

# MARIJN J.H. HEULE

August 20, 2019

## Personal Information

Name: Marienus Johannes Hendrikus Heule  
Born: March 12, 1979, Rijnsburg, The Netherlands  
Nationality: Dutch  
E-mail: [mheule@cs.cmu.edu](mailto:mheule@cs.cmu.edu)  
Homepage: <http://www.cs.cmu.edu/~mheule/>

## Employment

period	university	remarks
2019–	Associate Professor Carnegie Mellon University United States	
2017–2019	Research Assistant Professor The University of Texas at Austin United States	
2012–2017	Research Scientist The University of Texas at Austin United States	
2008–2012	Post-Doc TU Delft, The Netherlands NICTA, Sydney, Australia JKU, Linz, Austria	from 04/2008 until 04/2012 except for: with Toby Walsh, 10/2009–12/2009 with Armin Biere, 04/2011–10/2011

## Education

period	education	remarks
2004–2008	PhD Applied Computer Science Delft University of Technology The Netherlands	cum laude
1998–2004	MSc Applied Computer Science Delft University of Technology The Netherlands	Best Graduate Student Award 2004 Applied Computer Science
1998–2001	Theology Leiden University The Netherlands	
1997–1998	Propaedeutics Computer Science Delft University of Technology The Netherlands	completed in one year
1991–1997	Gymnasium Rijnlands Lyceum Oegstgeest The Netherlands	Top High School level in The Netherlands, which includes Latin and Greek courses

## Languages

<i>Dutch</i>	native
<i>English</i>	fluent (writing and speech)
<i>German</i>	moderate (writing and speech)
<i>French</i>	moderate (writing and speech)
<i>Latin</i>	basic (reading)
<i>Classical Greek</i>	basic (reading)
<i>Classical Hebrew</i>	basic (reading)

## Awards

### Best Paper Awards

- Benjamin Kiesl, Adrian Rebola-Pardo, and Marijn J.H. Heule.  
*Extended Resolution Simulates DRAT.*  
IJCAR 2018, Springer LNCS **10900**, pp. 516–531
- Marijn J.H. Heule, Benjamin Kiesl, Martina Seidl, and Armin Biere.  
*PRuning Through Satisfaction.*  
HVC 2017, Springer LNCS **10629**, pp. 179–194.
- Marijn J.H. Heule, Benjamin Kiesl, and Armin Biere.  
*Short Proofs without New Variables.*  
CADE 2017, Springer LNCS **10395**, pp. 130–147.
- Valentin Wüstholtz, Oswaldo Olivo, Marijn J.H. Heule, and Işıl Dillig.  
*Static Detection of DoS Vulnerabilities in Programs that use Regular Expressions.* TACAS 2017, Springer LNCS **10206**, pp. 3–20.
- Marijn J.H. Heule, Oliver Kullmann, and Victor W. Marek.  
*Solving and Verifying the boolean Pythagorean Triples problem via Cube-and-Conquer.* SAT 2016, Springer LNCS **9710**, pp. 228–245.
- Marijn J.H. Heule, Oliver Kullmann, Siert Wieringa, and Armin Biere.  
*Cube and Conquer: Guiding CDCL SAT Solvers by Lookaheads.*  
Haifa Verification Conference 2011, Springer LNCS **7261**, pp. 50–65.
- Marijn J.H. Heule and Sicco Verwer.  
*Using a satisfiability solver to identify deterministic finite state automata.*  
Benelux Conference on Artificial Intelligence 2009, pp. 91–98.

### Winner of the StaMinA competition 2010

<http://stamina.chefbe.net/>

### Medals won at SAT competitions:

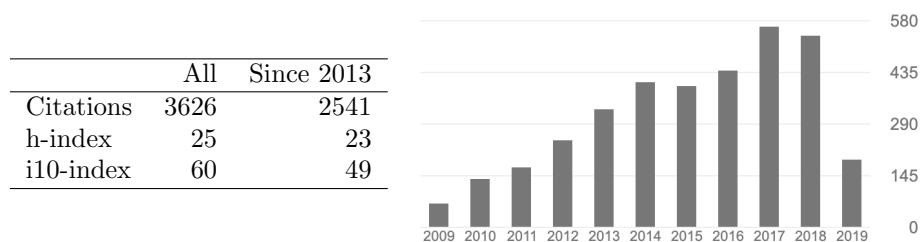
<http://www.satcompetition.org/>

- Gold medal on seq. UNSAT random problems by march\_rw at SAT '11
- Gold medal on parallel UNSAT random problems by march\_rw at SAT '11
- Gold medal on UNSAT random problems by march\_hi at SAT '09

- Silver medal on ALL random problems by march\_hi at SAT '09
- Gold medal on SAT crafted problems by march\_ks at SAT '07
- Gold medal on UNSAT random problems by march\_ks at SAT '07
- Silver medal on ALL random problems by march\_ks at SAT '07
- Bronze medal on UNSAT crafted problems by march\_dl at SAT '05
- Silver medal on SAT crafted problems by march\_dl at SAT '05
- Bronze medal on ALL crafted problems by march\_dl at SAT '05
- Silver medal on UNSAT random problems by march\_dl at SAT '05
- Silver medal on ALL random problems by march\_dl at SAT '05
- Best Sat solver on SAT crafted problems by march\_eq at SAT '04
- Best Sat solver on ALL crafted problems by march\_eq at SAT '04

## Publications

Citations overview based on Google Scholar



## Books (editor)



Marijn J.H. Heule and Sean Weaver.

