

# **2024 L Latin American Computer Conference (CLEI 2024)**

**Bahía Blanca, Argentina  
12-16 August 2024**



**IEEE Catalog Number: CFP2425S-POD  
ISBN: 979-8-3315-4098-2**

**Copyright © 2024 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP2425S-POD
ISBN (Print-On-Demand):	979-8-3315-4098-2
ISBN (Online):	979-8-3315-4097-5
ISSN:	2381-1609

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

## TABLE OF CONTENTS

Autumn of Code UC: An Experience Teaching Software Engineering Contributing to Open Source Projects .....	1
<i>Luca Cernuzzi</i>	
Active Methodologies Applied to Entrepreneurship Training: Implications in Higher Education of Computing Careers .....	10
<i>Gabriela G. González, Mariana R. Sandi</i>	
Damo's Quest: A Gamified Environment for Learning Programming.....	19
<i>Emilio Ormeño, Sergio F. Ochoa, Claudio A. Alessio, Cintia Ferrarini</i>	
Logic Programming in Primary School: Facing Computer Science at an Early Age .....	23
<i>Jorge P. Rodríguez, Laura A. Cecchi</i>	
Active Learning in Software Engineering: A Rapid Review .....	32
<i>Juan I. Irabedra, Martín Solari, Gastón Mousqués</i>	
Mapping Kolb's Learning Style to Roles in Software Development Team .....	40
<i>Mauricio Hidalgo, Kattia Rodriguez, Hernán Astudillo</i>	
The CTFd Tool Adapted to Cybersecurity Teaching in Schools.....	49
<i>Benjamin F. Starnari, Gabriela Suárez, Claudia Queiruga, Paula Venosa</i>	
SETMAT: A Representation Instrument for Software Engineering Teaching Practices .....	56
<i>María C. Gómez-Álvarez, Carlos M. Zapata-Jaramillo, Hernán Astudillo-Rojas</i>	
Test-Driven Development: Challenges and Recommendations for Trainers and Educators .....	65
<i>Nicolás Paez, Diego Fontdevila, Alejandra Zangara</i>	
Exploring Students' Behaviors and Perceptions in Continuous Measurement of Software Projects.....	75
<i>Christian Quesada-López, Sivana Hamer, Marcelo Jenkins</i>	
AelE: A Versatile Tool for Teaching Programming and Robotics using Arduino .....	85
<i>Gonzalo P. Fernández, Christian Cossio-Mercado</i>	
Causal Analysis of Failure in a First-Year Course at a Chilean University Based on Programming Support Guides .....	95
<i>Gaston Sepulveda, Billy Peralta, Pablo Schwarzenberg, Marcos Levano</i>	
Advancing Healthcare in Córdoba: Telemedicine as a Service (PGaaS) and Addressing OWASP Machine Learning Security Challenges.....	102
<i>Yair R. Julio, Angel P. Mangones, Juan T. Tovio, Frank I. Hernández, José Aguilar, Sirley K. Gomez</i>	
Leveraging Zero-Knowledge Proofs for Blockchain Interoperability: Experiences with Ethereum and Hyperledger Fabric .....	111
<i>Santiago Martinez, Agustín Ameigenda, Braian De Barros, Guzmán Llambías, Laura González, Raúl Ruggia</i>	
ALPACS: Interoperable Repository of Medical Images.....	121
<i>Mauricio Solar, Mauricio Araya, Ricardo Ñanculef, Liubov Dombrovskaia, Victor Castañeda, Ian Roberts</i>	

