

25th International Conference on Theory and Applications of Satisfiability Testing

SAT 2022, August 2–5, 2022, Haifa, Israel


Edited by

Kuldeep S. Meel

Ofer Strichman



Editors

Kuldeep S. Meel 

School of Computing, National University of Singapore, Singapore
meel@comp.nus.edu.sg

Ofer Strichman 

Technion, Haifa, Israel
ofers@technion.ac.il

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■ Preface

This volume contains the papers presented at SAT 2022, the 25th International Conference on Theory and Applications of Satisfiability Testing, held during August 2–5, 2022 in Haifa, Israel. SAT 2022 was part of the Federated Logic Conference (FLoC) 2022 and was hosted by the Department of Computer Science at the Technion campus.

The International Conference on Theory and Applications of Satisfiability Testing (SAT) is the premier annual meeting for researchers focusing on the theory and applications of the propositional satisfiability problem, broadly construed. Aside from plain propositional satisfiability, the scope of the meeting includes Boolean optimization, including MaxSAT and pseudo-Boolean (PB) constraints, model counting, quantified Boolean formulas (QBF), satisfiability modulo theories (SMT), and constraint programming (CP) for problems with clear connections to Boolean reasoning. Many hard combinatorial problems can be tackled using SAT-based techniques, including problems that arise in formal verification, artificial intelligence, operations research, computational biology, cryptology, data mining, machine learning, mathematics, etc. Indeed, the theoretical and practical advances in SAT research over the past 25 years have contributed to making SAT technology an indispensable tool in a variety of domains.

SAT 2022 welcomed scientific contributions addressing different aspects of SAT interpreted in a broad sense, including (but not restricted to) theoretical advances (such as exact algorithms, proof complexity, and other complexity issues), practical search algorithms, knowledge compilation, implementation-level details of SAT solvers and SAT-based systems, problem encodings and reformulations, applications (including both novel application domains and improvements to existing approaches), as well as case studies and reports on findings based on rigorous experimentation.

This year, we adopted a two-phase reviewing model. After the first phase, papers received one of the three notifications: *Accept*, *Reject*, and *Revise and Resubmit*. The papers that received *Revise and Resubmit* were invited for re-submission, with specific requests from the reviewers. They were then re-reviewed.

A total of 70 papers were submitted to SAT 2022. Unlike previous years, there was no separate category for short papers this year. Each submission was reviewed by three Program Committee members and their selected external reviewers. The review process included an author response period, during which the authors of submitted papers were given the opportunity to respond to the initial reviews of their submissions. To reach a final decision, a Program Committee discussion period followed the author response period. External reviewers supporting the Program Committee were also invited to participate directly in the discussions for the papers they reviewed.

After the first phase, 25 papers were accepted while seven papers received notification of *revise and resubmit*. Following the second phase, six out of seven papers were accepted. Therefore, in total 31 out of 70 submissions were accepted.

The Program Committee singled out the following two submissions for the Best Paper Award:

- Milan Mosse, Harry Sha and Li-Yang Tan “A generalization of the Satisfiability Coding Lemma and its applications”
- Stephan Gocht, Ruben Martins, Jakob Nordström and Andy Oertel “Certified CNF Translations for Pseudo-Boolean Solving”

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In addition, the following paper received the Best Student Paper Award:

- Markus Anders “SAT Preprocessors and Symmetry”

This year is a special year for the SAT community: it is the 25th year of the SAT conference. Therefore, in addition to presentations on the accepted papers, the scientific program of SAT included a retrospective session to celebrate some major developments in the field over the past 25 years. Jakob Nordström took on the challenging task conceptualizing and organizing such a session: five speakers were invited to present a summary of selected achievements.

- Alexander Nadel: “Conflict-Driven SAT Solving”
- Marijn Heule: “Modern SAT Techniques ”
- Jeremias Berg: “Maximum Satisfiability for Real-World Optimization”
- Armin Biere: “Trusting SAT Solvers”
- Olaf Beyersdorff: “Proof complexity and SAT solving”

Each of the invited speakers presented a broad overview of a particular direction of research, in a celebratory style that sought to highlight achievements of the community at large.

