

# Xuran Cai

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## Education

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<b>Oxford-Max-Plank joint Program</b> , Doctor of Philosophy	Sep 2025 - Present German & UK
<ul style="list-style-type: none"><li>Joint Program by University of Oxford and Max Plank Institute</li><li>Research Interest: Graph Theory, Verification, general TCS</li><li>Supervisor: Prof. Amir Goharshady(Oxford) and Prof. Rupak Majumdar(MPI)</li></ul>	
<b>Hong Kong University of Science and Technology</b> , Master of Philosophy	Sept 2023 – June 2025 Hong Kong SAR
<ul style="list-style-type: none"><li>Thesis: Enhancing Compiler Optimization Efficiency through Grammatical Decompositions of Control-Flow Graphs</li><li>Supervisor: Prof. Amir Goharshady and Prof. Jiasi Shen</li></ul>	
<b>University of Wisconsin-Madison</b> , Bachelor of Science	Sept 2019 – May 2023 USA
<ul style="list-style-type: none"><li>GPA: 3.86/4.0</li><li>Major: Double Major in Computer Science and Mathematics</li><li>Graduate with Distinction and Major Distinction in CS</li></ul>	

## Publications

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<b>Series-Parallel-Loop Decompositions of Control-flow Graphs</b>	Feb 2026
<i>X. Cai</i> , A.K. Goharshady, S. Hitarth, C.K. Lam	
Journal of Systems Architecture, JSA'26	
<b>Invariant Generation for Floating-Point Programs via Constraint Solving</b>	Jan 2026
<i>X. Cai</i> , L. Chen, H. Fu,	
Submit to International Conference on Computer Aided Verification, CAV'26	
<b>Efficient Algorithms for Partial Constraint Satisfaction Problems over Control-flow Graphs</b>	December 2025
<i>X. Cai</i> , A.K. Goharshady,	
International Symposium on Software Engineering: Theories, Tools, and Applications, SETTA'25	
<b>Enhancing Compiler Optimization Efficiency through Grammatical Decompositions of Control-Flow Graphs</b>	July 2025
<i>X. Cai</i> ,	
Mphil Final Thesis	
<b>Faster Chaitin-like Register Allocation via Grammatical Decompositions of Control-Flow Graphs</b>	March 2025
<i>X. Cai</i> , A.K. Goharshady, S. Hitarth, C.K. Lam	
International Conference on Architectural Support for Programming Languages and Operating Systems, ASPLOS'25	
<b>Faster Lifetime-optimal Speculative Partial Redundancy Elimination for Goto-free Programs</b>	November 2024
<i>X. Cai</i> , A.K. Goharshady	
International Symposium on Software Engineering: Theories, Tools, and Applications, SETTA'24	

## Teaching Assistant Experiences

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<b>Design and Analysis of Algorithms</b>	HT Semester 2025-26
• Institute: Oxford	
• Instructor: prof. Sandra Kiefer	
<b>Functional Programming</b>	MT Semester 2025-26
• Institute: Oxford	
• Instructor: prof. Andrzej Murawski	
<b>Honors Discrete Mathematical Tools for Computer Science</b>	Fall Semester 2024-25
• Institute: HKUST	
• Instructor: prof. Amir Goharshady	
<b>Discrete Mathematical Tools for Computer Science</b>	Spring Semester 2023-24
• Institute: HKUST	
• Instructor: prof. Sunil Arya and prof. Jiasi Shen	
<b>Introduction to Computer Networks</b>	Spring Semester 2021-22
• Institute: UW-Madison	
• Instructor: prof. Suman Banerjee	

## Funding

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<b>Researcher Salary – MPI-SWS, Kaiserslautern, German</b>	Jan 2026 - present
<b>Department Scholarship – University of Oxford, Oxford, UK</b>	Oct 2025 - present
<b>Postgraduate Scholarship – HKUST, Hong Kong SAR</b>	Sep 2023 - July 2025

## Internship

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<b>Summer Intern Software Developer</b> , Intel – Shanghai, China	June 2021 - Aug 2021
• Worked on designing a service mesh structure with SGX hardware	
• Designed and implemented the stereotype of the system	

## Conference/Summer Schools

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<b>Setta'25</b> , Oxford, UK	Dec 1 - Dec 3, 2025
<b>Setta'24</b> , Hong Kong SAR	Nov 26 - Nov 28, 2024
<b>FM'24</b> , Milan, Italy	Sep 9 - Sep 13, 2024
<b>Summer School on Discrete Mathematics</b> , Prague, Czech Republic	July 1- July 5, 2024