

CURRICULUM VITAE

Cesare Tinelli

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EDUCATIONAL AND PROFESSIONAL HISTORY

HIGHER EDUCATION

Ph.D.	University of Illinois at Urbana-Champaign	1999	Computer Science
M.S.	University of Illinois at Urbana-Champaign	1995	Computer Science
Laurea	Università degli Studi di Bari, Italy	1990	Computer Science (<i>magna cum laude</i>)

ACADEMIC POSITIONS

Aug 2012 – present	Professor in Computer Science, The University of Iowa
Aug 2005 – Jul 2012	Associate Professor in Computer Science, The University of Iowa
Aug 1999 – Jul 2005	Assistant Professor in Computer Science, The University of Iowa
Jun 1999 – Aug 1999	Visiting Lecturer, University of Illinois at Urbana-Champaign.

HONORS AND AWARDS

Best Paper Award, 16th Conference on Formal Methods in Computer-Aided Design, 2016
Collegiate Scholar Award, The University of Iowa, 2012–14
Haifa Verification Conference Award, 2010
National Science Foundation CAREER Award, 2003

SCHOLARSHIP

Legend: * = major contribution *** = equal contribution
 ** = secondary contribution **** = minor contribution

REFEREED PUBLICATIONS

Journals

1. *** A. Reynolds, C. Tinelli, C. Barrett. Constraint Solving for Finite Model Finding in SMT Solvers. Special issue on new trends in Constraint Logic Programming. *Theory and Practice of Logic Programming*. 2017. (conditionally accepted) 40 pages.
2. *** A. Reynolds, V. Kuncak, C. Tinelli, C. Barrett, M. Deters. Refutation-Based Synthesis in SMT. Special issue on Syntax-Guided Synthesis. *Journal of Formal Methods in System Design*. 2017. (accepted) 31 pages. (Invited submission.)
3. *** T. Liang, A. Reynolds, N. Tsiskaridze, C. Tinelli, C. Barrett, M. Deters. An efficient SMT solver for string constraints. Special issue on selected works from CAV 2014. *Journal of Formal Methods in System Design*. 48(3):206–234, June 2016. 29 pages. (Invited submission.)
4. *** A. Stump, D. Oe, A. Reynolds, L. Hadarean, and C. Tinelli. SMT Proof Checking Using a Logical Framework. *Journal of Formal Methods in System Design*. 41(1):91–118, February 2013. 29 pages.
5. *** A. Fuchs, A. Goel, J. Grundy, S. Krstić, and C. Tinelli. Ground interpolation for the theory of equality. *Logical Methods in Computer Science*, 8:(1), 2012. Special issue with selected papers from TACAS 2009. 23 pages.
6. *** P. Baumgartner, B. Pelzer, and C. Tinelli. Model Evolution with Equality - Improved. *Journal of Symbolic Computation*, 47:1011–1045, 2012. Special Issue on First Order Theorem Proving. 35 pages.
7. ** C. Barrett, Y. Ge, and C. Tinelli. Solving Quantified Verification Conditions using Satisfiability Modulo Theories. *Annals of Mathematics and Artificial Intelligence*, 55:101–122, 2009. 22 pages.
8. *** P. Baumgartner, A. Fuchs, H. de Nivelle, and C. Tinelli. Computing Finite Models by Reduction to Function-Free Clause Logic. *Journal of Applied Logic*, 7:58–74, 2009. 17 pages.
9. *** P. Baumgartner and C. Tinelli. The Model Evolution Calculus as a First-Order DPLL Method. *Artificial Intelligence*, 172:591–632, 2008. 42 pages. (Invited submission.)
10. *** C. Barrett, I. Shikhanian and C. Tinelli. An Abstract Decision Procedure for Satisfiability in the Theory of Inductive Data Types. *Journal on Satisfiability, Boolean Modeling and Computation*, 3:1–17, 2007. 24 pages.
11. *** R. Nieuwenhuis, A. Oliveras, and C. Tinelli. Solving SAT and SAT Modulo Theories: from an Abstract Davis-Putnam-Logemann-Loveland Procedure to DPLL(T). *The Journal of the ACM*, 53(6):937–977, November 2006. 41 pages.
12. *** F. Baader, S. Ghilardi and C. Tinelli. A New Combination Procedure for the Word Problem that Generalizes Fusion Results in Modal Logics. *Information and Computation*, 240(1), October 2006. Special Issue on Combining Logical Systems. 48 pages.

13. *** P. Baumbartner, A. Fuchs and C. Tinelli. Darwin: A Theorem Prover for the Model Evolution Calculus. *Int'l Journal of Artificial Intelligence Tools*, 15(1), February 2006. Special issue with selected papers from ESFOR 2004. 31 pages. (Invited submission.)
14. *** C. Tinelli and C. Zarba. Combining nonstably infinite theories. *Journal of Automated Reasoning*, 34(3), April 2005. 35 pages.
15. * C. Tinelli. Cooperation of background reasoners in theory reasoning by residue sharing. *Journal of Automated Reasoning*, 30(1):1-31, January 2003. 31 pages.
16. * C. Tinelli and C. Ringeissen. Unions of non-disjoint theories and combinations of satisfiability procedures. *Theoretical Computer Science*, 290(1), 2003. 63 pages.
17. *** F. Baader and C. Tinelli. Deciding the word problem in the union of equational theories. *Information and Computation*, 178(2), 2002. Special issue with selected work from RTA'99. 45 pages. (Invited submission.)
18. * C. Tinelli and M. T. Harandi. Constraint logic programming over unions of constraint theories. *The Journal of Functional and Logic Programming*, 1998(6), 1998. 50 pages.

