

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.

Applications: Databases, Big Data, Data Integration and Federation, Software Engineering, Natural Language Processing, Web and Semantic Web, Agents, Artificial Intelligence, Bioinformatics, Education, Computational life sciences, Education, Cybersecurity, and Robotics.

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
- *Antonius Weinzierl, Richard Taupe and Gerhard Friedrich.* Advancing Lazy-Grounding ASP Solving Techniques – Restarts, Phase Saving, Heuristics, and More.
- *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
- *Farhad Shakerin and Gopal Gupta.* White-box Induction From SVM Models.
- *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
- *Gianvincenzo Alfano, Sergio Greco, Francesco Parisi and Irina Trubitsyna .* On the Semantics of Abstract Argumentation Frameworks: A Logic Programming Approach”.
- *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.
- *Joao Marquez-Silva.* Formal Reasoning Methods for Explainability in Machine Learning.
- *Francesca Rossi.* When Is It Morally Acceptable to Break the Rules? A Preference-Based Approach.

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

- *Marina De Vos.* Norms, Policy and Laws: Modelling, Compliance and Violation.

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

- The John Alan Robinson 20 year test of time award: *Marc Deneker.* Extending Classical Logic with Inductive Definitions. Computational Logic, LNCS n. 1861 pp. 703-717, Springer 2000.
- The Alain Colmerauer 10 year test of time award: *Johannes Oetsch, Jörg Pührer, Hans Tompits.* Catching the Ouroboros: On debugging non-ground answer-set programs. Theory and Practice of Logic Programming, 10(4-6): 513-529, ICLP 2010.

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 Barták	Katsumi Inoue	Guillermo R. Simari
Christoph Benz Müller	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 Kiziltan	Hans Tompits
Manuel Carro	Ekaterina Komendantskaya	Francesca Toni
Angelos Charalambidis	Evelina Lamma	Irina Trubitsyna
Michael Codish	Michael Leuschel	Mirek Truszczyński
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	Jose 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.