Proceedings of *Theory and Applications of Satisfiability Testing 2015*  
 2 Lecture Notes in Computer Science **9340**, Springer (2015).



Armin Biere, Marijn J.H. Heule, Hans van Maaren, and Toby Walsh.  
*Handbook of Satisfiability*.

1 IOS Press (2009).

## Book chapters



Marijn J. H. Heule, Oliver Kullmann, and Armin Biere.

*Cube and Conquer for Satisfiability*.

Chapter 2, *Handbook of Parallel Constraint Reasoning*, Springer (2018), pp. 31-59.

3




Marijn J.H. Heule and Armin Biere.












*Proofs for Satisfiability Problems*.









Chapter 1, *All about Proofs, Proofs for All*, College Publications (2015).

2




-  Marijn J.H. Heule and Hans van Maaren.  
*Look-Ahead Based SAT Solvers.*  
1 Chapter 5, Handbook of Satisfiability, IOS Press (2009), pp. 155–184.

## Journal papers













-  Marijn J. H. Heule, Benjamin Kiesl, and Armin Biere.  
*Strong Extension-Free Proof Systems.*  
19 Accepted for the Journal of Automated Reasoning (2019).
-  Marijn J. H. Heule.  
*Computing Small Unit-Distance Graphs with Chromatic Number 5.*  
18 Geombinatorics **XXVIII**(1): 32–50 (2018).
-  Marijn J.H. Heule.  
*Brute Trust.*  
17 Nieuw Archief voor Wiskunde, 5th series, **19**(3): 226–227 (2018).
-  Marijn J.H. Heule.  
*Avoiding Triples in Arithmetic Progression.*  
16 Journal of Combinatorics **8**(3): 391–422 (2017).
-  Marijn J.H. Heule and Oliver Kullmann.  
*The Science of Brute Force.*  
15 Communications of the ACM **60**(8):70–79 (2017).
-  Marijn J.H. Heule, Martina Seidl, and Armin Biere.  
*Solution Validation and Extraction for QBF Preprocessing.*  
14 Journal of Automated Reasoning (2016).
-  Marijn J. H. Heule and Stefan Szeider.  
*A SAT Approach to Clique-Width.*  
13 ACM Transactions on Computational Logic **16**(3): 24 (2015).
-  Marijn J. H. Heule, Matti Järvisalo, Florian Lonsing, Martina Seidl, and Armin Biere. *Clause Elimination for SAT and QSAT.*  
12 Journal of Artificial Intelligence Research **53**:127–168 (2015).
-  Marijn J.H. Heule, Warren A. Hunt Jr, and Nathan Wetzler.  
*Bridging the Gap Between Easy Generation and Efficient Verification of Unsatisfiability Proofs.*  
11 Software Testing, Verification and Reliability **24**(8):593–607 (2014).
-  Christiaan Hartman, Marijn J.H. Heule, Kees Kwekkeboom, and Alain Noels. *Symmetry in Gardens of Eden.*  
10 The Electronic Journal of Combinatorics **20**(3): P16 (2013).
-  Marijn J.H. Heule and Sizzo Verwer.  
*Software model synthesis using satisfiability solvers.*  
9 Empirical Software Engineering **18**(4): 825–856 (2012).













-  8 Matti Järvisalo, Armin Biere, and Marijn J.H. Heule. *Simulating Circuit-Level Simplifications on CNF*. Journal of Automated Reasoning **49**(4):583–619 (2012).
-  7 Peter van der Tak, Antonio Ramos, and Marijn J.H. Heule. *Reusing the Assignment Trail in CDCL Solvers*, system description. Journal on Satisfiability, Boolean Modeling and Computation **7**:133–138 (2011).
-  6 Marijn J.H. Heule and Hans van Maaren. *Parallel SAT Solving using Bit-level Operations*. Journal on Satisfiability, Boolean Modeling and Computation **4**:99–116 (2008).
-  5 Marijn J.H. Heule and Hans van Maaren. *Whose side are you on? Finding solutions in a biased search-tree*. Journal on Satisfiability, Boolean Modeling and Computation **4**:117–148 (2008).
-  4 Hans van Maaren, Linda van Norden, and Marijn J.H. Heule. *Sums of squares based approximation algorithms for MAX-SAT*. Discrete Applied Mathematics **156**(10):1754–1779 (2008).
-  3 Paul Herwig, Marijn J.H. Heule, Martijn van Lambalgen, and Hans van Maaren. *A new method to construct lower bounds for Van der Waerden numbers*. The Electronic Journal of Combinatorics **14** (2007), #R6.
-  2 Marijn J.H. Heule and Leon J.M. Rothkrantz. *Solving Games: Dependence of applicable solving procedures*. Elsevier Science of Computer Programming **67**(1):105–124 (2007).
-  1 Marijn J.H. Heule and Hans van Maaren. *March\_dl: Adding Adaptive Heuristics and a New Branching Strategy*. Journal on Satisfiability, Boolean Modeling and Computation **2**:47–59 (2006).