Conference/Workshop Proceedings

1. *** A. Mebsout and C. Tinelli. Proof Certificates for SMT-based Model Checkers for Infinite-state Systems. In *Proc. of 16th Conference on Formal Methods in Computer-Aided Design (Mountain View, CA, USA)*, 2016. Springer.
2. *** G.. Katz, C. Barrett, C. Tinelli, A. Reynolds, and L. Hadarean. Lazy Proofs for DPLL(T)-Based SMT Solvers. In *Proc. of 16th Conference on Formal Methods in Computer-Aided Design (Mountain View, CA, USA)*, 2016. Springer. (Best paper award.)
3. *** A. Champion, A. Mebsout, C. Stickse, and C. Tinelli. The Kind 2 Model-Checker. In *Proc. of 28th Int'l Conference on Computer Aided Verification (Toronto, Canada)*, 2016. Springer.
4. *** A. Champion, A. Gurfinkel, T. Kahsai, and C. Tinelli. CoCoSpec: A Mode-Aware Contract Language for Reactive Systems. In *Proc. of the 14th Int'l Conference on Software Engineering and Formal Methods (Vienna, Austria)*, 2016. Springer.
5. *** K. Bansal, A. Reynolds, C. Barrett, and C. Tinelli. A New Decision Procedure for Finite Sets and Cardinality Constraints in SMT. In *Proc. of the 8th Int'l Joint Conference on Automated Reasoning (Coimbra, Portugal)*, 2016. Springer.
6. ** A. Reynolds, J. Blanchette, S. Cruanes, and C. Tinelli. Model Finding for Recursive Functions in SMT. In *Proc. of the 8th Int'l Joint Conference on Automated Reasoning (Coimbra, Portugal)*, 2016. Springer.
7. *** L. Hadarean, C. Barrett, A. Reynolds, C. Tinelli and M. Deters. Fine-grained SMT proofs for the theory of fixed-width bit-vectors. In *Proc. of the 20th Int'l Conference on Logic for Programming, Artificial Intelligence and Reasoning (Suva, Fiji)*. Springer, 2015.

8. *** T. Liang, N. Tsiskaridze, A. Reynolds, C. Tinelli, and C. Barrett. A Decision Procedure for Regular Membership and Length Constraints over Unbounded Strings. In *Proc. of the 10th Int'l Symposium on Frontiers of Combining Systems (Wroclaw, Poland)*. Springer, 2015.
9. *** A. Reynolds, M. Deters, V. Kuncak, C. Tinelli, and C. Barrett. Counterexample-Guided Quantifier Instantiation for Synthesis in SMT. In *Proc. of the 27th Int'l Conference on Computer Aided Verification (San Francisco, CA)*. Springer, 2015.
10. *** M. Brain, C. Tinelli, P. Rümmer and T. Wahl. Counterexample-Guided Quantifier Instantiation for Synthesis in SMT. In *Proc. of the 22nd IEEE Symposium on Computer Arithmetic (Lyon, France)* IEEE, 2015.
11. ** T. King, C. Barrett and C. Tinelli. Leveraging Linear and Mixed Integer Programming for SMT. In K. Claessen and V. Kuncak editors *Proc. of the 14th Int'l Conference on Formal Methods in Computer-Aided Design*. IEEE, 2014.
12. *** A. Reynolds, C. Tinelli and L. De Moura. Finding Conflicting Instances of Quantified Formulas in SMT. In K. Claessen and V. Kuncak editors *Proc. of the 14th Int'l Conference on Formal Methods in Computer-Aided Design*. IEEE, 2014.
13. *** A. Stump and G. Sutcliffe and C. Tinelli. StarExec: a Cross-Community Infrastructure for Logic Solving. In *Proc. of the 7th Int'l Joint Conference on Automated Reasoning (Vienna, Austria)*. Springer, 2014
14. *** L. Hadarean, K. Bansal, D. Jovanović, C. Barrett and C. Tinelli. A Tale Of Two Solvers: Eager and Lazy Approaches to Bit-vectors. In *Proc. of the 26th Int'l Conference on Computer Aided Verification (Vienna, Austria)*. Springer, 2014
15. *** T. Liang, A. Reynolds, C. Tinelli, C. Barrett and M. Deters. A DPLL(T) Theory Solver for a Theory of Strings and Regular Expressions. In *Proc. of the 26th Int'l Conference on Computer Aided Verification (Vienna, Austria)*. Springer, 2014
16. *** A. Reynolds, C. Tinelli, A. Goel, S. Krstić. Finite Model Finding in SMT. In N. Sharygina and H. Veith editors, *Proceedings the 25th Int'l Conference on Computer Aided Verification (Saint Petersburg, Russia)*. Volume 8044 of *LNCS*. Springer, 2013. 16 pages.
17. *** A. Reynolds, C. Tinelli, A. Goel, S. Krstić, M. Deters, and C. Barrett. Quantifier Instantiation Techniques for Finite Model Finding in SMT. In M. P. Bonacina editor, *Proceedings the 24th Int'l Conference on Automated Deduction (Lake Placid, NY, USA)*. Volume 7898 of *LNCS*. Springer, 2013. 15 pages.
18. *** P.-L. Garoche, T. Kahsai and C. Tinelli. Incremental Invariant Generation using Logic-based Automatic Abstract Transformers. In G. Brat, N. Rungta and A. Venet editors, *Proc. of the 5th NASA Formal Methods Symposium (Moffett Field, CA, USA)*. Volume 7871 of *LNCS*. Springer, 2013. 15 pages.
19. *** T. Liang and C. Tinelli. Exploiting parallelism in the ME calculus. In P. Fontaine, R. Schmidt and S. Schulz editors, *Proc. of the Third Workshop on Practical Aspects of Automated Reasoning Proving (Manchester, UK)*. EPiC, 2012. 13 pages.