Process Mining-Based Assessment of Cyber Range Trainings .....	130
<i>Guillermo Guerrero, Gustavo Betarte, Juan D. Campo</i>	
A Deep Learning Approach for Anomaly Detection for Industrial Control Systems .....	140
<i>Damián M. Giracca, Fabio L. Pires, Benjamín Barán, Eustaquio A. M. Jara</i>	
Machine Learning-Driven Immersive Scenarios Classification and Generation for Virtual Reality.....	150
<i>Mario A. Leiva, Fiorella Cravero, Matias N. Selzer</i>	
Performance Evaluation of Resource Allocation Algorithms for Multi-Core Optical Networks Considering Physical Layer Impairments .....	160
<i>Rayline P. Mendes, Aline G. Morais, Jurandir C. L. Júnior</i>	
An IoT Application Based on LoRa for Monitoring and Managing a Rural Establishment.....	170
<i>Ari Fainerman, Federico Fuidio, Cristina Mayr, Martin Wildbaum, Diego Durán, Juan A. Mezzera, Nicolás Sosa</i>	
Development of a Blockchain-Based Web3 Application for CO <sub>2</sub> Absorption Right Management .....	175
<i>Germán A. Arab, Juan I. Cogliatti, Cristina Mayr, Juan A. Arab, Luis M. Borrazás, Pablo Urquizó</i>	
IoT++: An Enhanced Interoperability Based on Semantic for IoT Environments.....	179
<i>Ana Aguilera, Dominique Garrido, Irvin Dongo, Maria Cornejo-Lupa</i>	
Reinforcement Learning Based Routing, Modulation Level and Spectrum Assignment in Elastic Optical Networks.....	189
<i>Enzo Unzain, Roberto Fernandez, Diego P. Pinto-Roa</i>	
Evolutionary Multiobjective Multicast Virtual Network Function Placement in NFV-SDN Networks .....	197
<i>Carlos Cañete, Crishtian Medina, Luis G. Moré, José Colbes, Diego P. Pinto-Roa</i>	
Advances in IoT for Federated Machine Learning with GAN Applied to Gesture Recognition .....	207
<i>Paula Verghelet</i>	
BrainWave Navigator Human-Computer Interaction using an Electroencephalography Device .....	211
<i>José Guzmán, Antonio S. Sprock, Ana M. Bezeira</i>	
Modeling and Functional Validation of the IEEE 802.16 MAC Protocol for the Management of Connections and Dynamic Service Flows .....	216
<i>Ana M. Bezeira</i>	
Data Interoperability in Learning Analytics - Review of Literature.....	226
<i>Juary C. Rocha, Vinicius Ramos, Cristian Cechinel, Emilcy J. Hernández-Leal, Roberto Munoz, Tiago T. Primo</i>	
Analysis of Security Permissions on Android and iOS from a Privacy Perspective.....	234
<i>Carlos Luna, L. R. I. Galuppo</i>	
OntoPriv: Enhancing Understanding and Compliance in Privacy Legislation via Legal Ontologies.....	244
<i>Gabriela Suntaxi, Kelvin Ojeda, Franciso Rodríguez</i>	
Digital Transformation in Dental Care: An Artificial Intelligence Application for Automated Dental Radiology Diagnosis .....	254
<i>Débora Pollicelli, Facundo Roffet, Lautaro Verdi, Juan Bajo, Paula Borda, Juan Paez, Aaron Choque, Francisco R. Iaconis, Mariano Grippio, Claudio Delrieux</i>	