## Conference papers










-  50 Marijn J. H. Heule, Benjamin Kiesl, and Armin Biere. *Encoding Redundancy for Satisfaction-Driven Clause Learning*. TACAS 2019, Springer LNCS **11427** (2019), pp. 41–58. **Best Paper Nomination**
-  49 Marijn J. H. Heule, Benjamin Kiesl, and Armin Biere. *Clausal Proofs of Mutilated Chessboards*. To appear in NASA Formal Methods (2019).
-  48 Marijn J. H. Heule. *Schur Number Five*. Proceedings of AAAI-18 (2018), pp. 6598–6606.

-  Benjamin Kiesl, Adrian Rebola-Pardo, and Marijn J.H. Heule.  
*Extended Resolution Simulates DRAT.*  
IJCAR 2018, Springer LNCS **10900** (2018), pp. 516–531.  
47 **Best Paper Award**
-  Marijn J. H. Heule and Armin Biere.  
*What a Difference a Variable Makes.*  
TACAS 2018, Springer LNCS **10806** (2018), pp. 75–92.  
46
-  Marijn J.H. Heule, Benjamin Kiesl, Martina Seidl, and Armin Biere.  
*PRuning Through Satisfaction.*  
HVC 2017, Springer LNCS **10629** (2017), pp. 179–194.  
45 **Best Paper Award**
-  Marijn J.H. Heule, Oliver Kullmann, and Victor W. Marek. *Solving very hard problems: Cube-and-Conquer, a hybrid SAT solving method.*  
Proceedings of IJCAI (2017), pp. 4864–4868.  
44
-  Marijn J.H. Heule, Warren A. Hunt Jr., Matt Kaufmann, and Nathan D. Wetzler.  
*Efficient, Verified Checking of Propositional Proofs.*  
ITP 2017, Springer LNCS **10499** (2017), pp. 269–284.  
43
-  Benjamin Kiesl, Marijn J.H. Heule, and Armin Biere .  
*A Little Blocked Literal Goes a Long Way.*  
SAT 2017, Springer LNCS **10491** (2017), pp. 281–297.  
43
-  Marijn J.H. Heule, Benjamin Kiesl, and Armin Biere.  
*Short Proofs without New Variables.*  
CADE 2017, Springer LNCS **10395** (2017), pp. 130–147.  
42 **Best Paper Award**
-  Luís Cruz-Filipe, Marijn J.H. Heule, Warren Hunt, Matt Kaufmann, and Peter Schneider-Kamp.  
*Efficient Certified RAT Verification.*  
CADE 2017, Springer LNCS **10395** (2017), pp. 220–236  
41
-  Katalin Fazekas, Marijn J.H. Heule, Martina Seidl, and Armin Biere.  
*Skolem Function Composition for Quantified Boolean Formulas.*  
TAP 2017, Springer LNCS **10375** (2017), pp. 129–138.  
40
-  Tomáš Balyo, Marijn J.H. Heule, and Matti Järvisalo.  
*SAT Competition 2016: Recent Developments.*  
Proceedings of AAI (2017), pp. 5061–5063.  
39
-  Valentin Wüstholtz, Oswaldo Olivo, Marijn J.H. Heule, and Işıl Dillig.  
*Static Detection of DoS Vulnerabilities in Programs that use Regular Expressions.*  
TACAS 2017, Springer LNCS **10206** (2017), pp. 3–20.  
38 **Best Paper Award**










-  Marijn J.H. Heule, Oliver Kullmann, and Victor W. Marek.  
*Solving and Verifying the boolean Pythagorean Triples problem via Cube-and-Conquer.*  
 37 SAT 2016, Springer LNCS **9710** (2016) pp. 228–245.  
**Best Paper Award**
-  Cuong Kim Chau and Marijn J.H. Heule.  
*Computing Maximum Unavoidable Subgraphs Using SAT Solvers.*  
 36 SAT 2016, Springer LNCS **9710** (2016) pp. 196–211.
-  Marijn J. H. Heule. *The Quest for Perfect and Compact Symmetry Breaking for Graph Problems.*  
 35 SYNASC (2016).
-  Marijn J. H. Heule, Rezwana Reaz, H. B. Acharya, and Mohamed G. Gouda.  
*Analysis of Computing Policies Using SAT Solvers (Short Paper).*  
 34 SSS 2015, Springer LNCS **10083** (2016) pp. 190–194.
-  Marijn J. H. Heule and Armin Biere.  
*Compositional Propositional Proofs.*  
 33 LPAR-20, Springer LNCS **9450** (2015) pp. 444–459.
-  Marijn J. H. Heule, Warren Hunt, Jr., and Nathan Wetzler.  
*Expressing Symmetry Breaking in DRAT Proofs.*  
 32 CADE-25, Springer LNCS **9195** (2015) pp. 591–606.
-  Marijn J. H. Heule, Martina Seidl, and Armin Biere.  
*Blocked Literals are Universal.*  
 31 NASA Formal Methods, Springer LNCS **9058** (2015) pp. 436–442.
-  Rezwana Reaz, Muqet Ali, Mohamed G. Gouda, Marijn J. H. Heule, and Ehab Elmallah. *The Implication Problem of Computing Policies. Stabilization, Safety, and Security of Distributed Systems,* Springer LNCS **9212** (2015) pp. 109–123.
-  Marijn J. H. Heule and Torsten Schaub.  
*What’s Hot in the SAT and ASP Competitions.*  
 29 AAIL. (2015) pp. 4322–4323.
-  Marijn J.H. Heule, Martina Seidl, and Armin Biere.  
*Efficient Extraction of Skolem Functions from QRAT Proofs.*  
 28 Formal Methods in Computer-Aided Design (2014) pp. 107–114.
-  Marijn J.H. Heule, Martina Seidl, and Armin Biere.  
*A Unified Proof System for QBF Preprocessing.*  
 27 IJCAR 2014, Springer LNCS **8562** (2014) pp. 91–106.
-  Anton Belov, Marijn J.H. Heule and Joao P. Marques-Silva.  
*MUS Extraction using Clausal Proofs.*  
 26 SAT 2014, Springer LNCS **8561** (2014), pp. 48–57.

