions. Method validates open circuit fault detection technique for predictive maintenance avoiding production perturbation and repair costs.	Algeria, Brazil, Paraguay, UK
2	609	Sensitivity-Driven Optimization of a Batch Cultivation DAE Model of Mycobacterium smegmatis	Camila Díaz, Michelle Gibert, Rodrigo Tapia, Celeste Vargas and José Pérez-Correa	Refines dynamic model based on differential-algebraic equations incorporating oxygen transfer and consumption dynamics. Develops CasADi-based Python package automating DAE formulation, simulation, sensitivity analysis, and parameter calibration workflows. Sensitivity analysis reduces original 26 fitting parameters to 4, decreasing Akaike Information Criterion by 40%. Normalized fitting errors for biomass, glycerol, ammonia, and pH reduced to single-digit values.	Chile
3	630	Optimization of Bacteriophage Production in Batch Bioreactors	Gabriel Castro, Marina Contreras, Fernanda Santos, Jairo Pinto and José Pérez-Correa	Presents dynamic modeling and optimization framework for bacteriophage production incorporating infection timing via smooth pulse function. Model accounts for spontaneous mutation, phage adsorption, bacterial lysis, and resistance emergence with parameter reduction. Grey Wolf Optimizer used to optimize phage inoculum size and injection timing maximizing peak concentration. Optimal strategy achieves 329% increase in final phage concentration with Monte Carlo validation.	Chile
4	657	Development and Design of a PID control for continuous influenza virus production in cell culture	Rodrigo Salazar B., Carlos Fuhrhop B., Felipe Tapia, Felipe Valencia and Paolo Mercorelli	Develops proportional-integral controller for nonlinear six-state infectivity model describing influenza-A propagation in continuous bioreactor. Model linearized around nominal dilution rate using first-order Taylor expansion with open-loop analysis. Plant transfer function derived with Routh-Hurwitz criterion applied to delimit stabilizing PI gains. Closed-loop simulations show PI controller yields reference tracking and attenuates DIP-induced oscillations without overshoot.	Chile, Germany
5	759	A Python Framework to Find Local Structural Identifiable Lumped Parameter Bioprocess Models	Sofía Breton Montero, José Tomás Suazo Zavando, Felipe Guzmán Arce and José Ricardo Pérez-Correa	Presents Python implementation for local structural identifiability analysis based on numerical sensitivity and symbolic reduction. Framework applied to microbial growth model validating numerical consistency with original MATLAB implementation. Singular Value Decomposition of Relative Output Sensitivity Matrix reveals structurally non-determinable parameters. Three parameter-fixing strategies implemented with Hierarchical V-last proving most efficient for identifiability restoration.	Chile
6	769	Embedded Hardware-in-the-Loop Platform for Observer-Based Drug Delivery Control with Remote Monitoring	Rodrigo F. de Souza, Cecília F. Morais, Jonathan M. Palma and Diana C. González	Presents hardware-in-the-loop testbed validating drug delivery control strategy based on discrete-time pharmacokinetic model. Two ESP32 microcontrollers: one emulates physiological processes, other executes PI controller with discrete-time observer. Controller regulates drug concentration using only blood measurements reducing invasive sensing need. Real-time remote monitoring through Blynk IoT platform with simulation and experimental validation.	Brazil, Chile
7	920	Robust MPC strategy for Markovian Jump Systems with Multiplicative and Additive uncertainty Applied to Precision Medicine	Marcelo Aravena-Arellano, Diego Muñoz-Carpintero and Jonathan M. Palma	Addresses Precision Medicine problem steering blood medication concentration using Markovian Jump System modeling. System subject to multiplicative and additive uncertainty with states corresponding to successful/unsuccessful medicine ingestion. RMPC strategy presented with unknown Markovian states at each sampling time defining different system modes. Online optimization of feedback gain with invariant set constraints guaranteeing input-to-state stability.	Chile

Track Control Systems & Processes & Theory	Session 4: Bioprocess Control and Optimization	Chair Session:
Wennesday october 29, 2025.	ROOM 6: 09:00–10:30	Papers: S4 (6) 548, 617, 764, 805, 871, 872

#	ID	Title	Authors	Abstract	Country
1	548	When is an Observer Based Controller equivalent to a Proportional Integral Derivative Controller?	Ivan Acencio and Alejandro Rojas	Presents systematic study of equivalence between observer-based controllers with integral action and PID controllers. Develops explicit analytical relationships between PID gains and state feedback/observer gains for first and second-order systems. First-order systems show mathematical equivalence to complete PID controller while second-order takes filtered PD form. Theoretical framework supported by case studies validating practical applicability of derived relationships.	Chile
2	617	Modular and Explainable Architectures for Expert Systems in Industrial Process Control: A Critical Review	Saul De la Fuente Ruiz, José Antonio Vazquez López, Ismael López Juarez, Carlos Eduardo Belman López and Diana Guadalupe Molina Bermúdez	Presents critical review of ten recent expert systems studies focusing on architectural structure, explainability, and validation. Identifies most robust systems as modular hybrid architectures integrating symbolic reasoning, fuzzy logic, and ML. Observes lack of dynamic knowledge updating mechanisms and real-world functional validation. Proposes explainable, scalable architecture for real-time processing, auditable inference, and adaptation to changing conditions.	Mexico
3	764	Real-Time Ultrasonic Inspection System for Oil Content in Emulsions for Production Lines	Renato Galleguillos and Paloma Ponce	Presents real-time ultrasonic inspection system with temperature compensation for monitoring oil content in emulsion production. Enables continuous, non-destructive quality control measuring ultrasonic wave propagation velocity through oil-in-water emulsions. Specialized measurement chamber with piezoelectric transducers provides accurate concentration estimates within 2% error. Experimental validation shows strong linear correlation with temperature compensation ensuring industrial reliability.	Chile
4	805	Nonlinear Model Predictive Control N-MPC for a Conical Tank	Luis Vargas, Karina Montaluisa, Jacqueline Del Rosario Llanos Proaño and Paola Velasco	Proposes nonlinear predictive control (N-MPC) minimizing steady-state error while avoiding severe actuator actions. Uses particle swarm optimizer (PSO) to solve optimization problem considering plant operating restrictions. Comparison with linear MPC shows N-MPC superior performance with 13% overshoot reduction and 67% settling time improvement. Tests performed at different operating points demonstrating controller efficiency across operational ranges.	Ecuador
5	871	Diseño y Construcción de una Celda de Flotación Automatizada de Bajo Costo para Aplicaciones de Control de Procesos Mineros	Ignacio Parraguez Garrido, Diego Montoya-Acevedo, Carlos Restrepo Patiño, Catalina Gonzalez Castaño and Freddy Flores-Bahamonde	Presents design, implementation, and validation of low-cost automated flotation cell for mining laboratory applications. Prototype integrates reconfigurable technologies including 3D printing, efficient power electronics, and ESP32-based embedded control. Architecture allows programmed adjustment of critical process parameters through touch interface. Comparison with commercial reference cell shows equivalent metallurgical recovery with 63.2% energy consumption reduction.	Chile
6	872	Diseño de un Sistema Automatizado para el Control y Monitorización de Ensayos de Sedimentación con Floculantes en Aplicaciones Mineras	René Contreras, Julian Vega, Sebastian Riffo, Catalina Gonzalez and Carlos Restrepo	Presents design and construction of automated system for sedimentation tests with flocculants optimizing water reuse. Equipment composed of two ESP32 microcontrollers, optical sensors, motors, and graphical control interface. System automates sedimentation velocity measurements and resulting process curves improving data acquisition over manual methods. Validations performed in mining laboratory using real samples demonstrating high system reliability.	Chile

Track Eco-technology and digital agriculture

Track Eco-technology and digital agriculture	Session 1: Based Agricultural Monitoring and Computer Vision	Chair Session:		
Wennesday october 29, 2025.	ROOM 4: 14:30–16:00	Papers: S1 (6) 543, 798, 667, 564, 960, 613		

#	ID	Title	Authors	Abstract	Country
1	543+	Design and Validation of an Open-Source Platform for Autonomous Missions in Precision Agriculture	Gregorio Ariel Guerrero Moral, Micaela Jara Ten Kathen and Enrique Antenor Vargas Cabral	Presents design and validation of modular open-source platform for autonomous aerial missions combining PX4 autopilot with simulation environments. Coverage path planning module developed using exact cellular decomposition and Boustrophedon patterns evaluated through SITL simulations. Experimental results demonstrate effective area coverage, improved path efficiency, precise waypoint tracking, and consistent mission performance. Platform promotes reproducibility, scalability, and flexibility in UAV-based agricultural tasks with future extensions planned.	Paraguay
2	798+	A Hailo-Accelerated System for Precision Agriculture: Real-Time On-Board YOLO Inference on a Drone Platform	Barbara Vergara, Christian Fernández-Campusano and Héctor Kaschel	Presents intelligent agriculture system based on edge computing for UAV deployment using Raspberry Pi 5 with Hailo-8L accelerator. Core system provides 13 TOPS processing power for on-board inference implementing YOLOv8s and YOLOv10s models. Performance evaluated in CPU-only and hardware-accelerated scenarios measuring FPS, latency, and CPU usage metrics. Results demonstrate significant performance increase with hardware acceleration validating low-power, high-performance platform viability.	Chile
3	667	Early Nutrient Deficiency Detection in Hydroponic Lettuce via CNN-Based Image Analysis	Yessica Recalde, Alfredo Renault, Diego F. Palacios, Alba Chaparro, Alejandro Carissimo, Juan S. Gonzalez, Maira Santacruz, Mario Arzamendia and Derlis O. Gregor	Presents methodological approach for automated plant health diagnosis in hydroponic lettuce crops using Convolutional Neural Networks. Semantic segmentation system developed based on U-Net architecture trained with labeled RGB images from Roboflow dataset. Model achieved mean IoU of 0.69 and F1 Score of 0.79 demonstrating high accuracy in distinguishing healthy/nutrient-deficient regions. Research represents pivotal step toward computer vision integration in precision agriculture with sustainability impact potential.	Paraguay
4	564	Automated Water-Quality Assessment via YOLO Detection of Aquatic Macroinvertebrate Bioindicators	Kevin Galeano, Vanessa Carmona, Angelica Torres, Claudia Gómez-Leguizamón, Osvaldo D. Frutos, Regina León-Ovelar and Derlis O. Gregor	Presents deep learning-based computer vision system for automatic detection of aquatic macroinvertebrates as water quality bioindicators. Three object detection models (YOLOv11, YOLOv12, YOLOv8x) trained on dataset of 7,492 augmented images across 9 families. YOLOv11 and YOLOv12 achieved perfect classification (100% recall, 99-100% precision) while YOLOv8x reached 99.4% mAP@0.5. Results validate feasibility of automated ecological monitoring enabling efficient, scalable, low-cost bioindication in freshwater environments.	Paraguay
5	960	From Classification to Captioning: Adapting Vision-Language Models for Fruit Quality Description	Jose Donoso, Orietta Nicolis, Christian Pieringer and Billy Peralta	Implements and evaluates Vision-Language Models (BLIP, BLIP-2, GIT) for generating textual descriptions of fruit quality. Systematic comparison using manually curated dataset of image captions for bananas, apples, and oranges enabling zero-shot inference. Fine-tuned BLIP significantly outperforms other models achieving BLEU scores up to 0.615 and METEOR scores above 0.7. Findings highlight importance of rich textual datasets and fine-tuned VLMs potential for enhancing post-harvest processing decisions.	Chile
6	613	Fusión espacial y análisis multivariado para la caracterización de Oídio en viñedos comerciales del Maule: Un enfoque basado en PCA, clustering y geoestadística	Yordanis Garcia Dousat, Miguel Araya-Alman, Ruber Hernandez Garcia and Héctor Valdés Gómez	Presents integrated approach combining PCA with Varimax rotation, clustering, and geostatistical modeling for spatial characterization of powdery mildew. Uses field data of incidence, severity, canopy porosity, trunk cross-sectional area, and yield parameters from Sauvignon Blanc/Chardonnay vineyards. PCA explained 63.3% variance for Sauvignon Blanc and 49.2% for Chardonnay with successful zone differentiation. Integration enables "hotspot" detection facilitating site-specific interventions and optimizing agrochemical use for sustainable viticulture practices.	Cuba, Chile

Track Eco-technology and digital agriculture	Session 2: Thermal Sensing and Spectroscopic Analysis	Chair Session:		
Wennesday october 29, 2025.	ROOM 4: 16:30–18:00	Papers: S2 (6) 802, 885, 929, 915, 924, 900		

#	ID	Title	Authors	Abstract	Country
1	802	A Novel RGB-Guided Thermal Masking Pipeline for Low-Cost Vineyard Canopy Temperature Extraction	Fernando Fuentes-Peñailillo, Maria del Campo-Hitschfeld, Emmanuel Torres Quezada, Ricardo Vega, Arturo Bisono and Francisco Orgaz	Proposes reproducible, unsupervised, modular pipeline for vegetation masking in thermal images guided by synchronized RGB imagery. Method uses empirical HSV-based color segmentation generating binary canopy mask geometrically aligned to thermal frame. Designed for low-power embedded systems operating without training or complex calibration, implemented in Python with open-source libraries. Preliminary results demonstrate improved canopy temperature consistency enabling cost-effective thermal monitoring in resource-constrained vineyard environments.	Chile, Dominican Republic
2	885+	Part I – Design and Technical Validation of a Modular Thermocouple Grid for Low-Cost Thermal Mapping Systems	Fernando Fuentes-Peñailillo, Maria del Campo, Karen Gutter, Valentina Saavedra, Francisco Mateo and Emmanuel Torres Quezada	Presents design and validation of modular, scalable, low-cost thermocouple grid system as open-source alternative to commercial infrared cameras. System consists of 8×8 Type K thermocouple array with 10cm spacing connected via analog multiplexers and SPI amplifiers. Validation experiments confirmed adequate spatial resolution, sub-3-second response times, and ±0.7°C thermal accuracy across array. System provides scientifically validated foundation for distributed thermal sensing addressing high-density acquisition challenges.	Chile
3	929+	Part II – Application-Oriented Functional Validation of a Modular Thermocouple Grid System under Laboratory-Simulated Scenarios	Fernando Fuentes-Peñailillo, Maria del Campo, Emmanuel Torres Quezada, Valentina Saavedra and Francisco Mateo	Presents functional evaluation of thermocouple grid system under laboratory-simulated conditions emulating agriculture, electronics, and ecology scenarios. Three thermal environments constructed using controlled heating sources and diverse surface materials assessing spatial resolution and stability. System successfully reconstructed temperature distributions with high spatial fidelity ($R > 0.90$) and consistent acquisition stability ($\sigma < \pm 0.3$°C). Findings support use as flexible, accessible alternative to infrared imaging in experimental thermal sensing applications.	Chile
4	915	Maloney-Wandell Spectral Recovery for Estimating Temperature, Radiation, and Sodium Distributions in Biomass Pellet Flames	Fernando Castillo, Hugo Garcés, Guillermo Zieballe, Marcel Gutiérrez, Edgardo Pérez and Matias Espinoza	Implements compact spectral recovery system based on Maloney-Wandell method for optical-thermal variable estimation in biomass combustion. Pixel-wise continuous spectra of Pinus radiata pellet flames reconstructed from multiband CMOS trichromatic camera images. Flame temperature estimated using two-color pyrometry with local radiation calculation and sodium distribution mapping. Results consistent with literature demonstrating feasibility for non-invasive monitoring of combustion processes under real conditions.	Chile
5	924	Spectral Analysis of Sodium and Potassium Emissions in Wood Combustion for Tree Structure and Provenance Assessment	Matias Espinoza and Fernando Castillo	Presents spectral analysis of sodium and potassium emissions during wood combustion characterizing elemental behavior across tree structural parts. Optical Emission Spectroscopy employed using FLAME spectrometer with standardized sample dimensions and humidity from six trees. Significant variability observed in Na and K peak intensities across species and geographic regions. Statistical correlation analysis revealed strong relationships between trunk sections with Pearson coefficient $r = 0.97$ for same-species trees.	Chile
6	900	Estimation of NaCl concentration in aqueous solution using partial least square regression and Raman spectroscopy	Edgardo Pérez, Daniel Sbarbaro, Rodrigo Fuentes and Fernando Castillo	Proposes partial least squares regression model for NaCl concentration estimation from Raman spectra addressing traditional technique limitations. Raman spectroscopy provides molecular-level information but faces challenges from spectral band overlap and low cross-sections. Study includes robustness evaluation under temperature variations for environmental monitoring and industrial process applications. Method enables non-invasive, real-time monitoring suitable for biological applications requiring accurate salt concentration determination.	Chile

Track Eco-technology and digital agriculture	Session 3: Wireless Sensor Networks and Agricultural Process Optimization	Chair Session:		
Thursday october 30, 2025.	ROOM 2: 9:00–10:30	Papers: S3 (4) 710, 821, 858, 894		

#	ID	Title	Authors	Abstract	Country
1	710	Low-Cost Wireless Sensor Node for Real-Time Measurement of Key Variables in CWSI Estimation: Field Feasibility Test	Fernando Fuentes-Peñailillo, Maria Luisa del Campo-Hitschfeld, Emmanuel Torres Quezada, Karen Gutter and Javiera Jaramillo	Presents design and field validation of low-cost wireless sensor node for Crop Water Stress Index (CWSI) estimation variables. System combines open-source microcontroller, low-power environmental sensors, and LoRa communication enabling modular deployment and autonomous operation. Seven-day field trial demonstrated reliable, time-synchronized data acquisition with adequate stability and precision under vineyard conditions. Results confirm platform suitability as scalable alternative supporting development of distributed, energy-efficient monitoring systems.	Chile
2	821	A Review of Artificial Intelligence Methods for Carbon Capture Estimation in Regenerative Agriculture	Gabriel Gatica, Rodrigo Ortega, Edison Vásquez, Bárbara Díaz Rojas and Gastón Lefranc	Presents state-of-the-art review of AI applications in soil organic carbon estimation for regenerative agriculture. Integrates machine learning algorithms, remote sensing, sensor infrastructures, and GIS improving SOC monitoring accuracy and scalability. Highlights hybrid AI models (CNN-XGBoost), digital twins, and explainable AI advancing measurement, reporting, verification frameworks. Incorporates omics data with microbiome-based indicators modeling biogeochemical processes for carbon-efficient agricultural systems aligned with climate goals.	Chile
3	858+	Otimização Da Aplicação De Adubo Foliar Utilizando Programação Linear Para Redução De Custos	Antônio Marcos de Melo Medeiros de Melo Medeiros, Matheus Dias Barros, Bruno Quirino de Oliveira and Marcos Antônio de Souza	Presents research on foliar fertilizer application optimization in agriculture addressing significant production cost component. Main objective evaluates linear programming feasibility as approach for plant nutrition cost reduction in agribusiness context. Research identifies relevant data and evaluates practical choices compared to linear programming algorithm decisions. Methodology concentrates on field data collection and analysis with qualitative method comparisons for agricultural optimization.	Brazil
4	894*	Design and evaluation of an energy-efficient hybrid cooling system for poultry processing	Leandro Ambrosio-Flores, Daniel Felipe Sempertegui-Tapia and Renan Jorge Orellana-Lafuente	Presents hybrid cooling system design combining immersion and forced-air cooling optimizing energy and water usage. System developed based on thermal properties analysis, ambient conditions, and space constraints with mechanical moving mechanism. Reduced ice consumption from 0.9 to 0.4 kg/kg chicken and water usage from 2.89 to 1.408 L/kg. Economic assessment demonstrated system viability for decentralized, rural Latin American settings with improved sustainability performance.	Bolivia

