Introduction to the 36th International Conference on Logic Programming Special Issue I

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This issue and its companion, the following one in this volume, contain the regular papers of the 36th International Conference on Logic Programming (ICLP 2020), held virtually in Rende (CS), Italy, from September 20 to September 25, 2020. This was the first time that the ICLP and its collocated events were run remotely, prompted by the COVID-19 pandemic.

Since the first conference held in Marseille in 1982, ICLP has been the premier international event for presenting research in logic programming. The scope of the conference covers all areas of logic programming including:

**Foundations:** Semantics, Formalisms, Answer-Set Programming, Non-monotonic Reasoning, Knowledge Representation.

**Declarative Programming:** Inference engines, Analysis, Type and mode inference, Partial evaluation, Abstract interpretation, Transformation, Validation, Verification, Debugging, Profiling, Testing, Logic-based domain-specific languages, constraint handling rules.

**Related Paradigms and Synergies:** Inductive and Co-inductive Logic Programming, Constraint Logic Programming, Interaction with SAT, SMT and CSP solvers, Logic programming techniques for type inference and theorem proving, Argumentation, Probabilistic Logic Programming, Relations to object-oriented and Functional programming, Description logics, Neural-Symbolic Machine Learning, Hybrid Deep Learning and Symbolic Reasoning.

**Implementation:** Concurrency and distribution, Objects, Coordination, Mobility, Virtual machines, Compilation, Higher Order, Type systems, Modules, Constraint handling rules, Meta-programming, Foreign interfaces, User interfaces.

Besides the main track, ICLP 2020 included the following additional tracks:

- **Applications Track**: This track invites submissions of papers on emerging and deployed applications of LP, describing all aspects of the development, deployment, and evaluation of logic programming systems to solve real-world problems, including interesting case studies and benchmarks, and discussing lessons learned.

- **Sister Conferences and Journal Presentation Track**: This track provides a forum to discuss important results related to logic programming that appeared recently (from January 2018 onwards) in selective journals and conferences but have not been previously presented at ICLP.

- **Research Challenges in Logic Programming Track**: This track invites submissions of papers describing research challenges that an individual researcher or a research group is currently attacking. The goal of the track is to promote discussions, exchange of ideas, and possibly stimulate new collaborations. Papers submitted to this track do not go through the usual review and will not be published in the proceedings they will be presented at the conference.

- **Women in Logic Programming Track**: This track aims to increase the visibility and impact of women in LP. It invites submissions of papers in all areas of logic programming co-authored by at least one woman and includes invited talks and presentations by women in logic programming.

The organizers of ICLP 2020 were:

**General Chairs**

Sergio Greco, University of Calabria, Italy
Nicola Leone, University of Calabria, Italy

**Program Chairs**

Francesco Ricca, University of Calabria, Italy
Alessandra Russo, Imperial College London, UK

**Organizing Chairs**

Marco Calautti, University of Calabria, Italy
Carmine Dodaro, University of Calabria, Italy

**Publicity Chairs**

Laura Pandolfo, Università degli Studi di Sassari, Italy

**Applications Track Chairs**

Alexander Artikis, University of Piraeus & NCSR Demokritos, Greece
Angelika Kimmig, Cardiff University, UK
Research Challenges in Logic Programming Track Chairs
   Gerhard Friedrich, Universität Klagenfurt, Austria
   Fabrizio Riguzzi, Università di Ferrara, Italy

Sister Conferences and Journal Presentation Track Chairs
   Paul Fodor, Stony Brook University, USA
   Marco Maratea, University of Genova, Italy

Women in Logic Programming Special Session Chairs
   Francesca Alessandra Lisi, University of Bari Aldo Moro, Italy
   Alessandra Mileo, INSIGHT Centre for Data Analytics, Dublin City University, Ireland

Workshops Chair
   Martin Gebser, University of Potsdam, Germany

Doctoral Consortium Chairs
   Daniela Inclezan, Miami University, USA
   Bart Bogaerts, Vrije Universiteit Brussel, Belgium

ASP Programming Competition Chairs
   Jessica Zangari, University of Calabria, Italy
   Markus Hecher, Vienna University of Technology, Austria

Three kinds of submissions were accepted:

- Technical papers for technically sound, innovative ideas that can advance the state of logic programming.
- Application papers that impact interesting application domains.
- System and tool papers which emphasize novelty, practicality, usability, and availability of the systems and tools described.

