DOMINIK WINTERER

Department of Computer Science   ✉ dominik.winterer@inf.ethz.ch
ETH Zurich, Switzerland   🌐 https://wintered.github.io
CNB H 103.2   🐦 @DominikWinterer

VISION

I am passionate about solidifying software foundations. Currently, I am researching techniques for automatically testing SMT solvers, making them more reliable and improve their performance. I am leading the Project Yin-Yang on SMT solver testing, a fuzzing campaign which found ★ **1,500+ bugs** in the state-of-the-art SMT solvers Z3 and CVC5. My research style is strongly quality and impact-driven whether it is research papers, tools, artifacts, *etc.* I am particularly passionate about mentoring students. Seeing my mentees succeed and help further their careers fills me with pride.

EDUCATION

ETH Zurich, Switzerland   Mar 2019 – Present
Ph.D. in Computer Science
Advisor: Prof. Dr. Zhendong Su

University of Freiburg, Germany   Oct 2011 – Mar 2018
MSc. Computer Science
BSc. Computer Science

EXPERIENCE

Academic Assistant, University of Konstanz, Germany   Jul 2018 - Feb 2019
Teaching classes on SMT Solving & Software Engineering

IBM Research Intern, Yorktown Heights, USA   Jun 2017 - Sep 2017
Hosted by Michael Katz. Developed kstar, a framework for top-k planning.

Undergraduate research in AI Planning   Jan 2015 - Aug 2018
Papers & talks at top conferences (IJCAI 2016, ICAPS 2017, 2018, 2019)

SELECTED PUBLICATIONS

1. Mauro Bringolf, <u>Dominik Winterer</u>, Zhendong Su. Janus: Finding Incompleteness Bugs in SMT Solvers. *Under review.*

2. Jiwon Park*, <u>Dominik Winterer</u>*, Chengyu Zhang, and Zhendong Su. Generative Type-Aware Mutation for Testing SMT Solvers. *In Proceedings of SPLASH/OOPSLA 2021.*

3. <u>Dominik Winterer</u>*, Chengyu Zhang*, and Zhendong Su. On the Unusual Effectiveness of Type-Aware Operator Mutations for Testing SMT Solvers. *In Proceedings of SPLASH/OOPSLA 2020* (**36%**).

4. <u>Dominik Winterer</u>*, Chengyu Zhang*, and Zhendong Su. Validating Solvers via Semantic Fusion. *In Proceedings of PLDI 2020* (**22%**).
   🏅 **Distinguished Paper Award**
   ★ Invited to TOPLAS special issue

IMPACT

Project Yin-Yang on SMT solver testing: I'm leading this project which aims at developing novel, effective, practical methods and techniques to help make SMT solvers more reliable, powerful, and usable. We have designed three techniques for testing SMT solver correctness: Semantic Fusion, Type-Aware Mutation, and Generative Type-Aware mutation (publications 2 - 4). Using these techniques we have found and reported **1,500+** unique bugs (1,000+ fixed) in the state-of-the art SMT solvers Z3 and CVC4/5, many of which are critical. I'm the lead developer of the SMT solver testing framework **yinyang** in which the three techniques are realized. The tool and project got awarded a ♀ Google Open Source peers bonus and has 110+ stars on GitHub. In the future, the project will aim at tackling (a) unexpected incompleteness in SMT solvers (see publication 1), (b) methods to improve SMT solvers performance, and (c) generalizing generative type-aware mutation to other applications beyond SMT solvers.

SERVICE

TSE reviewer	Sep 2021
POPL '21 artifact evaluation committee	Sep 2021
OOPSLA '21 SRC program committee	Jun 2021
ISSTA '21 artifact evaluation committee	Mar 2021
AAAI '21 reviewer	Oct 2020
OOPSLA '20 session chair	Oct 2020
AAAI '20 reviewer	Oct 2019
JAIR reviewer	Aug 2017

MENTORING

Jiwon Park (f), Jan 2021 - Mar 2021 & Sep 2021 - present (with Prof. Zhendong Su)

Undergraduate from LIX, École Polytechnique, France

♀ won 2nd place at FSE '21 student research competition

★ co-first author of Generative Type-Aware Mutation for Testing SMT Solvers

Mauro Bringolf (m), Jan 2021 - Aug 2021 (with Prof. Zhendong Su)

Master thesis student from ETH Zurich

★ First author of Janus: Finding Incompleteness Bugs in SMT Solvers

Now: Software Engineer at University of St. Gallen

Dylan J Wolff (m), Jan 2020 - Aug 2021 (with Prof. Zhendong Su & Dr Manuel Rigger)

Master thesis student from ETH Zurich

Now: Ph.D. student at National University of Singapore

AWARDS & GRANTS

- Google Open Source Peers Bonus 2021
- PLDI '20 Distinguished Paper Award
- ICAPS Doctoral Consortium travel grant (500 USD)
- IJCAI '16 travel grant (1,000 USD)

REFERENCES

Prof. Dr. Zhendong Su	Michael Katz, Ph.D.	Prof. Dr. Andreas Podelski	Prof. Dr. Malte Helmert
Full Professor	Research Staff Member	Full Professor	Associate Professor (tenured)
ETH Zurich, AST lab	IBM Yorktown Heights	University of Freiburg	University of Basel, AI