Track Engineering Education

Track Engineering Education		Session 1: Educational Technologies & Training Systems		Chair Session:	
Wennesday october 29, 2025.		ROOM 5: 14:30–16:00		Papers: S1 (6) 151, 369, 601, 677, 758, 921	
#	ID	Title	Authors	Abstract	Country
1	151	Assessment of Digital Maturity Level in Universities: Key Performance Indicators and Continuous Improvement Strategies	Alejandro Alvarez Toro-Moreno	Presents methodological proposal for assessing digital maturity in higher education using KPIs across four dimensions: people, processes, technology, environment. Mixed-methods approach with interviews and surveys identifies structural barriers to digital transformation in Chile. Results enable development of evaluation system supporting evidence-based decision-making and sustainability of digital transformation. Proposal presented as replicable tool for quality management and strategic planning enhancing operational efficiency.	Chile
2	369	Tracking in the Classroom: A Novel BLE-based Micro-location Platform for Collaborative Learning Analytics	Hector Cornide Reyes, David Rojas, Diego Antonio Monsalves Cabello and Fabián Riquelme	Presents micro-location platform based on Bluetooth Low Energy technology supporting collaborative learning analytics in classrooms. System consists of mobile app for real-time BLE beacon detection and web management platform enabling tracking/visualization. Proof-of-concept implemented using game-based teamwork scenario collecting data on engagement, time-on-task, and interaction frequency. Platform provides educators accessible, low-cost tool for analyzing and improving collaborative learning experiences.	Chile
3	601	A Source of Income for Elderly People: Opportunities in Oral Storytelling	Lucio Cañete, Pablo Adasme and Enrique San Juan	Presents ranking of state actions promoting private demand for oral storytelling services by older adults. Considering cultural richness and economic hardship, research explores mechanisms positioning performing art as income source. Methodology includes literature review, AI support, expert interviews, Analytic Hierarchy Process, and Monte Carlo simulation. Result shows state actions inventory ranked: Non-Transferable Incentives, Training, Advertising, Public-Private Partnerships, Cultural Projects Promotion.	Chile
4	677	Active Learning and Gamification in Six Sigma Education	Andrea Insfran-Rivarola, Ana Pamela Arevalos, Emilio Bordón, Sharon Macias-Velazquez and Fabrizio Recalde	Addresses need to improve Six Sigma teaching helping undergraduate students understand concepts in real industry environments. Innovative pedagogical strategy implemented under Halloween theme integrating DMAIC cycle with gamification, project-based learning, role-playing. Academic performance improved from 70% to 81% with reduced variability (standard deviation decreased from 18% to 7%). Results showed methodology improved motivation, engagement, and retention as replicable model for higher education.	Paraguay, México
5	758+	Personalized Learning in Programming: Evaluating a chatbot using Naive Bayes versus IRT	Maria Morales, Joaquin Silva, Claudio Cubillos and Rafael Mellado	Presents educational chatbot using AI and natural language processing to improve student performance in object-oriented programming. Utilizes Dialogflow CX, Google Cloud Functions, and Firebase with Naive Bayes classifier dynamically adapting questions. Controlled experiment with 115 students showed 2.8% improvement for Naive Bayes versus 1.2% for IRT group. Work presents scalable framework for adaptive learning with practical implications for engagement and retention.	Chile
6	921	Preliminary study of learning patterns in engineering students	Carolina Zambrano and Carlos Hernandez	Learning pattern concept integrates motivation, learning conception, regulation strategies, and content processing strategies per Vermunt's model. Four learning patterns formed: meaning-directed, application-directed, reproduction-directed, and undirected learning patterns. Study identifies patterns in first-year engineering students applying Vermunt's Learning Styles Inventory to 120 students. Reliability analysis yielded satisfactory coefficients and exploratory factor analysis confirmed existence of four learning patterns.	Chile

Track Engineering Education		Session 2: Active Learning and Pedagogical Innovation		Chair Session:	
Wennesday october 29, 2025.		ROOM 5: 14:30–16:00		Papers: S2(5) 809, 816, 844, 868, 873	
#	ID	Title	Authors	Abstract	Country
1	809	Transformación didáctica del análisis de datos en educación superior: Del software privativo al ecosistema abierto con Python y Google Colab	Erica Milin, Silvia Quiroga and Ruben Flecha	Presents didactic innovation proposal for teaching data analysis using open-source software and cloud-based tools. Proposes replacing proprietary tools (Excel, EasyFit) with Google Colab and Python environment in Simulation course. Objective fosters technical skills aligned with market demands, enhances reproducibility, and facilitates collaborative work. Transition aligns with principles of openness, equity, and pedagogical renewal in data science education.	Argentina
2	816	Mainstreaming Gender in Engineering Research Training: A Chilean Case Study	Karina Vilches-Ponce, Alma Calderón-López and Daniela Soto	Presents pedagogical strategy for integrating gender perspective into doctoral research training in engineering. Approach addresses ethical, epistemological, and social dimensions particularly in AI data-driven research contexts. Grounded in feminist epistemology, digital ethics, and open science structuring four-stage training process. Model contributes to forming researchers capable of recognizing and mitigating bias in computational systems.	Chile
3	844	Development of a Didactic Platform for Sandbox Seismic Experiment	Andres Ortiz Salazar, Klyfton Stanley Fernandes da Silva Queiroz, Carlos Cesar Nascimento da Silva, Anelma Silva da Costa, Anderson Eugenio Silva da Costa and Fernado Cesar Alves da Silva	Presents design, development, and implementation of didactic platform for seismic experiments in sandbox simulating wave propagation. Uses HCSR04 piezoelectric transducer, automated movement system with Arduino controller, and graphic interface for analysis. Platform reproduces real geological conditions in controlled environment allowing algorithm testing and seismic response analysis. Offers user-friendly system contributing to advances in understanding earth's crust deformation and wave propagation.	Brazil
4	868	MathQuest: un software educativo para reforzar ecuaciones de primer grado	José Pailamilla, Nathalia Trigo, Claudio Cubillos, Daniela Quiñones Otey and Nicolás Acuña	Presents creation of "MathQuest" educational software, desktop application for Windows reinforcing first-degree equations through play. Software helps character overcome 3 difficulty levels with 4 exercises based on Chilean Ministry objectives. Validation with 40 users through pre-test, MathQuest test, post-test, and questionnaire showed effectiveness in educational terms. Findings indicate MathQuest motivates users but requires improvements in difficulty and interface.	Chile
5	873	Integrating of Research Social Responsibility in the PhD Engineering Theses	Marco Mora, Italo Torres-Gonzalez and Jesus Arrieta-Villamizar	Addresses "social responsibility of research" and how it can be addressed in graduate engineering education. Proposes way of integrating social responsibility concept in engineering doctoral theses defining outcomes and activities. Activities add to and complement traditional scientific research objectives of doctoral thesis projects. Two cases of inclusion presented being developed in Engineering Doctorate Program at Universidad Católica del Maule.	Chile

Track Engineering Education		Session 3: Social Responsibility and Gender Inclusion in Engineering		Chair Session:	
Thursday october 29, 2025.		ROOM 4: 9:00–10:30		Papers: S3 (3) 779, 883, 902	
#	ID	Title	Authors	Abstract	Country
1	779	Virtualization of the data room methodology for academic monitoring: A pilot study at the University of Atacama	Nahur Manuel Meléndez Araya, Jocelyn A. Soto Castillo and Maximiliano Muñoz Valderrama	Describes "data room" concept for academic monitoring determining degree and manner of knowledge acquisition by students. Method establishes relationship between content and grades obtained focused on improving work done. Proposal validated at Universidad de Atacama enabling Teaching-Learning process monitoring by determining achievement degree. Results allow monitoring learning outcomes of involved units for each evaluation.	Chile
2	883	Role Play as a First Approach to the Professional Role in Students of Electrical Engineering	Felipe Alarcón Osorio, Matías Pavez Bravo, Alvaro Hoffer, Constanza Lazcano and Camilo Maury Loustau	Analyzes strengths and challenges when electrical engineering students confront first real-world professional situation through Role-Playing. Experience involved 14 students and 2 external expert evaluators using pre-designed rubric assessing performance. Results indicate simulating scenarios supports application of theoretical knowledge, promotes integration with other courses, strengthens collaboration. Significantly enhances students' intrinsic motivation when addressing problems related to their development field.	Chile
3	902	Analysis of characteristics of incoming students to informatics programs at the Facultad Politécnica of the Universidad Nacional de Asunción	Ellen Mendez, Rita Cantero and Christian Von Lücken	Choosing university career always represents great challenge for young people in times where STEM careers play important role. STEM disciplines are fundamental pillars for economic and social progress globally including Paraguay. Importance lies in capacity to drive innovation, solve complex problems, and prepare societies for technological evolution challenges. Paper presents analysis of incoming student characteristics across different dimensions for Computer Engineering and Computer Science programs.	Paraguay

Track Geosciences & Remote Sensing

Track Geosciences & Remote Sensing		Session 1: Environmental Monitoring and Detection Systems		Chair Session:	
Thuesday october 28, 2025.		ROOM 6: 14:30–16:00		Papers: Sen S1 (6) 493, 574, 796, 797, 922, 962	
#	ID	Title	Authors	Abstract	Country
1	493	Deep Learning for Gas Emission Localization in Open-air Dump Using UAV-Based Thermal Imaging	Angelica M. Vidal, Mathias P. Solis, Maira Santacruz, Derlis O. Gregor	Effective management of open-air landfills presents significant environmental challenge due to greenhouse gas emissions. Study introduces methodology for automatic detection of gas emission zones in thermal imagery using UAVs and computer vision. Faster R-CNN model with ResNet-50 backbone developed and trained on custom dataset generated through color threshold segmentation. Results confirm viability of approach for identifying critical emission zones providing complementary tool for environmental management.	Paraguay
2	574	Implementation of an Agricultural Monitoring System Based on Vegetation Indices	Renato Meléndez	Paper presents implementation of agricultural monitoring system in San Clemente, Maule Region, Chile using UAVs with multispectral sensors. Primary objective generates vegetation indices (NDVI, GNDVI, NDWI) providing precise georeferenced information on crop health for maize cultivation. Methodology combines remote sensing, GNSS positioning, and cartographic processing to identify water stress and nutritional deficiencies. Results demonstrate significant improvements in efficiency, input savings, and environmental impact reinforcing precision agriculture value.	Chile
3	796	Design and Implementation of a Matrix Muon Detection System Using Silicon Photomultipliers (SiPMs)	Alan Cuevas, Lucas Boscarino, Jorge Molina	Work focuses on design and implementation of muon detection system measuring flux and angular distribution of particles. Tool allows analyzing effects of South Atlantic Magnetic Anomaly in terms of muon flux and phenomena like solar storms. Detection system based on scintillator materials with optical fiber read by silicon photomultipliers with transimpedance amplifier conditioning. Implementation of 24 channels in geometric configuration produces outputs processed by FPGA device validating system performance.	Paraguay
4	797	Design and Implementation of a Particle Detection System for the MUA Mission aboard the GuaraniSat-2 nanosatellite	Maximiliano Romero, Sebastián Monje, Giovanni Secchia, Lucas Cho, Alan Cuevas, Diego Stalder, Jorge Molina	South Atlantic Anomaly region where Earth's magnetic field weakens allowing high-energy particles to enter the atmosphere. Universidad Nacional de Asunción developed South Anomaly Monitoring Unit mission integrated into GuaraniSat-2 nanosatellite. Work presents design and implementation of Detection and Conditioning unit capturing energetic particles passage generating digital signal. System architecture described including electronic design, PCB, mechanical housing and operating test results.	Paraguay
5	922	Adaptive Polynomial Models for Analysis and Recovery of High-Frequency Meteorological Data	Osvaldo Delgado González, Lien Rodríguez López, Samuel Montejo Sánchez	High-frequency meteorological data essential for critical applications but face interruptions in automated weather stations. Work proposes adaptive polynomial method modeling seasonal thermal dynamics through season-specific regressions capturing minute-scale variations. Methodology combines real-time synthetic data generation and post-interruption bidirectional interpolation with adaptive weighting. Validated with Valparaíso station data reducing RMSE from 3.60°C to 2.46°C in summer achieving 0.11°C average error.	Chile, Cuba
6	962	Earthquake Forecasting using Temporal Transformers on Spatial Grids in Chile	Yerko Farfan, Orietta Nicolis, Billy Peralta	Accurate earthquake forecasting remains central challenge in geosciences due to complex nonlinear seismic processes particularly in Chile. Deep learning framework presented for short-term forecasting based on spatio-temporal seismic patterns applying five temporal architectures. Eleven years of Chilean seismic data (2007-2017) used constructing 4,018 labeled sequences from daily 4×4 georeferenced grids. PatchTST achieves highest F1 score (0.74) while CCT obtains best precision contributing to reliable data-driven forecasting tools.	Chile

Track IoT & Mechatronics

Track IoT & Mechatronics		Session 1: IoT Monitoring and Remote Systems		Chair Session:	
Thursday october 30, 2025.		ROOM 5: 14:30–16:00		Papers: S1 (5) 166, 557, 755, 834, 754	
#	ID	Title	Authors	Abstract	Country
1	166+	IoT-based Monitoring of Radio Base Stations: Design, Implementation, and Future Enhancements	Roman Lara, Jorge Cruz, Brayan Ligna	Efficient monitoring and management of radio base stations are critical for ensuring continuous communication in remote and urban areas. This paper designs and implements an intelligent monitoring system for radio base stations, leveraging advanced Internet of Things technologies, databases, and visualization tools. The proposed system integrates sensors connected to a micro-controller, enabling continuous measurement of critical parameters such as AC/DC voltages, temperature, humidity, and door status.	Ecuador
2	557+	Enhancing Remote Monitoring Applications using Hybrid IoT, Cloud Services and AI-Driven Tools	Luciano Chiang	This paper presents a novel system architecture that uses Internet of Things (IoT) devices and cloud services, enhanced by artificial intelligence (AI) to enable improved real-time monitoring of remote environments. The proposed solution combines ESP32 microcontrollers, AWS EC2-based servers, TUYA-compatible stations, and OpenAI's GPT-3.5 model via its API. Data collected from physical sensors are transmitted wirelessly using a MIFI device to servers where it is stored, processed, and interpreted.	Chile
3	755	Remote Monitoring, Control, and Update Triggering via LoRaWAN in an Edge-Based Vehicle Counting System	Fabian Palacios-Pereira, Marcelo Palma, Mario Arzamendia, Derlis O. Gregor, Diego Palacios, Ariel Fleitas, Hernán Lezcano	This paper presents an autonomous, low-power, and scalable vehicle counting and monitoring system that does not depend on continuous internet connection for its operation. The proposal integrates LoRa communication for long-distance transmission of counting data with high energy efficiency, edge processing using NVIDIA Jetson Nano running YOLOv8n-based detection model, and remote feature update capability through decentralized InterPlanetary File System (IPFS).	Paraguay
4	834	Low-Cost Autonomous Station for Particulate Matter Monitoring with Solar Energy	Silvia Barreto Cristaldo, Diego Stalder, Carolina Recalde, Ángel Rincón, Luis Bernal	Particulate matter pollution represents one of the main environmental risks to human health, especially in urban areas. This work presents the design and implementation of a low-cost autonomous station for real-time measurement of PM1, PM2.5, PM4, PM10 and environmental variables (relative humidity and temperature). The system integrates the Sensirion SPS30 sensor with an ESP32 module that manages data acquisition, SD card module, dual WiFi/GSM communication and energy management.	Paraguay
5	754+	Dynamic Weighing Using MLP Neural Network Implemented on ARM Board Equipped with NPU	Fernando Passold, Davi Schena Silva	This project proposes the use of Artificial Neural Networks to filter noise caused by structural vibrations present in dynamic weighing systems, where it is desirable to weigh goods inside moving vehicles without requiring stops. The study highlights the challenges of dynamic force measurement, where external vibrations introduce noise into load cell readings, reducing accuracy. Traditional model-based compensation methods require extensive expertise in mechanics and system dynamics.	Brazil

Track IoT & Mechatronics	Session 2: AI and Smart Systems for IoT Applicationss	Chair Session:		
Thursday october 30, 2025.	ROOM 5: 14:30–16:00	Papers: S2 (3) 631, 707, 899		
#	ID	Title	Authors	Abstract	Country
1	631	Adaptive Machine Learning for Intrusion Detection in IoT Environments under Concept Drift: A Comparative Study Using IoT-23	Jorge Andrés González-Quintana, Juan Ignacio Iturbe Araya, Helena Rifa-Pous	The performance of machine learning-based intrusion detection systems in smart home environments deteriorates over time due to concept drift, where the statistical properties of network traffic evolve. This paper presents a comparative evaluation of three drift adaptation techniques (ADWIN, HDDMW, DWM) applied to four classical classifiers using the IoT-23 dataset. Results indicate that adaptation significantly improves performance in key metrics such as F1-score, Matthews Correlation Coefficient, and balanced accuracy.	Chile, Spain
2	707*	EcoGrow: Automatic GreenHouse for Personal Plant Care with IoT and AI Integration	Elsa Yolanda Torres Torres, Antonio Carlos Bento, Maria Claudia Cavada Felix, Fiorella de Medina Castro, Andres Garza Mancilla, Juan Pablo Escalona Castellanos, Paris Ramonfaur Martinez, Daniel Couto Gatti	The EcoGrow project introduces a smart greenhouse system that integrates Internet of Things and Artificial Intelligence to simplify and optimize personal plant care. This system is designed for individuals with limited gardening expertise, utilizing sensors to monitor environmental factors such as temperature, soil moisture, and UV light. Automated controls and AI-driven recommendations enable real-time data analysis and adaptive plant care through dedicated app and web platform.	Mexico
3	899*	Vehicular Crowdsensing: A Comprehensive Review of Applications, Challenges, and Future Directions	Jonatan Mora Gonzalez, Jack Fernando Bravo-Torres, Esteban Ordoñez Morales, Julio Montesdeoca	The increasing presence of connected vehicles has given rise to Vehicular Crowdsensing, a transformative paradigm that leverages vehicle-generated data to create smarter, safer, and more sustainable urban environments. This state-of-the-art review provides comprehensive examination of VCS, encompassing its architectural foundations, diverse applications, and key challenges. The review delves into vast potential of VCS to revolutionize intelligent transportation systems, public safety, and environmental sustainability.	Ecuador

