

## Preface

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*submitted 20 November 2020; revised 16 December 2020; accepted 17 December 2020*

This special issue of Theory and Practice of Logic Programming contains thoroughly revised and significantly extended versions of selected papers presented at the 15th International Conference on Logic Programming and Nonmonotonic Reasoning (LPNMR 2019), which was held in Philadelphia, PA (USA), on June 3–7, 2019, as part of the Philadelphia Logic Week (PLW) 2019.

PLW brought together several major events dedicated to the research on logic, knowledge representation, reasoning, transformations, and provenance: the 15th International Conference on Logic Programming and Nonmonotonic Reasoning (LPNMR 2019), the Datalog 2.0 Workshop, the 8th International Workshop on Bidirectional Transformations (Bx 2019), and the 11th International Workshop on Theory and Practice of Provenance (TaPP 2019).

The LPNMR conference series, established in 1991, is driven by key researchers in the field of LPNMR. It is a forum for exchanging ideas on declarative logic programming, nonmonotonic reasoning, and knowledge representation. LPNMR attracts a substantial number of highly visible submissions. The aim of the conference is to facilitate interactions between researchers and practitioners interested in the design and implementation of logic-based programming languages and database systems, and those working in knowledge representation and nonmonotonic reasoning. LPNMR strives to encompass theoretical and experimental studies that have led or will lead to advances in these areas, as well as their use in practical applications. To promote the bold goals of LPNMR 2019, this edition was located under the umbrella of PLW 2019, which brought together major events mentioned in the opening sentence.

PLW and LPNMR 2019 edition of the conference attempted to raise submissions devoted toward use of techniques from logic programming and nonmonotonic reasoning in emerging applications stemming from such areas as deep learning, robotics, cybersecurity, modeling cyberphysical systems, and human-aware AI. Aspects that have been studied in commonsense reasoning, inconsistency tolerance, and handling of dynamic knowledge appear essential in enabling these emerging applications to provide explanations and justifications of their outcomes. LPNMR 2019 aimed to bring together researchers from the field of logic programming and nonmonotonic reasoning and from application areas of

the aforementioned kind in order to share research experiences, promote collaboration, and identify directions for joint future research.

LPNMR 2019 received 45 submissions, among them 6 were summary-reject and 39 (35 long and 4 short papers) went into the reviewing phase. Each submission was reviewed by at least three program committee members. From the 35 long submissions, 22 were accepted as regular long papers and 2 as short papers. In addition, one of the short submissions was accepted. Several papers were encouraged to submit the long versions of their work for Rapid Publication Track to the journal of Theory and Practice of Logic Programming. All these submissions were subject to a rigorous reviewing process. This special issue is the result of these efforts and nicely reflects the wide range of topics covered by LPNMR 2019 ranging from fundamental theoretical contributions to real-world applications. We give a short summary of these papers next.

In their paper “Splitting Epistemic Logic Programs,” Pedro Cabalar, Jorge Fandinno, and Luis Fariñas del Cerro contribute to the research on an extension of the traditional stable semantics of logic programs that permits modal operators to reason over the set of stable models of a program. These kind of programs, originally introduced by Michael Gelfond in 1991, have received significant interest by the community in the last years. The paper in this volume investigates how the central concept of splitting can be applied to epistemic programs. Among the main findings is that most of the existing semantics for such programs do not allow for a natural splitting property. Results of this kind are not only of theoretical value. Since splitting is a key for more efficient implementations, understanding this concept for epistemic programs is also valuable from a practical perspective. The conference version of this paper was selected by the LPNMR PC Chairs for the Springer Best Paper Award.

In the paper “Elaboration Tolerant Representation of Markov Decision Process via Decision-Theoretic Extension of Probabilistic Action Language pBC+,” Yi Wang and Joohyung Lee investigate ways to extend a probabilistic action language with the concept of utility in decision theory. Answer-set programming (ASP) is used here to define the semantics of this language which therefore directly inherits the nonmonotonic features of the ASP semantics. More specifically, this is accomplished by extending the ASP dialect of LP<sup>MLN</sup> with the notion of utility. Moreover, it is shown that the new semantics can be alternatively defined in terms of Markov Decision Process. Also a prototypical implementation is presented.

An exciting application for ASP is presented by Dirk Abels, Julian Jordi, Max Ostrowski, Torsten Schaub, Ambra Toletti, and Philipp Wanko. Their paper “Train Scheduling with Hybrid Answer Set Programming” shows how large-scale, real-world train scheduling instances from the Swiss Federal Railways can be solved by contemporary ASP methods and systems. More specifically, in order to capture the required types of constraints induced by routing and scheduling, the authors present encodings that rely on a hybrid approach using difference constraints (over integers). Their experiments, which include real-world instances up to 467 train lines, show the potential of the proposed encoding, providing high-quality train schedules spanning 6 h within minutes.

Finally, also the paper “Manipulation of Articulated Objects using Dual-arm Robots via Answer Set Programming” presents ASP in action. The authors Riccardo Bertolucci, Alessio Capitanelli, Carmine Dodaro, Nicola Leone, Marco Maratea, Fulvio Mastrogiovanni, and Mauro Vallati introduce a framework for automated manipulation of objects

in a robot architecture. In this context, strategies are often special-tailored for the particular setting at hand, thus lacking flexibility and declarativity. The framework proposed in this paper overcomes this shortcoming thanks to ASP which is used for representing the configuration of the articulated object, for consistency checking, and for planing the sequence of manipulation actions. Moreover, the concept of macro action is taken into account in order to generate more compact plans.

We would like to thank all authors for preparing, submitting, and revising their contributions to this special issue. We also thank all members of the LPNMR 2019 Program Committee for their valuable work in reviewing the submissions, all conference participants for fruitful discussions, and the local organization team of PLW 2019 under the lead of Marcello Balduccini for being our hosts. Special thanks also to Andreas Pieris and Mario Alviano as Chairs of Datalog 2.0 for the excellent collaboration. To make this special issue possible, we are particularly grateful to Mirek Truszczyński for his encouragement and guidance through the whole process. Last but not least, we are deeply indebted to all reviewers of this special issue for their timely expertise in carefully reviewing the contributions.