20. **A. Stump, A. Reynolds, C. Tinelli, A. Laugesen, H. Eades, C. Oliver, R. Zhang. LFSC for SMT Proofs: Work in Progress. In D. Pichardie and T. Weber editors, *Proc. of the 2nd Int'l Workshop on Proof eXchange for Theorem Proving (Manchester, UK)*. Volume 878 of CEUR Workshop Proceedings, 2012. 7 pages.
21. *** P.-L. Garoche, T. Kahsai, C. Tinelli and M. Whalen. Incremental verification with mode variable invariants in state machines. In A. Goodloe and S. Person editors, *Proc. of 4th NASA Formal Methods Symposium*. Volume 7226 of LNCS. Springer, 2012. 15 pages.
22. *** P. Baumgartner and C. Tinelli. Model Evolution with Equality Modulo Built-in Theories. In N. Bjørner and V. Sofronie-Stokkermans editors, *Proc. of the 23rd Int'l Conference on Automated Deduction*. Volume 6803 of LNAI. Springer, 2011. 15 pages.
23. ** C. Barrett, C. Conway, M. Deters, L. Hadarean, D. Jovanovic, T. King, A. Reynolds, and C. Tinelli. CVC4. In G. Gopalakrishnan and S. Qadeer editors, *Proc. of the 23rd Int'l Conference on Computer Aided Verification*. Volume 6806 of LNCS. Springer, 2011. 10 pages.
24. *** T. Kahsai and C. Tinelli. PKind: A parallel k-induction based model checker. In J. Barnat and K. Heljanko editors, *Proc. of the 10th Int'l Workshop on Parallel and Distributed Methods in Verification (Snowbird, Utah)*. Volume 72 of *Electronic Proceedings in Theoretical Computer Science*. 2011. 8 pages
25. *** A. Reynolds, C. Tinelli and L. Hadarean. Certified Interpolant Generation for EUF. In S. Lahiri and S. Seshia editors, *Proc. of the 9th Int'l Workshop on Satisfiability Modulo Theories (Snowbird, USA)*. 2011. 7 pages.
26. *** T. Kahsai and Y. Ge, and C. Tinelli. Instantiation-Based Invariant Discovery. In M. Bobaru, K. Havelund, G. Holzmann, R. Joshi editors, *Proc. of the 3rd NASA Formal Methods Symposium (Pasadena, CA)*. Volume 6617 of LNCS. Springer, 2011. 15 pages.
27. * C. Barrett, A. Stump and C. Tinelli. The SMT-LIB Standard - Version 2.0. In A. Gupta and D. Kroening editors, *Proc. of the 8th Int'l Workshop on Satisfiability Modulo Theories*. 2010. 10 pages.
28. *** A. Reynolds, L. Hadarean, C. Tinelli, Y. Ge, A. Stump and C. Barrett. Comparing Proof Systems for Linear Real Arithmetic with LFSC. In A. Gupta and D. Kroening editors, *Proc. of the 8th Int'l Workshop on Satisfiability Modulo Theories*. 2010. 10 pages.
29. *** A. Goel, S. Krstić and C. Tinelli. Ground Interpolation for Combined Theories. In R. Smidh editor, *Proc. of the 22nd Int'l Conference on Automated Deduction (Montreal, Canada)*. Volume 5663 of LNAI. Springer, 2009. 16 pages.
30. *** A. Fuchs, A. Goel, J. Grundy, S. Krstić, and C. Tinelli. Ground Interpolation for the Theory of Equality. In S. Kowalewski and A. Philippou editors, *Proc. of the 15th Int'l Conference on Tools and Algorithms for the Construction and Analysis of Systems (York, UK)*. Volume 5505 of LNCS. Springer, 2009. 15 pages.
31. *** P. Baumgartner, A. Fuchs and C. Tinelli. ME(LIA) - Model Evolution With Linear Integer Arithmetic Constraints. In I. Cervesato, H. Veith and A. Voronkov editors,

- Proc. of the 15th Int'l Conferences on Logic for Programming, Artificial Intelligence and Reasoning (Doha, Qatar)*. Volume 5330 of *LNAI*. Springer, 2008. 15 pages.
32. *** G. Hagen and C. Tinelli. Scaling up the formal verification of Lustre programs with SMT-based techniques. In A. Cimatti and R. Jones editors, *Proc. of the 8th Int'l Conference on Formal Methods in Computer-Aided Design*. IEEE, 2008. 9 pages.
 33. ** C. Barrett, Y. Ge, and C. Tinelli. Solving Quantified Verification Conditions using Satisfiability Modulo Theories. In F. Pfenning editor, *Proc. of the 21st Int'l Conference on Automated Deduction*. Volume 4603 of *LNCS*. Springer, 2007. 16 pages.
 34. *** C. Barrett and C. Tinelli. CVC3. In W. Damm and H. Hermanns editors, *Proc. of the 19th Int'l Conference on Computer Aided Verification (Berlin, Germany)*. Volume 4590 of *LNCS*. Springer, 2007. 5 pages.
 35. *** S. Krstić, A. Goel, J. Grundy and C. Tinelli. Combined Satisfiability Modulo Parametric Theories. In O. Grumberg and M. Huth editors, *Proc. of the 13th Int'l Conference on Tools and Algorithms for the Construction and Analysis of Systems (Braga, Portugal)*. Volume 4424 of *LNCS*. Springer, 2007. 15 pages.
 36. *** P. Baumgartner, A. Fuchs and C. Tinelli. Lemma Learning in the Model Evolution Calculus. In M. Hermann and A. Voronkov editors, *Proc. of the 13th Int'l Conference on Logic for Programming, Artificial Intelligence and Reasoning (Phnom Penh, Cambodia)*. Volume 4246 of *LNCS*. Springer, 2006. 15 pages.
 37. *** C. Barrett, R. Nieuwenhuis, A. Oliveras, and C. Tinelli. Splitting on Demand in SAT Modulo Theories. In M. Hermann and A. Voronkov editors, *Proc. of the 13th Int'l Conference on Logic for Programming, Artificial Intelligence and Reasoning (Phnom Penh, Cambodia)*. Volume 4246 of *LNCS*. Springer, 2006. 15 pages.
 38. *** C. Barrett, I. Shikanian, and C. Tinelli. An Abstract Decision Procedure for Satisfiability in the Theory of Recursive Data Types In B. Cook and R. Sebastiani editors, *Proc. of the 4th Int'l Workshop on Pragmatics of Decision Procedures in Automated Reasoning*. Electronic Notes in Theoretical Computer Science, 2006. 11 pages.
 39. *** P. Baumgartner, A. Fuchs, H. de Nivelle, and C. Tinelli. Computing Finite Models by Reduction to Function-Free Clause Logic. In *Proc. of the Int'l Workshop on Disproving (Seattle, Washington)*, 2006. 14 pages.
 40. *** P. Baumgartner and C. Tinelli. The Model Evolution calculus with equality. In R. Nieuwenhuis editor, *Proc. of the 20th Int'l Conference on Automated Deduction (Tallinn, Estonia)*. Volume 3632 of *LNAI*. Springer, 2005. 16 pages.
 41. *** R. Nieuwenhuis, A. Oliveras, and C. Tinelli. Abstract DPLL and abstract DPLL modulo theories. In F. Baader and A. Voronkov editors, *Proc. of the 11th Int'l Conference on Logic for Programming Artificial Intelligence and Reasoning (Montevideo, Uruguay)*. Volume 3452 of *LNAI*. Springer, 2005. 15 pages.
 42. * C. Tinelli and C. Zarba. Combining decision procedures for theories in sorted logics. In J. Alferes and J. Leite editors, *Proc. of the 9th European Conference on Logic in Artificial Intelligence (Lisbon, Portugal)*, volume 3229 of *LNAI*. Springer, 2004. 13 pages.