Track Energy & Power Systems

Track Energy & Power Systems	Session 1: Grid Integration and Power System Stability	Chair Session:		
Tuesday october 28, 2025.	ROOM 1: 09:00–10:30	Papers: S1 (6) 1003, 1004, 556, 799, 793, 674		
#	ID	Title	Authors	Abstract	Country
1	1003+	Analysis of Grid Connection Requirements for Grid-Forming Inverters Using EMTP Software	Sebastian Seguel Barrios, Luis Gonzalez Pincheira, Hector Chavez, Roberto Perez, Carlos Fuentes, Juan Quiroz	Technical-regulatory analysis of Grid-Forming inverters evaluating performance in power systems based on international standards. Test benches defined and validated to assess operational capabilities in representative scenarios with Droop control implementation. Simulations confirm GFM inverters with Droop control maintain system stability under various operating conditions. Disconnection of synchronous machines highlights fundamental role of Droop control in frequency and voltage regulation.	Chile
2	1004+	Analysis of Pre-Dispatch Scenarios to Determine the Value of Demand Disconnection as a Frequency Control Ancillary Service	Brayan Alucema, Luis Gonzalez, Hector Chavez, Roberto Perez	Analyzes economic feasibility of demand disconnection as ancillary service for frequency control in Chile's National Electric System. Study focuses on cost-effectiveness of interruptible loads implementing REFLEX model in PLEXOS software. Results show optimal cost of demand disconnection approximately 100 USD/MWh to minimize operational costs. Demand disconnection viable alternative for frequency control with complementary flexibility deficiencies and thermal generation reserves.	Chile
3	556	Evaluation of Behind-the-Meter Battery Energy Storage Systems for Frequency Regulation Services	Jorge Angamarca-Armas, Danny Espín-Sarzosa, Esteban Gil	Proposes methodology to evaluate Behind-the-Meter Battery Energy Storage Systems participation in frequency regulation. Approach integrates simplified economic dispatch model, operational strategy with fixed energy reserves, and dynamic simulations. Study applied to Medium-Sized Power System of Punta Arenas in Chile showing BTM-BESS integration enhances frequency response. Results achieve 1.18% improvement in nadir and 41.09% reduction in steady-state frequency error.	Chile
4	799	Intelligent Grid Support with VPPs: A Scalable Solution for PMGD Integration Challenges	Felisa Córdova, Franco Yanine, Thierry De Saint Pierre, Mokhtar Aly, Hans Rother	Power quality issues and blackouts increasingly linked to grid imbalances from growing Distributed Generation penetration. Virtual Power Plants offer scalable solution integrating large-scale energy storage, advanced diagnostics, and real-time control. SiVUr solution introduced employing Artificial Intelligence to optimize VPP effectiveness in mitigating disturbances. Creates dynamic interactions between DERs and loads crucial for modern power grids maintaining reliability and flexibility.	Chile
5	793	Electrical Substation Digitalization case study with Merging Unit in the Paraguayan Power System	Diego Rojas, Enrique Paiva, Ubaldo Fernández, Percy Salas, Cesar Adorno, Rodney Fariña	Merging Units convert analog signals from CTs and VTs into digital data transmitted via IEC 61850 standard. Implementation described at General Díaz Substation, first in Paraguay using Merging Units for power system digitalization. Represents technological benchmark within country opening path for future digital substation deployments. Enhances reliability, scalability, and smart grid readiness across Paraguayan power grid.	Paraguay
6	674+	Developing a Modular Framework for IEC 61850-Compliant Communication and Data Modeling in Smart Photovoltaic (PV) Power Plants	Yessica Monges	Growing photovoltaic energy adoption transforms power generation driving decentralized supply schemes with new challenges. IEC 61850 standard demonstrated versatility in managing Distributed Energy Resources including photovoltaic systems. Paper presents IEC 61850 integration model applied to field-testing buoy implementing real photovoltaic system. Measures communication performance and response times via real-time SCADA monitoring platform for field performance evaluation.	Paraguay

Track Energy & Power Systems	Session 2: Electric Vehicles and Smart Charging Systems	Chair Session:		
Tuesday october 28, 2025.	ROOM 1: 14:30–16:00	Papers: S2(6) 1022, 1033, 1034, 773, 781, 794		
#	ID	Title	Authors	Abstract	Country
1	1022	Control of a Single-Phase EV Charger for V2G Applications	Tomas Ravet, Matias Diaz, Patricio Pizarro	Growth of electromobility drives need for advanced charging solutions allowing interaction with electrical grid. Work presents modeling and control strategy for bidirectional charger designed for V2G applications. Topology based on three-stage cascaded architecture with totem-pole rectifier, Dual Active Bridge converter, and interleave buck converter. Complete system analyzed with control strategy validated through simulations demonstrating viability for residential applications.	Chile
2	1033	Hardware-in-the-Loop Validation of a Transformerless Electric Vehicle Charger	Daniel Velasquez, Alexander Rojas, Matias Diaz, Luis Pua, Luca Tarisciotti, Yeiner Arias-Esquivel	Transformerless converter topologies gained relevance in high-power EV chargers with V2G capability offering reduced volume and weight. Work presents Hardware-in-the-Loop validation of transformerless fast charger based on cascaded control structure. HIL platform consists of two RT Box 1 units for real-time emulation with MicroLabBox dSPACE controller. Results confirm accurate voltage regulation and proper capacitor voltage balancing demonstrating control strategy feasibility.	Chile, Costa Rica
3	1034	Experimental Assessment of a DC/DC Interleaved Converter for Hydrogen Generation	Luis Pua, Alexander Rojas, Daniel Velasquez, Macarena Villa, Matias Diaz, Mauricio Espinoza	Green hydrogen key enabler for decarbonization with electrolyzer performance influenced by input current quality. Work presents design, control, and experimental validation of multiphase interleaved DC/DC converter for electrolysis applications. Converter operates in continuous conduction mode with hierarchical control scheme on dSPACE MicroLabBox platform. Results demonstrate stable operation, reduced current distortion, and improved suitability for direct electrolyzer coupling.	Chile, Costa Rica
4	773	Hierarchical Control and Power Converter Topology for an Isolated DC Microgrid for EV Charging	Diego Román, José Aguilar, Enrique Espina	Isolating pulsed dynamics of electric vehicle charging from main grid major challenge in future energy systems. Work proposes isolated DC microgrid architecture capable of autonomous operation over complete daily cycle. Generation subsystem based on PEM fuel cell supported by first-life and second-life battery storage systems. Hierarchical control strategy combines primary, secondary, and tertiary levels ensuring stability and optimal scheduling.	Chile
5	781	A Review of Communication Protocols for Vehicle-Grid Integration through Charging Infrastructure: Enabling Ancillary Services	Simon Cerda, Enrique Espina, Javier Vargas	Growing electric vehicle adoption presents new challenges and opportunities for power grids through Vehicle-Grid Integration. Review covers fundamentals of VGI, enabling communication protocols, and analyzes standards like ISO 15118 and OCPP. Critical assessment of current readiness, implementation gaps, and security limitations provided for interoperable systems. Outlines key barriers and opportunities for deploying intelligent Vehicle-Grid Integration systems enabling ancillary services.	Chile
6	794	Electric Vehicles in Microgrids: A Review of Control Architectures and Integration Approaches	Ignacia Loyola, Enrique Espina, Karina Barbosa	Integration of electric vehicles into microgrids introduces control challenges due to charging demand variability. Work presents functional classification of control architectures in MG with EV structured by hierarchical levels. Classification enables detailed analysis of relationship between control levels and specific services provided. Framework facilitates comparative evaluation offering structured perspective on research trends and gaps.	Chile

Track Energy & Power Systems		Session 3: Renewable Energy Systems and Optimization		Chair Session:	
Tuesday october 28, 2025.		ROOM 1: 16:30–18:00		Papers: S3 (6) 1005, 46, 513, 577, 694	
#	ID	Title	Authors	Abstract	Country
1	1005+	Techno-Economic Analysis for the Implementation of a Photovoltaic System in Goat Farming Facilities in the Coquimbo Region	Daniel Castro, Gonzalo Toledo, Luis Gonzalez Pincheira, Hector Chavez	Paper assesses technical and economic feasibility of increasing support pillar height for photovoltaic systems on goat farms. Strategic integration of PV and agriculture results in agrivoltaic systems with height increase not compromising viability. Research presents comprehensive review of structural modifications, behavioral characteristics, and PV configurations. Technical evaluation applied structural mechanics validated in MATLAB and ANSYS with economic assessment through cash flow model.	Chile
2	46	Multi-Objective Optimal Scheduling of Smart Microgrid with Uncertainty Analysis of Electric Vehicle	Moslem Dehghani, Seyyed Mohammad Bornapour, Jose Rodriguez	Study aims to reduce daily cost and pollution emission of small MG system incorporating PVs, WTs, ESSs, and EVs. Energy management system considers ESS and EV charging requirements, consumer loads, and initial energy levels. Gray wolf algorithm employed with weighted sum method for multi-objective optimization addressing uncertainties. Results show considering ESS and EV reduces both cost and emissions with 5.4% cost reduction by increasing EV participation.	Iran, Chile
3	513	Global Maximum Power Point Coupling in Cooperative Game Theory for Power Loss Reduction	Walter Cedillo, Javier Cabrera-Mejía	Study minimizes photovoltaic power losses by developing model integrating shading factors, solar path tracking, and energy management. Proposes coupling maximum power point model with cooperative game theory as novel concept using Pareto order. Algorithm enables energy transfer to mitigate losses by dynamically reconfiguring photovoltaic system distributing shading effects. Results show 38.04% power loss reduction with two microgrids coalescing, reaching 51.34% with network integration.	Ecuador
4	577	Development of a calculator to estimate the potential for generating electricity from biogas produced from municipal solid waste	Gabriela González Troche, Daniel Ríos Festner	Biogas renewable energy source taking advantage of organic waste for electricity production favoring circular economy. Work develops calculation tool for estimating electricity generation from biogas produced from Urban Solid Waste. Methodology based on key variables identification and algorithm design programmed in HTML, CSS and JavaScript. Case study at Polytechnic Faculty quantified 189 kg daily usable waste producing 23.88 m^3 biogas and 42.76 kWh electricity.	Paraguay
5	694*	Evaluation of Weibull Parameters and Wind Energy Potential: A Case Study in Palca - Peru	Ubaldo Yancachajlla Tito, Celso Antonio Sanga Quiroz, Edilberto Velarde Coaquira, Nelson Esteban Chambi Quiroz	Study assessed wind energy potential in rural community of Palca using data measured at 10 meters height. Weibull distribution shape and scale parameters determined with values showing good agreement with measured data. Average annual power density 58.82 W/m^2 indicating marginal wind potential suitable for small-to-medium scale projects. Three turbine models evaluated with Gamesa G136-4.5 MW achieving 31% capacity factor guiding renewable integration.	Peru

Track Energy & Power Systems		Session 4: Energy Storage and Hydrogen Systems		Chair Session:	
Wednesday october 29, 2025.		ROOM 1: 09:00–10:30		Papers: S4 (5) 824, 851, 836, 465, 545	
#	ID	Title	Authors	Abstract	Country
1	824	Dynamic Hydrogen Microgrid Control: A Dual-Domain MPC Approach with Local Flow Loops	Juan Sebastian Gomez Quintero, Antonia Azar, Angel Ulloa, Nadia Yasic, Cristobal Carrasco, Cristobal Parrado	Model predictive control strategy for dynamic energy management in hydrogen-powered microgrid integrating PEM electrolysis, storage, and fuel cells. Dual-domain framework couples electrical and moist-air domains accurately representing hydrogen flow behavior. Fast-acting local control loops ensure safe pressurization while high-level MPC optimizes power dispatch. Results demonstrate system's ability to manage rapid disturbances maintaining continuous power supply during outages.	Chile
2	851*	Sistemas de Armazenamento de Energia em Escala: Análise Comparativa entre BESS e HSS	Amaro Krob, Carlos Frederico, Miguel Udaeta, Vivane Nascimento, Vanessa Massara, Andrea Collin	Comparative analysis of Battery Energy Storage Systems and Hydrogen Storage Systems for large-scale energy storage. Multicriteria assessment using Analytic Hierarchy Process evaluates efficiency, environmental impact, cost, safety and recyclability. Results show BESS outperforms in efficiency while HSS offers advantages in long-duration storage and sustainability. Study addresses technological challenges concluding HESS represents resilient and scalable solution for future systems.	Brazil
3	836	Energy, Economic, and Environmental Evaluation of the Incorporation of Electric Buses into the Public Transportation System of the Metropolitan Area of Asunción, Paraguay	Diana Valdez, Dana Aguilera, Estela Riveros, Félix Fernández, Enrique Buzarquis	Paraguay, a major hydropower producer, relies on imported fossil fuels for transport, causing economic and environmental issues. This study evaluates the impacts of electrifying Asunción's bus fleet using LEAP software across five scenarios to 2050. Full transition to electric buses, especially with a commuter train, is the most efficient, reducing energy use by 61% and eliminating direct GHG emissions by 2040. Financially, total electrification minimizes losses (NPV -71M USD) versus inaction (NPV -214M USD).	Paraguay
4	465	Strategic Location and Generation Optimization in Radial Power Systems using Voltage Stability Indices and Fuzzy Logic Optimization	Hernan Ramirez, Rodney Fariña and David Franco	This paper proposes a fuzzy logic-based methodology to optimize the placement and sizing of distributed generation in radial power systems. By integrating voltage stability indices, it identifies critical nodes and enhances system reliability. The approach considers multiple operational criteria and constraints. Results show improved voltage stability and reduced power losses.	Paraguay
5	545.	Faults in Overhead HVDC Transmission Lines: A Case Study Based on the Kimal–Lo Aguirre HVDC System	Camilo Villegas, Cristián Pesce, Rodrigo Villalobos, Gabriel Olguín and Eduardo Richard	This paper analyzes fault behavior in an LCC-HVDC system with a Dedicated Metallic Return (DMR), using the future Kimal–Lo Aguirre link as a case study. Three DC fault types are simulated in PSCAD™ to evaluate their impact on current severity and converter dynamics. The study examines control performance and frequency stability in weak AC grids. Results provide insights and recommendations for the design and protection of LCC-HVDC systems with DMR.	Chile

Track Energy & Power Systems		Session 5: Energy Storage and Hydrogen Systems		Chair Session:	
Wennesday october 29, 2025.		ROOM 1: 14:30–16:00		Papers: S5 (6) 621, 766, 849, 887, 911, 958	
#	ID	Title	Authors	Abstract	Country
1	621*	Advanced Power Quality Assessment Using Real-World Measurements and PowerFactory Simulation	Sebastián Salazar, Sebastián Vaca, Gabriel Salazar, Verónica Rosero, Eduardo Salazar	Power quality analysis crucial for stable operations in systems with high-power loads preventing equipment failures. Paper evaluates power quality considering voltage and current harmonics, flicker, and voltage imbalance aspects. Demonstrates PowerFactory from DIgSILENT functionalities highlighting capabilities for advanced power quality assessment. Results show injection harmonic levels, THD estimations, and compliance with global standards validating simulation tools.	Ecuador
2	766+	Thermal and Electromagnetic Impact on Conductor Sag in a 115 kV Transmission Line: A Finite Element Approach	Hernan Alonso Bravo Urrea, Harold Díaz, Felipe Santacruz	Multiphysics analysis of 115 kV ACSR transmission line using finite element modeling in COMSOL Multiphysics. Study investigates thermal and electromagnetic effects of increased current flow from contingency scenarios on conductor sag. Coupled electromagnetic-thermal simulation determines magnetic field intensity, current density, and temperature profiles integrated into mechanical models. Findings demonstrate elevated temperatures cause significant sag increases compromising clearance standards and system reliability.	Colombia
3	849	Calculation of the Impact of Overvoltage Transients in Hydroelectric Plants and the Electric Power Industry	Alvaro Soto, Vladimir Esparza, Jose Mahomar, Fredy Muñoz, Daniel Quezada, Jaime Rohten	Study analyzes electrical transients in power systems understanding origin, effects, and mitigation measures. Real field measurements carried out at hydroelectric plant, industrial facility, and EV charging system. Monitoring and analysis methodologies applied according to international standards for transient event characterization. Results show continuous monitoring and predictive strategies improve operational stability reducing failures and extending equipment lifespan.	Chile
4	887+	Simulaciones de transitorios electromagnéticos usando Hypersim y Simscape de Matlab	Brian Muñoz, Hector Chavez	Paper evaluates Simscape MATLAB toolbox capabilities for electromagnetic transient simulations comparing with Hypersim specialized software. Two case studies of increasing complexity analyzed applying identical fault events in each environment. Graphical and quantitative comparison metrics assess voltage, current, and generator speed responses. Results highlight Simscape limitations and advantages providing insight into real-time simulation applicability.	Chile
5	911	Impact Assessment of Connecting an On-Grid Photovoltaic Generation System to the Electrical Distribution Network in Chillán	Eduardo Iraira, Jaime Rohten, Jorge Varela, Javier Muñoz, Johan Guzmán, José Silva	Chile's push to decarbonise distribution grid under PMGD scheme motivates detailed appraisal of small-scale photovoltaics. Study investigates 144 kW PV plant proposed for 13.2 kV radial serving Chillán horticultural terminal. Composite procedure in DIgSILENT PowerFactory couples steady-state power-flow and short-circuit with transient fault simulation. Results show PMGD integration does not have great impact due to low power level.	Chile
6	958	Finite Element Validation of MCSA-Based Algorithm for Rotor Fault Diagnosis in Low-Power Induction Machines	Gonzalo Fonseca-Yañez, Carlos Madariaga-Cifuentes, Juan A. Tapia	Paper presents finite element validation framework for rotor fault detection algorithm using motor current signature analysis. Method focuses on identifying broken rotor bars through FFT-based spectral analysis with diagnostic severity table. Calibrated 2D FE model simulates various fault scenarios including different BRB quantities and spatial distributions. Results demonstrate algorithm accurately detects and classifies rotor faults under moderate and high loads.	Chile

