

UMANG MATHUR

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EDUCATION

University of Illinois at Urbana Champaign <i>PhD in Computer Science</i> Thesis: Algorithmic Advances in Dynamic Analysis for Detecting Concurrency Bugs	Aug. 2015 - Dec. 2021
Indian Institute of Technology - Bombay <i>B.Tech (Hons.) in Computer Science and Engineering</i> <i>Minors in Physics</i>	Jul. 2010 - May 2014

EMPLOYMENT

National University of Singapore <i>Presidential Young Professor</i>	Aug. 2021 - present
IIT Bombay <i>Visiting Assistant Professor</i>	April 2023 - present
Simons Institute for the Theory of Computing, Berkeley <i>NTT Research Fellow</i>	Jan. 2021 - May. 2021
Facebook Inc., Bellevue, USA <i>Research Scientist</i>	Aug. 2020 - Aug. 2021
WorldQuant Research, India <i>Senior Quantitative Researcher</i>	Jul. 2014 - Jul. 2015

HONORS AND AWARDS



Distinguished Paper Award at CPP 2024	2023
ACM SIGPLAN Distinguished Paper Award at POPL 2023	2023
Google South Asia & Southeast Asia Research Awards 2022 (USD 30,000)	2022
Best Paper Award at ASPLOS 2022	2022
Simons Institute Research Fellowship, sponsored by NTT Research	2021
Selected as a Young researcher in Computer Science to attend the 8 th Heidelberg Laureate Forum	2020
Google PhD Fellowship	2019
Mavis Future Faculty Fellowship, College of Engineering, UIUC	2019
C.W. Gear Outstanding Graduate Award, Department of Computer Science, UIUC	2019
ACM SIGSOFT Distinguished Paper Award at ESEC/FSE 2018	2018
Selected to represent India at the 11 th Asian Physics Olympiad, Taiwan	2010
Gold Medals at the Indian National Physics and Chemistry Olympiads	2010
Silver Medal at the 5 th International Junior Science Olympiad, South Korea	2008
KVPY fellowship, Government of India	2008
NTSE scholarship, Government of India	2008
SSTSE scholarship, State Government of Rajasthan, India	2008

INTERNSHIPS

Facebook, Inc., USA <i>Software Engineering Intern, "Interpretable Bug Isolation for App Crashes"</i>	May. 2019 - Aug. 2019
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Google, LLC., USA <i>Software Engineering Intern, “Improving Time Series Forecasting for Ads”</i>	May. 2018 - Aug. 2018
SRI International, USA <i>Research Intern, “Program Synthesis Via Proof Search”</i>	May. 2016 - Aug. 2016
LaBRI, France <i>Research Intern, “Non-Zeno strategies for Timed Games”</i>	May. 2013 - Jul. 2013
LSV, ENS Cachan, France <i>Research Intern, “Quantitative Verification of Probabilistic Recursive Programs”</i>	May. 2012 - Jul. 2012