43. *** H. Ganzinger, G. Hagen, R. Nieuwenhuis, A. Oliveras, and C. Tinelli. DPLL(T): Fast Decision Procedures. In R. Alur and D. Peled editors, *Proc. of the 16th Int'l Conference on Computer Aided Verification*, volume 3114 of *LNCS*. Springer, 2004. 14 pages.
44. *** P. Baumgartner, A. Fuchs and C. Tinelli. Darwin: A Theorem Prover for the Model Evolution Calculus. in G. Sutcliffe, S. Schulz and T. Tammet editors, *Proc. of the 1st Workshop on Empirically Successful First Order Reasoning, ESFOR 2004, (Cork, Ireland)*, Electronic Notes in Theoretical Computer Science, 2004. 25 pages.
45. *** F. Baader, S. Ghilardi and C. Tinelli. A New Combination procedure for the Word Problem that Generalizes Fusion Results in Modal Logics. In D. Basin and M. Rusinowitch editors, *Proc. of the 2nd Int'l Joint Conference On Automated Reasoning (Cork, Ireland)*, volume 3097 of *LNCS*. Springer, 2004. 15 pages. (Nominated for Best Paper Award.)
46. *** P. Baumgartner and C. Tinelli. The Model Evolution calculus. In F. Baader editor, *Proc. of the 19th Int'l Conference on Automated Deduction (Miami, USA)*. Volume 2741 of *LNAI*. Springer, 2003. 15 pages.
47. *** C. Tinelli and C. Zarba. Combining non-stably infinite theories. In I. Dahn and L. Vigneron editors, *Proc. of the 4th Int'l Workshop on First Order Theorem Proving (Valencia, Spain)*, Electronic Notes in Theoretical Computer Science, 2003. 14 pages.
48. * C. Tinelli. A DPLL-based Calculus for Ground Satisfiability Modulo Theories. In G. Ianni and S. Flesca editors, *Proc. of the 8th European Conference on Logic in Artificial Intelligence (Cosenza, Italy)*, volume 2424 of *LNAI*. Springer, 2002. 13 pages.
49. *** F. Baader and C. Tinelli. Combining decision procedures for positive theories sharing constructors. In S. Tison editor, *Proc. of the 13th Int'l Conference on Rewriting Techniques and Applications (Copenhagen, Denmark)*. Volume 2378 of *LNCS*. Springer, 2002. 15 pages.
50. * C. Tinelli. Cooperation of background reasoners in theory reasoning by residue sharing. In P. Baumgartner and H. Zhang editors, *Proc. of the Int'l Workshop on First order Theorem Proving (St Andrews, Scotland)*, 2000. 8 pages.
51. *** F. Baader and C. Tinelli. Combining equational theories sharing non-collapse-free constructors. In H. Kirchner and Ch. Ringeissen editors, *Proc. of the 3rd Int'l Workshop on Frontiers of Combining Systems (Nancy, France)*. Volume 1794 of *LNAI*. Springer-Verlag, 2000. 15 pages.
52. *** F. Baader and C. Tinelli. Deciding the word problem in the union of equational theories sharing constructors. In P. Narendran and M. Rusinowitch, editors, *Proc. of the 10th Int'l Conference on Rewriting Techniques and Applications (Trento, Italy)*. Volume 1631 of *LNCS*. Springer-Verlag, 1999. 15 pages.
53. *** F. Baader and C. Tinelli. A new approach for combining decision procedures for the word problem, and its connection to the Nelson-Oppen combination method. In W. McCune, editor, *Proc. of the 14th Int'l Conference on Automated Deduction (Townsville, Australia)*, volume 1249 of *LNAI*. Springer-Verlag, 1997. 15 pages.

54. * C. Tinelli and M. T. Harandi. Constraint logic programming over unions of constraint theories. In E. C. Freuder, editor, *Proc. of the 2nd Int'l Conference on Principles and Practice of Constraint Programming (Cambridge, MA)*, volume 1118 of *LNCS*. Springer-Verlag, 1996. 15 pages.
55. * C. Tinelli and M. T. Harandi. A new correctness proof of the Nelson–Oppen combination procedure. In F. Baader and K.U. Schulz, editors, *Frontiers of Combining Systems: Proc. of the 1st Int'l Workshop (Munich, Germany)*, Applied Logic. Kluwer, 1996. 17 pages.

EDITED WORK

Archival

1. *** C. Baier and C. Tinelli, editors. *Proc. of TACAS 2015, 21st Int'l Conference on Tools and Algorithms for the Construction and Analysis of Systems* Volume 9035 of *LNCS*. Springer, 2015.
2. *** D. McGuinness, A. Stump Geoff Sutcliffe, and C. Tinelli, editors. *EMSQMS 2010. Workshop on Evaluation Methods for Solvers, and Quality Metrics for Solutions*. Volume 6 of EasyChair Proceedings in Computing, 2012. 51 pages.
3. * C. Tinelli and V. Sofronie-Stokkermans, editors. *Proc. of FroCoS 2011, the 8th Int'l Symposium Frontiers of Combining Systems (Saarbrücken, Germany)*. Volume 6989 of *LNCS*. Springer, 2011. 276 pages.
4. **** W. Ahrendt, P. Baumgartner, H. de Nivelle, S. Ranise, and C. Tinelli, editors. Decision Procedures and Disproving. Special issue of *Electronic Notes in Theoretical Computer Science* with selected papers from PDPAR'04 and Disproving'04. Volume 125, number 3. Elsevier, 2005. 164 pages.
5. * C. Tinelli and T. Rus, editors. Algebraic Methodology and Software Technology. Special issue of *Theoretical Computer Science* with selected papers from AMAST 2000. Vol. 291(3), 2003. 170 pages.

