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Enhancing AI Capabilities by Rules: Applications and Opportunities

Abstract:

In the recent years, Artificial Intelligence has seen a tremendous boost in interest, and it is widely considered key to future information technology. Much of this interest has been fueled by major advances in machine learning, which allow for solving a range of problems building on a data-driven, sub-symbolic approach. For the solutions available, however, important concerns are robustness, safety, explainability and trustworthiness in general. Apparently, symbolic approaches to AI that are built on formal (logic-based) models have much to offer in this regard. We consider Answer Set Programming (ASP), a prominent rule-based such approach that has been gaining popularity for declarative problem solving in many AI applications and beyond. We then consider developments in ASP to facilitate neuro-symbolic AI, aiming to bridge sub-symbolic and symbol-based AI, in order to enhance the capabilities of modern AI systems. We discuss opportunities for ASP, such as reasoning, model-building, and explainability, as well as challenges, e.g. dealing with uncertainty and seamless integration, which provide directions for future research.

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Bio:

Thomas Eiter is Professor of Knowledge-Based Systems in the Faculty of Informatics at the Vienna University of Technology (TU Wien), Austria, where he heads the Institute of Logic and Computation. He has been working in various fields of Computer Science and Artificial Intelligence; his main research interests are currently knowledge representation and reasoning, declarative problem solving, and stream reasoning.

Eiter has been serving on several editorial boards (e.g. of AIJ, JAIR, IEEE TKDE, and AI Review) and conference committees (recently, as Conference Chair of IJCAI 2019). He is an ACM Fellow, Fellow of the European Association for AI (EurAI), Member of the Austrian Academy of Sciences, and Member of the European Academy of Sciences (London). Furthermore, he was President of KR Inc. (2014/15) and is the current President of the Association for Logic Programming.