-  Tomáš Balyo, Andreas Fröhlich, Marijn J.H. Heule and Armin Biere.  
*Everything You Always Wanted to Know About Blocked Sets (But Were Afraid to Ask).*  
25 SAT 2014, Springer LNCS **8561** (2014), pp. 317-332.
-  Nathan Wetzler, Marijn J.H. Heule, and Warren A. Hunt, Jr.  
*DRAT-trim: Efficient Checking and Trimming Using Expressive Clausal Proofs.*  
24 SAT 2014, Springer LNCS **8561** (2014), pp. 422-429.
-  Marijn J.H. Heule and Armin Biere.  
*Blocked Clause Decomposition.*  
23 LPAR-19, Springer LNCS **8312** (2013), pp. 423-438.
-  Marijn J.H. Heule, Warren A. Hunt Jr, and Nathan Wetzler.  
*Trimming while checking clausal proofs.*  
22 FMCAD (2013), pp.181-188.
-  Marijn J.H. Heule, Warren A. Hunt Jr, and Nathan Wetzler.  
*Mechanical Verification of SAT Refutations with Extended Resolution.*  
21 ITP 2013, Springer LNCS **7998** (2013), pp. 229-244.
-  Marijn J.H. Heule, Stefan Szeider.  
*A SAT Approach to Clique-Width.*  
20 SAT 2013, Springer LNCS **7962** (2013), pp. 318-334.
-  Marijn J.H. Heule, Warren A. Hunt Jr, and Nathan Wetzler.  
*Verifying Refutations with Extended Resolution.*  
19 CADE-24, Springer LNCS **7898** (2013), pp. 345-359.
-  Marijn J. H. Heule, Matti Järvisalo, and Armin Biere.  
*Revisiting Hyper Binary Resolution.*  
18 CPAIOR 2013, Springer LNCS **7874** (2013), pp. 77-93.
-  Norbert Manthey, Marijn J.H. Heule, and Armin Biere.  
*Automated Reencoding of Boolean Formulas.*  
17 HVC 2012, Springer LNCS **7857** (2013) pp. 102-117.
-  Magdalena Widl, Armin Biere, Petra Brosch, Uwe Egly, Marijn J.H. Heule, Gerti Kappel, Martina Seidl, and Hans Tompits.  
*Guided Merging of Sequence Diagrams.*  
16 SLE 2012, Springer LNCS **7745** (2013), pp. 164-183.
-  Matti Järvisalo, Marijn J.H. Heule, and Armin Biere.  
*Inprocessing Rules.*  
15 CADE 2012, Springer LNCS **7364** (2012), pp. 355-370.
-  Marijn J.H. Heule, Oliver Kullmann, Siert Wieringa, and Armin Biere.  
*Cube and Conquer: Guiding CDCL SAT Solvers by Lookaheads.*  
14 HVC 2011, Springer LNCS **7261** (2012), pp. 50-65 , best paper award.



