Preface of the special issue
"Logic, Argumentation, and AI" in JLC

With the development of next generation artificial intelligence, the interplay between knowledge-based approaches and machine learning approaches is gaining momentum. This trend drives the researchers to pay attentions to possible and novel developments in relevant areas, either based on their theoretical foundations, or based on their efficient applications.

This special issue collects the newly developed works from logic, argumentation and artificial intelligence, to stimulate possible outcomes from their interactions. This volume includes 14 papers selected from 25 submissions accepted to the 2020 International Conferences on Logic and Artificial Intelligence at Zhejiang University (ZJULogAI). ZJULogAI was jointly organized by the University of Luxembourg and Zhejiang University as a three-day digital online event. It consists of three sub-events: the 5th Asian Workshop on Philosophical Logic (AWPL 2020), the 3rd International Conference on Logic and Argumentation (CLAR 2020), and the 6th Global Conference on Artificial Intelligence (GCAI 2020). Five experts (Christoph Benzmüller, Claude Sammut, Dag Westerståhl, Fei Wu, Marc van Zee) in logic and AI were invited to present their current work, covering the topics of ethical-legal AI systems, logic-based robots, big data intelligence, and natural language and AI.

The knowledge-based interplay between logic and artificial intelligence contributes most in this volume. The topics contain many mainstreams focusing on knowledge-based AI, including game theory, theories of belief and evidence, and common-sense reasoning. Liping Tang develops a signaling game for learning private belief at uncertain situations, and specifies when this kind of learning is possible. Thomas Studer and Michael Baur investigate an algebraic foundation of justification. This theoretical account has an interesting connection with data science. Thomas Ågotnes and Yì N. Wáng systematically explore standard notions of group knowledge and belief, under different assumptions. Sejla Dautovic, Dragan Doder and Zoran Ognjanovic provide logics for reasoning about degrees of confirmation. Takahiro Sawasaki and Katsuhiko Sano study three important theoretical aspects of common-sense modal predicate logics, to fulfill the void in

literature. Mina Young Pedersen, Sonja Smets and Thomas Ågotnes investigate relations between modal logics and social network, from various axiomatic possibilities of balance, to a qualitative measurement of polarization.

In addition, this volume covers the prevalent field of machine learning methods for logic and AI. The contributions focus on logical proofs in machine learning. Jan Gorzny, Ezequiel Postan and Bruno Woltzenlogel Paleo develop an efficient method for compressing first-order logic proofs based on lifting proof compression. Based on machine learning, Nicos Isaak and Loizos Michael design an automated system that is able to output the hardness-indexes of Winograd schemas. Cezary Kaliszyk, Stanisław Purgał and Julian Parsert propose an encoding that allows for logical properties to be preserved, their encoding is reversible and adequately viable for machine learning method.

Another possible and important interplay in this volume is the ingredient mixed by logic and argumentation. Xu Li and Yì N. Wáng introduce an epistemic logic in which belief is justified by abstract argumentation. This new setting can be naturally extended into the multi-agent environment. Weiwei Chen proposes various possible ways to aggregate argumentation, which can still preserve the standard properties in Dung's semantics.

This volume also touches other aspects of logic. Two possible resolutions of the Liar paradox are presented in this volume. Ming Hsiung studies the Solovay functions and presents a sufficient and necessary condition that leads to the liar paradox. In contrast, Marcos Cramer deals with the liar paradox along the paracomplete approach, and offers a variant of the Kleene logic to explain the issue. Ivo Deuntsch and Wojciech Dzik examine a possible unification by applying ideal algebraic as semantic base for modal logic.

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