Three additional keynote and plenary speakers presented in talks held jointly with with other conferences of FLoC: Donald Kunth, Orna Kupferman, and Catuscia Palamidessi

SAT, together with the other constituent conferences of FLoC, hosted various associated events. In particular, the following four workshops were held, affiliated with SAT:

- Logic-based Methods in Machine Learning, organized by Alexey Ignatiev and Stefan Szeider
- Proof Complexity, organized by Olaf Beyersdorff, Jan Johannsen, and Marc Vinyals
- Pragmatics of SAT, organized by Matti Järvisalo and Daniel Le Berre
- Quantified Boolean Formulas and Beyond, organized by Hubie (Hubert) Chen, Florian Lonsing, Martina Seidl, and Friedrich Slivovsky,
- Counting and Sampling, organized by Johannes Fichte, Markus Hecher, Kuldeep S. Meel

As in previous years, the results of several competitive events were announced at SAT:

- MaxSAT Evaluation 2022, organized by Fahiem Bacchus, Matti Järvisalo, Jeremias Berg, Ruben Martins, and Andreas Niskanen,
- Model Counting Competition 2022, organized by Markus Hecher and Johannes K. Fichte,
- SAT Competition 2022, organized by Marijn Heule, Markus Iser, Matti Jarvisalo, Martin Suda, and Tomáš Balyo, and
- QBFEVAL 2022, organized by Luca Pulina, Martina Seidl, and Ankit Shukla

We thank everyone who contributed to making SAT 2022 a success. We are indebted to the Program Committee members and the external reviewers, who dedicated their time to review and evaluate the submissions to the conference. We thank the authors of all submitted papers for their contributions, the SAT association for their guidance and support in organizing the conference, the EasyChair conference and program management system for facilitating the submission and selection of papers, as well as scheduling of the final program. We wish to thank the workshop chair, Alexander Nadel, the webmaster, Jiong Yang, and all the organizers of the SAT affiliated workshops and competitions. Special thanks goes to the organizers of FLoC, in particular to Orna Grumberg and Eran Yahav, for coordinating the various conferences and taking care of the local arrangements.

We gratefully thank the sponsors of SAT 2022: RenYing Technology, the Artificial Intelligence journal, CAS Merlin, and the SAT association for the financial and organizational support for SAT 2022. Thank you.

July 2022

Kuldeep S. Meel
Ofer Strichman

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■ List of Authors


Josep Alòs  (25)
Logic & Optimization Group (LOG),
University of Lleida, Spain


Markus Anders (1)
TU Darmstadt, Germany


Carlos Ansótegui  (25)
Logic & Optimization Group (LOG),
University of Lleida, Spain


Gilles Audemard  (28)
CRIL, Univ. Artois & CNRS, Lens, France


Jakob Bach  (2)
Karlsruhe Institute of Technology (KIT),
Germany


Max Bannach  (19)
Institute for Theoretical Computer Science,
Universität zu Lübeck, Germany

Lucas Berent  (18)
Technical University of Munich, Germany

Jeremias Berg  (12, 13, 14)
HIIT, Department of Computer Science,
University of Helsinki, Finland

Olaf Beyersdorff  (5, 11)
Institut für Informatik,
Friedrich-Schiller-Universität Jena, Germany

Armin Biere  (27)
University of Freiburg, Germany


Nikolaj Bjørner  (26)
Microsoft Research, Redmond, WA, USA


Lukas Burgholzer  (18)
Johannes Kepler University Linz, Austria

Benjamin Böhm  (11)
Friedrich Schiller Universität Jena, Germany


Klemens Böhm (2)
Karlsruhe Institute of Technology (KIT),
Germany

Miguel Cabral (29)
INESC-ID, IST, University of Lisbon, Portugal

Leroy Chew  (10)
TU Wien, Austria

Md Solimul Chowdhury  (27)
Carnegie Mellon University,
Pittsburgh, PA, USA

Johannes K. Fichte  (30)
TU Wien, Austria

Robert Ganian  (15)
Algorithms and Complexity Group,
TU Wien, Austria


Iván Garzón (3)
LSI, DaSCI, University of Granada, Spain


Jesús Giráldez-Cru (3)
DECSAI, DaSCI, University of Granada, Spain

Stephan Gocht  (16)
Lund University, Sweden;
University of Copenhagen, Denmark


Markus Hecher  (30)
TU Wien, Austria


Marijn J. H. Heule  (10, 27)
Carnegie Mellon University,
Pittsburgh, PA, USA;
Amazon Web Services, Inc.,
Pittsburgh, PA, USA

Marijn J.H. Heule  (21)
Carnegie Mellon University,
Pittsburgh, PA, USA

Markus Iser  (2)
Karlsruhe Institute of Technology (KIT),
Germany


Dmitry Itsykson (6)
St. Petersburg Department of V.A. Steklov
Mathematical Institute of RAS, Russia

Christoph Jabs  (12)
HIIT, Department of Computer Science,
University of Helsinki, Finland

Mikoláš Janota  (7, 29)
Czech Technical University in Prague,
Czech Republic

Jie-Hong Roland Jiang (23)
Graduate Institute of Electronics Engineering /
Department of Electrical Engineering, National
Taiwan University, Taipei, Taiwan

Jean Christoph Jung (31)
Universität Hildesheim, Germany

Matti Järvisalo  (12, 13, 14)
HIIT, Department of Computer Science,
University of Helsinki, Finland