-  Marijn J.H. Heule, Matti Jarvisalo, and Armin Biere.  
*Efficient CNF Simplification based on Binary Implication Graphs.*  
13 SAT 2011, Springer LNCS **6695** (2011), pp. 201–215.
-  Antonio Ramos and Peter van der Tak and Marijn J.H. Heule.  
*Between Restarts and Backjumps.*  
12 SAT 2011, Springer LNCS **6695** (2011), pp. 216–229.
-  Marijn J.H. Heule, Matti Järvisalo, and Armin Biere.  
*Clause Elimination Procedures for CNF Formula.*  
11 LPAR-17, Springer LNCS **6397** (2010), pp. 357–371.
-  Matti Järvisalo, Armin Biere, and Marijn J.H. Heule.  
*Blocked Clause Elimination.*  
10 TACAS 2010, Springer LNCS **6015** (2010), pp. 129–144.
-  Marijn J.H. Heule and Toby Walsh.  
*Symmetry within Solutions.*  
9 24th AAI (2010), pp. 77–82.
-  Marijn J.H. Heule and Sicco Verwer.  
*Exact DFA Identification Using SAT Solvers.*  
8 ICGI 2010, Springer LNCS **6339** (2010), pp. 66–79.
-  Bas Schaafsma, Marijn J.H. Heule, and Hans van Maaren.  
*Dynamic Symmetry Breaking by Simulating Zykov Contraction.*  
7 SAT 2009, Springer LNCS **5584** (2009), pp. 223–236.
-  Henriette Bier, Adriaan de Jong, Gijs van der Hoorn, Niels Brouwers,  
Marijn J.H. Heule, and Hans van Maaren.  
*Prototypes for Automated Architectural 3D-Layout.*  
6 VSM 2007, Springer LNCS **4820** (2008), pp. 203–214.
-  Marijn J.H. Heule and Hans van Maaren.  
*From Idempotent Generalized Boolean Assignments to Multi-bit  
Search.* SAT 2007, Springer LNCS **4501** (2007), pp. 134–147.
-  Marijn J.H. Heule and Hans van Maaren.  
*Effective Incorporation of Double Look-Ahead Procedures.*  
4 SAT 2007, Springer LNCS **4501** (2007), pp. 258–271.
-  Marijn J.H. Heule and Hans van Maaren. *Observed Lower Bounds for  
Random 3-Sat Phase Transition Density using Linear Programming.*  
3 SAT 2005, Springer LNCS **3569** (2005), pp. 122–134.
-  Marijn J.H. Heule and Hans van Maaren.  
*Aligning CNF- and Equivalence-Reasoning.*  
2 SAT 2004, Springer LNCS **3542** (2005), pp. 145–156.
-  Marijn Heule, Joris van Zwieten, Mark Dufour and Hans van Maaren.  
*March\_eq: Implementing Additional Reasoning into an Efficient Look-  
Ahead Sat Solver.*  
1 SAT 2004, Springer LNCS **3542** (2005), pp. 345–359.

## Refereed workshops papers

-  Armin Biere and Marijn J. H. Heule (2018).  
*The Effect of Scrambling CNFs.*  
9 Accepted for Pragmatics of Satisfiability (2018).
-  Marijn J.H. Heule and Armin Biere.  
*Clausal Proof Compression.*  
8 International Workshop on the Implementation of Logics, EPiC **40** (2015), pp. 21–26.
-  Marijn J.H. Heule, Norbert Manthey, and Tobias Philipp.  
*Validating Unsatisfiability Results of Clause Sharing Parallel SAT Solvers.*  
7 Pragmatics of SAT 2014, EPiC **27** (2014), pp. 12–25.
-  Peter van der Tak, Marijn J.H. Heule, and Armin Biere.  
*Concurrent Cube-and-Conquer.*  
6 Pragmatics of SAT 2012.
-  Oliver Gableske and Marijn J.H. Heule.  
*EagleUP: Solving Random 3-SAT using SLS with Unit Propagation.*  
5 Pragmatics of SAT 2011.
-  Marijn J.H. Heule and Toby Walsh.  
*Internal Symmetry.*  
4 10th SymCon (2010), pp. 19–33.
-  Sid Mijnders, Boris de Wilde, and Marijn J.H. Heule.  
*Symbiosis of Search and Heuristics for Random 3-SAT.*  
3 Third International Workshop on Logic and Search (2010).
-  Marijn J.H. Heule, Matti Järvisalo, and Armin Biere.  
*Covered Clause Elimination.*  
2 LPAR-17 short paper, EPiC **13** (2010), pp. 41–46.
-  Marijn J.H. Heule.  
*Solving edge-matching problems with satisfiability solvers.*  
1 Second International Workshop on Logic and Search (2008).

## International Visits and Invited Talks

- An invited tutorial at Formal Methods in Computer-Aided Design 2018 on *Formal Verification of Unsatisfiability Results* (October 30, 2018)
- Attended the BIRS Theory and Practice of Satisfiability Solving in Oaxaca, Mexico, including an invited talk of an hour on *Computable Short Proofs* (August 27, 2018)

- An invited talk at the Vrije Universiteit Amsterdam, the Netherlands on *Computable Short Proofs* (August 1, 2018)
- Invited speaker at the The 21st International Conference on Theory and Applications of Satisfiability Testing in Oxford, England on *Computable Short Proofs* (July 11, 2018)
- An invited talk at RWTH Aachen University, Germany on *Everything's Bigger in Texas — The Largest Math Proof Ever* (June 20, 2018)
- An invited talk at the Vrije Universiteit Amsterdam, the Netherlands on *Everything's Bigger in Texas — The Largest Math Proof Ever* (December 19, 2017)
- Invited speaker at the 3rd Global Conference on Artificial Intelligence in Miami, Florida on *Everything's Bigger in Texas — The Largest Math Proof Ever* (October 20, 2017).
- An invited talk at the Parallel Constraint Reasoning workshop in Gothenburg, Sweden on *Solving very hard problems: Cube-and-Conquer, a hybrid SAT solving method* (August 6, 2017)
- Attended a Dagstuhl meeting in Wadern, Germany, including an invited talk of an hour on *Practical Proof Systems for SAT and QBF* (September 20, 2016).
- Research visit to Rice University in Houston, Texas, including an invited talk of an hour on *Everything's Bigger in Texas — The Largest Math Proof Ever* (August 24, 2016).
- An invited talk at the Fields Institute in Toronto, Canada on *Applications of SAT solving to Mathematics: Proofs and Heuristics* (August 18, 2016).
- Research visit to Max Planck Institute in Saarbrücken, Germany, including an invited talk of an hour on *Everything's Bigger in Texas — The Largest Math Proof Ever* (July 27, 2016).
- An invited talk at the Industry Day of SAT 2016 in Bordeaux, France on *Proofs of Unsatisfiability* (July 9, 2016).
- Research visit to Johannes Kepler University in Linz, Austria, including an invited talk of an hour on *Everything's Bigger in Texas — The Largest Math Proof Ever* (June 22, 2016).
- An invited talk at the 50 Years of the Hales-Jewett Theorem conference in Bellingham, Washington on *Solving and Verifying the Boolean Pythagorean Triples Problem via Cube-and-Conquer* (May 6, 2016).
- An invited talk at the UCSD in San Diego, California on *Solving and Verifying the Boolean Pythagorean Triples Problem via Cube-and-Conquer* (April 14, 2016).
- An invited talk at the SRI in Palo Alto, California on *Solving and Verifying the Boolean Pythagorean Triples Problem via Cube-and-Conquer* (April 13, 2016).