OTHER PUBLICATIONS

Invited Contributions

1. *** C. Barrett and C. Tinelli. Satisfiability Modulo Theories. In E. Clark, T. Henzinger and H. Veith editors, *Handbook on Model Checking*. Springer, 2017 (scheduled). 32 pages.
2. *** C. Barrett, R. Sebastiani, S. Seshia and C. Tinelli. Satisfiability Modulo Theories. In A. Biere, H. van Maaren and T. Walsh editors, *Handbook on Satisfiability*. IOS Press, 2009. 66 pages.
3. *** B. Beckert, T. Hoare, R. Hähnle, D. R. Smith, C. Green, S. Ranise, C. Tinelli, T. Ball, S. K. Rajamani. Intelligent Systems and Formal Methods in Software Engineering. *IEEE Intelligent Systems Magazine*, 21(6):71-81, November/December 2006. 11 pages.

SOFTWARE TOOLS

1. * *Kind 2*, an automatic model checker of safety properties. 2013–present. (<http://kind.cs.uiowa.edu>)
2. *** *CVC4*, an automatic solver for Satisfiability Modulo Theories (SMT) problems. Joint development with C. Barrett at Stanford. 2009–present. (<http://cvc4.cs.stanford.edu/web/>)
3. * *Kind*, an automatic model checker of safety properties. 2005–2013. (<http://clc.cs.uiowa.edu/Kind>)
4. ** *CVC3*, an automatic solver for Satisfiability Modulo Theories (SMT) problems. Joint development with C. Barrett at NYU. 2006–2011. (<http://www.cs.nyu.edu/acsys/cvc3/>)
5. * *Darwin*, a theorem prover for first-order logic. Joint development with P. Baumgartner at the University of Koblenz and MPI. 2004–2010. (<http://combination.cs.uiowa.edu/Darwin/>)

FUNDING

Unrestricted gifts

1. Donation from GE Global Research in support of continued research and development of Kind 2 tool. \$95,000. 2016.
2. PI, Equipment grant from Intel Corporation. \$9,000. 2006.
3. PI, donation from Intel Corporation’s Strategic CAD Labs to support the SMT-LIB project. \$8,333. 2006.
4. PI, Donation from Intel Corporation’s Strategic CAD Labs to support the SMT-LIB project. \$8,333. 2005

External, current

1. PI, Myriad: Automatic Software Diversity for Execution-Time Protection, with David Melski, PI (Grammatech) and Clark Barret, PI (Stanford). DARPA, \$2,500,000. Iowa portion: \$566,815. Start date: 06/01/2015. 3.5 years.
2. co-PI, Contract-based compositional verification for outsourced flight critical systems, with T. Kahsai, PI (CMU/NASA). NASA, \$1,386,307. Iowa portion: \$297,034. Start date: 06/01/2014. 3 years.
3. PI, *Breaking the SMT bottleneck in symbolic security analysis*, with C. Barrett, PI (NYU) and D. Brumley, PI (CMU). NSF, \$1,189,507. Iowa portion: \$397,708. Start date: 08/14/2012. 5 years.
4. co-PI, *StarExec: Cross-Community Infrastructure for Logic Solving*, with A. Stump, PI, and Geoff Sutcliffe, PI (University of Miami). NSF, \$2,110,133. Iowa portion: \$1,959,838. Start date: 09/01/2011. 6 years.

External, completed

1. co-PI, Qualification of Formal Methods Tools, with L. Wagner, PI (Rockwell-Collins). NASA, \$1,000,000. Iowa portion: \$269,176. Start date: 10/01/2014. 2 years.
2. co-PI, Certified SMT Solving for System Verification, with C. Barrett, PI (NYU). DARPA (AFRL/NASA), \$550,300. Iowa portion: \$99,900. Start date: 01/09/2013. 2 years.
3. PI, Verification of Complex Systems via SMT. United Technologies Research Center, \$70,927. Start date: 08/12/2013. 17 months.
4. co-PI, Compositional Verification of Flight Critical Systems, with D. Cofer, PI (Rockwell-Collins), and M. Whalen, co-PI (Minnesota). NASA, \$1,931,500. Iowa portion: \$210,000. Start date: 01/06/2013. 3 years.
5. co-PI, *Formal Verification Quasi-Synchronous Systems*, with S. Miller, PI (Rockwell-Collins), and S. Smolka, co-PI (SUNY). AFRL, \$700,000. Iowa portion: \$150,000. Start date: 01/01/2013. 2 years.
6. PI, *Kind SMT-based Model checker*. Rockwell-Collins Inc., \$24,930. Start date: 01/01/2013. 1 year.
7. PI, *Further Improving Counterexample Generation in Satisfiability Modulo Theories*. Intel Corp., \$30,000. Start date: 01/01/2013. 1 year.
8. PI, *Scalable and Accurate SMT-based Model Checking of Data Flow Systems*, with C. Barrett, PI (New York University). AFOSR, \$1,122,959 Iowa portion: \$522,437. Start date: 08/01/2009. 4 years.
9. PI, *Improving Counterexample Generation in Satisfiability Modulo Theories*. Intel Corporation, \$28,000. Start date: 08/15/2011. 1 year.
10. PI, *Parallel Automated Reasoning*, with C. Barrett, PI (New York University). NSF EAGER, \$250,000. Iowa portion: \$125,202. Start date: 09/01/2010. 2 years.
11. PI, *2010 Midwest Verification Day Workshop* with A. Stump, co-PI. NSF, \$5,250. Start date, 07/13/2010. 1 year.
12. co-PI, *A Cross-Community Solver Execution Service. Planning Grant*, with A. Stump, PI, and Geoff Sutcliffe, PI (University of Miami). NSF, \$100,000. Iowa portion: \$84,197. Start date: 05/01/2010. 1 year.
13. co-PI, *Efficient and flexible proof checking for Satisfiability Modulo Theories*, with A. Stump, PI, and C. Barrett, PI (New York University). NSF, \$449,986. Iowa portion: \$299,986. Start date: 07/01/2009. 3 years.
14. PI, *SMT-LIB, A common library and infrastructure for satisfiability modulo theories*, with C. Barrett, PI (New York University) and A. Stump, PI (Washington University). NSF, \$494,049. Iowa portion: \$160,903. Start date: 08/01/2006. 2 years.
15. Participation to the IFIP Conference on Verified Software: Theories, Tools, and Experiments. (By invitation only). NSF Travel grant. \$2,000. (Awarded in 2005.)

