Zhonghan Wang

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Education

University of Toronto 2026/01 – Future
PhD in Electrical and Computer Engineering (ECE) Toronto, Canada
- Research Area: Formal Methods, Automated Reasoning, Theorem Proving

Institute of Software, Chinese Academy of Sciences 2021/09 – 2025/07
Master of Engineering in Computer Science (CS), GPA 3.7/4.0 Beijing, China
- Courses: Mathematical Logic and Theory of Programming, Formal Language and Automata Theory
- Second-class Academic Scholarship

Nankai University 2017/08 – 2021/06
Bachelor of Science in Electronic Engineering (EE) Tianjin, China
- GPA: 89.17/100, 3.71/4.0 (Rank: 6/45)
- Courses: Computer Principle, EDA Fundamental and Application, Analog Electronics Technology

Publications

Improving NLSAT for Nonlinear Real Arithmetic (single author) ASE 2025, Seoul
- Implement a clause-level propagation mechanism in NLSAT
- Design a new branching heuristic based on clause-level propagation
- Solved most satisfiable instances in SMT-LIB QF_NRA benchmark

Efficient Local Search for Nonlinear Real Arithmetic (first author) VMCAI 2024, London
Code: https://github.com/yogurt-shadow/LS_NRA
Video: https://www.youtube.com/watch?v=CKGDRTXvKjk
- Introduce Local Search algorithm into all classes of SMT(NRA)
- Design boundary structure to compute Local Search operation incrementally
- Design Relaxation strategy for equalities constraints
- Implement based on Z3, beat all mainstream SMT Solvers on QF_NRA satisfiability instances of SMT_LIB.

Projects

Z3 Plus Plus: Gold medal in SMT-COMP SMT-COMP 2022 & 2023
WebPage: https://z3-plus-plus.github.io/ Code: https://github.com/shaowei-cai-group/z3pp
- Implement sample-cell projection in Z3's Nlsat Solver
- Implement feasible region checker to shortcut unsat instances

Dynamic Variable Order of Nlsat https://github.com/yogurt-shadow/z3-dnlsat
- Introduce VSIDS dynamic branching heuristic into Nlsat Solver
- Fasten solving procedure both on satisfiable and unsatisfiable instances

KeymaeraX: Verification of Hybrid Systems (CMU 15-424) https://github.com/yogurt-shadow/CMU-15-424
- Self Solutions to practices in **Logical Foundations of Cyber Physical Systems**
- Use **KeymaeraX** to model and verify hybrid systems using dynamic differential logic (d$\mathcal{L}$) interactively

Work Experience

Alibaba Group 2022/10 - 2023/08
Research Internship in Operations Research
- Design Local Search Heuristic for advertising allocation problem

Programming Languages

C/C++, Java, Python, VHDL, Verilog, Shell, HTML, Java, CSS, SQL, Matlab etc. Very familiar with SMT tools, like Z3, CVC5, Yices, etc.