ICLP adopted the hybrid publication model used in all recent editions of the conference, with journal papers and Technical Communications (TCs), following a decision made in 2010 by the Association for Logic Programming. Papers of the highest quality were selected to be published as rapid publications in this special issue of TPLP. The TCs comprise papers which the Program Committee (PC) judged of good quality but not yet of the standard required to be accepted and published in TPLP as well as extended abstracts from the different tracks and dissertation project descriptions stemming from the Doctoral Program (DP) held with ICLP.

We have received 88 submissions of abstracts, of which 77 resulted in paper submissions, distributed as follows: ICLP main track (53 papers), Applications track (seven full papers and one short paper), Sister Conferences and Journal Presentation track (six papers), Women in Logic Programming session (five full papers and three short papers) and Research Challenge Track (two short papers). The Program Chairs organized the refereeing process that involved the program committee and several external reviewers. Each technical paper was reviewed by at least three referees who provided detailed written evaluations. This yielded submissions short-listed
as candidates for rapid communication. The authors of these papers revised their submissions in light of the reviewers suggestions, and all these papers were subject to a second round of reviewing. Of these candidates papers, 27 were accepted to appear for publication in Theory and Practice of Logic Programming as rapid communications. In addition, the Program Committee recommended 40 papers to be accepted as technical communications, to appear at Electronic Proceedings in Theoretical Computer Science (EPTCS) either as full papers or extended abstracts, of which 38 were also presented at the conference (two were withdrawn).

The 27 papers selected from several tracks of the conference program for publication in Theory and Practice of Logic Programming appear in two issues of this journal, the present issue (fourteen papers) and the following one (thirteen papers). The present issue contains the following fourteen papers.

Papers from the Main Track.

- Alessandro Burigana, Francesco Fabiano, Agostino Dovier and Enrico Pontelli. Modelling Multi-Agent Epistemic Planning in ASP
- Carmine Dodaro, Thomas Eiter, Paul Ogris and Konstantin Schekotihin. Managing caching strategies for stream reasoning with reinforcement learning
- Elena Bellodi, Marco Alberti, Fabrizio Riguzzi and Riccardo Zese. MAP Inference for Probabilistic Logic Programming
- Fred Mesnard, Etienne Payet and German Vidal. Concolic Testing in CLP
- George Baryannis, Ilias Tachmazidis, Sotiris Batsakis, Grigoris Antoniou, Mario Alviano and Emmanuel Papadakis. A Generalised Approach for Encoding and Reasoning with Qualitative Theories in Answer Set Programming
- Giovambattista Ianni, Francesco Pacenza and Jessica Zangari. Incremental maintenance of overgrounded logic programs with tailored simplifications.
- Jorge Fandinno, Vladimir Lifschitz, Patrick Lühne and Torsten Schaub. Verifying Tight Logic Programs with anthem and Vampire
- Laura Giordano and Daniele Theseider Dupre*. An ASP approach for reasoning in a concept-aware multipreferential lightweight DL.
- Pedro Cabalar, Jorge Fandinno and Yuliya Lierler. Modular Answer Set Programming as a Formal Specification Language.
- Pedro Cabalar, Martín Diéguez, Torsten Schaub and Anna Schuhmann. Towards Metric Temporal Answer Set Programming
Richard Taupe, Antonius Weinzierl and Gerhard Friedrich. Conflict Generalisation in ASP: Learning Correct and Effective Non-Ground Constraints

In addition to the presentations of accepted papers, the technical program of ICLP 2020 included four invited talks for the Main Track:

- Luc De Raedt. From Probabilistic Logics to Neuro-Symbolic Artificial Intelligence.
- Esra Erdem. Applications of Answer Set Programming where Theory meets Practice.

