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Selected papers from the Second International Joint Conference on Conceptual Knowledge Structures

CONCEPTS, the International Joint Conference on Conceptual Knowledge Structures, is a merger of the three conferences CLA, ICCS, and ICFCA, which have been essential venues for researchers and practitioners working on theoretical and applied aspects of formal concept analysis and representation of conceptual knowledge, as well as closely related areas, such as data mining, information retrieval, knowledge management, and discovery:

- 29th International Conference on Conceptual Structures (ICCS)
- 19th International Conference on Formal Concept Analysis (ICFCA)
- 18th International Conference on Concept Lattices and their Applications (CLA).

CONCEPTS 2025, the second conference in this new series, took place in Cluj-Napoca, Romania, from September 8 to September 12, 2025. It aims to continue the tradition and standards of previous conferences and to become a key annual meeting for all members of the three communities, CLA, ICCS, and ICFCA, to remain informed of new developments and challenges in this field.

Submissions of significant and original research were invited on topics relevant to the conference. They were subject to single-blind peer review by following three different modalities: journal-track papers, regular papers, and short papers.

A total of 46 contributions were submitted from authors all over the world. There were 13 submissions for the journal track and 33 regular or short ones. Each submission was assigned and evaluated by three distinct reviewers. Submissions in which a program chair is a co-author were reviewed without the chair's involvement. Twenty-five regular and two short papers were accepted after revision. The seven accepted journal-track papers are published in this special issue of the International Journal of Approximate Reasoning, while the Springer volume of the proceedings contains the twenty-five regular and two short accepted papers [1].

The accepted journal-track papers are presented in this special issue of the International Journal of Approximate Reasoning:

- *The language of Contextual Attribute Logics – Introduction and survey* by Bernhard Ganter [2] presents an overview of Contextual Attribute Logic(s), a branch of Contextual Logic founded by Rudolf Wille. It presents a logic language that is based on mathematical logic, but uses a different terminology to better serve the interpretative goal of Formal Concept Analysis (FCA). The author provides background knowledge and elements of modal and multimodal logics, such as Description Logics.
- *Theoretical Comparison of Relational Concept Analysis (RCA) and Graph-FCA (GCA)* by Vanessa Fokou, Peggy Cellier, Xavier Dolques, Sébastien Ferré, and Florence Le Ber [3] gives an extensional and intensional comparison of two methods, namely Relational Concept Analysis (RCA) and Graph-FCA (GCA), which are two extensions of FCA. It shows that the extensional comparison provides the theoretical proof that the set of RCA concept extents is included in the set of GCA concept extents. Furthermore, to allow the comparison of concept intensions, a transformation of RCA results into relational patterns is performed. These results allow a sound interpretation of RCA results and help combine the two approaches for data exploration.
- *PAC learning of concept inclusions for ontology-mediated query answering* by Sergei Obiedkov and Barıs Sertkaya [4] describes (i) a probably approximately correct (PAC) algorithm for learning description-logic ontologies via subsumption queries and (ii) a method to fine-tune query distribution during learning to boost recall in ontology-mediated query answering. The study includes an experimental evaluation on OWL 2 EL ontologies, concluding that the approach helps significantly improve recall while having a high precision of query answering.

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- *Double Boolean algebras: constructions, sub-structures and morphisms* by Gael Tenkeu Kembang, Yannick Lea Tenkeu Jeufack, Etienne Romuald Temgoua Alomo, and Léonard Kwuida [5] proposes to characterize sub-algebras of double Boolean algebras as well as morphism between them, describes the lattice of sub-algebras of trivial double Boolean algebras, and presents a method to construct pure double Boolean algebras.
- In *A minimal base or a direct base? That is the question!*, Jaume Baixeries and Amedeo Napoli [6] revisit the problem of computing the closure of a set of attributes given a set of implications. They propose an extensive empirical study of the impacts of minimality and directness on the closure algorithms. The validation results suggest a different look at the computation of a set of attributes given a set of implications.
- *Cooperative games with fuzzy characteristic functions on concept lattices* by Martin Waffo Kemgne, Blaise Bleriot Koguep Njionou, Dmitry I. Ignatov, and Leonard Kwuida [7] introduces cooperative games with fuzzy payoffs on concept lattices. The contribution generalizes prior results on games over concept lattices, where the payoffs are real numbers. An axiomatization of the Shapley value for these games is proposed and its applicability is illustrated through a concrete example.
- *Triadic data: representation and reduction* by Kouankam Djouohou Léa Aubin, Koguep Njionou Blaise Blériot, and Léonard Kwuida [8] explores the adaptation of key notions in FCA to Triadic Concept Analysis by studying the representation problem, the notion of redundant attributes and subcontexts.

We would like to conclude this editorial by conveying our appreciation to all contributing authors, as well as the members of the CONCEPTS 2025 Program Committee and the external reviewers, for their tremendous efforts in reviewing the submitted papers promptly.

Our thanks also go to the sponsors of this event: The Babeş-Bolyai University of Cluj-Napoca, the Romanian Ministry of Education and Research, SAS Analytical Solutions S.R.L., and the Raiffeisen Bank Romania.

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