

# Zhonghan Wang

wangzh@ios.ac.cn | [github.com/yogurt-shadow](https://github.com/yogurt-shadow) | <https://yogurt-shadow.github.io/> | Interest: SMT Solving, Formal Method

## Education

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### Stake Key Laboratory of Computer Science, Institute of Software, Chinese Academy of Sciences

Master of Engineering in Computer Science (CS), GPA 3.7/4.0

Sep. 2021 – Present, Beijing, China

Advisor: Prof. Bohua Zhan & Prof. Lijun Zhang

- Courses: Mathematical Logic and Theory of Programming, Formal Language and Automata Theory
- Second-class Academic Scholarship

### Nankai University

Aug. 2017 – Jun. 2021

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

## Publication

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### Efficient Local Search for Nonlinear Real Arithmetic [\[code\]](#)[\[paper\]](#)

VMCAI 2024, London

25th International Conference on Verification, Model Checking and Abstract Interpretation

[Zhonghan Wang](#), Bohua Zhan, Bohan Li, Shaowei Cai

- 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.

## Preprint

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### ClauseSMT: A NLSAT-Based Clause-Level Framework for Satisfiability Modulo Nonlinear Real Arithmetic Theory [\[paper\]](#)

arXiv 2406.02122

[Zhonghan Wang](#)

- Introduce clause-level information to avoid literal-decision caused conflict
- Design clause-level propagation (borrowed by unit-propagation) to facilitate branching heuristic
- ClauseSMT solves the most satisfiable instances and the second most unsatisfiable instances in SMT-LIB

## Research Project

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### Z3 Plus Plus [\[homepage\]](#)[\[code\]](#)

SMT-COMP 2022

Shaowei Cai, Bohan Li, Jinkun Lin, [Zhonghan Wang](#), Bohua Zhan, Xindi Zhang, Mengyu Zhao (alphabetical order)

Main developer of Nonlinear Real Arithmetic track in Z3 Plus Plus

- Implement sample-cell projection in Z3's Nlsat Solver
- Implement feasible region checker to shortcut unsat instances

### Dynamic Variable Order of Nlsat [\[paper\]](#) [\[code\]](#)

- Introduce VSIDS dynamic branching heuristic into Nlsat Solver
- Fasten solving procedure both on satisfiable and unsatisfiable instances

## Related Course Project

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### KeymaeraX: Verification of Hybrid Systems (CMU 15-424) [\[code\]](#)

- Use **KeymaeraX** to model and verify hybrid systems using dynamic differential logic ( $d\mathcal{L}$ ) interactively
- Solutions to practices in **Logical Foundations of Cyber Physical Systems**

### Isabelle/HOL Exercise

Code: [https://github.com/yogurt-shadow/Isar\\_Exercise](https://github.com/yogurt-shadow/Isar_Exercise)

- Self Solutions to practices in **Concrete Semantics**

## Internship Experience

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Research Internship in Alimama Department, Alibaba Group  
Shenzhen Research Institute of Big Data (SRIBD), CUHK(SZ)

2022 - 2023  
2024

## Research Talks

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Efficient Local Search for Nonlinear Real Arithmetic [video]  
VMCAI, Institution of Engineering and Technology (IET), London, UK

Jan. 2024

## Programming Languages

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C/C++, Java, Python, VHDL, Verilog, Shell, HTML, Java, CSS, SQL, Matlab etc.

## English Level

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TOEFL: Overall: 102 (Reading: 28, Listening: 26, Speaking: 22, Writing: 26)  
GRE: Verbal: 159 Quantitative: 170 Writing: 3.5

2024.7.20  
2019.12.28

## References

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**Dr. Shaowei Cai** (<https://lcs.ios.ac.cn/~caisw/>)  
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