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Selected Papers from the 5th International Joint Conference on Rules and Reasoning (RuleML+RR 2021)

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The four papers following this introduction were originally presented at the 5th International Joint Conference on Rules and Reasoning (RuleML+RR 2021). The conference Program Committee chairs, in collaboration with the editor-in-chief of the Theory and Practice of Logic Programming journal invited the authors of these papers to extend them and submit full improved versions for publication in the journal.

RuleML+RR joined the efforts of two well-established conference series: the International Web Rule Symposia (RuleML) and the Web Reasoning and Rule Systems (RR) conferences. The RuleML symposia have been held since 2002 and the RR conferences since 2007. The RuleML Symposia were devoted to disseminating research, applications, languages, and standards for rule technologies, with attention to both theoretical and practical developments, to challenging new ideas and to industrial applications. The RR conferences have been a forum for discussion and dissemination of new results on Web Reasoning and Rule Systems, with an emphasis on rule-based approaches and languages.

To leverage these ambitions, RuleML+RR 2021 was organized as part of the virtual event *Declarative AI 2021: Rules, Reasoning, Decisions, and Explanations*, held from the 8th to the 15th of September 2021. This event was hosted by KU Leuven, Belgium. With its general topic "Declarative Artificial Intelligence," a core objective of the event was to present the latest advancements in AI and rules, rule-based machine learning, reasoning, decisions, and explanations and their adoption in IT systems. To this end, Declarative AI 2021 brought together co-located events with related interests. In addition to RuleML+RR this included DecisionCAMP 2021 and the Reasoning Web Summer School (RW 2021).

The program of the main track of RuleML+RR 2021 included the presentation of 17 full research papers and two short papers. These contributions were carefully selected by the Program Committee from 39 high-quality submissions to the event. Each paper was carefully reviewed and discussed by at least three members of the PC. The technical program was then enriched with the additional contributions from its subevents as well as from DecisionCAMP 2021, a co-located event aimed at practitioners.

To select papers for this issue, a class of submissions having the highest reviewing scores and support from the PC members and reviewers was identified and their authors invited to submit extended and improved versions of their papers to this journal.

These submissions underwent several rounds of peer-review by at least three expert referees, resulting in four papers being accepted for inclusion in this issue. These are briefly presented next.

Extended High Utility Pattern Mining: An Answer Set Programming Based Framework and Applications. This work by Francesco Cauteruccio and Giorgio Terracina deals with the problem of finding patterns in a data set, which are relevant for a given application. Using the declarative language of Answer Set Programming (ASP), the authors present a framework where users can specify the criteria defining relevance in the specific use-case, together with a procedure to compute this relevance effectively. Beyond the theoretical framework, the paper includes applications using new definitions of utility and real-life scenarios.

Solving Rehabilitation Scheduling Problems via a Two-Phase ASP Approach. Remaining within the general topic of applications of ASP, this work by Matteo Cardellini and colleagues presents a general method for a scheduling problem where many different constraints need to be considered. The practical motivation of this work is to schedule rehabilitation therapy sessions for patients, which comply with a large set of constraints from the patient, the operator, the structure, and other limitations. Yet, the results are general enough to solve other complex scheduling problems as well.

Evaluating Datalog Tools for Meta-reasoning over OWL 2 QL. By "meta-reasoning," the authors of this work, Haya Majid Qureshi and Wolfgang Faber, refer to the task of reasoning about *properties* of concepts and relations in an ontology, rather than about the concepts themselves. Recent work on the topic has shown that meta-reasoning in the lightweight ontology language OWL 2 QL can be reduced to Datalog. Using this reduction as a starting point, the authors evaluate different tools which can handle Datalog for their suitability to meta-reasoning, concluding that it can be performed with a limited use of time and memory.

Distributed Subweb Specifications for Traversing the Web. Bart Bogaerts and colleagues analyse the use and applicability of link traversal query processing (LTQP) in practical scenarios. LTQP is known to suffer from limitations related to performance and quality issues. This work argues first for the practical need of LTQP in decentralised webs of data, and then proposes methods to alleviate its issues by moving the burden of finding adequate data sources from the consumer to the data publisher. The work shows empirically that these modifications improve performance and the quality of the service.

These submissions showcase the diversity and quality of the contributions to RuleML+RR 2021.

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This special issue would not have been possible without all the reviewers who agreed to evaluate the submissions and provided helpful and constructive comments. We would also like to acknowledge the hard work and effort of the organizers, PC members, and

reviewers whose efforts made RuleML+RR 2021, from which the papers of this special issue were intially identified, possible.