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- Benjamin Kiesl  (27)
Amazon Web Services, Inc., Munich, Germany
- Markus Kirchweger  (4)
Algorithms and Complexity Group,
TU Wien, Austria
- Jean-Marie Lagniez  (28)
CRIL, Univ Artois & CNRS, Lens, France
- Meena Mahajan  (22)
The Institute of Mathematical Sciences,
Chennai, India; Homi Bhabha National Institute,
Training School Complex, Anushaktinagar,
Mumbai, India
- Vasco Manquinho  (29)
INESC-ID, IST, University of Lisbon, Portugal
- Ruben Martins  (16)
Carnegie Mellon University,
Pittsburgh, PA, USA
- Valentin Mayer-Eichberger (31)
Universität Potsdam, Germany
- Stefan Mengel (17)
Univ. Artois, CNRS, Centre de Recherche en
Informatique de Lens (CRIL), Lens, France
- Pablo Mesejo (3)
DECSAI, DaSCI, University of Granada, Spain
- Marie Miceli  (28)
CRIL, Univ Artois & CNRS, Lens, France
- Milan Mossé (9)
Department of Philosophy,
University of California Berkeley, CA, USA
- Alexander Nadel  (8)
Intel Corporation, Haifa, Israel
- Nina Narodytska  (26)
VMware Research, Palo Alto, CA, USA
- Andreas Niskanen  (12, 14)
HIIT, Department of Computer Science,
University of Helsinki, Finland
- Jakob Nordström  (16)
University of Copenhagen, Denmark;
Lund University, Sweden
- Andy Oertel  (16)
Lund University, Sweden;
University of Copenhagen, Denmark
- Tomáš Peitl  (11)
TU Wien, Vienna, Austria
- Jelle Piepenbrock  (7)
Czech Technical University in Prague,
Czech Republic;
Radboud University Nijmegen, Netherlands
- Bartosz Piotrowski  (7)
Czech Technical University in Prague,
Czech Republic;
University of Warsaw, Poland
- Filip Pokrývka  (15)
Masaryk University, Brno, Czech Republic
- Franz-Xaver Reichl (20)
TU Wien, Austria
- Artur Riazanov (6)
St. Petersburg Department of V.A. Steklov
Mathematical Institute of RAS, Russia;
The Henry and Marylin Taub Faculty of
Computer Science, Technion, Israel
- Valentin Roland (30)
secunet Security Networks AG, Essen, Germany
- Abdallah Saffidine (31)
University of New South Wales,
Sydney, Australia
- Josep M. Salvía  (25)
Logic & Optimization Group (LOG),
University of Lleida, Spain
- Manfred Scheucher  (4)
Institut für Mathematik,
Technische Universität Berlin, Germany
- André Schidler (15)
Algorithms and Complexity Group,
TU Wien, Austria
- Agnes Schleitzer (5)
Institut für Informatik,
Friedrich-Schiller-Universität Jena, Germany
- Christoph Scholl (23)
Department of Computer Science,
Universität Freiburg, Germany
- Harry Sha (9)
Department of Computer Science,
University of Toronto, CA
- Kirill Simonov (15)
Algorithms and Complexity Group,
TU Wien, Austria
- Malte Skambath  (19)
Department of Computer Science,
Universität Kiel, Germany


Friedrich Slivovsky (20, 24)
TU Wien, Austria

Pavel Smirnov (13)
HIIT, Department of Computer Science,
University of Helsinki, Finland

Petr Smirnov  (6)
HSE University at Saint Petersburg, Russia;
St. Petersburg Department of V.A. Steklov
Mathematical Institute of RAS, Russia


Gaurav Sood  (22)
The Institute of Mathematical Sciences,
Chennai, India;
Homi Bhabha National Institute,
Training School Complex, Anushaktinagar,
Mumbai, India

Bernardo Subercaseaux  (21)
Carnegie Mellon University,
Pittsburgh, PA, USA

Stefan Szeider  (4, 15)
Algorithms and Complexity Group,
TU Wien, Austria


Li-Yang Tan (9)
Department of Computer Science,
Stanford University, CA, USA


Till Tantau (19)
Institute for Theoretical Computer Science,
Universität zu Lübeck, Germany

Eduard Torres  (25)
Logic & Optimization Group (LOG),
University of Lleida, Spain

Kuan-Hua Tu (23)
Graduate Institute of Electronics Engineering,
National Taiwan University, Taipei, Taiwan

Hao-Ren Wang (23)
Graduate Institute of Electronics Engineering,
National Taiwan University, Taipei, Taiwan

Michael W. Whalen  (27)
Amazon Web Services, Inc.,
Minneapolis, MN, USA;
The University of Minnesota,
Minneapolis, MN, USA

Robert Wille  (18)
Technical University of Munich, Germany;
Software Competence Center Hagenberg GmbH
(SCCH), Austria