- An invited talk at the Kestrel Institute in Palo Alto, California on *Solving and Verifying the Boolean Pythagorean Triples Problem via Cube-and-Conquer* (April 12, 2016).
- An invited talk at AAI-15 in Austin, Texas on *What's Hot in the SAT and ASP Competitions* (January 27, 2015).
- Research visit to KTH Royal Institute of Technology in Stockholm, Sweden, including an invited talk of an hour on *Easy Generation and Efficient Validation of Proofs for SAT and QBF* (October 27, 2014).
- Invited Talk at the Second International Workshop on Quantified Boolean Formulas, Vienna, Austria. A 45 minutes tutorial on *A Unified Proof System for QBF Preprocessing*, July 13, 2014.
- Invited Talk at the All about Proofs, Proofs for All Workshop, Vienna, Austria. A 30 minutes tutorial on *Proofs for Satisfiability Problems*, July 18, 2014.
- Invited Talk at the Aalto University, Helsinki, Finland. A 105 minutes tutorial on *Preprocessing* at the SAT/SMT Summer School , July 5, 2013.
- Talk at the Second International Workshop on Proof Exchange for Theorem Proving. *Efficient and Verified Checking of Unsatisfiability Proofs*, June 9, 2013
- Tutorial on *State-of-the-art SAT Solving* at CADE-24, Lake Placid, United States on June 8, 2013.
- Talk at the High Confidence Software and Systems Conference (HCSS) 2013, Annapolis, United States. *Efficient and Verified Checking of Unsatisfiability Proofs*, May 9, 2013.
- Invited Talk at Microsoft Research Cambridge, United Kingdom. *Cube and Conquer: Guiding CDCL SAT Solvers by Lookaheads*, August 2, 2012.
- Visiting Researcher at The Business Informatics Group, Faculty of Informatics of the Vienna University of Technology, Vienna, Austria, March, 2012. Including an invited talk on *Software Model Synthesis by Identifying DFAs using Satisfiability Solvers*, March 5, 2012.
- Master Class at the International Conference on Integration of Artificial Intelligence (AI) and Operations Research (OR) techniques in Constraint Programming (CP), Berlin, Germany. *Search in SAT*, May 23, 2011.
- Visiting Researcher at NICTA and the University of New South Wales, Sydney, Australia, October-December 2009. Including an invited talk on *The Method in the Madness: New lower bounds for Van der Waerden numbers*, October 9, 2009.
- Visiting Researcher at University of Ulm, Ulm, Germany, September 2009. Including an invited talk on *State-of-the-art SAT solving using look-ahead techniques*, September 17, 2009.

- Invited Talk at the Department of Defense Satisfiability Workshop, Baltimore, United States. *Improving the odds: New lower bounds for Van der Waerden numbers*, March 4, 2008.
- Visiting Researcher at Swansea University, Swansea, United Kingdom, July 2005. Including an invited talk on *Observed Lower Bounds for Random 3-SAT Phase Transition Density using Linear Programming*, July 7, 2005.

## Academic Activities

### Grants

- PI on NSF (with co-PI Scott Aaronson), project number CCF-1813993: MaPaMaP: Massively Parallel Solving of Math Problems. \$400,000, started September 2018.
- PI on NSF, project number CCF-1618574: Mechanical Verification of QBF Results. \$500,000, started September 2016.
- PI on NSF, project number CCF-1526760: IsoLator: Avoiding Isomorphic Graphs Effectively. \$500,000, started September 2015.
- Co-PI on DARPA STAC, contract number #FA8750-15-2-0096: AUDITR: Securing Space/Time Defences in JAVA Bytecode. UT Austin subcontracts from UC Boulder (PI Pavol Cerny). UT Austin's subcontract: \$1,585,140 shared between co-PI's Isil Dillig and Marijn Heule, started April 2015.

