

Sarah Winkler | Curriculum Vitae

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Research Interests

- automated reasoning, in particular equational reasoning
- term rewriting, in particular termination and completion
- formal verification and interactive theorem proving (Isabelle/HOL)
- SAT/SMT based program analysis

Higher Education

University of Innsbruck

Doctoral degree in Technical Sciences, cum laude 11/2008–3/2013
supervised by Aart Middeldorp; Thesis: *Termination Tools in Automated Reasoning*

University of Innsbruck

Master degree of Computer Science, cum laude 10/2006–10/2008

University of Innsbruck

Bachelor degree of Computer, cum laude 10/2003–9/2006

Professional Experience

University of Innsbruck

postdoctoral researcher since 10/2016
funded by FWF project *Instantiation- and Learning-Based Methods in Equational Reasoning*

Microsoft Research, Cambridge

research software developer 9/2015–9/2016
working with Nuno Lopes on SMT-based translation validation for C/C++ compilers

Microsoft Research, Cambridge

contractor 4/2015–7/2015
working with Andrey Rybalchenko on invariant inference for Dafny

University of Innsbruck

postdoctoral researcher 4/2013–3/2015
employed on FWF Austria-Japan joint project on *Constrained Rewriting and SMT*

University of Innsbruck

doctoral student 2/2009–1/2013
funded by an ÖAW docfForte grant

University of Innsbruck

programmer 2007–2009
FWF project *Termination Tools: Verification and Optimization* (four months in total)

Self-Employed

free-lance programmer and web developer 2002–2006

Teaching Experience

International Summer School on Rewriting

basic track

2015, 2017, 2019

together with Aart Middeldorp.

SAT and SMT Solving

conception and teaching of lecture, University of Innsbruck

summer terms 2018 and 2019

Formal Language and Automata Theory

teaching assistant, University of Innsbruck

winter terms 2009, 2011–2014, 2017

Term Rewriting

teaching assistant, University of Innsbruck

winter terms 2009, 2010, 2011, 2012

Various subjects

teaching assistant, University of Innsbruck

2006–2010

Exercise classes on *Functional Programming*, *Introduction to Computer Science*, *Formal Methods*, *Algorithms and Data Structures*, and *Logic* (one term each).

Funded Projects and Awards

FWF Hertha Firnberg project

Instantiation- and Learning-Based Methods in Equational Reasoning

10/2016–9/2019

Austrian Science Fund FWF project T789

ÖAW docfForte grant

Termination Tools in Automated Reasoning

2/2010–1/2013

PhD grant awarded by the Austrian Academy of Sciences

Doktoratsstipendium

Nachwuchsförderung Universität Innsbruck

2/2009–1/2010

PhD scholarship awarded by the University of Innsbruck to promote young scientists

Studienförderpreis

Deutscher Freundeskreis der Universitäten Innsbrucks

7/2008

prize awarded for master project

Invited Activities

Dagstuhl Seminar 19371: Deduction Beyond Satisfiability

invited participant

9/2019

FSCD 2019

invited speaker

6/2019

4th International Conference on Formal Structures for Computation and Deduction

Dagstuhl Seminar 15381: Information from Deduction: Models and Proofs

invited participant

9/2015

Participation in Committees

- program committee of *27th International Conference on Automated Deduction (CADE-27)*.
- program committee of *8th International Workshop on Confluence (IWC 2019)*.
- co-organization of *Automated Reasoning: Challenges, Applications, Directions, Exemplary Achievements (ARCADE 2019)*.

Research Visits

Japan Advanced Institute of Science and Technology, Nomi City

hosted by Nao Hirokawa

2013–2019

four research visits, seven weeks in total

Nagoya University

hosted by Naoki Nishida

2018

University of Hokkaido, Sapporo

hosted by Masahito Kurihara

2013–2019

three research visits, eight weeks in total

MIT, Cambridge/United States

hosted by Kurt Fendt

2006

resulting in a bachelor project extending the on-line learning environment *Metamedia*

Talks

I had the opportunity to present twelve publications at international conferences and four workshop papers, corresponding to [7, 8, 9, 11, 14, 16, 17, 18, 19, 20, 21, 22] and [24, 25, 26, 27] from the publication list below, respectively.