Track Energy & Power Systems		Session 6: Energy Markets and Economic Dispatch		Chair Session:	
Wennesday october 29, 2025.		ROOM 1: 16:30–18:00		Papers: S6 (6) 562, 665, 944, 568, 750, 864	
#	ID	Title	Authors	Abstract	Country
1	562	Complexity of the Unit Price of Household Electricity in México	Jesús Martínez-Patiño, José Lozano-García, Alejandro Pizano-Martínez, Roberto José Muñoz-Mujica	Study focuses on unit energy costs based on domestic tariffs applied by Federal Electricity Commission in Mexico. Analyzes tariff structure according to energy consumption blocks, price application, and average summer temperature. Detailed study of composition shows government subsidies impact and geographic variation with calculation equations. Framework allows accurate estimation of residential electricity cost and better understanding of energy expenditures.	Mexico
2	665	Convex Hull Pricing via Ramp-Constrained Network-Flow Unit Commitment Models	Lucas Bórquez Cerda, Alejandro Angulo, Nicolás Rojas Jeria	Work presents Convex Hull Pricing framework based on network-flow formulation of Unit Commitment with ramp constraints. Inclusion of ramp constraints impacts feasible solution polyhedron no longer exhibiting total unimodularity requiring MIP solvers. Solution approach relaxes power balance constraint applying primal-dual Bienstock-Zuckerberg algorithm with iterative partitions. Results show BZ algorithm outperforms DW and LM reducing computational times by 40% and 18% respectively.	Chile
3	944	Marginal Costs in the Chilean Electricity Market with inter-hourly Linkage	David Sanhueza, Rodrigo Rozas, Leonardo Gacitúa	Chile forecasts variable renewable energy accounting for over 60% installed capacity by 2043 demanding adequate price signals. Temporal Locational Marginal Pricing enhance conventional nodal pricing embedding ramp-rate and storage constraints into energy price. Study solves OPF for Chilean system projected to 2043 benchmarking net revenues under LMP versus TLMP. Results show technologies with low ramping capability experience significant revenue reductions demonstrating intertemporal constraints influence.	Chile
4	568*	Dynamic and Fair Allocation of Shared Energy Resources in Energy Communities	Eduardo Salazar, Sebastián Salazar, Verónica Rosero, Mauro Jurado, Sebastián Vaca	Paper presents mixed-integer linear programming model for dynamic and fair allocation of shared energy in energy communities. Model computes hourly coefficients to distribute energy from shared PV plant and community battery storage. Primary goal minimizes total electricity bill while enforcing quantitative fairness among members through daily constraints. Results show weekly bill reductions of at least 78% with fair allocation achieved in single optimization step.	Spain, Ecuador, Argentina
5	750	Dynamic Economic Dispatch of Microgrid with Renewable and Conventional Generation	José M. Lozano-García, Melanny Julisa Ramírez-Lara, Alejandro Pizano-Martínez, Gabriel Avina-Cervantes, Luis Ramón Merchan-Villalba, Jesús Martínez-Patiño	Paper addresses dynamic economic dispatch problem in microgrid interconnected with main power system including traditional components. Study involves determining optimal configuration of microgrid components to supply energy at lowest cost. Cost factors include conventional and renewable generator functions, asymmetric energy exchange costs, and demand response strategy. Results demonstrate optimizer enables microgrid to adapt to adverse conditions consistently meeting demand at lowest cost.	Mexico
6	864+	Aplicação do Despacho Econômico e Ambiental (DEA) em Sistemas Isolados: Estudo de Caso para o Sistema de Boa Vista – RR	Henrique Maximiano, Miguel Udaeta, Vanessa Massara, Viviane Nascimento	Article applies Environmental Economic Dispatch methodology to future partially interconnected Boa Vista power system. Multi-objective linear optimization model includes realistic constraints like biomass generation inflexibility minimizing costs and emissions. Simulations based on public data reveal optimal trade-off with BRL 800/tCO2eq carbon price reducing emissions 41%. Results confirm EED as robust quantitative tool for evaluating decarbonization costs and designing energy policies.	Brazil

Track Energy & Power Systems		Session 7: Sustainable Energy Transition		Chair Session:	
Thursday october 29, 2025.		ROOM 1: 09:00–10:30		Papers: S7 (5) 650, 820, 857, 870, 876, 641	
#	ID	Title	Authors	Abstract	Country
1	650	Evaluation of PV Cooling Demands in Northern Chile Using a Heat Map Approach	Felipe A. Díaz, Daniela F. Martínez, Ernesto Castillo	Study assesses cooling requirements of photovoltaic systems in northern Chile with high solar irradiance and low winds. Differential thermal model developed computing transient temperature of each PV layer using finite volume method. Model incorporates convective and radiative heat losses, solar irradiation, wind velocity, and ambient temperature. Maximum PV temperatures evaluated across 421 locations synthesized into heat map identifying regions for cooling strategies.	Chile
2	820+	Nuclear Power Plants in Energy Transition: State-of-the-Art Technology Assessment and Sustainability Perspectives	Daniel Albano, Miguel Edgar Morales Udaeta, Viviane Tavares Nascimento	Climate change intensified global search for low-carbon energy sources with nuclear reconsidered as strategic option. Article presents technical and strategic review of nuclear energy state of art focusing on role in power systems. Discusses key reactor types, technological evolution to Generation IV and SMRs, and applications in hydrogen production. Work clarifies potential of nuclear energy in decarbonizing power sector and achieving climate targets.	Brazil
3	857	Multi-Dimensional Assessment of Infrastructure Gaps on the Integration of Large-Scale Intermittent Renewables: The Case of Brazil	Rafael Nascimento, Daniel Rodrigo Falconi, Viviane Tavares Nascimento, Vanessa Meloni Massara, Miguel Edgar Morales Udaeta, Eduardo Coelho Marques da Costa	The global energy transition is accelerating the integration of intermittent renewable sources, creating significant technical, regulatory, and operational challenges for power systems. This paper advances the debate by providing an updated and multi-dimensional analysis of infrastructure gaps in the large-scale integration of solar and wind energy, with a focus on the Brazilian power system. Drawing on international experiences, it highlights obstacles and lessons learned, then develops a case study of the Brazilian National Interconnected System (SIN), characterized by rapid renewable growth and a structural shift of power flows toward the Northeast. Using the most recent data (2024–2025), the study documents rising curtailment and its economic impacts, and uniquely links these outcomes to emerging technological and regulatory solutions. In particular, the paper examines the role of grid-forming battery energy storage systems (BESS), dynamic line rating (DLR), and AI-driven parameter estimation, alongside evolving market and policy frameworks. By integrating technical, regulatory, and institutional dimensions, this work contributes an original applied perspective and proposes actionable pathways for policymakers, system operators, and private stakeholders engaged in the sustainable energy transition.	Brazil
4	870+	Curtailment as an Opportunity: Demand-Side Management for the Energy and Social Development of Rio Grande do Norte	Santiago Silveira Barbosa, Miguel Edgar Morales Udaeta, André Luiz Veiga Gimenes, Viviane Tavares Nascimento, Vanessa Meloni Massara	Accelerated renewable energy growth in Rio Grande do Norte positioned state as Brazil's largest electricity producer. Expansion not matched by proportional local consumption resulting in high curtailment levels due to limited demand. Work analyzes strategic role of Demand Side Management as tool to mitigate curtailment and foster socioeconomic development. Study proposes attracting energy-intensive industries, data centers, efficiency programs, and smart grids improving HDI and GDP.	Brazil
5	876+	Electric Mobility from Biomass: Technological Advances, Scalability, and Sustainability	Gustavo G Noronha, Miguel Edgar Morales Udaeta, Viviane Nascimento, Vanessa Meloni Massara	Paper analyzes strategic role of biomass in promoting low-carbon electric mobility in Brazil focusing on bioelectricity. Study highlights environmental performance of electric vehicles depends on electricity mix used for charging. Bioelectricity from agricultural, forestry, and urban residues offers pathway to reduce CO_2 emissions with simulation results. Brazil has unique advantages including clean grid, abundant biomass, and agro-energy expertise for sustainable mobility.	Brazil
6	641	Metaheuristic-Enhanced PV Power Forecasting Using Hybrid Machine Learning: A Case Study in Cuba	Liomnis Osorio, Víctor Tuninetti, Laurent Duchêne, Jaime Rohten, Sunny Narayan, Mailyn Moreno-Espino	Accurate photovoltaic power forecasting critical to grid integration in tropical regions with limited measurement infrastructure. Hybrid framework integrates metaheuristic-optimized physical model with machine learning regression for enhanced forecasting. Thermally informed cell temperature model generates physically consistent power outputs as synthetic ML targets. ANN and GBM models achieved superior performance demonstrating enhanced accuracy in sensor-constrained environments.	Chile, Belgium, Mexico, Spain

Track Energy & Power Systems		Session 8: Digital Infrastructure and Communication Systems		Chair Session:	
Thursday october 29, 2025.		ROOM 1: 14:30–16:00		Papers: S8 (6) 892 867, 901, 615, 878, 890	
#	ID	Title	Authors	Abstract	Country

1	892	Control System for the Formation of a Balanced Hybrid Single/Three-Phase Microgrid from Three Isolated Single-Phase Microgrids	Bárbara Contreras Bustamante, Patricio Mendoza-Araya	Access to electricity in isolated rural areas challenging due to geographical, technical, and economic constraints. Hybrid single/three-phase microgrid topology proposed consisting of three single-phase microgrids connected to common busbar. Decentralized phase angle shift PI control system proposed to regulate phase shift through power transfer. Simulation results validate control system effectiveness forming balanced three-phase system allowing three-phase load connection.	Chile
2	867*	Análisis predictivo del consumo eléctrico en una subestación usando GRU en Alto Paraná, Paraguay	Obdulio Sebastián Vazquez Villalba, Pedro Gardel Sotomayor, Micaela Jara Ten Kathen	Article analyzes and validates short-term electricity consumption predictive model using Deep Learning with GRU mechanism. Exogenous variables influencing energy consumption considered with two scenarios developed evaluating impact of variable sets. Performance evaluated using precision metrics achieving MAPE around 9.93%, MSE 0.003, MAE 9.57, and R^2 0.85. Results indicate state-of-the-art Machine Learning techniques stand out as promising tool for energy consumption planning.	Paraguay
3	901	Evaluating the impacts of realistic communications on a Microgrid Central Controller through real time simulation	Cristóbal Undurraga, Patricio Mendoza-Araya	Work studies microgrid performance when affected by communication loop problems modeled in Typhoon HIL 604 simulator. Controller Hardware in the Loop setup implements centralized control externally on Raspberry Pi device via Ethernet. Ten scenarios investigate performance when subjected to delay inclusion in communication link using Modbus TCP protocol. Results show certain scenarios with increased delay cause progressive performance decrease becoming unstable reinforcing communications design importance.	Chile
4	615	Humidity Range for Pollution Estimation in High Voltage Electrical Insulators	Eduardo Richard, Rodrigo Villalobos and Cristian Pesce	This paper studies how humidity affects leakage current indicators used to assess contamination on high-voltage insulators. Experiments under controlled conditions reveal that leakage current depends on both contamination and ambient humidity. Several LC-derived indicators from the literature are analyzed for reliability. Results identify a humidity range (80–90%) where contamination levels can be visually distinguished through characteristic current patterns.	
5	878*	Analysis and Evaluation of Alternatives and Requirements for Electric Bus Charging Terminals for Public Transport in the Metropolitan Area of Asunción, Paraguay	Marcos Benitez, Mauricio Galeano and Carlos Sauer	This study analyzes the technical, economic, and regulatory feasibility of electric bus charging terminals in the Metropolitan Area of Asunción. A methodology defines four scalable terminal modules adapted to Paraguay's electrical system and tariff structure. Results show that Module 2 (24 chargers, 4.8 MW) offers the best balance between cost and reliability. The work also proposes regulatory updates to enable higher-capacity terminals and support sustainable electric mobility policies in Paraguay.	Paraguay
6	890*	Techno-economic analysis of a diesel–wind–photovoltaic hybrid system with battery storage for an off-grid household on Amantani Island, Peru	Ubaldo Yancachajlla Tito, Celso Antonio Sanga Quiroz, Edilberto Velarde Coaquira and Nelson Esteban Chambi Quiroz	This study evaluates a hybrid PV–wind–diesel–battery system for an off-grid home on Amantaní Island, Peru, using HOMER Pro simulations. Three configurations were analyzed for cost and performance. Scenario 1 (Load Following) achieved the best balance, with a 96.7% renewable fraction and low energy cost (0.264 USD/kWh). The results demonstrate the techno-economic feasibility and scalability of hybrid renewable systems in remote Andean regions.	

Track Energy & Power Systems

Track Energy & Power Systems		**Session 9: S9: Advanced Topics in Power Systems**		**Chair Session:**	
Thursday october 29, 2025.		**ROOM 1: 16:30–18:00**		**Papers: S9 (6) 918, 954, 1006, 800, 893, 969**	
#	**ID**	**Title**	**Authors**	**Abstract**	**Country**
1	918	Study of Demagnetization in a Coreless Axial-Flux Permanent Magnet Synchronous Generator for Small Hybrid Vertical-Axis Wind Turbines	Alvaro Hoffer, Felipe Alarcón Osorio, Matías Jiménez, Diego Obando, Boris Pavez, Hector Young, Javier Coloma, Jonathan Mac-Kay, Felipe Ruiz, José Rodriguez	Paper presents demagnetization study of coreless axial flux PMSG for small hybrid vertical-axis wind turbines. Small VAWT systems exposed to harsh environmental conditions causing performance degradation particularly affecting permanent magnets. Two harsh scenarios analyzed: overload from high wind speeds and short-circuit fault in connection line. Results indicate even under rated conditions partial demagnetization can occur potentially leading to gradual generator degradation.	Chile, Italy
2	954	Analytically Estimated Cut-Off Frequency as a Decision Criterion Between Hairpin and Conventional Windings	Carlos Gálvez-Araya, Carlos Madariaga-Cifuentes, Cesar Gallardo and Juan Tapia	This paper introduces an analytical method to estimate AC losses in hairpin windings for high-frequency induction motors. Hairpin windings offer better thermal performance and current density but suffer greater skin and proximity effects. The proposed model predicts the cut-off frequency where hairpin windings become more efficient than conventional ones, considering geometry and slot parameters. Finite Element Analysis validates the results, confirming the method's reliability and usefulness for optimizing electric motor design.	Chile, UK100+
3	1006+	Impact of Operational Minutes Modeling on the Operation Forecast of Generadora Metropolitana's Assets	David Lefin, Julio Zavaleta, Hector Chavez, Carlos Fuentes, Luis Gonzalez and Roberto Perez	Proposes incorporating four constraints into pre-dispatch problem modeled using PLEXOS software in Chile. Objective represents Nueva Renca and Los Vientos power plants operation ensuring operational security of 110 kV Ring. Performance evaluated through simulations on high local demand days in 2023 comparing with pre-constraint scenarios. Results demonstrate proposed constraints enable more accurate representation of security-based operational conditions.	Chile, Bolivia
4	800*	Desafios Futuros da Estabilidade de Sistemas Elétricos	Isabela Andrade Fernandes, Miguel Edgar Morales Udaeta, Viviane Tavares Nascimento, Vanessa Meloni Massara and André Luiz Veiga Gimenes	Identifies how global climate change creates new challenges for power systems worldwide through case analysis. Heatwaves and extreme storms compromise system stability through structural grid damage and peak demand surges. For each climate-related issue, potential solutions proposed ranging from energy storage investments to underground transmission. Study addresses operational challenges and proposes resilience strategies for climate-impacted power systems.	Brazil
5	893	Impactos de la incorporación del comportamiento de los usuarios finales en programas de gestión de demanda eléctrica	Isidora González V. and Patricio Mendoza-Araya	Evaluates impacts of considering user needs represented through behavioral economics in Time of Use and Real Time Pricing. Integration analyzed to determine if it contributes to Demand Side Management program improvements for current challenges. Results show including user diversity improves demand stability and increases distributor gains by 38% for RTP. Reinforces importance of considering consumer preferences and responses in tariff design for fair transition.	Chile
6	969*	Principais Desafios da Expansão Rede de Transmissão Nacional: Um Estudo sobre Eficiência e Desenvolvimento Energético	Patricia Sebajos Vaz, André Luiz da Veiga Gimenes and Miguel Edgar Morales Udaeta	Examines main challenges faced in electric transmission network expansion with emphasis on Northeast Region. High penetration of renewable sources like wind and solar imposes additional infrastructure requirements. Qualitative research combines bibliographic review with technical and regulatory data documentary analysis. Results reveal bottlenecks related to environmental licensing, generation-transmission lag, and institutional fragmentation in energy planning.	Brazil

Track Information Technology and Communications

Track Information Technology and Communications		**Session 1: Optical and Wireless Communications Systems**		**Chair Session:**	
Tuesday october 28, 2025.		**ROOM 5: 9:00–10:30**		**Papers: S1 (6) 152, 468, 529, 595, 801, 807**	
#	**ID**	**Title**	**Authors**	**Abstract**	**Country**
1	152	Evaluation of Modulation Techniques in MIMO-VLC Systems: Mitigating Ambient Light Interference for Enhanced Performance	Javier Guaña-Moya, Milton Román-Cañizares, Laura Romero, Pablo Palacios, Cesar Azurdia Meza, David Zabala-Blanco, Ismael Soto, María Camila Reyes	Visible Light Communication combined with 2x2 MIMO links significantly enhances capacity and range but ambient light interference limits performance. Evaluated three modulation formats (NRZ, RZ, QPSK) on MIMO-VLC link compared with SISO operation using OptiSystem simulations. MIMO extends interference-free reach from 1.12 km to 1.45 km with QPSK and halves BER at shorter distances.	Ecuador, Chile
2	468+	Towards Intelligent 5G Networks: Design and Simulation of RIC-Enabled O-RAN Architecture Using ns-3	Luis Felipe Lastra Saavedra, Christian Fernandez-Campusano, Mario Zapata-Herrera	Evolution toward Open-Radio Access Network drives development of flexible interoperable solutions in 5G mobile networks. However efficient adaptive resource management in O-RAN 5G networks remains challenging especially in dynamic heterogeneous traffic conditions. Proposes evaluating RAN Intelligent Controller integration impact within O-RAN 5G architecture through ns-3 and 5G-LENA simulation.	Chile, Spain
3	529	Strategic LED Placement for Blooming Mitigation in Optical Camera Communication	Leonardo Muñoz, Francisca Vera, Lisandra Bravo, Gabriel Saavedra	Growing demand for higher wireless data capacity highlights radio frequency limitations making Optical Camera Communication promising solution. Presents experimental OCC system designed to reduce optical distortions including blooming through practical LED arrangement methods. Experiments with multiple LEDs in various spatial configurations at 30-200 cm distances enabled detailed blooming intensity assessment.	Chile

4	595+	A 5G-Based Autonomous Aerial System for Real-Time Anomaly Prevention and Response in Smart Urban Environments	Julio Rodrigo Lucero Parra, Matias Muñoz Catalan, Christian Fernández-Campusano, Jonathan Pereira Mendoza	Presents design implementation and experimental validation of autonomous UAV system for anomaly detection and rapid response in smart cities. Integrates modular open-source architecture, real-time embedded AI, and hybrid 5G + mesh network connectivity for robust low-latency urban surveillance. System composed of quadcopter with Pixhawk controller, Raspberry Pi 4, and Quectel 5G module managed via cloud backend.	Chile, Spain
5	801	Assessment of Commercial Photodetectors for VLC Systems in NLoS Scenarios Utilizing Ray-Tracing	Diego Castillo, Cesar Azurdia, Pablo Palacios, David Zabala, Fernanda Borja, Jonas Peñailillo	Visible Light Communications directly addresses key 6G objectives especially in indoor scenarios but faces Line-of-Sight dependency challenges. Evaluates impact of two commercial photodetectors with distinct responsivity curves in scenarios with variable LoS obstructions. Uses realistic ray-tracing approach with Zemax OpticStudio software measuring SNR and BER metrics.	Chile
6	807	Experimental Characterization of Power-Aware OSNR Error in EDFA Links for Data-Driven QoT Modeling	Leonardo Muñoz Rosel, Cristóbal Melo, Harry Verspagen, Ariel Leiva, Gabriel Saavedra	Experimentally characterizes launch power variation impact in 200 km two-span optical link quantifying prediction error of simplified Quality of Transmission estimation models. Analysis focuses on OSNR error from approximating amplifier gain profile with fixed average value under low-power conditions.	Chile, Netherlands

Track Information Technology and Communications **Session 2: IoT and Smart Agriculture 5.0 Applications** **Chair Session:**

