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Introduction

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Résumé. — Knowledge engineering is a field of Artificial Intelligence that contributes to the development of models, methods, and tools for the acquisition, representation, and integration of knowledge. Its goal is the production of "intelligent" methods and tools capable of assisting humans in their activities and decision-making. The French Knowledge Engineering conference is a place for exchange and reflection, presentation and discussion of theories, practices, methods, and tools related to knowledge engineering. This community now also takes into account the rise of machine learning algorithms and their impact on individual and collective practices, while keeping humans at the center of decision-making systems that leverage data and knowledge. This special issue includes extended versions of a selection of the best papers from the 2021, 2022, and 2023 editions.

Mots-clés. — Knowledge Engineering.

The French Knowledge Engineering conference (*journées francophones d'Ingénierie des Connaissances* - IC) have been held annually since 1997, initially under the auspices of Gracq (Groupe de Recherche en Acquisition des Connaissances) and then under those of AFIA's Knowledge Engineering (SIC) group. For several years now, IC has been hosted by the PFIA platform, along with several other French conferences in the field of artificial intelligence.

Knowledge engineering can be seen as the part of Artificial Intelligence concerned with knowledge from the points of view of representation, acquisition, and integration in digital environments. Its purpose is to produce "intelligent" methods and tools capable of assisting humans in their activities and decision-making.

The Knowledge Engineering conference brings together the French-speaking community and is a place for exchange and reflection, presentation and comparison of theories, practices, methods, and tools. This community must now take into account the rise of learning algorithms and their impact on individual and collective practices, while keeping humans at the center of data and knowledge systems.

With regard to submissions in the various editions, IC 2021 received twenty-two articles, fifteen of which were accepted (ten long articles, four derived from publications in international conferences and journals in the field, and one short article). For IC

2022, the conference received thirty-four article submissions (ten long articles and eight short articles of original work were accepted, as well as eleven articles of previously published work). Finally, for IC 2023, the number of submissions remained steady, with thirty-two articles submitted (seven long articles and ten short articles, as well as one position paper and one poster accepted). It also accepted three articles of previously published work and abstracts in French. We note that authors remain interested in sharing their original contributions with the community.

We can also observe various emerging themes in these three editions. For IC 2022, articles at the heart of knowledge engineering such as "complex knowledge modeling," and "knowledge graph refinement," as well as "explainability and interpretability in knowledge graphs" and "machine learning, ontologies, and knowledge graphs." For IC 2023, topics such as "information extraction and knowledge graphs," "ontology alignment and data linking," "ontologies and reasoning for complex systems," as well as emerging topics in the community such as "knowledge, learning, temporality," and "knowledge engineering and FAIR data."

This special issue brings together extended versions of a selection of the best articles from the 2021 (program committee chair Maxime Lefrançois), 2022 (Fatiha Saïs), and 2023 (Cassia Trojahn) editions. Nineteen scientific contributions were selected (6 IC 2023, 7 IC 2022, and 6 IC 2021), and nine extended versions were evaluated. These articles correspond to those selected for the best long or short article award. Eight were ultimately accepted and are featured in this special issue. These articles demonstrate the wide range of topics covered in IC.

The article entitled "***Study of key transferability for data linking between knowledge graphs***", which received the IC 2023 Best Long Paper Award, focuses on data linking between knowledge graphs. In this work, in order to reduce the computation time for key discovery and, consequently, for the data linking task, the authors study the issue of transferability of keys discovered in one graph to another graph, with promising experimental results.

The article entitled "***Hybridization of AI Models with Ontologically Explainable Classifiers***" focuses on knowledge engineering, proposing a hybrid architecture that combines machine learning and symbolic reasoning to build explainable classifiers. Inspired by neuro-symbolic approaches and concept-based models, this approach is based on OntoClassifier, a module that uses domain ontologies to automatically generate classifiers that can be interpreted by users. It addresses the challenges of explainable AI by integrating knowledge and reasoning modes specific to the target domain.

The article entitled "***Connections and Relations***" introduces the notion of "epistemic ontologies" and proposes a characterization of the complex physical and mental entities they aim to represent. These entities, such as states of affairs, propositions, or events, depend existentially on other entities. To account for their unity, the author uses the ontological figure of "connection," inspired by Gustav Bergmann's nexus. He thus distinguishes between physical connections (qualities linked to their carrier object, interactions between objects and processes) and conceptual connections, which

constitute our knowledge of the world. The article argues that states of affairs are exclusively connections and that relations do not exist as physical realities, but only as conceptual constituents.

The article entitled "***Knowledge graph tool for researchers in ancient and medieval zoology***" proposes, as part of the HisINum project, a generic and reusable approach for the analysis of ancient texts and semantic indexing in the form of knowledge graphs. Using the TheZoo thesaurus and the morph-xR2rml tool, the authors transform manual and automatic annotations from Latin and Greek texts into RDF graphs, which can be used by SPARQL queries and a dedicated visualization application. This work contributes to the study of the transmission of zoological knowledge from Antiquity to the Middle Ages, offering historians and philologists new tools to explore, compare, and enrich their textual corpora.

The article entitled "***Construction and exploitation of a knowledge graph on scientific literature in life sciences***" contributes to the field of knowledge engineering by proposing a new knowledge graph built from articles on wheat genomic selection, automatically structuring entities in the domain using an ontology. Its originality lies in the use of the W3C Web Annotation ontology to formalize the context in which entities appear, thus facilitating detailed analysis of relationships and associations in scientific literature.

The article entitled "***The importance of terms in knowledge graphs and how to find them***" highlights an often overlooked aspect of knowledge graphs: the role of terms from controlled vocabularies, beyond classes and properties alone. Based on a systematic analysis of some twenty SPARQL access points, the authors propose a methodology for identifying these terms in graphs. The originality of the approach lies in the use of these lexical elements as indicators of semantic content, with results and queries made available online.

The article entitled "***Semantic description of plant phenological development stages and extraction of new labels***" proposes a methodological framework for the semantic description of plant phenological stages, based on the PPDO ontology. As part of the D2KAB project, this ontology has been enriched to model several phenological scales related to various crops. The originality lies in the semantic alignment of existing scales and their use to automatically annotate agricultural reports, illustrating the contribution of ontologies to the structuring, interoperability, and analysis of agro-environmental data.

The article entitled "***Creating a geohistorical knowledge graph from 19th-century Parisian trade directories: application to the photography industry***" (special prize for short article IC 2023) presents a concrete case study of the use of semantic approaches. It proposes an automatic approach for constructing and visualizing a geohistorical knowledge graph of businesses listed in old directories.

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We would also like to thank all those who, through their presentations, contributions, and reports, have been part of the IC French-speaking community for over 35 years.

Abstract. — L'ingénierie des connaissances est une thématique de l'Intelligence Artificielle qui contribue au développement de modèles, méthodes et outils pour l'acquisition, la représentation et l'intégration de connaissances. Sa finalité est la production de méthodes et outils « intelligents », capables d'aider l'humain dans ses activités et ses prises de décisions. La conférence Ingénierie des Connaissances est un lieu d'échanges et de réflexions, de présentation et de confrontation des théories, pratiques, méthodes et outils autour de l'ingénierie des connaissances. Cette communauté prend désormais en compte l'essor des algorithmes d'apprentissage automatique et leurs retombées sur les pratiques individuelles et collectives, tout en conservant l'humain au centre des systèmes de décision exploitant les données et les connaissances. Ce numéro spécial regroupe des versions étendues d'une sélection des meilleurs articles des éditions 2021, 2022, et 2023.

Keywords. — Ingénierie des Connaissances.