CanSat Picosatellite as a First Approach to Space Technologies (Design, Construction of a CanSat Picosatellite and Its Ground Station) .....	263
<i>Mauricio S. M. Conde, Jorge W. O. Araoz</i>	
Beyond Words: A Preliminary Study for Multimodal Hate Speech Detection .....	271
<i>Sofía Barceló, Magali Boulanger, Antonela Tommasel, Juan M. Rodriguez</i>	
The Capacitated Multi-Depot Vehicle Routing Problem with Stochastic Pickups and Deliveries .....	275
<i>Brenner H. O. Rios, Eduardo C. Xavier</i>	
Detection of Gender Bias in Legal Texts using Classification and LLMs .....	283
<i>Christian J. Ratovicus, J. A. Diaz-Pace, Antonela Tommasel</i>	
Multiobjective Optimization Model for Regime Adjustment in Crude Oil Production .....	293
<i>Matías Micheletto, Javier Marengo, Rómulo Alcoleas, Carlos De Marziani, Rodrigo Santos</i>	
Context-Aware Cognitive Agents using Knowledge Graphs for Automated Negotiation .....	297
<i>Dan E. Kröhling, Omar J. A. Chiotti, Ernesto C. Martínez</i>	
Distinguishing Samples from the $\mathcal{G}^0_1$ Distribution by using Tsallis Entropy .....	307
<i>Andrea Rey, Juliana Gambini</i>	
Robust Implementation of Permutation Monte Carlo for Network Reliability Estimation .....	316
<i>Héctor Cancela, Leslie Murray, Gerardo Rubino</i>	
Pattern-Based Interoperability Framework from OWL to Conceptual Modelling Languages .....	324
<i>Giuliano Marinelli, Germán Braun, Pablo Fillotrani</i>	
Transfer Learning and Fine-Tuning for Facial Expression Recognition with Class Balancing .....	334
<i>Josef Ruzicka, Adrian Lara</i>	
Hiring People with Disabilities: Work Assignment Models for Decision Support .....	338
<i>Michele Blasiak, Julieta Oberti, Jimena Strechia, Héctor Cancela, Patricia Quintana</i>	
Real-Time Handgun Detection using Transformers on Nvidia Jetson AGX Xavier .....	348
<i>Luis A. Bustamante, Juan C. Gutiérrez</i>	
AI-Based Point Cloud Upsampling for Autonomous Driving Systems .....	354
<i>Nicolás Salomón, Claudio A. Delrieux, Leandro E. Borgnino, Damián A. Morero</i>	
A Machine Learning-Based System for Medical Assistance in the Diagnosis of Cardiovascular Diseases .....	364
<i>Vinicius M. Bezerra, Eutino J. V. Sirqueira, Felipe G. Dos Santos, Carlos E. B. Sousa, Jurandir C. L. Júnior</i>	
Comparative Evaluation of Image Classification Models for Ornamental Rock Classification .....	374
<i>Douglas F. Dias, Karin S. Komati, Kelly A. D. S. Gazolli</i>	
Analysis of Quantum Support Vector Machines in Classification Problems .....	378
<i>Jairo A. F. Camargo, Jose Aguilar, Ángel Pinto</i>	
A First Approach to Multiple Credibility Limited Belief Base Revision .....	385
<i>Marcelo A. Falappa</i>	
Low-Rank Adaptation Applied to Multiclass Diabetic Retinopathy Classification .....	389
<i>Sebastián Ferreira-Caballero, Diego P. Pinto-Roa, José L. V. Noguera, Jordan Ayala, Pedro E. Gardel-Sotomayor, Pastor Pérez-Estigarribia</i>	