Tuesday october 28, 2025. **ROOM 5: 14:30–16:00** **Papers: S2 (5) 776, 791, 775, 803, 880**

#	ID	Title	Authors	Abstract	Country
1	776	Technical Evaluation and Challenges of LoRa Technology Applied to Smart Agriculture 5.0	Hector Kaschel, Sergio Cordero, Carlos Navarro, Pablo Adasme	Presents technical overview of LoRa technology application, prominent in wireless sensor networks classified as LPWAN due to versatility, robustness, wide coverage, and low cost. Focuses on comparing common LoRa parameters for timely correct technology selection decisions in smart agriculture 5.0 context. Experimental work used five TTGO T-BEAM ESP32 boards implementing network with Thing Network platform.	Chile
2	791	Proposal of an Intelligent Irrigation Model based on Machine Learning applied to Smart Farming 5.0	Marco Fernández, Héctor Kaschel	Proposes intelligent irrigation model based on machine learning for agriculture 5.0 reviewing relevant articles in area. Proposes irrigation model based on linear regression predicting crop moisture as function of temperature, soil pH, and irrigation time. Develops algorithm generating graphs of relevant variables and predicting soil moisture based on proposed linear regression model.	Chile
3	775	System for Detecting Diseases in Grapevines Using Digital Image Processing and CNN Applied to Viticulture	Sebastian Sanchez, Hector Kaschel, Sergio Cordero	Proposes grapevine disease detection system using digital image processing and convolutional neural networks within simulated environment. Implements image preprocessing module applying adaptive segmentation and thresholding enhancing feature extraction for CNN training. CNN designed and trained for automatic disease classification with performance evaluation using previously acquired dataset.	Chile
4	803	Comparative Analysis of mmWave Microstrip Antennas for 5G and Optimization Proposal Using Machine Learning	Tomás Bavestrello, Héctor Kaschel, Sergio Cordero	Rapid expansion of 5G wireless systems increased demand for efficient compact antenna designs operating in mmWave spectrum. Presents comparative analysis by electromagnetic simulation of square patch microstrip antennas with slot structures for 22, 28, and 32 GHz bands. Antennas evaluated based on gain, return loss, VSWR, radiation patterns, and impedance with frequency-dependent trends analysis.	Chile
5	880	Study on the Challenges and Future Trends of IoT and 5G/6G Networks in Smart Agriculture 5.0	Héctor Kaschel, Sergio Cordero, Pablo Adasme, Cristian Ahumada	Presents challenges and trends of current technologies in smart agriculture 5.0 context providing brief state-of-art overview highlighting innovative applications. IoT plays predominant role allowing access to communications, telecommunications, and cloud storage services for sensor data collection. Electronic devices like humidity and temperature sensors enable farmers keeping data records anticipating field problems.	Chile

Track Information Technology and Communications Conference **Session 3: Wireless Systems and Cybersecurity** **Chair Session:**

Tuesday october 28, 2025. **ROOM 5: 16:30–18:00** **Papers: S3 (5) 430, 572, 576, 818, 852**

#	ID	Title	Authors	Abstract	Country
1	430*	SDR Testbed for RF Fingerprinting in Wireless Networks	Daniel Quillay, René Játiva E.	Presents design and evaluation of Software-Defined Radio testbed for studying RF signal propagation and fingerprint shaping across multiple sensors and frequency bands. System consists of four receiver nodes based on Raspberry Pi 4 and ADALM-Pluto SDR with central transmitter coordination. Setup enables OFDM-based signal transmission and precise RSSI measurement via custom Python processing.	Ecuador
2	572	Wireless Propagation Characterization in Multi-Level Building at 2.4 GHz	Farid Agustín Díaz Cid, Felipe Vicente Garay, Marcelo García, Melissa Eugenia Diago Mosquera	Presents comprehensive wireless propagation characterization at 2.4 GHz in multi-level indoor environment through measurements at UTFSM Building P. Measurement campaign encompasses five receiver locations across three floors with systematic 5×5 grid sampling approach capturing large-scale and small-scale effects. Excess path loss analysis demonstrates significant environmental impact with values ranging from 6.9 dB to 26.9 dB.	Chile
3	576	Estimating the Direction of Arrival Using Convolutional Recurrent Neural Networks	Bastian Estay Zamorano, Ali Dehghan Firoozabadi, Alessio Brutti, Pablo Adasme, David Zabala-Blanco, Pablo Palacios Játiva, Cesar Azurdia Meza	Sound Event Localization and Detection fundamental task in spatial audio processing involving identification of sound event types and locations. Current SELD models struggle with low signal-to-noise ratios and high reverberation requiring reformulated approach. Addresses SELD by reformulating Direction of Arrival estimation as multi-class classification task leveraging deep Convolutional Recurrent Neural Networks.	Chile, Iran, Italy
4	818+	Assessing the Impact of Cyberattacks through the Integration of a Honeypot in a Controlled Environment	Jorge Andrade, Christian Lazo, Luis Veas, Carlos Melo	Cybersecurity critical concern for modern organizations due to ongoing rise in cyberattacks worldwide with companies frequently targeted by malicious actors. Honeypots emerge as effective defensive tool designed to attract, divert, and analyze attacks enabling malicious behavior study. Work focuses on integrating low and medium-interaction Honeypots assessing various cyberattacks targeting SSH and HTTP services.	Argentina
5	852	A Short Survey and Brief Tutorial on the State of the Art in Internet Routing Security	Carlos Martínez, Cristina Mayr, Claudio Risso	Internet routing security critical concern continuing to grow in importance focusing on Border Gateway Protocol vulnerabilities and common routing incidents. Article addresses techniques and protocols developed to mitigate security threats including RPKI/ROV and Internet Routing Registries. Security issues persisted for decades despite proposals aimed at addressing them with contribution organizing diverse problems and solutions.	Chile

Track Information Technology and Communications **Session 4: Antenna Design and RF Technologies** **Chair Session:**

Wennesday october 28, 2025. **ROOM 5: 9:00–10:30** **Papers: S4 (5) 439, 690, 822, 664, 846, 352**

#	ID	Title	Authors	Abstract	Country
1	439	Design and Simulation of a High-Gain 4 × 1 Microstrip Patch Antenna Array at 2.45 GHz for Wi-Fi 6 and IoT Applications	Cristian Ahumada, Héctor Kaschel, Roman Osorio-Comparan, Sergio Cordero, Claudio Valencia	Presents design and simulation of high-gain 4x1 microstrip patch antenna array operating at 2.45 GHz optimized for Wi-Fi 6 and IoT applications. Implemented on cost-effective FR-4 substrate achieving simulated gain of 11.44 dBi, return loss of -38.67 dB, and VSWR of 1.158. Multistage impedance matching network ensures efficient power distribution across array.	Chile
2	690	Wireless Channel Characterization using LoRa and Zigbee IoT Technologies on University Scenarios	Hernán Felipe Urzúa Suárez, Melissa Eugenia Diago-Mosquera	Presents experimental methodology characterizing wireless propagation in university environments using low-cost IoT technologies LoRa and Zigbee. Measurement campaigns carried out in three representative campus scenarios collecting RSSI data in structured grid format. Empirical path loss models (Close-In and Floating Intercept) fitted and evaluated using cross-validation with FI model achieving lowest error metrics.	Chile, Mexico
3	822*	On the Design and Optimization of a 10 Port Directional Coupler at Microwave and Millimeter Wave Frequencies using Waveguide Technology	Raul Haro Baez, Evelin Hidalgo, Evelin Sanguano, Carlos Romero, Fabián Sáenz, Rodolfo Gordillo, Diego Benitez	Presents design, simulation, and optimization of 10-port directional coupler using rectangular waveguides enhancing power distribution efficiency in telecommunications systems. Design process focuses on optimizing electrical properties reducing return losses and transmission coefficients using CST Studio Suite software. Iterative simulations using WR-51 waveguide identified optimal configurations within 14.50-22 GHz range.	Ecuador
4	664	Bifunctional Metasurface Project for Simultaneous Absorption and Polarization Conversion	Thayana Mayrink Lessa de Sousa, Pedro Vladimir Gonzalez Castellanos, Francisco Diego Martins Nobre, Antonio Campos, Maurício Weber Benjó da Silva, Raimison Bezerra de Almeida	Presents thin single-layer metasurface capable of simultaneously achieving dual-band absorption (5G and WLAN) and polarization conversion in X-band. Structure composed of sub-resonators formed by spirals and square patch with diagonal fishbone cut printed on substrate. Unit cell exhibits absorption peaks of 94.18% and 97.15% at 3.58 and 5.40 GHz with polarization conversion ratio above 90%.	Brazil
5	846	Development of a Low-Cost Polarization and Spatial Mode Controller for Quantum and Optical Applications in Optical Fibers	Alex Schaak, Bastián Aroca, Angelo Barbieri, Daniel Quezada, Gustavo Cañas, Alvaro Alarcón	Presents design and experimental validation of low-cost motorized polarization and spatial mode controller for optical and quantum technologies. System integrates ESP32 microcontrollers, 3D-printed mechanical components, and web-based interface for remote optical state adjustment in single-mode and few-mode fibers. Experimental tests demonstrate device achieves polarization extinction ratios and modal crosstalk levels comparable to commercial manual controllers.	Chile
6	352	Challenges in the development of a block-based programming environment for Arduino	Cossio-Mercado, Fernández	This paper examines the pedagogical and technical challenges in developing a block-based programming environment for Arduino. It highlights issues stemming from the gap between low-level Arduino C++ and high-level visual programming, such as memory management and type enforcement. Additional challenges relate to block frameworks that prevent rather than teach from errors. The findings offer insights valuable to educators introducing programming to beginners.	Argentina

Track Robotics and Computer Vision

Track Robotics and Computer Vision		Session 1: Advanced Learning and AI-Driven Robotic Control		Chair Session:	
Tuesday october 28, 2025.		ROOM 4: 09:00–10:30		Papers: S1 (6) 522, 549, 746, 856, 948, 949	
#	ID	Title	Authors	Abstract	Country
1	522	Deep Reinforcement Learning based Swarm Motion for Collision Avoidance via Self-configurable Potential Formation	Kevin Soza, Marco Herrera, Oscar Camacho, Juan Pablo Vásconez, Roberto Andrade and Alvaro Prado	This work introduces a Deep Reinforcement Learning (DRL)-based flocking motion control framework that enables emergent collective dynamics over an adjustable formation structure, while ensuring collision avoidance. A Deep Deterministic Policy Gradient (DDPG) agent learns coordinated motion strategies directly from experience. The Potential Linked Nodes (PLN) structure adjusts the kinematic configuration of the swarm to reach a goal point and collectively evade external obstacles.	Chile, Ecuador560
2	549+	ALMA-IA: A Real-Time System for Automatic Analog Gauge Reading Using Edge Devices and Deep Learning	Micaela Jara Ten Kathen, Maximiliano Bonnin, Gregorio Ariel Guerrero Moral and Mario Arzamendia	This paper presents ALMA-IA, a real-time system based on edge devices and deep learning for automated reading of analog gauges. The system combines computer vision and deep learning techniques to automatically extract gauge readings. Tests conducted in both simulated and real-world environments showed a mean absolute error below 0.01, mean absolute percentage error under 7%, and coefficient of determination above 0.98.	Paraguay
3	746	Towards Adaptive and Safe Human-Robot Collaboration: A Multimodal AI Framework for Cross-Domain Cobot Integration	Gaston Lefranc, Gustavo Schleyer, Roman Osorio-Comparan and Ismael Lopez-Juarez	This article explores the integration of collaborative robots (cobots) with advanced AI algorithms across five strategic sectors: underground mining, geriatric medicine, precision agriculture, port logistics, and high-precision manufacturing. It proposes technologies such as Graph Convolutional Neural Networks, Multimodal Transformers, Soft Actor-Critic with Constrained Policy Optimization, and TactileGAN for generating realistic haptic feedback.	Chile/Mexico
4	856	Towards Agentic Manufacturing using Sim2Real and DRL Approaches	Ismael Lopez-Juarez and Luis Castillo-Barrientos	Agentic Manufacturing envisions intelligent, autonomous systems capable of perceiving, reasoning, and acting purposefully within complex production environments. This work presents a training methodology where an autonomous robotic agent learns to perform complex trajectory tracking on three-dimensional surfaces using only partial visual observations. The learned policy was successfully validated on a KUKA KR16HW robot equipped with a GMAW welding system.	Mexico, UK
5	948	An Affordable Robotic Manipulation Platform with Flexible Gripper and Vision for AI-Driven Control	Ismael Lopez-Juarez, Kieran Lopez-Valadez, Jaime Aviles-Viñas, Roman Osorio-Comparan and Luis Castillo-Barrientos	This paper presents the design and implementation of a low-cost, vision-guided robotic system for automated object recognition and manipulation. The platform integrates a MyCobot 280 Pi robotic arm with a custom 3D-printed, stepper-actuated gripper featuring compliant TPU fingers. Experimental results validate the system's ability to reliably detect, grasp, and relocate colored objects within a 400 mm × 400 mm workspace.	Mexico
6	949	Zero-Shot Robotic Control via Custom LLM Agents: A Lightweight Framework for Embodied Learning	Ismael Lopez-Juarez, Kieran Lopez-Valadez and Luis Castillo-Barrientos	This work presents an AI-powered framework for autonomous robot control using a custom large language model (LLM) agent built with DeepSeek. By leveraging document-based prompt injection, the system incorporates domain-specific knowledge into the LLM to enable zero-shot Python code generation. The agent extracts and executes code in real time to control a myCobot 280 Pi robotic arm, operating entirely offline.	Mexico

Track Robotics and Computer Vision		Session 2: Embedded Systems and Applied Robotics		Chair Session:	
Tuesday october 28, 2025.		ROOM 4: 14:30–16:00		Papers: S2 (6) 837, 789, 524, 914, 863, 875	
#	ID	Title	Authors	Abstract	Country
1	837	Inexpensive Robotic Hand Prosthesis Controlled by EMG Signals: Design, Implementation and Functional Validation	Felipe Cid, Gustavo Schleyer, Daniel Lühr and Pablo Ulloa	This paper presents the design, development, and functional validation of an inexpensive robotic hand prosthesis controlled via electromyographic (EMG) signals. The system integrates 3D-printed mechanical structures, EMG signal acquisition using MyoWare sensors, and servo-based actuation. The prosthesis aims to provide a functional and accessible solution for individuals with transradial amputations, addressing cost and usability barriers in the Chilean context.	Chile
2	789	Development of a Compact and Affordable Differential Mobile Robot for Educational Purposes	Gustavo Schleyer, Felipe Cid, Daniel Lühr and Juan Schilling	This work presents the design and construction of a differential-drive mobile robot for educational applications. The objective was to create an accessible and versatile platform for the Austral University of Chile. The resulting robot provides a cost-effective alternative to existing educational platforms (e.g., the e-Puck2 by EPFL), offering comparable functionality and supporting hands-on learning in robotics and embedded systems.	Chile
3	524*	Semantic Segmentation for Pest Detection on Organic Banana Leaves	Pierina García, Javier Machacuay, José Manrique and William Ipanaqué	Pests recognition in agriculture currently relies on manual inspections, which are subjective, time-consuming, and difficult to scale. This research develops two segmentation models: one based on the U-Net architecture, and the other based on the SegFormer architecture. The best model, U-Net, achieved a Dice coefficient of 0.9535, confirming the viability of deep learning for accurate and automated banana pest segmentation.	Peru
4	914	Autonomous Beach Cleanup Robot for the Chilean Coastline Using Edge AI and Computer Vision	Felipe Zambrano, Jaime Pavesi, Néstor González, Iván Ramírez and Thamara Villegas	Marine debris threatens Chile's 4,000 km coastline. This paper presents an autonomous beach cleanup robot that detects and collects the five litter classes most commonly found on Chilean beaches without human supervision. The 50 cm × 24 cm prototype integrates a Raspberry Pi 4B, a Coral USB Edge TPU accelerator achieving real-time inference (18 frames/s). Field trials show an 84% pick-up success rate.	Chile
5	863+	Semi-Automatic Attendance Control System with Facial Recognition	Juan Ignacio Ascione, Juan Manuel Hermida, Federico Vázquez, Analia Conde and Nicolas Rondan	The project aimed to develop a functional prototype for partially automating attendance taking in university classrooms using advanced facial recognition technology. The system employs integrated camera technology for in-classroom image capture, processed by a custom-developed facial recognition algorithm. Custom APIs were developed for seamless integration with the Moodle educational platform, enabling automatic synchronization of attendance records with Universidad de Montevideo's academic system.	Uruguay
6	875*	Route Planner for Scale Autonomous Vehicle Based on Neural Networks and Computer Vision	Rodrigo Javier Báez Maciel, Micaela Jara Ten Kathen and Mario Arzamendia	This work presents the design and implementation of a route planner for a scale autonomous vehicle, based on computer vision and convolutional neural networks. The system's goal is to keep the vehicle centered on the route while completing a planned path, using semantic segmentation to interpret navigable areas. Fast-SCNN outperformed DeepLabV3 in all aspects, showing lower turning error, better speed adjustment, and higher real-time processing capabilities.	Paraguay

Track Robotics and Computer Vision		Session 3: Autonomous Navigation and Specialized Applications		Chair Session:	
Tuesday october 28, 2025.		ROOM 4: 16:30–18:00		Papers: S3 (6) 815, 833, 643, 905, 542	
#	ID	Title	Authors	Abstract	Country
1	815*	Real-Time Autonomous Navigation with ResNet-18 and PyTorch Based on AI computer Jetson Nano	Gabino Rey Vidangos Ponce, Marco Antonio Quispe Barra, Russel Allidren Lozada Vilca, Susan Machaca Condori, Jimena Inés Coila Monje and James Rolando Arredondo Mamani	This paper presents the design and implementation of a low-cost autonomous vehicle prototype that takes advantage of machine learning and computer vision techniques. The system integrates a ResNet-18 convolutional neural network, trained using PyTorch and deployed on an NVIDIA Jetson Nano. The experimental results show that the trained model enables the vehicle to follow the learned trajectories, validating the performance and adaptability of the system.	Peru
2	833	Towards the utilization of lensless camera sensors for star tracking systems in femto-satellites	Alexander Hilgarth, Michael Dorin, Matthias Jung and Sergio Montenegro	The current state of miniaturization enables economically viable space missions in the CubeSat format. This paper focuses on the star sensor subsystem and proposes an alternative implementation based on a lensless imaging approach for foil-based femto-satellites. The work demonstrates the feasibility of the lensless concept and reports promising results from initial experiments, paving the way for low-cost yet sophisticated space missions.	Germany
3	643	Transcription of Large-Scale Sculptural Works to Their Digital Twins	Luis García	This paper presents an applied research project aimed at producing scaled replicas of monumental sculptures through a hybrid workflow combining terrestrial 3D scanning, photogrammetry, and digital fabrication. The replicas were fabricated using Fused Deposition Modeling (FDM) and ceramic extrusion. The research critically engages with the implications of digital reproduction in architectural practice, addressing questions of authorship, authenticity, and the ethical dimensions of cultural replication in the context of digital twin technologies.	Chile
4	905*	A Robust Hybrid Fuzzy-Fuzzy Cascade and Sliding Mode Control Scheme for Tracking in Aerial Manipulators	Gabriela M. Andaluz, Paulo Leica, Guillermo Palacios and Oscar Camacho	This paper presents a robust hybrid control strategy based on a Fuzzy-Fuzzy cascade architecture combined with a Sliding Mode Control (SMC) scheme for trajectory tracking of an aerial manipulator. The Fuzzy-Fuzzy cascade control enhances the robustness of conventional fuzzy controllers while incorporating the strong robustness properties of SMC. The proposed controller integrates the dynamic model of the aerial manipulator into its structure, contributing to compensating for the system's nonlinearities.	Argentina
5	542+	Temporally-structured PID reward shaping in reinforcement learning for robust path planning of mobile robots in mining environments	Christian Camacho, Jose Alcayaga, Marco Herrera, Oscar Camacho and Alvaro Prado	This paper investigates the application of Reinforcement Learning (RL) techniques for path planning of Skid-Steer Mobile Robots (SSMRs) with reward shaping based on classical feedback control. Part of the reward function is designed as a weighted sum of three control components. The approach is implemented using DDPG, TD3, SAC and PPO algorithms. Experimental results demonstrate improvements in motion performance with reductions in cumulative goal tracking error.	EEcuador, Spain