### Editorial

- Editor of the SAT 2015 Proceedings (2015)
- Associate Editor of the Journal on Satisfiability, Boolean Modeling and Computation since February 2012
- Editor of the Handbook of Satisfiability (2009)
- Production Editor of the Journal on Satisfiability, Boolean Modeling and Computation from August 2005 (first issue) until February 2012

### Program Committee Co-Chair

- International Conference on Theory and Applications of Satisfiability Testing in 2015

### Program Committee Member

- AAI Conference on Artificial Intelligence in 2015 and 2019
- International Conference on Automated Deduction in 2015, 2017, and 2019

- International Conference on Integration of Artificial Intelligence (AI) and Operations Research (OR) techniques in Constraint Programming in 2012
- International Conference on Theory and Applications of Satisfiability Testing in 2009, 2011, 2012, 2013, 2014, 2016, 2017, 2018, and 2019
- Design, Automation and Test in Europe in 2016 and 2017
- International Joint Conferences on Artificial Intelligence in 2013, 2015, 2016, and 2018
- International Conference on Artificial Intelligence for Industries in 2018
- International Workshop on Symmetry in Constraint Satisfaction Problems in 2012
- Practical aspects of automated reasoning workshop in 2016 and 2018
- Workshop on Automated Reasoning: Challenges, Applications, Directions, Exemplary Achievements in 2017 and 2019
- Pragmatics of SAT Workshop in 2011 and 2014
- Workshop on Quantified Boolean Formulas in 2016
- Workshop on Beyond NP in 2016
- Knowledge Representation & Automated Reasoning Workshop in 2010
- Workshop on Parallel Satisfiability Solving in 2009
- Workshop on Logic and Search in 2014
- Workshop on the ACL2 Theorem Prover and its Applications in 2015

## Reviewer

- Alan Turing Centenary Conference
- Annals of Mathematics and Artificial Intelligence
- Benelux Conference on Artificial Intelligence
- Communications of the ACM
- Electronic Journal of Combinatorics
- Formal Methods in Computer-Aided Design
- Haifa Verification Conference
- Information Processing Letters
- INFORMS Journal on Computing
- International Conference on Integration of Artificial Intelligence (AI) and Operations Research (OR) techniques in Constraint Programming

- International Conference on Theory and Applications of Satisfiability Testing
- International Conference on Tools and Algorithms for the Construction and Analysis of Systems
- International Symposium on Mathematical Foundations of Computer Science
- Journal of Artificial Intelligence Research
- Journal on Satisfiability, Boolean Modeling and Computation
- Logic for Programming, Artificial Intelligence and Reasoning
- Science

### Competition Organization

- The International Satisfiability Competition (2013, 2014, 2016, 2017, 2018)
- The Second Answer Set Programming Competition (2009)

### In the Media

My work on proof production and validation has been widely reported in international media, including Nature News, Der Spiegel, and the Daily Mail. Below an overview of appearances in newspapers, magazines, TV, and blogs.

- 04/29/18 Volkskrant  
*Ouderdomsgeroe haalt 68 jaar oud raadsel in de wiskunde uit de knoop*
- 04/27/18 NRC  
*Man van 'we leven ooit 1.000 jaar?' brengt oplossing oud pixelprobleem dichterbij*
- 04/18/18 Wired  
*An Anti-Aging Pundit Solves a Decades-Old Math Problem*
- 04/17/18 Quanta Magazine  
*Decades-Old Graph Problem Yields to Amateur Mathematician*
- 05/10/16 I Programmer  
*A Mathematical Proof Takes 200 Terabytes To State*
- 05/13/16 Unocero  
*Una prueba matemática que requiere de 200 Terabytes*
- 05/26/16 **Nature News**  
*Two-hundred-terabyte maths proof is largest ever*
- 05/27/16 Popular Mechanics  
*World's Largest Math Proof Takes Up 200 Terabytes*
- 05/28/16 Azimuth  
*Very Long Proofs*
- 05/28/16 fossBytes  
*Pythagorean Triples — The World's Largest Ever Math Proof Takes Up To 200TB*

- 05/29/16 Engadget  
*Largest-ever math proof chews up 200TB of data*
- 05/30/16 Phys.org  
*Computer generated math proof is largest ever at 200 terabytes*
- 05/30/16 Computational Complexity  
*New Ramsey Result that will be hard to verify but Ronald Graham thinks its right which is good enough for me*
- 05/30/16 **Der Spiegel**  
*Zahlenrätsel: Der längste Mathe-Beweis der Welt*
- 05/31/16 Science Alert  
*The world's largest maths problem has been solved, and it takes up 200 TB*
- 05/31/16 TechWorm  
*The largest ever supercomputer generated math proof is at 200 terabytes*
- 05/31/16 WinFuture  
*200 Terabyte weisen Falschheit mathematischer Annahme nach*
- 05/31/16 Cosmos Magazine  
*Computer cracks 200-terabyte maths proof*
- 05/31/16 De Standaard  
*Wiskundig bewijs vult nationale bibliotheek*
- 05/31/16 Tom's Hardware  
*Problemno risolto con 200 terabyte di dati, volete provare?*
- 05/31/16 ANSA  
*La più lunga dimostrazione matematica di tutti i tempi*
- 06/01/16 Index  
*200 ezer gigabájt a világ legbonyolultabb matematikai bizonyításá*
- 06/02/16 Tech Times  
*Largest Math Proof In The World Solved In 2 Days, 200 Terabytes In Size*
- 06/02/16 The Conversation  
*Will computers replace humans in mathematics?*
- 06/03/16 Kennislink  
*De tweedeling stopt bij 7824*
- 06/06/16 Jornal do Brasil  
*Matemáticos resolvem maior equação do mundo*
- 06/08/16 Een Vandaag (with video)  
*Nederlandse wetenschapper lost wiskundig probleem op*
- 06/10/16 The Aperiodical  
*Just how big is a big proof?*
- 06/13/16 UKNow  
*World's Largest Math Proof Produced at 200 Terabytes*
- 06/14/16 Heise  
*Zahlen, bitte! Mit 800 CPU-Kernen zur Zahl 7825*
- 06/22/16 READAROUNDYOURSUBJECT  
*A Super Computer for a Super Long Proof*



