Preface

This volume contains the proceedings of the 27th International Conference on Automated Deduction (CADE-27). The conference was hosted by the Universidade Federal do Rio Grande do Norte, in Natal, Brazil, during August 23–30, 2019. CADE is the major forum for the presentation of research in all aspects of automated deduction, including foundations, applications, implementations, and practical experience.

The Program Committee accepted 34 papers (27 full papers and 7 system descriptions) out of 65 submissions (53 full papers and 12 system descriptions). Each submission was reviewed by at least three Program Committee (PC) members or external reviewers appointed by the PC members in charge. The main criteria for evaluation were originality and significance, technical quality and completeness, comparison with related work and completeness of references, quality of presentation, clarity, and readability. All papers containing experimental data were also evaluated with respect to reproducibility.

The technical program of the conference included three invited talks:

- Cas Cremers (CISPA Helmholtz Center for Information Security, Saarbrücken, Germany): "Automated Reasoning for Security Protocols"
- Assia Mahboubi (Inria, LS2N, Université de Nantes, France and Vrije Universiteit Amsterdam, the Netherlands): "Computer Deduction and (Formal) Proofs in Mathematics"
- Cesare Tinelli (Department of Computer Science, The University of Iowa, USA): "From Counter-Model-based Quantifier Instantiation to Quantifier Elimination in SMT"

During the conference, the Herbrand Award for Distinguished Contributions to Automated Reasoning was presented to Nikolaj Bjørner and Leonardo de Moura in recognition of their numerous and important contributions to SMT solving, including its theory, implementation, and application to a wide range of academic and industrial needs. The Selection Committee for the Herbrand Award consisted of Bruno Dutertre, Juergen Giesl, Dale Miller (chair), and Larry Paulson.

The Thoralf Skolem Awards were conferred this year to reward CADE papers that have passed the test of time by being most influential papers in the field for 1979, 1990, 1999 and 2009. The authors receiving an award were:

- Peter Andrews for the paper entitled "General Matings" published in the CADE-4 proceedings in 1979.
  The paper is recognized for its invention of the generalized mating method for constructing refutations of formulas in conjunctive normal form. This development paved the way for the subsequent construction of many non-resolution methods in automated deduction, including the well-known connection method.

– Leo Bachmair and Harald Ganzinger for the paper entitled "On Restrictions of Ordered Paramodulation with Simplification" published in the CADE-10 proceedings in 1990.
  The paper is recognized for its development of the superposition calculus for equational first-order clauses alongside a new and powerful framework for proving completeness and accommodating redundancy. This framework forms the basis of many advanced modern theorem provers, and has been highly influential in accelerating progress in the area of automated deduction.
– Christoph Weidenbach for the paper "Towards an Automated Analysis of Security Protocols" published in the CADE-16 proceedings in 1999.
  The paper is recognized for two main contributions to automated deduction: first, its novel application of general theorem proving techniques to a key-exchange security protocol; and, second, its development of new decidability and undecidability results for fragments of monadic Horn theories.
– Rajeev Goré and Florian Widmann for the paper entitled "An Optimal On-the-Fly Tableau-Based Decision Procedure for PDL-Satisfiability" published in the CADE-22 proceedings in 2009.
  The paper is recognized for presenting the first decision procedure for propositional dynamic logic which is both theoretically optimal and effective in practice. Previous decision procedures are either suboptimal in the worst case, or worst-case optimal but with poor average-case performance. The solution in this paper thereby closed a problem that had been open for almost 30 years.

The conference issued a call for workshops out of which the following five proposals were approved:

– Automated Reasoning: Challenges, Applications, Directions, Exemplary Achievements (ARCADE)
– Deduction Mentoring Workshop (DeMent 2019)
– Logical and Semantic Frameworks, with Applications (LSFA)
– Proof eXchange for Theorem Proving (PxTP)
– Theorem Prover Components for Educational Software (ThEdu'19)

In addition, the conference included a two-day program of introductory tutorials. The first day was dedicated to tutorials given by local organizers, with an aim to promote among local and foreign students the research on automated reasoning carried out locally:

– Cláudia Nalon: "Machine Oriented Reasoning"
– Carlos Olarte: "Building Theorem Provers Using Rewriting Logic"
– Giselle Reis: "Intuitionistic Logic"

A one-day tutorial, titled "Build Your Own First-Order Prover" was given by Jens Otten on the second day.

During the conference, the CADE-27 ATP System Competition – CASC-27 – was held, organized by Geoff Sutcliffe. The description of the competition is available as an abstract in these proceedings.

I would like to thank the many people without whom the conference would not have been possible. First, I would like to thank all authors who submitted papers, all participants of the conference as well as the invited keynote speakers, the tutorial speakers, and the workshop organizers for their contributions. I am very grateful to the members of the PC and the external reviewers for carefully reviewing and selecting the papers. In particular, I would like to thank Philipp Rümmer and Roberto Sebastiani who acted as chairs for the papers I was conflicting with. Many thanks to Andrei Voronkov for providing the EasyChair system which greatly facilitated the reviewing process, the electronic PC meeting, and the preparation of the proceedings. I also thank the Trustees of CADE Inc. for their advice and support. Special thanks go to Elaine Pimentel, who as conference chair was involved in almost every aspect of the organization of the conference, and the members of the local organization team, Carlos Olarte, João Marcos, Cláudia Nalon, and Giselle Reis, for the tremendous effort they devoted to the organization of the conference. I am extremely grateful to Geoff Sutcliffe, for organizing CASC and being the publicity chair, and to Giles Reger, the workshop chair.

CADE-27 received support from many organizations. On behalf of all organizers, I would like to thank the Universidade Federal do Rio Grande do Norte, DMAT, ProEx, PPG, PROPESQ, the Universidade de Brasilia, CAPES, CNPq, CMU Qatar, the Association for Symbolic Logic, IBM, Imandra, Microsoft, and Springer.

August 2019 Pascal Fontaine

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