Track Robotics and Computer Vision		Session 4: Mobile Robot Control and Perception Systems		Chair Session:	
Wennesday october 29, 2025.		ROOM 4: 09:00–10:30		Papers: S4 (4) 475, 519, 492, 560	
#	ID	Title	Authors	Abstract	Country
1	475*	Blending Potential Fields and Hough Transform for Advanced Obstacle Avoidance in Mobile Robotics Systems	Esteban Pérez, Richard López, William Chamorro, Viviana Moya, Marco Herrera and Alvaro Prado	Omnidirectional robots with mecanum wheels offer enhanced maneuverability for real-time obstacle avoidance. This work proposes an obstacle avoidance framework that combines 2D LiDAR data with the Hough transform to detect and reconstruct line segments. These segments are integrated into an Artificial Potential Field (APF) algorithm, generating repulsive and attractive reactive navigation forces. The method is implemented on a Hiwonder omnidirectional robot utilizing a Jetson Nano and ROS Noetic architecture.	Ecuador
2	519	Trajectory tracking control of omnidirectional mobile robots: A comparison between SMC and null-space controllers	Richard López, Esteban Pérez, William Chamorro, Viviana Moya, Marco Herrera and Alvaro Prado	This study presents the implementation and comparative analysis of several trajectory tracking strategies for an omnidirectional mobile robot. The evaluated methods include SMC approaches (Lyapunov-based and transfer function) and NS controllers (PI, PD, PID, and Lyapunov-based variants). The results demonstrated that the Lyapunov-based controllers (SMC-LY and NS-LY) outperformed the other variants, achieving enhanced trajectory and orientation tracking accuracy, improved disturbance rejection, and greater energy efficiency.	Ecuador
3	492	Detection of Larval Foci through Computer Vision in Multispectral Drone Images using Faster R-CNN	Angelica M. Vidal, Mathias P. Solis, Maira Santacruz and Derlis O. Gregor	The automatic detection of larval breeding sites was addressed through the use of a convolutional neural network based on Faster R-CNN, trained with multispectral images captured by a DJI Mavic 3 Multispectral drone. The model, developed in PyTorch, was trained over 100 epochs using the AdamW optimizer. The results yielded a precision of 82.11% and a recall of 76.47%, demonstrating effective performance in detecting potential larval breeding sites with relevant applications in public health.	Paraguay
4	560	Occlusion-proof vehicle counting using computer vision and artificial intelligence	Diego F. Palacios, Derlis O. Gregor, Mario E. Arzamendia, Fabián Palacios and Sergio Toral Marin	This work develops and implements a vehicle counting algorithm in an urban monitoring environment through artificial vision. The algorithm uses two models based on artificial neural networks: an object detection model based on convolutional neural networks implementing YOLOv8, and a trajectory prediction model based on MLP. A trajectory prediction model was obtained with an average error of 0.68% in steady state. The counting capacity improved by 87.1% on average versus YOLOv8 with Kalman filter-based tracking.	Paraguay, Spain

Track Power Electronics

Track Power Electronics		Session 1: EV Charging and Battery Storage Systems		Chair Session:	
Tuesday october 28, 2025.		ROOM 2: 09:00–10:30		Papers: S1 (6) 14, 540, 788, 853, 859, 762	
#	ID	Title	Authors	Abstract	Country
1	14	Improved Power Quality Control of a Single-Stage Bidirectional AC to DC EV Charger	Marco Rivera, Emmanuel Osei-Mensah, Tabish Mir and Patrick Wheeler	This paper presents a resonance-less AC-DC charger design controlled by sinusoidal phase shift modulation (SPSM) strategy. The proposed topology has reduced component count due to absence of resonance tank and SPSM addresses high current at AC grid voltage zero-crossings. Unity power factor is achieved in all modes of operation with THD of 2.79% and 4.29% for G2V and V2G applications respectively.	Chile/UK
2	540+	Cascaded H-Bridge-Based Battery Storage Systems: A Distributed Control Approach for SoC Equalization of Second-Life Batteries	Carlos Smart, Andrés Mora and Claudio Burgos	This paper validates a novel consensus-based distributed control scheme for cascaded H-bridge battery energy storage system integrating second-life batteries. The architecture groups submodules into clusters based on shared characteristics enabling cost-effective integration of heterogeneous battery packs. The distributed control combines central controller for grid management with local controllers using consensus-based algorithm for SoC equalization within clusters. Results confirm stable and reliable performance for large-scale renewable energy integration and grid support applications.	Chile
3	788	Partial Power DC-DC Converter Interface for Second-Life Battery with Signal Injection for Online Battery Monitoring	Hugues Renaudineau, Nicolas Muller, David Ulloa, Francisco González-Tijerino and Jose Rodriguez	This paper proposes a high-efficiency partial power converter for second-life battery interface with signal excitation capability. The proposed PPC allows signal excitation for different patterns in open and closed-loop for Electrochemical Impedance Spectroscopy. The PPC allows higher efficiency compared to state-of-the-art buck-boost with estimated maximum efficiency of 99.4%. This addresses optimization of converter for use in second-life battery applications.	Chile
4	853	Performance Analysis and Enhancement of DC-DC Pseudo Partial Power Converter Fast EV Chargers Using FCS-MPC	Alvaro Pesántez, Mokhtar Aly, Hugues Renaudineau, Samir Kouro and Jose Rodriguez Perez	This paper presents analysis and enhancement of pseudo-PPC using finite control set model predictive control method. A sequential FCS-MPC is proposed for controlling output current and switched capacitor voltages separately without weighting factors. The pseudo-PPC processes a fraction of system's rated power utilizing switched capacitor cell eliminating need for high-frequency transformers. Results prove feasibility of FCS-MPC on PPC achieving better efficiency and partiality.	Chile
5	859	Model Predictive Control for Active Bridge Active Clamp Electric Mobility Applications	Henry Zapata-Fonseca and Luca Tarisciotti	This paper presents a moving discretized control set model predictive control strategy tailored for Active Bridge Active Clamp topology. The approach is designed to manage fast battery charging in electric vehicle applications efficiently. The proposed control optimizes power transfer, ensures battery safety and enhances system efficiency under dynamic operating conditions. Simulation results validate effectiveness of MPC strategy demonstrating potential for EV battery management systems.	Chile/UK
6	762	Data-Driven Model-Free Predictive Control of Quadratic Buck Converter for an Electrolyzer Load	Majid Rahmani, S. Alireza Davari, Freddy Flores Bahamonde, Mahdi S. Mousavi, Shirin Azadi, Carlos Torres-Pinzon and Jose Rodriguez	This article introduces a novel data-driven model-free framework for regulation of input current and output voltage in quadratic buck DC-DC converters. The algorithm is implemented on converter providing power to electrolyzer without any prior model information. The methodology incorporates data memory stack with parameter learning law to estimate unknown control input gain and aggregated disturbances. Experimental findings prove efficacy for QBC converters achieving constant output voltage regulation independent of load.	Chile, Iran, Colombia

Track Power Electronics		Session 2: Renewable Energy Systems and Grid Integration		Chair Session:	
Tuesday october 28, 2025.		ROOM 2: 14:30–16:00		Papers: S2 (6) 515, 534, 555, 602, 605, 786	
#	ID	Title	Authors	Abstract	Country
1	515	An Optimized ANN-PI Controller based MPPT of Photovoltaic System with a Zeta converter	Julio López Seguel, Piero Olavarría, Moslem Dehghani, Felipe Ruiz, Mokhtar Aly and José Rodríguez	This paper proposes an MPPT algorithm based on artificial neural network and proportional-integral controller in PV system with Zeta converter. An improved particle swarm optimization algorithm is used to fine-tune the parameters of proposed controller. Simulations performed in Simulink/Matlab under varying weather conditions compare optimized ANN-PI with three widely adopted MPPT techniques. Results reveal superiority of ANN-PI approach in terms of faster response time, higher MPP tracking efficiency and reduced steady-state power oscillations.	Chile
2	534*	Comparative Analysis of VSI vs. NPC Inverter Topologies in Grid-Connected PV Systems under Rapid Irradiance Transitions	Adolfo Gonzalez, Gianyacomo Zucchini, Osvaldo González, Raúl Gregor, Julio Pacher and Eduardo Espinosa	This article presents detailed comparison between two-level VSI and three-level NPC topologies in two-stage grid-connected photovoltaic system. Key performance metrics such as RMSE, THD, settling time, system efficiency and power factor are evaluated under variable irradiance conditions. Unlike prior studies limited to static conditions, this work introduces dynamic benchmark involving rapid irradiance transitions. Results show VSI achieves faster transient response while NPC achieves lower THD, enhanced voltage stability and reduced RMSE.	Chile/Paraguay
3	555	Load Observer-Based Deadbeat Predictive Control for LC-filtered Grid-Forming Inverter to Shape a Master-Slave Islanded Microgrid	Mahdi S. Mousavi, Moslem Dehghani, Felipe Ruiz Allende, Mokhtar Aly, Alireza Davari and Jose Rodriguez	This paper presents deadbeat model predictive control incorporating load observer for LC-filtered grid-forming inverter used to shape master-slave islanded microgrid. The proposed method directly controls capacitor voltage using two-step-ahead deadbeat solution resulting in straightforward algorithm rather than cascade structure. A load observer is proposed to estimate total current of connected branches including load and slave inverters. Simulations and experimental tests validate proposed method under various load-sharing conditions, load step changes and nonlinear load applications.	Chile/ Iran
4	602	Design of an Extended Kalman Filter for Sensorless Grid Synchronisation of a Doubly Fed Induction Generator	Knapoj Chaimanekorn, Jakson Bonaldo, Marco Rivera, Javier Muñoz, Nady Roch and Patrick Wheeler	This paper presents development and implementation of novel fifth-order extended Kalman filter observer for estimating rotor angle and rotor speed during grid synchronisation stage. The effectiveness is validated through simulations in MATLAB/Simulink and PLECS using 9 HP DFIG under flux vector control-based synchronisation strategy. The fifth-order EKF observer exhibits fast transient response and low ripple currents in steady state while maintaining reduced computational burden. The proposed synchronisation approach can be seamlessly integrated with conventional EKF model making it promising solution for sensorless DFIG startup.	Brazil

5	605	Model Predictive Current Control of a Fuel Cell Stack with an Interleaved Boost Converter	Marcos Gomez-Redondo, Alfredo Renault, Marco Rivera, Javier Muñoz, Patrick Wheeler and Jakson Bonaldo	This work presents suitable master-slave control strategy combining Proportional-Integral regulation in outer loop with Model Predictive Control in inner loop for current shaping in interleaved boost converter. The interleaved boost converter can step up voltage by dividing high input current resulting in small converter. The proposed controller is validated through simulations demonstrating effective current division and dynamic response. An interesting finding is MPC inherently produces phase-shifted currents among interleaved branches removing need for explicit modulation and simplifying control scheme.	Chile Paraguay
6	786	Zero-Ripple Converter: Membrane Protection in Electrolyzers and PEM Fuel Cells	Sebastián Riffo, Natalia Soto, Catalina González-Castaño and Carlos Restrepo	This article proposes a power converter with zero current ripple at both input and output to prevent premature degradation of fuel cells and electrolyzers. Traditional power converters generate triangular-shaped current ripple that negatively impacts fuel cells and electrolyzers due to chemical reactions and material sensitivity. The materials used in construction are particularly affected by high-frequency ripples. The proposed converter aims to prevent degradation in green hydrogen applications providing protection for membrane-based systems.	Chile

Track Power Electronics		**Session 3: Motor Drives and Advanced Control Techniques**		**Chair Session:**	
Tuesday october 28, 2025.		**ROOM 2: 16:30–18:00**		**Papers: S3 (6) 594, 751, 825, 826, 877, 937**	
#	**ID**	**Title**	**Authors**	**Abstract**	**Country**
1	594	Real-Time Implementation of Field-Oriented Control Enhanced with Fuzzy Logic for BLDC Motor Drives	Souheyb Mohammed Belhadj, Jakson Bonaldo, Marco Rivera, Patrick Wheeler, Jaime Rohten and Eduardo Espinosa	This paper presents enhanced Field-Oriented Control technique applied on Brushless DC motor drive. In proposed approach conventional Proportional-Integral controllers are replaced by Fuzzy Logic Controllers aiming to improve both dynamic and steady-state performance. The intelligent control technique is evaluated through simulations and validated through Hardware In the Loop implementation. The FLC-based FOC approach significantly enhanced dynamic response, reduced torque ripple and improved current regulation during transient and load-varying conditions.	Algeria, Brazil, Chile
2	751	Improving Deep Reinforcement Learning Efficiency in PMSM Drive Control Using Transfer Learning	Luciano Radrigan and Anibal Morales	This study investigates control performance and sample efficiency of Deep Q-Network versus Model Predictive Control within standardized gym-electric-motor simulation framework. Key metrics including torque tracking error, current consumption and percentage of steps violating physical limits are used for evaluation. Transfer learning from MPC-generated trajectories is applied to accelerate DRL training. Results show DQN approach can achieve comparable or superior control performance with reduced dependence on system modeling with proposed fine-tuning transfer learning scheme significantly improving DRL sample efficiency.	Chile
3	825*	Comparative Performance Evaluation of Sliding Mode Control and Finite Control Set Model Predictive Control for a Six-Phase IM	Gustavo Adolfo Ojeda Cuellar, Jorge Rodas, Paola Maidana, Christian Medina, Osvaldo Gonzalez, Yassine Kali, Amabilis Hernandez, Esteban Leguizamón and Nestor Villamayor	This paper presents theoretical analysis to assist control designers in selecting control strategy for six-phase induction machines. Advanced current control strategies including Sliding Mode Control and Finite Control Set Model Predictive Control have emerged as most studied approaches. The analysis helps meet specific design constraints such as minimising total harmonic distortion, achieving accurate current tracking and ensuring robust performance. The comparison enables full leverage of benefits including increased reliability and fault tolerance while minimizing losses related to x-y subspace.	Paraguay
4	826*	Comparative Study of DTC and PTC with Constrained Voltage Vectors in Multiphase Drive	Esteban Leguizamon, Jorge Rodas, Paola Maidana, Osvaldo Gonzalez, Christian Medina, Gustavo Ojeda and Amabilis Hernández	This study presents comparative analysis of Direct Torque Control and Predictive Torque Control using constrained voltage vectors to suppress currents in x-y plane. The assessment relies on Mean Square Error for tracking accuracy of torque, flux and x-y currents, and Total Harmonic Distortion for harmonic analysis. Both methods in classic forms stand out due to implementation feasibility and capacity to optimise dynamic performance. Results highlight trade-off between computational complexity and dynamic response fidelity offering practical guidance for selecting control strategies in multiphase drive applications.	Paraguay
5	877	Model-free PLL-based Sensorless Predictive control of Surface-Mounted PMSM drives	Mahdi S. Mousavi, Alireza Davari, Freddy Flores-Bahamonde and Jose Rodriguez Perez	This paper presents model-free phase-locked loop based speed estimation strategy for permanent magnet synchronous motors to improve performance of sensorless model-free predictive control method over wide speed range. The proposed method employs ultralocal model to simultaneously perform current control and back EMF estimation without requiring prior knowledge of motor parameters. A model-free PLL is integrated into ultralocal-model-based sensorless predictive control scheme leading to accurate rotor position tracking and robustness against disturbances. Simulation results demonstrate effectiveness of proposed method under various operating conditions.	Chile/USA
6	937*	Fault-Tolerant Predictive Current Control in Nine-Phase Generation System Driven by a Multi-Modular Matrix Converter	Carlos Piris, Bruno Sanabria, Edgar Maqueda, Sergio Toledo, Osvaldo González, Marco Rivera, Gustavo Ojeda, Matias Aguilar and Gianyacomo Zucchini	This paper proposes finite control set model predictive current control strategy for nine-phase generation system driven by multi-modular matrix converter topology. The architecture consists of parallel-connected matrix converter modules facilitating direct AC-AC power conversion and offering inherent fault-tolerance capabilities by dynamically redistributing load among active modules. Comprehensive simulations validate proposed method demonstrating accurate tracking of current references, robust dynamic performance under step changes and stable operation during module failure scenarios. Results confirm suitability for distributed generation, electric mobility and aerospace power systems where continuous reliable operation is critical.	Chile/Paraguay