- 07/05/16 CNRS Le Journal  
*La plus grosse preuve de l'histoire des mathématiques*
- 07/08/16 Jornal du Notítias  
*Resolvido problema matemático com 35 anos*
- 07/09/16 Inquirer.net  
*Math puzzle solved, but it will take 10 billion years to verify*
- 07/11/16 Y net (with video)  
**אחרי 35 שנה: פתרון לבעיית השלשות הפיתגוריות**
- 07/11/16 ABC.se  
*Resuelven el problema matemático más largo del mundo: se tarda en leer 10.000 millones de años*
- 07/11/16 **Daily Mail**  
*World's longest maths proof: Solution to a 30-year-old problem would take 10 BILLION years to read — all for a prize of just \$100*
- 07/12/16 El Diario  
*Resuelven problema matemático de hace 30 años*
- 07/12/16 Observador  
*Já foi resolvido o maior problema matemático do mundo*
- 07/13/16 Futurism  
*The Historical \$100 Prize Has Been Awarded for a Solution That Would Take 10 Billion Years to Read*
- 07/14/16 Omicrono  
*Descifran un problema matemático y se tardaría 10.000 millones de años en comprobarlo*
- 07/27/16 Sina  
*最长的数学证明破解了世界难题：全部阅读需100亿年*
- 07/30/16 DiarioDigitalRD  
*Un problema matemático de 200 terabytes*
- 09/02/16 El País  
*Pitágoras y la demostración de los 200 TB*
- 09/03/16 Gödel's Lost Letter and P=NP  
*How Hard, Really, is SAT?*
- 10/02/16 True Viral News  
*The world's largest maths problem has been solved, and it takes up 200 TB*

## Teaching Involvement

The University of Texas at Austin

- Practical SAT Solving – CS 395t (spring 2013)

## Delft University of Technology

- IN4077 Computational Logic and Satisfiability (2011-2012)
- IN4077 Computational Logic and Satisfiability (2010-2011)
- IN3130 Bachelor Seminar (2009-2010)
- IN4077 Computational Logic and Satisfiability (2009-2010)
- IN3130 Bachelor Seminar (2008-2009)
- IN4077 Computational Logic and Satisfiability (2008-2009)
- IN4077 Computational Logic and Satisfiability (2007-2008)
- IN4077 Computational Logic and Satisfiability (2006-2007)
- IN4077 Computational Logic and Satisfiability (2005-2006)
- IN4077 Computational Logic and Satisfiability (2004-2005)

## Summer Schools

- SAT / SMT / AR Summer school, Manchester, England, July 3-6, 2018
- IPA-course Formal Methods, Eindhoven, The Netherlands, June 11-15, 2018
- SC-Square Summer School, Saarbrücken, Germany, July 31-August 4, 2017
- Summer School on Formal Techniques, Menlo Park, CA, May 22-26, 2017
- SAT/SMT Summer School, Espoo, Finland, July 3-5, 2013

## Supervised PhD Students

- Nathan Wetzler (co-supervised Warren Hunt at UT Austin, May 2015)  
*Efficient, Mechanically-Verified Validation of Satisfiability Solvers*

## Supervised Master's Students

- Matt Denend (co-supervised with Scott Aaronson at UT Austin, May 2018)  
*Challenging Variants of the Collatz Conjecture*
- Sid Mijnders (Delft University of Technology, July 2012)  
*Minimally Unsatisfiable Subformulae*
- Peter van der Tak (Delft University of Technology, June 2012)  
*Concurrent Cube-and-Conquer*
- Thomas Verwoerd (Delft University of Technology, August 2010)  
*Enhancing incomplete SAT solver performance through integration of complete SAT solver strategies*
- Bas Schaafsma (Delft University of Technology, May 2009)  
*MiniMerge: Symmetry-Free Learning in Combinatorial Problems*  
Afterwards started a PhD at University of Trento, Italy

- Stephan van Keulen (Delft University of Technology, August 2008)  
*Using the bias of the direction heuristic of SAT solvers*
- Rogier Poldner (Delft University of Technology, April 2008)  
*MINIZSAT: A semi SAT-based pseudo-Boolean solver*
- Siert Wieringa (Delft University of Technology, August 2007)  
*Finding cores using a Brouwer's fixed point approximation algorithm*  
Afterwards started a PhD at Helsinki University of Technology, Finland
- Martijn van Lambalgen (Delft University of Technology, October 2006)  
*3MCard: A Lookahead Cardinality Solver*
- Paul Herwig (Delft University of Technology, October 2006)  
*Decomposing Satisfiability Problems*