16. PI, *CAREER: Fast Provers for Extended Static Checking of Software*. NSF, \$404,551. Start date: 06/01/2003. 5 years.
17. PI, *15th Int'l Workshop on Unification (UNIF 2001)*. NSF, \$12,780. Start date: 06/01/2001. 5 months.
18. co-PI, *Modular Combination of Satisfiability Procedures*, with Mehdi Harandi, PI (University of Illinois at Urbana-Champaign). NSF, \$211,356. Start date 09/01/99. 3 years.

Internal, completed

1. PI, *IREU Initiative. A new approach for solving binary integer programming problems*. \$3,000. 3 months. (Awarded in 2005.)
2. *Int'l travel grant*. Participation to 17th Int'l Conference on Computer-aided Verification (CAV'05). \$400. (Awarded in 2005.)
3. *Old Gold Fellowship*. Extending a Combination Method for the Word Problem to Many-sorted Logic. 1 month. 2001.
4. *Old Gold Fellowship*. Modular Combination of Constraint Solvers. 1 month. 2000.

INVITED TALKS AND LECTURES

International

1. *A Mode-aware Contract Language for Reactive Systems*. Int'l International Workshop on Numerical Software Verification. Toronto, Ontario, Canada. July 2016.
2. *Conflict-based Quantifier Instantiation for SMT* Dagstuhl Seminar on Information from Deduction: Models and Proofs. September 2015.
3. *An Efficient Solver for string and regular expression constraints*. Microsoft Research, Cambridge, UK. April 2015.
4. *SMT-based model checking*. École Normale Supérieure, Paris, France. July 2014.
5. *SMT-based Unbounded Model Checking with IC3 and Approximate QE*. French Alternative Energies and Atomic Energy Commission (CEA), Paris, France. July 2014.
6. *Extending SMT solving with constrained deduction and rewrite rules*. Int'l Workshop on rewriting logic and its applications, Grenoble, France. April 2014.
7. *Solving quantified formulas in SMT by finite model finding*. Synthesis, Verification, and Analysis of Rich Models, Madrid, Spain. October 2013.
8. *SMT-based model checking*. Instituto Madrileño de Estudios Avanzados (IMDEA), Spain. October 2013.
9. *Incremental SMT-based safety checking of reactive systems*. École Polytechnique Fédérale de Lausanne (EPFL), Switzerland. July 2013.
10. *Incremental SMT-based model checking of synchronous systems*. Max Planck Institute for Computer Science, Germany. July 2012.

11. *Introducing StarExec: a Cross-Community Infrastructure for Logic Solving*. COMPARE 2012, Manchester, UK. June 2012.
12. *Foundations of lazy SMT and DPLL(T)*. Int'l SAT/SMT Solver Summer School, Trento, Italy. June 2012.
13. *SMT-based model checking*. NASA Formal Methods Symposium, Norfolk, Virginia, USA. April 2012.
14. *The SMT-LIB standard and library*. Int'l SAT/SMT Solver Summer School, Cambridge, MA, USA. June 2011.
15. *The SMT-LIB Initiative and the Rise of SMT*. Haifa Verification Conference, Haifa, Israel. October 2010.
16. *Foundations of Satisfiability Modulo Theories*. Workshop on Logic, Language, Information and Computation, Brasilia, Brasil. July 2010.
17. *Interpolation in the Theory of Equality*. University of Oxford, Oxford, UK. July 2009.
18. *Ground Interpolation for the Theory of Equality*. Technical University of Dresden, Dresden, Germany. March 2009.
19. *Scaling up the formal verification of data flow programs with SMT-based techniques*. Chalmers University, Gothenburg, Sweden. December 2008.
20. *Combined Satisfiability Modulo Parametric Theories*. Dagstuhl Seminar on Deduction and Decision Procedures, Schloss Dagstuhl, Germany. October 2007.
21. *Trends and Challenges in Satisfiability Modulo Theories*. Int'l Verification Workshop, Bremen, Germany. July 2007.
22. *An Abstract Framework for Satisfiability Modulo Theories*. Int'l Conference on Automated Reasoning with Analytic Tableaux and Related Methods, Aix en Provence, France. July 2007.
23. *My Top Ten Things to Do for more Empirically Successful Computerized Reasoning*. FLoC'06 Workshop on Empirically Successful Computerized Reasoning, Seattle, WA. August 2006. (Invited panelist.)
24. *Computing Finite Models by Reduction to Function-Free Clause Logic*. University of Milan, Italy. July 2006.
25. *Solving Binary Integer Programs with DPLL(T)*. Dagstuhl Seminar on Deduction and Applications, Schloss Dagstuhl, Germany. October 2005.
26. *Theory and practice of decision procedures for combinations of theories*. 17th Int'l Conference on Computer Aided Verification. July 2005. (Invited tutorial.)
27. *Formalizing DPLL-based Solvers for Propositional Satisfiability and Satisfiability Modulo Theories*. Microsoft Research, Cambridge, England. July 2005.
28. *Formalizing DPLL-based Solvers for Propositional Satisfiability and Satisfiability Modulo Theories*. University of Birmingham, England. July 2005.

29. *DPLL-based Checkers for Satisfiability Modulo Theories*. University of Nijmegen, the Netherlands. June 2004.
30. *Combining decision procedures for sorted theories*. Complutense University of Madrid, Spain. June 2004.
31. *Combining non-stably infinite theories*. Max Planck Institute for Computer Science, Germany. January 2004.
32. *DPLL-based checkers for satisfiability modulo theories*. INRIA-Lorraine, France. January 2004.
33. *A DPLL-based calculus for ground satisfiability modulo theories*. University of Koblenz, Germany. April 2002.
34. *Modular combination of solvers for constraint-based reasoning*. University of Bari, Italy. July 2001.
35. *Combining decision procedures for the word problem*. University of Milan, Italy. June 2001.