Track Power Electronics		**Session 4: Active Power Filters and Power Quality**		**Chair Session:**	
Wennesday october 29, 2025.		**ROOM 2: 09:00–10:30**		**Papers: S4 (6) 583, 718, 721, 770, 854, 882**	
#	**ID**	**Title**	**Authors**	**Abstract**	**Country**
1	583*	Model Predictive Control with PWM for Reactive Power Compensation in Three-Level NPC Converters	Fernando Antúnez, Adolfo Gonzalez, Matías Aguilar, Jairo De Oliveira, Juan Insfran, Raúl Gregor, Leonardo Comparatore and Osvaldo González	This paper presents three-phase Shunt Active Power Filter based on three-level Neutral-Point-Clamped inverter controlled through finite-control-set model predictive control strategy operated using sinusoidal pulse-width modulation. The inverter switches at fixed frequency of 12.5 kHz reducing switching losses while remaining within safe operating range of IGBTs. Simulation results confirm system achieves THD of 3.89% in grid currents remaining below 5% limit established by IEEE 519 standard. The proposed hybrid strategy offers high-performance and hardware-efficient solution for power quality enhancement in grid-connected applications.	Paraguay
2	718*	A Sequential Model-Based Predictive Control for ANPC Shunt Active Power Filters for Power Quality Improvement in Three-Phase Four-Wire Systems	Matias Abel Aguilar Chaves, Juan Arnaldo Insfran Ferreira, Alfredo Renault Lopez, Leonardo Comparatore, Julio Pacher, Osvaldo Gonzalez, Marco Rivera, Patrick Wheeler and Eduardo Espinosa	This paper presents Sequential Model-Based Predictive Control strategy for three-level Active Neutral-Point Clamped Shunt Active Power Filter designed for power quality improvement in three-phase four-wire systems. The proposed control operates in synchronous reference frame to accurately generate compensation current references enabling SAPF to simultaneously perform harmonic mitigation, reactive power compensation and load balancing. A key feature is two-stage sequential optimization process which prioritizes current reference tracking before ensuring DC-link capacitor voltage balance eliminating need for complex weighting factor tuning. Results demonstrate excellent dynamic response, robust DC-link voltage regulation and significant power quality enhancement.	Chile/Paraguay/UK
3	721*	Sequential Model Based Predictive Current Control for a Three-Phase Four-Wire Shunt Active Power Filter Based on Three-Level NPC Converter	Juan Arnaldo Insfran Ferreira, Matias Abel Aguilar Chaves, Alfredo Renault, Leonardo Comparatore, Julio Pacher, Osvaldo Gonzalez, Marco Rivera and Patrick Wheeler	This paper proposes Sequential Model-Based Predictive Current Control strategy combined with Level-Shifted Pulse Width Modulation. The proposed control is applied to three-level Neutral Point Clamped Active Power Filter to compensate for non-linear and unbalanced load in three-phase four-wire system. The approach utilizes sequential two-stage optimization where first stage minimizes current reference tracking error and second stage ensures voltage balance of DC link capacitor. A key advantage is elimination of weighting factors which simplifies control algorithm compared to traditional multi-objective predictive control methods.	Chile/Paraguay/UK
4	770	Finite-Set Model Predictive Control of a Dynamic Voltage Restorer based on a Nine Switch Converter topology Solid State Transformer	Felipe Alvarado, Carlos Reusser and Domingo Ruiz	This paper presents dynamic voltage restorer based on Nine-Switch Converter Solid State Transformer configuration. Power quality is critical concern especially for voltage sensible equipment whose performance is highly dependent on stability and reliability of electrical supply. The DVR is power electronics-based device designed to detect and compensate for voltage sags in real time. Results under voltage-sag operation have been obtained using real-time simulation based on hardware in the loop control platform demonstrating effectiveness of proposed solution.	Chile
5	854	Hybrid Transformer as an Active Filter	Samuel Rebolledo, José Espinoza and Pablo Epul	This study presents Hybrid Transformer that performs as Active Filter addressing challenges in modern power systems from renewable integration and non-linear loads. HT offers flexible and controllable solution combining conventional transformer with solid-state technology to provide voltage regulation, reactive power compensation and harmonic filtering with improved efficiency and lower costs. The research focuses on shunt-series distribution HT to ensure nominal load voltage and unity power factor at PCC. Simulation results demonstrate effective mitigation of voltage sag/swell and current harmonics achieving significant THD reduction at PCC.	Chile
6	882	Scalable Fault-Tolerant Predictive Current Control for Multi-Modular DC–AC Converters	Sergio Nunez, Rodrigo Romero, Hernan Lezcano, Bruno Sanabria, Sergio Toledo, Carlos Romero, Raul Gregor and Marco Rivera	This work presents multi-modular converter architecture composed of multiple three-phase voltage source inverters each equipped with its own output filter and operating in parallel. The control strategy is based on current predictive control which enables precise and dynamic regulation of system. The main contribution lies in ability to maintain stable and continuous operation even when single module fails. The RMS and THD were used as figures of merit to validate effectiveness demonstrating potential for applications where robustness and fault tolerance are requirements.	Chile UK Paraguay

Track Power Electronics	Session 5: Modeling, Modulation and Inverter Control	Chair Session:			
Wennesday october 28, 2025.	ROOM 2: 14:30–16:00		Papers: S5 (5) 474, 606, 610, 697		
#	ID	Title	Authors	Abstract	Country
1	474	Evaluation of Loss Modeling and Efficiency Estimation of SiC-based Half-Bridge Rapid Prototyping Platform	Sebastián Arenas-Pérez, Polidoro S. Canales, Hugues Renaudineau, Jaime W. Zapata, Francisco González-Tijerino, Christian A. Rojas, Samir Kouro and Jose Rodriguez	This paper describes high-performances rapid prototyping SiC half-bridge designed with objectives toward research and teaching. Power electronics plays significant role in energy conversion systems and wide-band-gap semiconductors such as SiC MOSFETs are helping to improve performances. Hardware implementation is described as well as modeling through PLECS simulation software. Accuracy of efficiency estimation through simulation is evaluated considering case application example of synchronous buck DC-DC converter showing theoretical models allow estimation of efficiency with error below 5% for most tested cases.	Chile, Germany
2	606	A Modulation Scheme for a Single-Phase AC/AC Matrix Converter	Marcos Gomez-Redondo, Marco Rivera, Javier Muñoz, Patrick Wheeler, Jakson Bonaldo and Sergio Toledo	Single-phase matrix converters can serve as interface for sharing power between three-phase and single-phase electrical system. This paper analyses modulation schemes for single-phase matrix converter identifying two degrees of freedom that can be exploited to achieve control objectives. Article proposes to determine duty cycles of space-vector modulation by formulating and solving linear programming problem. Simulation results show proposal leads to lower total harmonic distortion of output current compared to popular method found in literature.	Chile, Brazil
3	610	Inner-Loop Model Predictive Control for Droop-Regulated Matrix Converters	Marcos Gomez-Redondo, Marco Rivera, Javier Muñoz, Patrick Wheeler, Jakson Bonaldo and Sergio Toledo	Grid-tied microgrids pave way for smooth transition from centralised to distributed generation. Power converters can address voltage fluctuation issues and among them matrix converter stands out when small size and low maintenance frequency are needed. In this context connection of microgrid through matrix converter is investigated through simulations in MATLAB/Simulink environment. A comparison is conducted between operation under classic droop control and droop control with model predictive control in inner loops demonstrating advantages of proposed control strategy.	Chile, Brazil
4	697	An Experimental Validation of Adaptive Optimal Backstepping Sliding Mode Controller in Voltage-Frequency Control of Single-Phase UPS Inverter	Moslem Dehghani, Mahdi S. Mousavi, Mina Ghasemigarpachi, Felipe Ruiz, Mokhtar Aly and Jose Rodriguez	This paper addresses voltage-frequency control of off-grid single-phase inverters with adaptive hybrid robust controller combining Sliding Mode Controller and Backstepping controller. By using SMC suggested controller is robust against various external disturbances and uncertainties which can be handled effectively. To mitigate chattering problem adaptive method is incorporated to update switching gain in real-time. Controller variables have been optimized using improved differential evolutionary optimization algorithm demonstrating proposed adaptive optimal BSMC approach can track reference signal very well and prepare stable output voltage signal.	Chile

Track Power Electronics	Session 6: Multilevel Converters and DC-DC Applications	Chair Session:			
Wennesday october 28, 2025.	ROOM 2: 16:30–18:00		Papers: S6 (4) 704, 811, 860, 774		
#	ID	Title	Authors	Abstract	Country
1	704	A Comprehensive Comparison of Three- and Five-Level NPC Converters	Oscar Paredes, Julio Pacher, Alfredo Renault, Jorge Rodas, Leonardo Comparatore, Carlos Paredes, Paola Maidana, Christian Medina, Marco Rivera and Patrick Wheeler	This paper presents comparative analysis of three- and five-level neutral-point clamp converter topologies focusing on structure, operation, modulation techniques and performance metrics. The study evaluates key parameters such as total harmonic distortion, switching losses, component stress and control complexity using simulations in Matlab/Simulink. Results show five-level converters significantly improve signal quality reducing THD to 0.94% compared to approximately 1.99% for three-level converters. However this improvement comes at cost of increased component count, higher control complexity and initial investment highlighting trade-offs between simplicity and performance.	Chile/Paraguay/UK
2	811	Direct Model Predictive Control in a Double-Input Single-Output DC-DC Converter in PV Applications	Diego Rojas, Duberney Murillo and Freddy Flores	This paper presents direct model predictive control for regulating voltages of photovoltaic modules connected to each input port of single-inductor multiport dc-dc converter. Single-inductor multiport dc-dc converters have gained importance due to reduction in number of inductors required in distributed applications. Results show fast dynamic response of each photovoltaic module's voltage without cross-coupling enabling rapid MPPT under different environmental conditions. It also demonstrates smooth transitions between different control loop changes proving effectiveness of direct predictive control strategy.	Chile Spain
3	860	Optimized Sliding Mode Current Sensorless Controller for Single-Phase F-type PFC Converters	Mokhtar Aly, Ahmed Shawky, Moslem Dehghani, Mahdi S. Mousavi, Ahmed Elsanabary, Ahmad Bala Alhassan and Jose Rodriguez	This paper presents optimized sliding mode controller for F-type-based power factor correction circuit. The proposed method eliminates required input-side AC current sensor while F-type PFC circuit offers superior benefits than T-type and NPC counterparts. The proposed optimum design eliminates chattering-related problems of SMC while preserving fast dynamic response, high power factor and superior performance compared to conventional PI method. The marine predator algorithm optimizer is presented to design SMC optimally with obtained results confirming superior SMC performance over conventional PI method.	Egypt, Kazakhstan
4	774+	One-Step Continuous Control Set Model Predictive Control of a Modular Multilevel Hexverter	Felipe Herrera and Roberto Cárdenas	This paper presents Continuous Control Set Model Predictive Control strategy for modular multilevel hexverter, member of Modular Multilevel Cascaded Converter family. The proposed method addresses simultaneous control of circulating currents and capacitor cluster voltage balancing by solving single quadratic optimization problem. Unlike previous approaches that treated these objectives independently this unified strategy enhances control optimality. System model is discretized using improved Euler method enabling accurate prediction of converter dynamics with simulation results demonstrating effectiveness in achieving dynamic regulation and voltage balancing under challenging operating conditions.	Chile

Track Production & Industry 4.0 and Smart Industry

Track Production & Industry 4.0	Session 1: Digital Transformation and Industry 4.0 Technologies	Chair Session:, ,			
Thursday october 30, 2025.	ROOM 3: 9:00–10:30		Papers: S1 (6) 614, 528, 865, 785, 443		
#	ID	Title	Authors	Abstract	Country
1	614	Optimization of the Polyisocyanurate (PIR) Panel Manufacturing Process Using a LiDAR-Based Monitoring System Integrated with Six Sigma Methodology	Rodrigo Azcurra, Fabio Maidana, Diego Stalder, Andrea Insfran-Rivarola and Ana Pamela Arévalos	Highly sensitive industrial processes require precise control to ensure product quality and reduce operating costs. This study integrated the Six Sigma statistical approach with an advanced technological improvement based on a laser distance sensor and angular control by servomechanism. The developed automated system for accurate determination of contact time during material expansion allows reducing the variability of the critical interval to defined target values and reducing projected waste to less than 4%.	Paraguay
2	528	Digital Twins and Augmented Reality in Mining and Wind Training: Applied Experience at UNL	Leonardo Benavides-M, José Ochoa-A, Cristian Ortega-R, Carlos Conza-Z, Julio Cuenca-T and Jessica Nataly Castillo Fiallos	During 2024-2025, the University National of Loja (UNL) developed innovative educational experiences focused on simulation and control of processes related to energy generation and mining. The activities involved three key systems: a physical prototype of ball mill grinding system, operational wind turbines from Villonaco Wind Farm, and a jaw crusher model digitally reconstructed. The project incorporated immersive experiences using virtual reality headsets, fostering meaningful learning aligned with Industry 4.0 principles.	Ecuador
3	865	Toward Smart LoRa Network Management through System Identification and Digital Twins: Mérida Case Study	Yumil Rueda Flores, Julio Heredia Lozano, Alejandro Castillo-Atoche, Renan Quijano-Cetina, Johan Estrada-Lopez, Ismael López-Juárez and Javier Vázquez-Castillo	Smart LoRa networks revolutionize urban planning by enabling cost-efficient, scalable, and real-time insights. This study integrates System Identification (SI) and Digital Twins (DTs) into the management framework, using Mérida city, Mexico, as a case study. SI transforms noisy and hysteresis-affected signals into reliable data sources, while DTs create real-time virtual replicas enabling predictive simulations. Experimental results demonstrate a closed-loop control that dynamically optimizes sensing/transmission schedules to extend battery life by 40%.	Mexico
4	785	Computational Analysis of the Plastic Zone at the Crack Tip in Nanocrystalline Aluminum for Industry 4.0 Applications	Ignacio Díaz-Contreras, Rodrigo Silva-Valenzuela, José Pérez-Ruiz, Luís López-de-Lacalle, Alejandro Pacheco-Sanjuán and Wilmer Velilla-Díaz	This work presents a comprehensive computational analysis of the fracture behavior in nanocrystalline aluminum, addressing challenges relevant to advanced manufacturing environments inspired by Industry 4.0. Molecular Dynamics simulations were conducted to estimate the plastic zone at the crack tip. Results indicate that conventional linear models significantly underestimate the plastic zone extent at the nanoscale, whereas the CTOD-based method aligns more closely with atomistic simulations, supporting the design of high-performance materials in Industry 4.0 driven manufacturing processes.	Chile/Spain/Colombia
5	443	Artificial Neural Network-Based Color Prediction of Tempranillo and Cabernet Sauvignon Red Wines Using Sensory Data	Nadia Paola Valadez-de la Paz, Aideé Hernández-López, Salvador Manuel Malagón-Soldara, Ismael López-Juárez, Vicente Figueroa-Fernández and José Antonio Vázquez-López	This study presents a hybrid approach that combines sensory analysis with artificial neural networks (ANNs) to predict the color intensity of red wines. The sensory evaluation was standardized using the Spectrum method. For model training, a multilayer perceptron with a backpropagation algorithm was used. Results indicated prediction accuracy levels exceeding 60% for color intensity, demonstrating the model's potential as a complementary tool for characterizing and quality control of red wines, fostering more efficient and data-driven decision-making in the wine industry.	Mexico

Track Production & Industry 4.0 and Smart Industry	Session 2: Sustainable Technologies Smart Session 1: AI-Driven Industrial Optimization	Chair Session:			
Thursday october 30, 2025.	ROOM 3: 14:30–16:00	Papers: Prod.S2(3) 831, 712, 838 SmartInd S1 (3) 723, 806			
#	ID	Title	Authors	Abstract	Countr
1	831	Machine Learning-Based Determination of Social Hierarchies in Domestic Sheep	Christian Lazo, Claudia Letelier, Roxana Cayul and Paula Mancilla	This study applies unsupervised machine learning to detect social hierarchies in sheep herds using phenotypic data and video-based behavioral monitoring. Three clustering algorithms were compared: K-means, agglomerative hierarchical clustering, and Gaussian mixture models. K-means achieved the best performance with three biologically meaningful clusters. Dominant animals averaged 67.8 kg with body condition score 3.8, while subordinate animals averaged 53.2 kg with score 2.9. This non-invasive, scalable approach enables automated identification of social structures supporting precision farming applications.	Chile
2	712	Development of a Safe Disassembly and Diagnostic Protocol for Electric Vehicle Battery Packs for Second-Life Applications	Vicente Castro, Enrique Espina and Felipe Quezada	The increasing circulation of electric vehicles (EV) has led to a rise in retired battery packs, commonly known as second-life batteries. This paper proposes a manual disassembly protocol, incorporating necessary safety measures and diagnostic procedures based on international standards. The protocol was validated through a case study of a battery pack extracted from a Maple 60S EV to evaluate its potential for second-life applications. The results demonstrate the protocol's validity, providing insights into the battery's lifespan and its suitability for reuse.	Chile
3	838	High-Efficiency Routing of Hydrogen Fleets Using MILP and Quantum Search Algorithms	Marcelo Aguayo, Ismael Soto and Pablo Palacios	This study validates the use of interchangeable hydrogen modules for decarbonizing mining fleets by comparing classical MILP optimization with a hybrid quantum-classical approach using Grover's algorithm. Results show the hybrid model found a more profitable solution than the classical model's global optimum and offers superior scalability. The primary advantage of the hybrid quantum method is its ability to decompose large logistical problems into manageable sub-tasks. The proposed framework can reduce CO_2 emissions by 200–300 tons per vehicle annually and improve overall fleet efficiency by 25%.	Chile
4	723	Review of Artificial Intelligence Solutions for the Wood Processing Industry	Felipe Gutiérrez, Alejandro Rojas and Mario Ramos	This work reviews artificial intelligence (AI) based solutions applied to the plywood manufacturing industry. The study is structured in three phases: analyzing approaches that assess performance using key performance indicators (KPIs) limited to individual workstations; examining system wide solutions that integrate production-line metrics with focus on handling process nonlinearities; and comparing generalized solutions through metric clustering. The goal is to provide decision-makers with a framework for selecting adaptable solutions based on their production line's specific requirements.	Chile
5	806	Discrete-Time Approximations for port-Hamiltonian Systems and Controllers Using Collocation Methods	Emilio José Olivares-Labraña, Maximilian Mogler, Laurent Lefèvre, Alessandro Macchelli, Yann Le Gorrec and Hector Ramirez	This work proposes a time-discretization for nonlinear port-Hamiltonian systems and their controllers using Collocation Methods. First, an overview of port-Hamiltonian systems is provided and Collocation Methods are presented, detailing their application in deriving discrete-time representations. Next, a time-discretization for controllers using a target system approach is proposed. The effectiveness of the proposed methodologies is illustrated through numerical example on a nonlinear port-Hamiltonian system presented by a piezoelectric actuator.	Chile/France/Italy

Track Smart Industry	Session 2: Advanced Control Systems and Economic Optimization	Chair Session:			
Thursday october 30, 2025.	ROOM 3: 14:30–16:00	Papers: S2(5) 827, 895, 923, 835, 558, 584			
#	ID	Title	Authors	Abstract	Country
1	827	Design and Implementation of Model Predictive Controllers with FPGA-based Acceleration	Francisco Abusleme, Angel L. Cedeño, Juan Aguero, César Silva Jiménez and Gonzalo Carvajal	This work reports the design and implementation of Model Predictive Controllers using both implicit and explicit formulations that leverage FPGA acceleration to reduce execution time. A case study of a servomotor is used to illustrate the development process. Experimental results show that by leveraging FPGA acceleration, the controller achieves a control interval of less than 20 µs. An explicit formulation using artificial neural networks reduces the latency to sub-microsecond levels, highlighting the effectiveness of FPGA-based acceleration for implementing low-latency, real-time Model Predictive Controllers.	Chile
2	895	A Computational Economic Complexity Model for Regional Economic Integration: Analysis of the EU, MERCOSUR, URUPABOL, and the Andean Community	Cristhian Daniel Marchuk Gaona, Luis Alberto Ríos Rivarola, Arturo González, Sanny González, Gabriel Pereira and Christian von Lücken	Regional Economic Integration is a process by which countries seek mutual benefits through the reduction of trade, social, and political barriers. This paper introduces a computational mathematical model grounded in Economic Complexity Theory to analyze economic blocs as unified entities. Four case studies are examined: the European Union, MERCOSUR, URUPABOL, and the Andean Community. Results reveal that integration enhances product diversity and increases the ubiquity of exports within the bloc, demonstrating that regional integration boosts development and strengthens competitiveness in the global economy.	Paraguay
3	923	Linear Quadratic Integral Control with Double Integrator for Platooning System: A Numerical Study of String Stability	Carlos Escobar, Luis Severino, Héctor Ramírez, Andrés Peters and Francisco Vargas	This work studies string stability in vehicle platoons based on linear quadratic integral control (LQI). The focus is on platoons modeled as continuous time LTI systems under a predecessor-following configuration with a time headway spacing policy. To ensure zero steady-state tracking error, the LQI technique with double integration is employed. Through numerical simulations, the relationship between the time headway constant and the weighting matrices of the LQI cost functional is shown, and how these design parameters affect string stability.	Chile
4	835	Advanced Traffic Flow Optimization Using UAVs and Quantum Communication Technologies	Felipe Ahumada, Ismael Soto, Pablo Adasme and David Zabala-Blanco	Urban traffic congestion presents a growing challenge for modern cities. This paper proposes an integrated system that combines Unmanned Aerial Vehicles (UAVs), satellite-based quantum communication, and quantum optimization for dynamic traffic signal control. The system captures real-time vehicle flow data using UAVs, securely transmitted via a quantum-secured communication channel. The collected data is processed using a QUBO model solved through Quantum Annealing. The proposed approach achieved a significant reduction in average vehicle waiting time from 14.07 seconds to 1.8 seconds, highlighting the potential of quantum-enhanced intelligent transport systems.	Chile
5	558*	Hybridization of the Ishikawa Method with the PSI Method in an MCDM Environment	Alejandra Holguin Avila, Laura Alejandra Galarza Alfaro, Luis Asuncion Perez Dominguez, Karla Gabriela Gomez Bull and Arlet Rebeca Salas Esquivel	This article proposes a hybrid approach combining the Ishikawa and Preference Selection Index (PSI) methods within a multicriteria decision-making framework. The Ishikawa method identifies possible problem causes, while PSI ranks them to determine the primary one. The hybridization enhances accuracy and systematic diagnosis. Results confirm its effectiveness as a reliable tool for engineering problem analysis and decision-making.	México
6	584	Modelling of structural vibrations excitation on RTG cranes	Nelson Cáceres, Constanza Ahumada and Doris Sáez	This paper presents an integrated structural-electrical model of an RTG crane to analyze operational vibrations. It combines a finite element beam structure, non-linear pendulum dynamics, and induction motor models for hoisting and trolley movement. The study includes model reduction analysis for efficiency, demonstrating the ideal number of nodes for the crane arm. Results present the vibrations observed in the crane arm structure due to lifting and lowering cargo at different trolley positions.	