Further international events where I presented my work include the following:

- 50th TRS Meeting, 2/2019, Atami, Japan
- 46th TRS Meeting, 2/2017, Shinojima, Japan
- Microsoft Research Dafny Mini-Workshop, 7/2015, Redmond, United States
- Dagstuhl Seminar 15381: Information from Deduction: Models and Proofs, 9/2015, Wadern, Germany
- Austria-Japan Summer Workshop on Rewriting, 8/2010, Obergurgl, Austria
- Workshop Paris-Innsbruck-Tbilisi, 5/2010, Paris, France

Software

mædmax: conflict-based equational theorem prover [9, 6]

main developer, since 2016

Ctrl: constrained rewrite tool [7, 8]

contributor, 2018

IsaFoR: Isabelle Formalization of Rewriting [5, 13, 14]

contributor, since 2013

TTT2: termination tool [2, 3]

contributor, 2012–2015

mkb_{TT}: completion tool [4]

main developer, 2008–2015

Language Skills

programming languages and proof assistants: OCaml, Isabelle/HOL, Python, PHP, C++

natural languages: German (mothertongue), English (fluent), Italian (B1)

Personal Interests

Besides my interests in logic, theoretical computer science and mathematics I like to do sports. Currently I especially favor mountain and road biking, hiking, and skiing. Moreover I enjoy going to the cinema and good reads.

Publications

Journal Publications

- [1] N. Hirokawa, A. Middeldorp, C. Sternagel, and S. Winkler. Abstract completion, formalized. 2019. Invited to FSCD 2017 Special Issue of LMCS, in preparation.
- [2] A. Yamada, S. Winkler, N. Hirokawa, and A. Middeldorp. AC-KBO Revisited. *Theor. Pract. Log. Prog.*, 16(2):163–188, 2016. doi: [10.1017/S1471068415000083](https://doi.org/10.1017/S1471068415000083).
- [3] H. Zankl, S. Winkler, and A. Middeldorp. Beyond Polynomials and Peano Arithmetic — Automation of Elementary and Ordinal Interpretations. *J. Symb. Comput.*, 69(C):129–158, 2015. doi: [10.1016/j.jsc.2014.09.033](https://doi.org/10.1016/j.jsc.2014.09.033).
- [4] S. Winkler, H. Sato, A. Middeldorp, and M. Kurihara. Multi-completion with termination tools. *J. Autom. Reasoning*, 50(3):317–354, 2013. doi: [10.1007/s10817-012-9249-2](https://doi.org/10.1007/s10817-012-9249-2).

Conference Publications

- [5] C. Sternagel and S. Winkler. Certified equational reasoning via ordered completion. Accepted to Proc. 27th CADE, 2019, to appear.
- [6] S. Winkler. Extending maximal completion. Accepted to Proc. 4th FSCD, 2019, to appear.
- [7] N. Nishida and S. Winkler. Loop detection by logically constrained term rewriting. In *Proc. 10th VSTTE*, volume 11294 of *LNCS*, pages 309–321, 2018. doi: [10.1007/978-3-030-03592-1_18](https://doi.org/10.1007/978-3-030-03592-1_18).
- [8] S. Winkler and A. Middeldorp. Completion for logically constrained rewriting. In *Proc. 3rd FSCD*, volume 108 of *LIPICs*, pages 30:1–30:18, 2018. doi: [10.4230/LIPICs.FSCD.2018.30](https://doi.org/10.4230/LIPICs.FSCD.2018.30).
- [9] S. Winkler and G. Moser. Mædmax: A maximal ordered completion tool. In *Proc. 9th IJCAR*, volume 10900 of *LNCS*, pages 472–480, 2018. doi: [10.1007/978-3-319-94205-6_31](https://doi.org/10.1007/978-3-319-94205-6_31).
- [10] N. Hirokawa, A. Middeldorp, C. Sternagel, and S. Winkler. Infinite runs in abstract completion. In *Proc. 2nd FSCD*, volume 84 of *LIPICs*, pages 19:1–19:16, 2017. doi: [10.4230/LIPICs.FSCD.2017.19](https://doi.org/10.4230/LIPICs.FSCD.2017.19).
- [11] H. Sato and S. Winkler. Encoding dependency pair techniques and control strategies for maximal completion. In *Proc. 25th CADE*, volume 9195 of *LNCS*, pages 152–162, 2015. doi: [10.1007/978-3-319-21401-6_10](https://doi.org/10.1007/978-3-319-21401-6_10).
- [12] T. Sternagel, S. Winkler, and H. Zankl. Recording completion for certificates in equational reasoning. In *Proc. 4th CPP*, pages 41–47, 2015. doi: [10.1145/2676724.2693171](https://doi.org/10.1145/2676724.2693171).
- [13] S. Winkler and R. Thiemann. Formalizing soundness and completeness of unravelings. In *Proc. FroCoS 2015*, volume 9322 of *LNCS*, pages 239–255, 2015. doi: [10.1007/978-3-319-24246-0_15](https://doi.org/10.1007/978-3-319-24246-0_15).
- [14] J. Nagele, R. Thiemann, and S. Winkler. Certification of nontermination proofs using strategies and nonlooping derivations. In *Proc. 6th VSTTE*, volume 8471 of *LNCS*, pages 216–232, 2014. doi: [10.1007/978-3-319-12154-3_14](https://doi.org/10.1007/978-3-319-12154-3_14).