National

1. *An overview of compositional model checking with Kind 2*. GE Global Research. Niskayuna, NY. July 2016.
2. *CoCoSpec: A Mode-aware Contract Language for Reactive Systems*. University of Colorado, Boulder, CO. May 2016.
3. *An Efficient Solver for string and regular expression constraints*. University of Nebraska, Lincoln, NE. November 2014.
4. *A Tate of SMT*. University of Nebraska, Omaha, NE. November 2014.
5. *Reasoning effectively with quantifiers and built-in theories—new solutions to a long-standing challenge*. Carnegie Mellon University, Pittsburgh, PA. November 2013.
6. *Incremental SMT-based safety checking of synchronous systems*. University of New Mexico, Albuquerque, NM. May 2013.
7. *SMT-based safety checking*. The University of North Carolina at Charlotte, Charlotte, NC. April 2013.
8. *Incremental SMT-based model checking of synchronous systems*. United Technologies Research Center, October 2012.
9. *Incremental SMT-based model checking of synchronous systems*. Microsoft Research, Redmond, WA. April 2012.
10. *Incremental and parallel model checking for synchronous systems*. Safe and Secure Systems and Software Symposium, Air Force Research Laboratory, Beavercreek, OH. June 2011.
11. *SMT-based model checking*. Summer School on Formal Techniques, Atherton, CA. May 2011.

12. *Improving inference tools for more usable verification*. NSF Workshop on Usable Verification, Redmond, WA. November 2010.
13. *Scalable and Accurate SMT-Based Model Checking of Data Flow Systems*. Safe and Secure Systems and Software Symposium, Air Force Research Laboratory, Beavercreek, OH. June 2010.
14. *SMT-based model checking and verification of data flow programs*. University of Delaware, Newark, DE. October 2009.
15. *Combined Satisfiability Modulo Parametric Theories*. Intel Corporation, Strategic CAD Labs, Portland, OR. October 2007.
16. *Splitting on Demand in Satisfiability Modulo Theories*. SRI Int'l, Menlo Park, CA. May 2007.
17. *The Impact of Craig's Interpolation Theorem in Computer Science*. Interpolations: A conference in honor of William Craig. University of California, Berkeley, CA. May 2007.
18. *Combination and Augmentation Methods for Satisfiability Modulo Theories*. Carnegie Mellon University, Pittsburgh, PA. April 2007.
19. *Splitting on Demand in Satisfiability Modulo Theories*. Microsoft Research, Redmond, WA. November 2006.
20. *Formalizing DPLL-based Solvers for Propositional Satisfiability and for Satisfiability Modulo Theories*. University of Illinois at Urbana-Champaign, Urbana, IL. April 2006.
21. *Abstract DPLL Modulo Theories*. Intel Corporation, Strategic CAD Labs, Portland, OR. March 2006.
22. *An Efficient Non-clausal Calculus for Satisfiability Modulo Theories*. New York University, New York, NY. November 2004.
23. *The DPLL(T_1, \dots, T_n) Framework for Satisfiability Modulo Multiple Theories*. Carnegie Mellon University, Pittsburgh, PA. October 2004.
24. *The combination problem in unsorted first-order logic*. Int'l Summer School on Combination of Decision Procedures, Stanford University and SRI Int'l, Palo Alto, CA. August 2004.
25. *The combination problem in sorted first-order logics*. Int'l Summer School on Combination of Decision Procedures, Stanford University and SRI Int'l, Palo Alto, CA. August 2004.
26. *DPLL-based checkers for satisfiability modulo theories*. University of Minnesota, Minneapolis, MN. February 2004.
27. *The model evolution calculus*. University of Illinois at Urbana-Champaign, Urbana, IL. October 2003.
28. *Ground satisfiability modulo theories*. Washington University in St. Louis, St. Louis, MO. April 2003.
29. *Ground satisfiability modulo theories*. Iowa State University, Ames, IA. April 2003.

30. *Ground satisfiability modulo theories*. Stanford University, Palo Alto, CA. February 2003.
31. *Combining satisfiability procedures for automated reasoning*. University of New Mexico, Albuquerque, NM. November 2001.

SERVICE

DEPARTMENT

Colloquium Series Chair, Spring 2002–Spring 2005
CSE Committee, Since Spring 2016
Executive Committee, Fall 2010–Spring 2011, Fall 2006–Spring 2009
Faculty Review Committee, Spring 2016, 2015, 2011
Graduate Committee, Since Fall 2016, Fall 2002–Spring 2003
Honors Program Chair, since Spring 2011
Promotion Committee, Fall 2013, Fall 2012, Spring 2010, Fall 2009
Recruiting Committee, Fall 2005–Spring 2006, Fall 2002–Spring 2003
Undergraduate Committee, Fall 2008–Fall 2009

COLLEGE

CDA Review Committee, Fall 2013
Faculty Assembly, 2011–2014

UNIVERSITY

Jakobsen Conference reviewer, Spring 2011
Iowa FIRST support, 2008

PROFESSION

Associate Editor

The Journal of Automated Reasoning, since Oct 2007

Trustee or Steering Committee Member

CADE Inc., Int'l Conference on Automated Deduction, Nov 2005–Nov 2008; ETAPS, European Joint Conferences on Theory and Practice of Software, since Dec 2013; FroCoS, Int'l Symposium on Frontiers of Combining Systems, since Aug 2010, Jul 2004–Nov 2007; FTP, Int'l Workshop on First-Order Theorem Proving, Nov 2003–Nov 2012; IJCAR, Int'l Joint Conference on Automated Reasoning, Oct 2004–Oct 2007; SMT, Int'l Workshop on Satisfiability Modulo Theories, since Sep 2012, Sep 2009–Aug 2011

Founder

SMT, Int'l Workshop on Satisfiability Modulo Theories; MVD, Midwest Verification Day workshop

Program Committee Chair

TACAS 2015, Int'l Conference on Tools and Algorithms for the Construction and Analysis of Systems; FroCoS 2011, Int'l Symposium on Frontiers of Combining Systems

