# Table of Contents

**Session 1: Invited Talk**

SAT-Based Counterexample Guided Abstraction Refinement in Model Checking . . . . . 1
*Edmund M. Clarke*

**Session 2**

Equational Abstractions . . . . . 2
*José Meseguer, Miguel Palomino, and Narciso Martí-Oliet*

Deciding Inductive Validity of Equations . . . . . 17
*Jürgen Giesl and Deepak Kapur*

Automating the Dependency Pair Method . . . . . 32
*Nao Hirokawa and Aart Middeldorp*

An AC-Compatible Knuth-Bendix Order . . . . . 47
*Konstantin Korovin and Andrei Voronkov*

**Session 3**

The Complexity of Finite Model Reasoning in Description Logics . . . . . 60
*Carsten Lutz, Ulrike Sattler, and Lidia Tendera*

Optimizing a BDD-Based Modal Solver . . . . . 75
*Guoqiang Pan and Moshe Y. Vardi*

A Translation of Looping Alternating Automata into Description Logics . . 90
*Jan Hladik and Ulrike Sattler*

**Session 4**

Foundational Certified Code in a Metalogical Framework . . . . . 106
*Karl Crary and Susmit Sarkar*

Proving Pointer Programs in Higher-Order Logic . . . . . 121
*Farhad Mehta and Tobias Nipkow*

ʎ . . . . . 136
*Dimitri Hendriks and Vincent van Oostrom*

Subset Types and Partial Functions . . . . . 151
*Aaron Stump*

**Session 5**

Reasoning about Quantifiers by Matching in the E-graph . . . . . 166
*Greg Nelson*

**Session 6**

A Randomized Satisfiability Procedure for Arithmetic and Uninterpreted Function Symbols . . . . . 167
*Sumit Gulwani and George C. Necula*

Superposition Modulo a Shostak Theory . . . . . 182
*Harald Ganzinger, Thomas Hillenbrand, and Uwe Waldmann*

Canonization for Disjoint Unions of Theories . . . . . 197
*Sava Krstić and Sylvain Conchon*

Matching in a Class of Combined Non-disjoint Theories . . . . . 212
*Christophe Ringeissen*

**Session 7**

Reasoning about Iteration in Gödel's Class Theory . . . . . 228
*Johan Gijsbertus Frederik Belinfante*

Algorithms for Ordinal Arithmetic . . . . . 243
*Panagiotis Manolios and Daron Vroon*

Certifying Solutions to Permutation Group Problems . . . . . 258
*Arjeh Cohen, Scott H. Murray, Martin Pollet, and Volker Sorge*

**Session 8: System Descriptions**

**TRP**++ 2.0: A Temporal Resolution Prover . . . . . 274
*Ullrich Hustadt and Boris Konev*

IsaPlanner: A Prototype Proof Planner in Isabelle . . . . . 279
*Lucas Dixon and Jacques Fleuriot*

`'Living Book' :- 'Deduction', 'Slicing', 'Interaction'` . . . . . 284
*Peter Baumgartner, Ulrich Furbach, Margret Gross-Hardt, and Alex Sinner*

The Homer System . . . . . 289
*Simon Colton and Sophie Huczynska*

**Session 9: CASC-19 Results**

The CADE-19 ATP System Competition . . . . . 295
*Geoff Sutcliffe and Christian Suttner*

**Session 10: Invited Talk**

Proof Search and Proof Check for Equational and Inductive Theorems .... 297
*Eric Deplagne, Claude Kirchner, Hélène Kirchner, and Quang Huy Nguyen*

**Session 11: System Descriptions**

The New WALDMEISTER Loop at Work ..... 317
*Jean-Marie Gaillourdet, Thomas Hillenbrand, Bernd Löchner, and Hendrik Spies*

About ✓eriFun ..... 322
*Christoph Walther and Stephan Schweitzer*

How to Prove Inductive Theorems? QUODLIBET! ..... 328
*Jürgen Avenhaus, Ulrich Kühler, Tobias Schmidt-Samoa, and Claus-Peter Wirth*

**Session 12: Invited Talk**

Reasoning about Qualitative Representations of Space and Time ..... 334
*Anthony G. Cohn*

**Session 13**

Superposition with Equivalence Reasoning and Delayed Clause Normal Form Transformation ..... 335
*Harald Ganzinger and Jürgen Stuber*

The Model Evolution Calculus ..... 350
*Peter Baumgartner and Cesare Tinelli*

Translation of Resolution Proofs into Short First-Order Proofs without Choice Axioms ..... 365
*Hans de Nivelle*

Efficient Instance Retrieval with Standard and Relational Path Indexing .. 380
*Alexandre Riazanov and Andrei Voronkov*

**Session 14**

Monodic Temporal Resolution ..... 397
*Anatoly Degtyarev, Michael Fisher, and Boris Konev*

A Principle for Incorporating Axioms into the First-Order Translation of Modal Formulae ..... 412
*Renate A. Schmidt and Ullrich Hustadt*

Schematic Saturation for Decision and Unification Problems . . . . . 427
*Christopher Lynch*

**Session 15**

Unification Modulo *ACUI* Plus Homomorphisms/Distributivity . . . . . 442
*Siva Anantharaman, Paliath Narendran, and Michael Rusinowitch*

Source-Tracking Unification . . . . . 458
*Venkatesh Choppella and Christopher T. Haynes*

Optimizing Higher-Order Pattern Unification . . . . . 473
*Brigitte Pientka and Frank Pfenning*

Decidability of Arity-Bounded Higher-Order Matching . . . . . 488
*Manfred Schmidt-Schauß*

**Author Index** . . . . . 503