and one invited talk in the Women in Logic Programming Track:


Furthermore, after a thorough examination of citation indices (e.g., Web of Science, Google Scholar), two test-of-time awards were identified:


We are deeply indebted to the Program Committee members and external reviewers, as the conference would not have been possible without their dedicated, enthusiastic and outstanding work. The Program Committee members of ICLP 2020 were:

Mario Alviano, Michael Gelfond, Ricardo Rocha
Nicos Angelopoulos, Laura Giordano, Chiaki Sakama
Marcello Balduccini, Gopal Gupta, Torsten Schaub
Mutsunori Banbara, Michael Hanus, Konstantin Schekotihin
Chitta Baral, Manuel V. Hermenegildo, Tom Schrijvers
Roman Bartáček, Katsumi Inoue, Guillermo R. Simari
Christoph Benzmüller, Tomi Janhunen, Tran Cao Son
Alex Brik, Jianmin Ji, Mohan Sridharan
François Bry, Nikos Katzouris, Theresa Swift
Pedro Cabalar, Michael Kifer, Paul Tarau
Francesco Calimeri, Zeynep Kızıltan, Hans Tompits
Manuel Carro, Ekaterina Komendantskaya, Francesca Toni
Angelos Charalambidis, Evelina Lamma, Irina Trubitsyna
Michael Codish, Michael Leuschel, Mirek Truszczynski
Stefania Costantini, Vladimir Lifschitz, German Vidal
Marc Denecker, Francesca Alessandra Lisi, Alicia Villanueva
Martín Diéguez, Yanhong A. Liu, David Warren
Carmine Dodaro  Marco Maratea  Jan Wielemaker
Agostino Dovier  Viviana Mascardi  Stefan Woltran
Thomas Eiter  Yunsong Meng  Jia-Huai You
Wolfgang Faber  Emilia Oikarinen  Shiqi Zhang
Thom Fruehwirth  Magdalena Ortiz  Neng-Fa Zhou
Marco Gavanelli  Simona Perri
Martin Gebser  Enrico Pontelli

The Program Committee members of the Applications Track were:

Nicos Angelopoulos  Gopal Gupta  Mohan Sridharan
Chitta Baral  Jianmin Ji  Paul Tarau
Alex Brik  Nikos Katzouris  David Warren
François Bry  Zeynep Kiziltan  Jan Wielemaker
Francesco Calimeri  Marco Maratea  Shiqi Zhang
Angelos Charalambidis  Yunsong Meng  Neng-Fa Zhou
Martín Diéguez  Konstantin Schekotihin
Martin Gebser  Tom Schrijvers

The external reviewers were:

Gianvincenzo Alfano  Rafael Kiesel  Francesco Parisi
Elena Bellodi  Vladimir Komendantskiy  Sascha Rechenberger
Pierre Carbonnelle  François Laferrière  Javier Romero
Matthew Castellana  Pedro Lopez-Garcia  Elmer Salazar
Wolfgang Dvořák  Julio Mariño  Mantas Simkus
Serdar Erbatur  Elena Mastria  Takehide Soh
Francesco Fabiano  Djordje Markovich  Fabio Tardivo
Jorge Fandinno  Simon Marynissen  Yi Tong
Andrea Formisano  José F. Morales  David Tuckey
David Fuenmayor  Johannes Oetsch  Sarat Chandra Varanasi

We also express our gratitude to the full ICLP 2020 organization committee. Further, we thank Torsten Schaub as current President and Thomas Eiter as incoming President of the Association of Logic Programming (ALP), Marco Gavanelli, in the role of conference-coordinator for ALP, and all the members of the ALP Executive Committee. We also thank Mirek Truszczyński, Editor-in-Chief of TPLP and the staff of Cambridge University Press for their assistance. Finally, we wish to thank each author of every submitted paper, since their efforts keep the conference alive, and the participants to ICLP for bringing and sharing their ideas and latest developments. This is particularly appreciated in this 36th edition of the conference which has run during the unprecedented time of the COVID-19 pandemic.