Program Committee Member

ARQNL 2014, Workshop on Automated Reasoning in Quantified Non-Classical Logics; CADE 26, 23–19, Int'l Conference on Automated Deduction; CAV 2015, '14, Int'l Conference on Computer Aided Verification; CSTVA 2014, Workshop on Constraints in Software Testing, Verification, and Analysis; Disproving 2006, '05, '04, Workshop on Disproving; ECAI 2006, European Conference on Artificial Intelligence; IJCAR 2014, '12, '10, '08, Int'l Joint Conference on Automated Reasoning; EMSQMS 2010, Workshop on Evaluation Methods for Solvers and Quality Metrics for Solutions; FMCAD 2014, Conference on Formal Methods in Computer-Aided Design; FroCoS 2015, '11, '09, '07, '05, '02, Int'l Symposium on Frontiers of Combining Systems; LICS 2016, Annual ACM/IEEE Symposium on Logic in Computer Science; LfSA 2010, Workshop on Logics for System Analysis; LPAR 2012, '10, '07, '05, '04, Int'l Conference on Logic for Programming, Artificial Intelligence, and Reasoning; NFM 2017, '13, NASA Formal Methods Symposium; PAAR 2008, Workshop on Practical Aspects of Automated Reasoning; PDPAR 2006, '05, '04, '03, Int'l Workshop on Pragmatics of Decision Procedures; PxTP 2015, Workshop on Proof eXchange for Theorem Proving; SETTA 2015, Symposium on Dependable Software Engineering: Theories, Tools and Applications; SMT 2016, '14-'07, Int'l Workshop on Satisfiability Modulo Theories; TABLEAUX 2017, Int'l Conference on Automated Reasoning with Analytic Tableaux and Related Methods; TACAS 2016 '15-'13, Int'l Conference on Tools and Algorithms for the Construction and Analysis of Systems; VSTTE 2014, '06, Working Conference on Verified Software: Tools, Techniques, and Experiments

Co-organizer

Dagstuhl Seminar on Deduction Beyond First-Order Logic, 2017; CADE-19, Int'l Conference on Automated Deduction; EMSQMS 2010, Workshop on Evaluation Methods for Solvers and Quality Metrics for Solutions; MVD 2010, 2009, Midwest Verification Day Workshop; PDPAR 2004, 2003, Int'l Workshop on Pragmatics of Decision Procedures; Int'l SAT/SMT Solvers Summer School 2011; StarExec 2013, 2012 Workshop on StarExec Infrastructure; UNIF 2002, 2001, Int'l Workshop on Unification

Book second reader

D. Kroening and O. Strichman. *Decision Procedures: An Algorithmic Point of View*. Springer, 2008
F. Baader and T. Nipkow. *Term Rewriting and All That*. Cambridge University Press, 1998

Research Proposal Reviewer

Air Force Office of Scientific Research, 2009
Austrian Science Fund, 2010
INRIA, France, 2013
National Science Foundation, 2017, 2015, 2011, 2010, 2005

Swiss National Science Foundation 2009
US-Israel Binational Science Foundation, 2005

Journal Reviewer

ACM Transactions on Computational Logic; Annals of Mathematics and Artificial Intelligence; The Journal of the ACM; The Journal of Automated Reasoning; Information and Computation; The Int'l Journal of Expert Systems; Journal on Satisfiability, Boolean Modeling and Computation; The Journal of Symbolic Computation; Theoretical Computer Science

Coordinator

StarExec, a cross community logic solving infrastructure and service (<http://www.starexec.org>), since Sep 2011.

The STM-LIB initiative, a standardization effort and a benchmark repository for satisfiability modulo theories solvers (<http://www.SMT-LIB.org>), since Aug 2003.

INDUSTRY

Consultation and collaboration with formal methods experts at General Electric Global Research, Niskayuna, NY on formal modeling and tool development. Since 2016.

Consultation and collaboration with formal methods experts at United Technologies Research Center, East Hartford, CT on formal modeling and tool development. Since 2013.

Consultation and collaboration with formal methods experts at Rockwell Collins, Cedar Rapids, IA on tool development and deployment. Since 2007.

Consultation and collaboration with formal methods experts at Intel Corporation, Hillsboro, OR on tool development and deployment. Since 2011.

TEACHING AT THE UNIVERSITY OF IOWA

Advising and Supervision

Name	Role	Status
Research Scientists		
Andrew Reynolds (PhD, U. of Iowa)	Supervisor	Current
Postdocs		
Daniel Larraz (PhD, T.U. of Barcelona)	Supervisor	Current
Burak Ekici (PhD, U. of Grenoble)	Supervisor	Completed '16
Adrien Champion (PhD, U. of Toulouse)	Supervisor	Completed '16
Alain Mepsout (PhD, U. of Paris)	Supervisor	Completed '16
Nestan Tsiskaridze (PhD, U. of Manchester)	Supervisor	Completed '16, later postdoc at UCSB
Christoph Stickel (PhD, U. of Manchester)	Supervisor	Completed '15, later at MathWorks
François Bobot (PhD, U. of Paris)	Supervisor	Completed '12, later at CEA, Paris
Temesghen Kahsai (PhD, U. of Swansea)	Supervisor	Completed '12, later at CMU/NASA Ames
Yeting Ge (PhD, NYU)	Supervisor	Completed '10, later at Two Sigma
PhD Dissertations		
Baolu Meng	Chair	Current
Ruoyu Zhang	Chair	Current
Guillaume Baudart (ENS, France)	Member	Current
Kshitij Bansal (NYU)	Member	Graduated '15, later at Google
Tianyi Liang	Chair	Graduated '14, later at Two Sigma
Liana Hadarean (NYU)	Co-Chair	Graduated '14, later postdoc at Oxford U.
Adrien Champion (Onera, France)	Member	Graduated '14, later postdoc at U. of Iowa
Julien Henry (U. of Grenoble, France)	Member	Graduated '14, later postdoc at U. of Wisconsin
Harley Eades	Member	Graduated '14, later at Georgia Regents U.
Peng Fu	Member	Graduated '14, later postdoc at U. of Dundee
Andrew Reynolds	Chair	Graduated '13, later postdoc at EPFL
Duccki Oe	Member	Graduated '12, later at Coverity
Alexander Fuchs	Chair	Graduated '09, later at COMSOFT
Philipp Rümmer (Chalmers U., Sweden)	Member	Graduated '08, later at Uppsala U.
George Hagen	Chair	Graduated '08, later at NASA, Langley
Joseph Hendrix (UIUC)	Member	Graduated '08, later at Galois
Haiou Shen	Member	Graduated '06, later at MathWorks
Albert Oliveras (UPC, Spain)	Co-chair	Graduated '06, later at UPC
Calogero Zarba (Stanford U.)	Member	Graduated '04, later at Neodata Group
MS Theses		
Alexander Fuchs (U. of Koblenz, Germ.)	Co-chair	Graduated '04
Kirk Hackert	Chair	Graduated '03
Aditya Sehgal	Member	Graduated '02
George Hagen	Member	Graduated '01
Javeed Chida	Member	Graduated '00