

# ZHIWEI ZHANG

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## RESEARCH INTEREST

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I am broadly interested in **Logic in AI**, especially how one can **Bridge Discrete and Continuous Optimization**. My work so far focuses on solving Boolean optimization problems such as **Generalized SAT and MaxSAT** by continuous methods, e.g., gradient descent. In the future, I look forward to adapting my work to areas such as Neurosymbolic AI and quantum computing.

## EDUCATION

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**Rice University, Houston, TX, USA**

*Ph.D. in Computer Science*

Expected May 2024

Advisor: **Prof. Moshe Vardi**

**Rice University, Houston, TX, USA**

*M.S. in Computer Science*

Jan. 2020

Advisor: **Prof. Moshe Vardi**

Thesis: [Solving Hybrid Boolean Constraints by Fourier Expansions and Continuous Optimization](#)

**Nanjing University, Nanjing, China**

*B.S. in Computer Science, National Elite Program*

Jun. 2018

## PUBLICATIONS

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\*indicates author list has been sorted alphabetically by last name and Zhiwei Zhang is the corresponding author;

- [AIJ'21] \*Anastasios Kyrillidis, Anshumali Shrivastava, Moshe Vardi, **Zhiwei Zhang**. “[Solving Hybrid Boolean Constraints in Continuous Space via Fourier Expansions.](#)” *Artificial Intelligence*, Journal.
- [AAAI'21] \*Anastasios Kyrillidis, Moshe Vardi, **Zhiwei Zhang**. “[On Continuous Local Search for Hybrid SAT Solving.](#)” *AAAI 2021*, virtual conference.
- [AAAI'20] \*Anastasios Kyrillidis, Anshumali Shrivastava, Moshe Vardi, **Zhiwei Zhang**. “[FourierSAT: A Fourier Expansion-Based Algebraic Framework for Solving Hybrid Boolean Constraints.](#)” *AAAI' 20*, **Oral presentation**.  
The two-page version of this paper was selected to the **finalist of Best Student Abstract Award** of AAAI'20.
- [CCKS'18] **Zhiwei Zhang**, Lingling Zhang, Hao Zhang, Weizhuo He, Zequn Sun, Gong Cheng, Qizhi Liu, Xinyu Dai, Yuzhong Qu. “[Towards Answering Geography Questions in Gaokao: A Hybrid Approach.](#)” *China Conference on Knowledge Graph and Semantic Computing*, 2018.

## MANUSCRIPTS

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- \*Anastasios Kyrillidis, Moshe Vardi, **Zhiwei Zhang**. “DPMS: An ADD-Based Symbolic Approach for Generalized MaxSAT Solving” , *under review*
- Junhyung Lyle Kim, Jose Antonio Lara Benitez, Mohammad Taha Toghiani, Cameron Wolfe, **Zhiwei Zhang** (alphabetical order), Anastasios Kyrillidis. “[Momentum-inspired Low-Rank Coordinate Descent for Diagonally Constrained SDPs](#)” , *under review*

## SELECTED PRESENTATIONS

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1. **Searching Inside the Box: A Continuous-Local-Search Approach for Hybrid SAT Solving** [\[slides\]](#)
  - (Invited) [Simons Institute](#), Workshop of Theoretical Foundations of SAT/SMT Solving, Virtual Workshop, Mar. 2021. [\[video\]](#)
  - (Invited) UT-Austin, Sep. 2021.
  - (Invited) [MURI](#) Meeting, Virtual Meeting, Nov. 2020.
  - (Conference) AAAI 2020, New York City, Feb. 2020.
2. **On Continuous Local BDD-Based Search for Hybrid SAT Solving** [\[slides\]](#)
  - (Conference) AAAI 2021, Virtual Conference, Feb. 2021
3. **Visualizing High-Dimensional Random Boolean Formulas** [\[slides\]](#)
  - (Invited) [MURI](#) Meeting, Virtual Meeting, Oct. 2021.

## OPEN SOURCE TOOLS

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**FourierSAT** [\[Github\]](#): A versatile SAT/MaxSAT solver written in Python based on continuous local search, which can handle hybrid Boolean constraints (CNF clauses, XOR, cardinality constraints).

**GradSAT** [\[Github\]](#): An extension of FourierSAT implemented in C++ which accepts Pseudo-Boolean constraints (PBs). BDDs are used for significantly accelerating gradient computations.

**Mixing++** [\[Github\]](#): An accelerated version of Mixing Method based on Semidefinite Programming (SDP).

## HONORS AND AWARDS

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[Andrew Ladd Graduate Fellowship](#) (1 student selected department-wise every year), Ken Kennedy Institute, 2021.

Travel grants: AAAI (2020), DIMACS Workshop-RNLSO (2019).

Outstanding graduate, Nanjing University, 2018.

First Prize, National Elite Program Scholarship (top 10% in Elite Program), CS Dept., Nanjing University, 2017.

Outstanding student (top 5% in university) Nanjing University, 2016.

## SKILLS

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Experience with identifying problems, collaborative research, algorithmic analysis, and technical presentations.

Proficient in C++, Python, and Mathematica. Some experience in MATLAB, C and Java.

## MENTORING, LEADERSHIP & ACTIVITIES

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- Teaching Assistant at Rice University for COMP 582 (Design and Analysis of Algorithms), COMP 408/548 (Verified Programming), COMP 545 (Advanced Topics in Optimization) and CSDSBR001 (Computer Science/Data Science Bridge Course).
- Coordinator, Graduate Student Association, Dept. of Computer Science, Rice University, Spring 2020 - Present.
- Faculty candidate committee of graduate students, Department of Computer Science, Rice University, 2019, 2020.