Study of the Learning Algorithm for Multivariable Data Analysis in Machine Learning Tasks Under Missing Data.....	398
<i>Jose Aguilar, Angel Pinto, Eduard Puerto, Yair E. R. Julio</i>	
Comparative Methods for Addressing Imbalanced Datasets in Predicting Medical Appointment No-Shows .....	407
<i>Marcelo A. Lovatte, Leandro C. Resendo, Karin S. Komati</i>	
An Automated Approach to University Course Timetabling Focused on Professor Assignment .....	417
<i>Marco Zunino, Sara V. Del Valle, Laura Gatti</i>	
Prediction of Peak-to-Peak Pressure Gradient in Patients with Aortic Coarctation using Physics-Informed Neural Networks .....	421
<i>Sebastián Jara, Rodrigo Salas, Ricardo Ñanculef, Israel Valverde, Sergio Uribe, Julio Sotelo</i>	
Analysis of Emotions on Twitter(X) Through MASOES Affective Model.....	425
<i>Niriaska Perozo, Giovanni González, Leonardo Rodríguez, Héctor Torrejón</i>	
Bayesian Network to Support Diagnosis of Rare Diseases in Chile.....	433
<i>David Araya, Javier Márquez, Nicole Nakousi, Carla Taramasco</i>	
An Integrated Beam Angle Selection and Direct Aperture Optimisation Model for the IMRT Problem .....	443
<i>Mauricio Moyano, Guillermo Cabrera-Guerrero</i>	
Automation of 4D Flow MR Image Processing Obtained by Cardiovascular Magnetic Resonance Imaging.....	447
<i>Aaron P. Sandoval, Rodrigo S. Fuentes, Julio G. Flores, Sergio U. Arancibia, Julio S. Parraguez</i>	
Towards Speech Emotion Recognition Applied to Social Robots.....	451
<i>Alvaro Gamboa, Irvin Dongo, Ana Aguilera, Rolinson Begazo</i>	
A Tabu Search Heuristic for the Clustered Prize-Collecting Arc Routing Problem .....	461
<i>Guillermo Palma</i>	
Apple Detection and Counting using Neural Networks .....	469
<i>Roxana Garderes, Facundo Gutiérrez, Mercedes M. Tanco, Gonzalo Tejera</i>	
Intelligent System for the Tracking of Muon Traces in the CONNIE Experiment.....	479
<i>Santiago Ferreyra, Diego Stalder, Jorge Molina</i>	
High-Resolution Income Estimates using Satellite Imagery: A Deep Learning Approach Applied in Buenos Aires.....	489
<i>Nicolás F. Abbate, Leonardo Gasparini, Franco Ronchetti, Facundo Quiroga</i>	
Detection of Urination using Machine Learning and Acoustics .....	499
<i>Miguel Piñeiro, Sebastián Puebla, Andrea Vázquez-Ingelmo, Carla Taramasco</i>	
Self-Supervised Learning Applied to Variable Star Semi-Supervised Classification using LSTM and GRU Networks .....	503
<i>Roberto Merino, Pablo Jara, Billy Peralta, Orietta Nicolis, Hans Lobel, Luis Caro</i>	
Diagnosis of Breast Cancer on Full Mammography using the BRINT Texture Descriptor and Convolutional Neural Networks.....	511
<i>Luis A. S. Marroquin, Juan C. G. Caceres</i>	

Towards Automated Fact-Checking: An Exploratory Study on Identifying Check-Worthy Phrases for Verification.....	521
<i>Galo E. P. Bartol, Antonela Tommasel</i>	
A Conditional Entropy-Based Evaluation of Clustering Approaches to Automatic Web Services Refactoring.....	531
<i>Guillermo Rodriguez, Cristian Mateos</i>	
Concepts and Applicability of Non-Functional Requirements for Particular and Universal Things.....	539
<i>Luis Olsina, Pablo Becker, María F. Papa, Gustavo Rossi</i>	
IPOptimizer: A Tool to Optimize the Pull Request Integration Process.....	549
<i>Agustín Olmedo, Lucas Barbeito</i>	
Measuring the Execution Time of Programs from Different Android Embedded Programming Languages.....	553
<i>Ricardo M. Filho, Ricardo Bonfim, Larissa Pessoa, Raimundo Barreto, Rosiane De Freitas</i>	
Runtime Verification of JavaScript Implementations using Aspect Oriented Programming and Regular Expressions.....	562
<i>Luciano Pacione, Dana K. Urribarri, Martín L. Larrea, Luciano H. Tamargo</i>	
Maintaining Consistency in the Coevolution of iStar Models and Use Cases in Requirements Engineering.....	571
<i>Diogo D. N. Paza, Marcos A. Dos Anjos, Vitor L. C. Gilnek, Victor F. A. Santander</i>	
Unveiling Quality in API Management: A Systematic Mapping Study.....	581
<i>Eder Dos Santos, Sandra Casas</i>	
Wireflows in Action: A Case Study on Non-UX Professionals' Perceptions of using a UX Technique.....	591
<i>Guilherme Guerino, Vinicius Nogueira, Gabriel Scapim, Mariana Alexandre, Silvio Gomes, Gislaine Leal, Renato Balancieri</i>	
Proposal for Validating a Requirement Elicitation Process using Action-Research.....	600
<i>Ezequiel Kahan, Marcela Genero, Alejandro Oliveros</i>	
A Systematic Literature Review of Usability Evaluation in Early Stages of Software Development.....	604
<i>Catalina Astudillo-Rodriguez, Juan P. Carvallo, Javier Diaz, Ivana Harari, Daniel Camacho</i>	
Is Explainability in the Radar of Software Architects? a Rapid Multivocal Review.....	614
<i>Fernando Muraca, María F. Pollo-Cattaneo, Hernán Astudillo</i>	
A Novel Quantum Fuzzy Approach to Interpret Dilemmas of Game Theory.....	618
<i>Cecília Botelho, Helida Santos, Giancarlo Lucca, Anderson Cruz, Adenauer C. Yamin, Renata H. S. Reiser</i>	
On the Variability of Microservice Decompositions: A Data-Driven Analysis.....	627
<i>Ana M. Saucedo, J. A. Diaz-Pace, Hernán Astudillo, Guillermo Rodriguez</i>	
Causal Organizational Mining in Software Engineering: Evaluating Improvement Strategies in Development Team Dynamics.....	636
<i>Fernando Montoya, Cristian Beltran, Hernan Astudillo</i>	
Security Mechanisms Used in Systems Based on Zero Trust Architecture: A Systematic Mapping.....	644
<i>Carlos Manzano, Gastón Márquez, Hernán Astudillo</i>	