Track VideoGames

Track VideoGames	Session 1: Reinforcement Learning and AI Applications	Chair Session:			
Thursday october 30, 2025.	ROOM 4: 14:30–16:00	Papers: S1 (6) 132, 191, 434, 461, 1016			
#	ID	Title	Authors	Abstract	Country
1	132*	Parallel Applications Codesign on Heterogeneous Computing Systems Using Reconfigurable Algorithmic Skeletons in OpenCL	Acosta-León	Reconfigurable heterogeneous computing systems (RHCS) exploit parallelism with FPGAs and microprogrammable devices but are complex to program. This paper presents **aSkelHCoRe**, a framework using Cole's skeletons with OpenCL/Python templates to hide parallelism and FPGA details. Experiments show hardware kernels with software-managed I/O improve execution time, allowing flexible software-hardware task allocation.	Chile
2	191	Artificial Intelligence in High School: Insights from a University Extension Experience	Kimura, Queiruga, Díaz	This work is part of the National University of La Plata's extension project, "AI in High School," which explores incorporating Artificial Intelligence into technical secondary education in Buenos Aires. It draws on university extension practices, technical education, and computational thinking approaches. In 2024, students and teachers engaged with machine learning, ethical and social implications, and inclusion/exclusion dynamics using Google Teachable Machine and MIT AppInventor. Initial reflections show students recognize AI in everyday applications but often overlook its negative impacts, highlighting the importance of critically examining training data.	Brazil

3	434	A Comparative Study of Grid Search and TPE for Tuning PPO on Atari Games	Enrique Escalona V. and Patricio Olivares R.	Hyperparameter tuning is a key component in optimizing the performance of reinforcement learning (RL) agents. This paper focuses on the effectiveness of Tree Structured Parzen Estimators (TPE), a probabilistic optimization algorithm, for tuning the Proximal Policy Optimization (PPO) method in Atari game environments. We benchmark TPE against the traditional Grid Search strategy across five representative Atari games.	Argentina
4	461	What the #*&% is a Shader and how is it implemented in Unity?	Carlos Astengo Noguez, Lorena Beatriz Martínez Elizalde, María Raquel Landa Cavazos and Danie López Sala	Shaders are often perceived as esoteric and daunting, but their fundamental role in computer graphics and the video game industry is both accessible and essential. This article aims to demystify shaders, providing a comprehensive overview from their basic definition to practical implementation in Unity. We will explore the different types of shaders, such as vertex and fragment shaders.	Chile
5	1016+	A University Technician's Degree in Video Game Design and Programming	Claudio Delrieux, Claudia Partal, Gonzalo López Borniego, Macarena Haspert and Carolina Rodríguez	The University Degree in Video Game Design and Programming at Universidad Provincial del Sudoeste (Bahía Blanca, Argentina), launched in 2025, offers a two-year comprehensive program combining design, programming, digital art, and sound. It trains students in all stages of video game creation using current technologies and collaborative methods. The curriculum emphasizes theoretical, technical, and artistic skills for professional development. Graduates will be prepared to design and program interactive games, create 2D/3D graphics, integrate sound, and contribute to projects in entertainment, education, and science.	Mexico

Track VideoGames		**Session 2: Game Development, Design and Graphics**	**Chair Session:**		
Thursday october 30, 2025.		**ROOM 4: 16:30–18:00**		**Papers: S2 (5) 563, 830, 971, 991, 909**	
#	**ID**	**Title**	**Authors**	**Abstract**	**Country**
1	563+	From Argumentation to Action: Building Science from REDIVJ with the TZEPIRC Methodology	Carlos Astengo, Lorena Beatriz Martínez Elizalde, Eduard Leonardo Sierra Ballén, Daniela L'Opez De Luise and Mario Andrés Bruno Meléndez	This article presents the conceptual foundations of TZEPIRC, its application in collaborative projects, and the results obtained in four experiences developed by students from member universities of the International Video Game Development Network (REDINVJ). The article emphasizes strengthening transversal competencies such as scientific argumentation, academic writing, and critical understanding of video games.	Colombia
2	830+	Reward-Driven Strategy Formation in Reinforcement Learning for Real-Time Fighting Games: A Street Fighter II Case Study	Nicolás Enriquez, José Benitez, Claudio Meneses, Christian Camacho and Alvaro Prado	Real-time fighting games present unique challenges for artificial intelligence due to their fast-paced, adversarial nature and the need for strategic diversity. In this study, it is investigated how the reward-function design based on curriculum learning influences the emergence of different playstyles in reinforcement learning agents trained in a Street Fighter II environment.	Chile
3	971	Unveiling the Secrets of Successful Game Design	Lorena Beatriz Martínez Elizalde, Carlos Astengo and Daniel López Salas	The MDA (Mechanics-Dynamics-Aesthetics) framework is a well-known but often misunderstood methodology in game development. Independent game developers frequently encounter challenges in game design due to unclear understanding of core mechanics and dynamics, and often neglecting the emotional journey and aesthetic design of the game. This article introduces a successful methodology that has been taught over the past two years.	Mexico
4	991+	Proposed Design of an Immersive Simulation: Virtual Reality and Mathematical Modeling	Francisco Guantecura, Felipe Muñoz La Rivera and Elisabeth Ramos Rodriguez	Mathematical modeling is recognized as a key pillar in contemporary mathematics education, as it enables students to connect real-world phenomena with mathematical formulations and solutions. However, its implementation in school contexts poses significant didactic and logistical challenges. In parallel, virtual reality has emerged as an educational technology capable of generating immersive and contextualized experiences.	Chile
5	909	Bio Lab Escape: an Educational Game for Teaching Cellular Biology	Oscar Rojas, Benjamín Robles, Sebastián Jeria, Makarena Abarca, Silvana Roncagliolo, Claudio Cubillos and Verónica Rojas	The use of video games is proposed as an effective strategy to address the growing lack of student motivation by integrating the playful dynamics inherent to these resources with the teaching-learning process. In this study, perception and knowledge surveys were administered before and after the use of an educational video game focused on cell biology content.	Chile

Track Invited Session

Track Invited Session		**Session 1: Advances in Computing: Tools, Accessibility, and Sustainability**	**Chair Session:**		
Thursday october 30, 2025.		**ROOM 7: 09:00–10:30**		**Papers: S1 (6) 12, 15, 99, 128, 210, 295**	
#	**ID**	**Title**	**Authors**	**Abstract**	**Country**
1	12	E-Museu: Exploring Computer History in a Virtual Environment	Gonzaga, Hernandes, De Ré	The Brazilian virtual museum landscape is currently precarious, especially in computing. UTFPR and Unicentro have projects cataloging electronic waste to support a virtual museum. The E-museum was created with a simple, user-friendly interface to share computer history, parts, and curiosities. It is now online, easy to use, and preserves technological culture for the community.	Brazil
2	15*	Cloud Computing and IoT for data collection and analysis: A case study in Poultry Farms	Oviedo, Flores-Cortez, Chopin, Alvarado, Monroy, Avalos	This study presents an IoT- and cloud-based system for monitoring environmental parameters affecting poultry farming in El Salvador. Sensors measure NH_3, NO_2, CO_2, CO, light, temperature, and humidity to analyze their impact on chicken growth. The 42-day case study took place at Universidad Salvadoreña Alberto Masferrer. Results provide the country's first dataset for studying how environmental factors influence broiler development.	El Salvador
3	99	Beyond Compliance: A User-Centered Approach to Web Accessibility Through the Accessibility Qualifier	Harari, Luján-Mora, Díaz	Web accessibility continues to be a significant challenge, restricting access and causing frustration for persons with disabilities (PwD). Traditional assessments emphasize technical compliance over user experience. The Accessibility Qualifier (AQ) allows PwD to evaluate websites based on personal perceptions and emotions. AQ enhances user empowerment, promotes inclusivity, and guides developers on accessibility impacts.	Ecuador
4	128	A Feature Space Maturity Model for ABM Frameworks: Definition and Experimentation	Luis Carlos Lara Lopez, Ignacio Trejos-Zelaya, Santiago Núñez-Corrales and José Helo-Guzmán	Agent Based Modeling (ABM) practice remains substantially constrained by the lack of systematic methods to evaluate and select ABM frameworks given a certain problem, as well as by the absence of protocols to identify and study potential differences across diverse computational implementations. In this article, we address both challenges to decrease model brittleness when using different software tools to perform ABM research.	Costa Rica
5	210	Quantifying the Carbon Footprint in Machine Learning: A Measurement Model for Cloud and Edge Computing	Patricio Elías Reyes, Cristian Leon Fuentes and Juan Felipe Calderón	This study addresses the environmental impact of machine learning by proposing a model to measure the carbon footprint of ML services on cloud (AWS) and edge (Raspberry Pi 4) infrastructures. Experiments with K-nearest neighbors and synthetic datasets measured energy use and CO_2 emissions during training and inference. Results show emissions rise with dataset complexity, and regression models predict these impacts. The work promotes sustainable computing by quantifying ML's environmental cost and encouraging transparent energy reporting.	Chile
6	295	An Approach to Variable Clustering: K-means in Transposed Data and its Relationship with PCA	Victor Saquicela, Kenneth Samuel Palacio-Baus and Mario Chifla	Principal component analysis (PCA) and K-means are fundamental techniques in multivariate analysis; nevertheless, how each technique relates to the other has been little explored, especially when K-means is used to transform data into variable clusters. This study aims to fill this gap and contribute to the understanding of their connection.	Ecuador

Track Invited Session

Track Invited Session		**Session 2: AI for Sustainability, Accessibility, and Data Innovation**	**Chair Session:**		
Thursday october 30, 2025.		**ROOM 2: 14:30–16:00**		**Papers: S2 (6) 211, 258, 268, 282, 288, 293**	
#	**ID**	**Title**	**Authors**	**Abstract**	**Country**
1	211	Quantifying the Carbon Footprint in Machine Learning: A Measurement Model for Cloud and Edge Computing	Patricio Elías Reyes, Cristian Leon Fuentes and Juan Felipe Calderón	In an increasingly digitized world, the environmental impact of information technology, particularly cloud computing and edge devices, has raised substantial concern. Despite growing reliance on machine learning (ML) models, the carbon footprint generated throughout their deployment pipelines remains poorly quantified. This research addresses this gap by proposing a carbon footprint measurement model for ML services.	Chile
2	258	Experiments on Automatic Alignment of Spoken Spanish and Uruguayan Sign Language Glosses	Martín Dutra, Roberto Aguirre and Luis Chiruzzo	This study explores the application of classic natural language processing (NLP) techniques to the task of aligning spoken Spanish with Uruguayan Sign Language (LSU) glosses, aiming to support the development of machine translation systems accessible to the deaf and hard-of-hearing population. Starting from video segments of a Uruguayan TV program with simultaneous Spanish audio and LSU interpretation.	Uruguay

3	268	Intelligent Information Systems in Practice for Precision Livestock Farming in Dairy and Poultry	Thiago Siqueira, Iran Silva, Andre Miyashiro, Julio Schendroski and Mateus Cardoso	Creating a world free of hunger requires decreasing food insecurity by means of developing sustainable food production systems able to increase both yield and productivity. However, diseases such as mastitis in dairy cattle and avian influenza reduce production, cause economic losses, impair farmer's livelihoods, affect the world trade, and can peril the health of breeding.	Brasil
4	282	Towards a Large Language Model for Guarani-Jopara: Challenges, and Early Outcomes	Margarita Ruiz-Olazar, Rubén Díaz, Diego Díaz Villalba, Marvin Agüero-Torales and Diego Ihara	This work presents ongoing research on the development of large language models (LLMs) tailored for Guarani-Jopara, a mixed variety of the Guarani language influenced by Spanish and widely spoken in Paraguay. Given the scarcity of digital resources in this language, we constructed a synthetic corpus by translating the Stanford Alpaca dataset.	Paraguay
5	288*	Adaptive Serious Game as a Support Tool for Children with Reading and Writing Difficulties	Matias Ricardo Villanueva Paz and Hernan Alejandro Quintana Cruz	This study evaluates a serious game with Dynamic Difficulty Adjustment (DDA) to support children with learning disabilities in reading and writing. Over a two-week intervention with participants aged 7–12, significant improvements were observed in word and pseudoword reading, word discrimination, and error detection. Usability tests showed high acceptance and ease of use. The results highlight the potential of adaptive games as effective tools in psycho-pedagogical treatment.	Chile
6	293	Discovery and exploration in data repositories	Raúl Maglione, Agustina Simoncelli, Nicolás Buero, Lorena Etcheverry and Adriana Marotta	This work addresses the improvement of data discovery and exploration in repositories, using the Uruguay Open Data Catalog based on CKAN as a case study. To overcome its limitations in search and filtering, a tool is proposed that integrates D3L, Aurum, TableMiner+, LLMs, and RDF graphs for automatic metadata enrichment. Results show enhanced data exploration through inferred relationships and semantic annotations. Additionally, natural language queries are enabled over the generated RDF graph.	Uruguay

Track Invited Session		**Session 2: AI for Sustainability, Accessibility, and Data Innovation**		**Chair Session:**	
Thursday october 30, 2025.		**ROOM 2: 16:00–18:00**		**Papers: S3 (6) 260, 297, 380, 382, 388, 402**	
#	**ID**	**Title**	**Authors**	**Abstract**	**Country**
1	260	Structuring Ontologies for Bayesian Reasoning in LLM Contexts	Araya, Valle, Taramasco	Large Language Models (LLMs) have proven to be effective tools for generating coherent text and supporting decision making across domains. However, in complex settings such as healthcare, decision making requires reasoning under uncertainty, causal inference, and the ability to quantify risks or probabilities related to specific events. This work proposes an architecture that constrains the generative freedom of the LLM through structured prompts which define expected entity types and semantic relations.	Chile
2	297	De la diversidad a la integración académica: Un análisis sobre estudiantes de nuevo ingreso en Ingeniería del Software e Informática	Rodríguez-Brenes, Chaves González, Rodríguez Cambronero	STEM programs in Costa Rican public universities are in high demand, but some are perceived as accessible only to certain groups, influencing students' decisions, as seen in computer science. This study examines social, economic, learning style, and technological access factors affecting the choice of scientific and technological careers. An initial analysis provides insights for designing inclusion and retention strategies. Preliminary results propose a framework to guide future research and actions.	Costa Rica
3	380*	ZooQL: Interactive Serious Game to Strengthen SQL and Relational Algebra Skills for University Students	Eduardo Patrick Miñan Panduro, Paolo Giuliano Zapata Albújar, Jose Jesus Valdivia Caballero and Edwin Jonathan Escobedo Cardenas	The learning of databases and query languages such as SQL is fundamental for computer science students; however, their abstract and technical nature represents a frequent challenge. Many face difficulties in understanding key concepts such as Relational Algebra, DML, DQL, and PL/SQL. To address this issue, this research proposes ZooSQL, an interactive serious game.	Peru
4	382	Comparing Fetal Liver Analysis with pure CNN vs. Complex Preprocessing Pipelines	Felipe Soares Muylaert Barroso, Alex Sandro Roschildt Pinto, Aldo Von Wangenheim, Luis Otavio Santos, Karine Souza Da Correggio and Thiago Zimmermann Loureiro Chaves	This study evaluates whether modern convolutional neural networks (CNNs) can match or surpass the performance of a state-of-the-art pre-processing method (AQUA) for fetal liver classification in ultrasound images. Using a dataset of nearly 1,500 expert-annotated fetal abdominal images, we implemented both the AQUA-based workflow and several CNN architectures.	Brazil
5	388+	Bunn, Pagliuso Neto, Pillon, Miers, Marques, Simplicio Jr	Comparative Performance Analysis of Permissioned Blockchain Protocols: IBFT 2.0 and QBFT	The adoption of blockchains in organizations has grown rapidly, with consensus protocols being a key configuration factor. Permissioned blockchains limit the choice of applicable consensus mechanisms, which in turn affect setup, management, and network maintenance. Selecting the appropriate consensus should rely on experimental indicators detailing algorithm performance and use cases. This study analyzes and evaluates consensus mechanisms for permissioned blockchain networks using Hyperledger Besu and smart contracts.	Brazil
6	402	Modeling Income Declaration Behavior in Chilean Student Loans: A Dataset and Baseline Predictive Analysis of the FSCU Program	Álex Paz, Broderick Crawford, Eric Monfroy, Andrés Yáñez Zúñiga, Ricardo Soto, José Barrera-García, Felipe Cisternas-Caneo and Benjamín López Cortés	This work presents a novel dataset designed to support predictive modeling of income declaration behavior in the University Credit Solidarity Fund (FSCU) program of Chile. Using institutional records from the Pontificia Universidad Católica de Valparaíso, we constructed a structured and anonymized dataset that captures academic, financial, and demographic variables relevant to student loan administration.	Chile