

Xuran Cai

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Education

Oxford-Max-Plank joint Program, Doctor of Philosophy Sep 2025 - Present
German & UK

- Joint Program by University of Oxford and Max Plank Institute
- Research Interest: Graph Theory, Verification, general TCS
- Supervisor: Prof. Amir Goharshady(Oxford) and Prof. Rupak Majumdar(MPI)

Hong Kong University of Science and Technology, Master of Philosophy Sept 2023 – June 2025
Hong Kong SAR

- Thesis: Enhancing Compiler Optimization Efficiency through Grammatical Decompositions of Control-Flow Graphs
- Supervisor: Prof. Amir Goharshady and Prof. Jiasi Shen

University of Wisconsin-Madison, Bachelor of Science Sept 2019 – May 2023
USA

- GPA: 3.86/4.0
- Major: Double Major in Computer Science and Mathematics
- Graduate with Distinction and Major Distinction in CS

Publications

Series-Parallel-Loop Decompositions of Control-flow Graphs Feb 2026

X. Cai, A.K. Goharshady, S. Hitarth, C.K. Lam
Journal of Systems Architecture, JSA'26

Invariant Generation for Floating-Point Programs via Constraint Solving Jan 2026

X. Cai, L. Chen, H. Fu,
Submit to International Conference on Computer Aided Verification, CAV'26

Efficient Algorithms for Partial Constraint Satisfaction Problems over Control-flow Graphs December 2025

X. Cai, A.K. Goharshady,
International Symposium on Software Engineering: Theories, Tools, and Applications, SETTA'25

Enhancing Compiler Optimization Efficiency through Grammatical Decompositions of Control-Flow Graphs July 2025

X. Cai,
Mphil Final Thesis

Faster Chaitin-like Register Allocation via Grammatical Decompositions of Control-Flow Graphs March 2025

X. Cai, A.K. Goharshady, S. Hitarth, C.K. Lam
International Conference on Architectural Support for Programming Languages and Operating Systems, ASPLOS'25

Faster Lifetime-optimal Speculative Partial Redundancy Elimination for Goto-free Programs November 2024

X. Cai, A.K. Goharshady
International Symposium on Software Engineering: Theories, Tools, and Applications, SETTA'24

Teaching Assistant Experiences

Design and Analysis of Algorithms <ul style="list-style-type: none">• Institute: Oxford• Instructor: prof. Sandra Kiefer	HT Semester 2025-26
Functional Programming <ul style="list-style-type: none">• Institute: Oxford• Instructor: prof. Andrzej Murawski	MT Semester 2025-26
Honors Discrete Mathematical Tools for Computer Science <ul style="list-style-type: none">• Institute: HKUST• Instructor: prof. Amir Goharshady	Fall Semester 2024-25
Discrete Mathematical Tools for Computer Science <ul style="list-style-type: none">• Institute: HKUST• Instructor: prof. Sunil Arya and prof. Jiasi Shen	Spring Semester 2023-24
Introduction to Computer Networks <ul style="list-style-type: none">• Institute: UW-Madison• Instructor: prof. Suman Banerjee	Spring Semester 2021-22

Funding

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

Internship

Summer Intern Software Developer, Intel – Shanghai, China <ul style="list-style-type: none">• Worked on designing a service mesh structure with SGX hardware• Designed and implemented the stereotype of the system	June 2021 - Aug 2021
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Conference/Summer Schools

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