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Rules and Reasoning

4th International Joint Conference, RuleML+RR 2020
Oslo, Norway, June 29 – July 1, 2020
Proceedings

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Preface

These are the proceedings of the 4th International Joint Conference on Rules and Reasoning (RuleML+RR 2020). 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 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. 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. Building on the tradition of both, RuleML and RR, the joint conference series RuleML+RR aims at bridging academia and industry in the field of rules, and at fostering the cross-fertilization between the different communities focused on the research, development, and applications of rule-based systems. RuleML+RR aims at being the leading conference series for all subjects concerning theoretical advances, novel technologies, and innovative applications about knowledge representation and reasoning with rules.

To leverage these ambitions, RuleML+RR 2020 was organized as part of the virtual event Declarative AI 2020: Rules, Reasoning, Decisions, and Explanations, that was held between June 29 – July 1, 2020. This event was co-organized by SINTEF AS, University of Oslo, and Norwegian University of Science and Technology, under the umbrella of the SIRIUS Centre for Scalable Data Access. With its general topic “Declarative Artificial Intelligence,” a core objective of the event was to present the latest advancements in AI and rules, reasoning, decisions, and explanations and their adoption in IT systems. To this end, Declarative AI 2020 brought together co-located events with related interests. In addition to RuleML+RR, this included DecisionCAMP 2020 and the Reasoning Web Summer School (RW 2020).

The RuleML+RR 2020 conference moreover included three subevents:

1. Doctoral Consortium – an initiative to attract and promote student research in rules and reasoning, with the opportunity for students to present and discuss their ideas, and benefit from close contact with leading experts in the field.
2. International Rule Challenge – an initiative to provide competition among work in progress and new visionary ideas concerning innovative rule-oriented applications, aimed at both research and industry.
3. Industry Track – a forum for all sectors of industry and business (as well as public sector) to present, discuss, and propose existing or potential rule-based applications.

The program of the main track of RuleML+RR 2020 included the presentation of seven full research papers and six short papers. These contributions were carefully selected by the Program Committee (PC) from 30 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 2020, a co-located event aimed at practitioners.

At RuleML+RR 2020 and DecisionCAMP 2020, four invited keynotes were presented by experts in the field:

- Dieter Fensel (University of Innsbruck Austria): “Knowledge Graphs: Methodologies, Tools, and Selected Use Cases”
- Eyke Hüllermeier (Paderborn University, Germany): “Multilabel Rule Learning”
- Derek Miers, (Gartner, UK): “What the Real World Needs From Decision Management, Reasoning and AI”
- Arild Waaler (University of Oslo, Norway): “Requirements as Rules”

The chairs sincerely thank the keynote speakers for their contribution to the success of the event. The chairs also thank the PC members and the additional reviewers for their hard work in the careful assessment of the submitted papers. Further thanks go to all authors of contributed papers, in particular, for their efforts in the preparation of their submissions and the camera-ready versions within the established schedule. Sincere thanks are due to the chairs of the Doctoral Consortium, the Rule Challenge, and the Industry Track, and to the chairs of all co-located Declarative AI 2020 events. The chairs finally thank the entire organization team including the publicity, proceedings, and sponsorship chairs, who actively contributed to the organization and the success of the event.

A special thanks goes to all the sponsors of RuleML+RR 2020 and Declarative AI 2020: SINTEF AS, University of Oslo, Norwegian University of Science and Technology, SIRIUS Centre for Scalable Data Access, RuleML Inc., RR Association, and Springer. A special thanks also goes to the publisher, Springer, for their cooperation in editing this volume and publication of these proceedings. We are grateful to the sponsors of the RuleML+RR 2020 Awards: the RR Association sponsored the Best Paper Award and the Best Presentation Award, and Springer sponsored the Best Student Paper Award and the Rule Challenge Award.

June 2020

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Keynote Abstracts

Knowledge Graphs: Methodology, Tools and Selected Use Cases

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Abstract. Smart speakers such as Alexa and later Google Home introduced Artificial Intelligence (AI) in billions of households making AI an everyday experience. We can now look for information and order products and services without leaving the house or touching a computer. We just talk to a box and this thing will kindly perform the desired tasks for us. These new communication channels define a new challenge for successful eMarketing and eCommerce. Just running a traditional website with many colorful pictures is no longer state of the art. Actually, the web is currently reinventing itself by applying schema.org. Data, content, and services (i.e., resources) become semantically annotated allowing software agents, so-called bots, to search through the web understanding its content. The user nowadays consults their personal bot to find, aggregate, and personalize information, to reserve, book, or buy products and services. In consequence, it becomes increasingly important for providers of information, products, and services to be highly active and visible in these new online channels to ensure their future economic maturity.

In our talk, we discuss methods and tools helping to achieve these goals. The core is the development and application of machine processable (semantic) annotations of online resources as well as their aggregation in large Knowledge Graphs. This enables bots to not only understand a question but be able to answer a question in a knowledgeable way and to organize a useful dialogue. We discuss the process of knowledge generation, hosting, curation, and deployment, focusing on the use of the Knowledge Graph to support dialogue-based interfaces. We also provide an outlook on the broader application context of cyber-physical systems and physical agents.

Requirements as Rules

Arild Waaler

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Abstract. A requirement is a statement to the effect that some function or quality shall be fulfilled. The concept of a requirement, and the associated concept of verification, suggests an interpretation in logical terms, with requirement statements represented as rules and verification conditions expressed in terms of logical consequence. This talk presents an industry-driven initiative to implement this idea for the digitalization of requirement handling along the value chain of the oil and gas industry. I will sketch an OWL-based approach that is simple, standards-based, and scalable – features that are vital for implementation in industry. I will then address shortcomings of the model along with constraints for solutions.

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