The Importance of Technological Innovation in SMEs: Methodological Proposal for Its Implementation.....	654
<i>María L. Pepe</i>	
Automatic Assessment of Dirt Roads Based on Crowdsensing.....	658
<i>Pablo S. Rosales, Matías J. Micheletto, Carlos De Marziani, Rómulo Alcoleas, Javier Askenazi</i>	
Can Pharmacovigilance Be Performed on Social Media? Mining Adverse Vaccine Reactions from Twitter .....	662
<i>María J. Martínez, Silvia N. Schiaffino, Daniela L. Godoy, Ignacio Ponzoni, Axel J. Soto</i>	
Design Thinking in Practice: The Case for a Redesign to Improve a Reservation System in an Educational Environment .....	666
<i>João Tardivo, Gustavo Domingos, Matheus Souza, Gislaine Leal, Guilherme Guerino, Thiago Coleti, Renato Balancieri</i>	
An Intelligent Application for Detecting Abnormal Movement Patterns and Fall Risk in Elderly People. Preliminary Results.....	676
<i>Diego R. Cruz, Carla T. Toro</i>	
Proto-Radial Algorithm to Obtain the Radial Set: A Deterministic Approach to Optimize Radial Systems.....	684
<i>Néstor Cáceres, Benjamín Barán, Enrique Chaparro</i>	
Automatic Land Use Classification in High-Resolution RGB Images.....	692
<i>Guillermina S. Santecchia, Claudio Delrieux</i>	
Building Tools to Analyze the Files of the Uruguayan Dictatorship: Information Extraction from the Personal Records of Organización Coordinadora De Operaciones Antisubversivas (OCHOA) .....	703
<i>Mateo Nogueira, Lorena Etcheverry, Gregory Randall</i>	
Implementing Neuroevolution for Gas Consumption Forecasting in the Steel Industry .....	713
<i>Vinicius M. De Oliveira, Karin S. Komati, Jefferson O. Andrade</i>	
Design, Implementation and Evaluation of an Information System for the Management of Digital Farming Scientific Data.....	723
<i>Allan B. Da Silva, Thiago L. L. Siqueira</i>	
Blockchain as Support for the Banking Sector with a Focus on Financial Assets in Colombia .....	733
<i>Karol M. Velasco, Michael M. González, Jairo A. Riaño</i>	
Development of Applications Based on Microservices - Case Study of Ministry of Economy and Finance of Paraguay .....	742
<i>Rafael F. P. Heikel, Marcos B. Guayuan, Marcelo L. Cremona, Horacio Nemeth, Julio C. Mello-Román</i>	

## **Author Index**