- [15] A. Yamada, S. Winkler, N. Hirokawa, and A. Middeldorp. AC-KBO revisited. In *Proc. 12th FLOPS*, volume 8475 of *LNCS*, pages 319–335, 2014. doi: [10.1007/978-3-319-07151-0](https://doi.org/10.1007/978-3-319-07151-0).
- [16] S. Winkler and A. Middeldorp. Normalized completion revisited. In *Proc. 24th RTA*, volume 21 of *LIPICs*, pages 319–334, 2013. doi: [10.4230/LIPICs.RTA.2013319](https://doi.org/10.4230/LIPICs.RTA.2013319).
- [17] S. Winkler, H. Zankl, and A. Middeldorp. Beyond Peano Arithmetic — Automatically Proving Termination of the Goodstein Sequence. In *Proc. 24th RTA*, volume 21 of *LIPICs*, pages 335–351, 2013. doi: [10.4230/LIPICs.RTA.2013335](https://doi.org/10.4230/LIPICs.RTA.2013335).
- [18] S. Winkler, H. Zankl, and A. Middeldorp. Ordinals and Knuth-Bendix orders. In *Proc. 18th RTA*, volume 7180 of *LNCS*, pages 420–434, 2012. doi: [10.1007/978-3-642-28717-6_33](https://doi.org/10.1007/978-3-642-28717-6_33).
- [19] S. Winkler and A. Middeldorp. AC completion with termination tools. In *Proc. 23rd CADE*, volume 6803 of *LNCS*, pages 492–498, 2011. doi: [10.1007/978-3-642-22438-6_37](https://doi.org/10.1007/978-3-642-22438-6_37).
- [20] S. Winkler and A. Middeldorp. Termination tools in ordered completion. In *Proc. 5th IJCAR*, volume 6173 of *LNCS*, pages 518–532, 2010. doi: [10.1007/978-3-642-14203-1_43](https://doi.org/10.1007/978-3-642-14203-1_43).
- [21] S. Winkler, H. Sato, A. Middeldorp, and M. Kurihara. Optimizing mkbTT (system description). In *Proc. 21st RTA*, volume 6 of *LIPICs*, pages 373–384, 2010. doi: [10.4230/LIPICs.RTA.2010.373](https://doi.org/10.4230/LIPICs.RTA.2010.373).
- [22] H. Sato, S. Winkler, M. Kurihara, and A. Middeldorp. Multi-completion with termination tools (system description). In *Proc. 4th IJCAR*, volume 5195 of *LNCS*, pages 306–312, 2008. doi: [10.1007/978-3-540-71070-7_26](https://doi.org/10.1007/978-3-540-71070-7_26).

Thesis.....

- [23] S. Winkler. *Termination Tools in Automated Reasoning*. PhD thesis, University of Innsbruck, 2013.

Workshops and Other Publications.....

- [24] S. Winkler. Mædmax at school: Learning selection in equational reasoning. In *Proc. 4th Conference on Artificial Intelligence and Theorem Proving*, 2019. To appear.
- [25] C. Sternagel and S. Winkler. Certified ordered completion. In *Proc. 7th International Workshop on Confluence*, pages 41–45, 2018.
- [26] S. Winkler. A ground joinability criterion for ordered completion. In *Proc. 6th International Workshop on Confluence*, pages 45–49, 2017.
- [27] H. Sato and S. Winkler. A satisfiability encoding of dependency pair techniques for maximal completion. In *Proc. 14th International Workshop on Termination*, pages 80–84, 2014.
- [28] H. Zankl, S. Winkler, and A. Middeldorp. Automating elementary interpretations. In *Proc. 14th International Workshop on Termination*, pages 90–94, 2014.
- [29] H. Zankl, S. Winkler, and A. Middeldorp. Automating ordinal interpretations. In *Proc. 12th International Workshop on Termination*, pages 94–98, 2012.

- [30] H. Sato, M. Kurihara, S. Winkler, and A. Middeldorp. Constraint-based multi-completion procedures for term rewriting systems. *IEICE Transactions on Information and Systems*, E92-D(2):220–234, 2009.
- [31] C. Sternagel, R. Thiemann, S. Winkler, and H. Zankl. CeTA — a tool for certified termination analysis. In *Proc. 10th International Workshop on Termination*, pages 84–87, 2009.