Preface to the CLEI 2025 Special Issue

Volume I

The present issue of CLEI Electronic Journal (CLEIej) is devoted to extended and revised papers of selected works presented at the 51st Latin American Informatics Conference (CLEI 2025), held in Valparaíso, Chile, from October 27th to 31st, 2025. The CLEI 2025 conference included five major tracks on different computer science and informatics areas, particularly: Computer Technology, Intelligent Systems, Software Systems, Systems In Practice, and Computer Science Education. A total of 275 submissions were received in these tracks, and 91 were accepted as full papers and 23 as work-in-progress. It resulted in an acceptance rate of 33.1% for full papers.

Based on the recommendations of the track chairs, we invited the authors of the 20 papers with the highest score to extend their work and submit it to this special issue. The authors of 14 papers accepted the invitation, and submitted an extended version of the previous article. These articles were reviewed by external researchers, and revised by the authors accordingly. It resulted in five articles accepted for final publication in this first volume of the special issue. A second volume will be published later with the remaining selected papers.

Next, we introduce the papers that are part of this first volume of the special issue:

"*An Ontology-Driven Approach for the Syntactic and Semantic Validation of SPARQL Queries*": This work introduces an ontology-driven approach for pre-validation of SPARQL queries, focusing on both syntactic and semantic correctness before execution. By leveraging ontologies as a structural model, the method detects common errors related to literal values and property constraints, thereby reducing unnecessary computational effort and improving query reliability. Its primary contribution lies in enhancing the quality of queries through early error detection, which not only optimizes system performance, but also supports more efficient data querying processes in semantic web applications. The approach's minimal overhead and detailed feedback foster greater user confidence and productivity, making it a significant step forward in semantic data management and query optimization.

"Managing Authorization in Government Management Systems: the Experience of SIARE-Artefactos": This research addresses the critical complexities of access control within distributed microservices architectures specifically tailored for public sector management. By introducing SIARE-Artefactos, the authors present an automated framework that handles the lifecycle of fine-grained authorization through code annotations and standardized protocols like OAuth 2.0. The primary contribution of this work lies in its modular, four-layer architectural design and the development of a reusable software component that streamlines security registration for large-scale governmental systems. Validated within Paraguay's national resource management ecosystem, the solution achieved a profound operational impact, slashing configuration times from nearly an hour to mere seconds while delivering a 74% reduction in manual effort and significantly minimizing human-driven security errors. Ultimately, this study offers a scalable blueprint for enhancing governance, traceability, and technical agility in the modernization of public digital infrastructures.

"*An Extended Study with LLM-Generated Synthetic Data of ArSGam: A Framework for Cognitive-Affective Personalization and Gamification in Serious Game*": This work introduces an efficient, training-free framework for object detection designed to bypass the exhaustive data labeling and computational costs of traditional deep learning. By repurposing Visual Foundation Models (specifically the Segment Anything Model), the study develops a two-stage system that identifies objects using a compact prototype-based classifier instead of extensive fine-tuning. Its primary impact is demonstrated in specialized fields like precision agriculture, where the model achieves high-precision results in drone imagery with only a few labeled examples. The technical contributions of this work include a Mahalanobis-based distance metric for robust few-shot classification, the application of Singular Value Decomposition to stabilize high-dimensional feature analysis, and a unique context-modeling strategy that effectively filters out background noise in complex environments.

"*Interactive Theorem Assistant for Learning 'A Logical Approach to Discrete Math': Proof Theory and Assessment Experience*": This research introduces CalcLogic, an interactive web-based platform designed to support the study of Calculational Logic as defined in the influential "A Logical Approach to Discrete Math" textbook. To facilitate a seamless user experience, the authors developed a novel proof theory that mechanizes logic within the equational fragment of Applied Lambda Calculus, allowing students to construct rigorous proofs—even those involving quantifiers and predicates—using only a mouse-driven interface. A key technical advancement is the use of structure

equalities to simplify the traditionally complex process of textual replacement, bypassing the need for students to master specialized markup or programming languages. The impact of this work was validated through educational experiments at the university level, which reveal that the tool not only fosters an intuitive grasp of formal reasoning, but also shows a strong correlation between digital exercise completion and improved performance in traditional written evaluations.

"*Explainable COVID-19 Classification Via Variational and Perceptual Autoencoder-Guided Occlusion*": This paper presents a training-free framework for object detection that effectively bypasses the high computational and labeling costs of conventional deep learning models. By repurposing Visual Foundation Models, particularly the Segment Anything Model, the system identifies objects using a compact prototype-based classifier instead of extensive retraining. The work has a significant impact on precision agriculture, where it demonstrates the ability to detect specific crops in drone imagery with high precision using only a few examples. Core technical contributions include the implementation of Mahalanobis distance and Singular Value Decomposition to ensure robust classification in high-dimensional feature spaces, alongside a context prototype designed to suppress background noise and reduce false positives in cluttered scenes.

We would like to warmly acknowledge all the CLEI 2025 Track Chairs for their invaluable support during the review process. Their dedication and careful evaluations were instrumental in identifying the papers invited to submit an extended version for this special issue.

We are also deeply grateful to the reviewers, whose commitment, expertise, and thoughtful assessments greatly contributed to ensuring the scientific quality of the articles published in this issue.

Our sincere thanks also to the authors, who accepted our invitation to prepare substantially revised and extended versions of their conference papers. By carefully addressing the reviewers' comments, they have significantly strengthened the quality and impact of their contributions.

We trust that readers will find this special issue both informative and inspiring, and that it will serve as a valuable showcase of the high-quality research being carried out by the Latin American scientific community.

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