PUBLICATIONS

35. [CAV’24] Zhendong Ang, Umang Mathur. “Predictive Monitoring with Strong Trace Prefixes.” *Proceedings of the 36th International Conference on Computer Aided Verification (CAV)*, 2024.
34. [PODS’24] Kuldeep S. Meel Sourav  Chakraborty  Umang Mathur. “A faster FPRAS for #NFA.” *Proceedings of the 43rd Symposium on Principles of Database Systems (PODS)*, 2024. [\[arXiv\]](#)
33. [CPP’24] Qiyuan Zhao, George Pirlea, Zhendong Ang, Umang Mathur, Ilya Sergey. “Rooting for Efficiency: Mechanised Reasoning about Array-Based Trees in Separation Logic.” *Proceedings of the 13th International Conference on Certified Programs and Proofs (CPP)*, 2024. [\[pdf\]](#)
32. [ASPLOS’24] Dylan Wolff, Zheng Shi, Gregory J. Duck, Umang Mathur, Abhik Roychoudhury. “Greybox Fuzzing for Concurrency Testing.” *Proceedings of the 29th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, 2024. [\[pdf\]](#)
31. [ICSE’24] Zheng Shi, Umang Mathur, Andreas Pavlogiannis. “Optimistic Prediction of Synchronization-Reversal Data Races.” *Proceedings of the 46th International Conference on Software Engineering (ICSE)*, 2024. [\[arXiv\]](#)
30. [POPL’24] Azadeh Farzan, Umang Mathur. “Coarser Equivalences for Causal Concurrency.” *Proceedings of the ACM on Programming Languages (POPL)*, 2024. [\[arXiv\]](#)
29. [POPL’24] Soham Chakraborty, S. Krishna, Umang Mathur, Andreas Pavlogiannis. “How Hard is Weak-Memory Testing?.” *Proceedings of the ACM on Programming Languages (POPL)*, 2024. [\[arXiv\]](#)
28. [POPL’24] Zhendong Ang, Umang Mathur. “Predictive Monitoring against Pattern Regular Languages.” *Proceedings of the ACM on Programming Languages (POPL)*, 2024. [\[arXiv\]](#)
27. [PLDI’23] Hünkar Can Tunç, Parosh A. Abdulla, Soham Chakraborty, S. Krishna, Umang Mathur, Andreas Pavlogiannis, . “Optimal Reads-From Consistency Checking for C11-Style Memory Models.” *Proceedings of the ACM on Programming Languages (PLDI)*, 2023. [\[arXiv\]](#)
26. [PLDI’23] Hünkar Can Tunç, Umang Mathur, Andreas Pavlogiannis, Mahesh Viswanathan. “Sound Dynamic Deadlock Prediction in Linear Time.” *Proceedings of the ACM on Programming Languages (PLDI)*, 2023. [\[arXiv\]](#)
25. [POPL’23] Mosaad Al Thokair, Minjian Zhang, Umang Mathur, Mahesh Viswanathan. “Dynamic Race Detection with O(1) Samples.” *Proceedings of the ACM on Programming Languages (POPL)*, 2023. **ACM SIGPLAN Distinguished Paper Award** [\[pdf\]](#)
24. [ASPLOS’22] Umang Mathur, Andreas Pavlogiannis, Hünkar Can Tunç, Mahesh Viswanathan. “A Tree Clock Data Structure for Causal Orderings in Concurrent Executions.” *Proceedings of the 27th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, 2022. **Best Paper Award** [\[pdf\]](#)
23. [TAC’22] Chuchu Fan, Zengyi Qin, Umang Mathur, Qiang Ning, Sayan Mitra, Mahesh Viswanathan. “Controller Synthesis for Linear Systems With Reach-Avoid Specifications.” *IEEE Transactions on Automatic Control (TAC)*, 2022. [\[pdf\]](#)
22. [CONCUR’22] Rucha Kulkarni, Umang Mathur, Andreas Pavlogiannis. “Dynamic Data-Race Detection through the Fine-Grained Lens.” *Proceedings of the 32nd International Conference on Concurrency Theory (CONCUR)*, 2021. [\[pdf\]](#)

21. [ESEC/FSE'21] Minjian Zhang, Umang Mathur, Mahesh Viswanathan. "Checking LTL[F,G,X] on Compressed Traces in Polynomial Time." *Proceedings of the 29th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE)*, 2021. [pdf]
20. [ICSE'21 (SEIP)] Vijayaraghavan Murali, Edward Yao, Umang Mathur, Satish Chandra. "Scalable Statistical Root Cause Analysis on App Telemetry." *Proceedings of the 43rd International Conference on Software Engineering, Software Engineering in Practice (ICSE, SEIP)*, 2021. [arXiv]
19. [POPL'21] Umang Mathur, Andreas Pavlogiannis, Mahesh Viswanathan. "Optimal Prediction of Synchronization-Preserving Races." *Proceedings of the ACM on Programming Languages (POPL)*, 2021. [pdf]
18. [FMSD'20] Umang Mathur, Matthew S. Bauer, Rohit Chadha, A. Prasad Sistla, Mahesh Viswanathan. "Exact Quantitative Probabilistic Model Checking Through Rational Search." *Formal Methods in System Design (FMSD)*, 2020. [pdf]
17. [LICS'20] Umang Mathur, Andreas Pavlogiannis, Mahesh Viswanathan. "The Complexity of Dynamic Data Race Prediction." *Proceedings of the 35th Annual ACM/IEEE Symposium on Logic in Computer Science (LICS)*, 2020. [pdf]
16. [CAV'20] Paul Krogmeier, Umang Mathur, Adithya Murali, P. Madhusudan, Mahesh Viswanathan. "Decidable Synthesis of Programs with Uninterpreted Functions." *Proceedings of the 32nd International Conference on Computer Aided Verification (CAV)*, 2020. [pdf]
15. [TACAS'20] Umang Mathur, P. Madhusudan, Mahesh Viswanathan. "What's Decidable About Program Verification Modulo Axioms?." *Proceedings of the 26th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS)*, 2020. [pdf]
14. [ASPLOS'20] Umang Mathur, Mahesh Viswanathan. "Atomicity Checking in Linear Time using Vector Clocks." *Proceedings of the 25th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, 2020. [pdf]
13. [POPL'20] Umang Mathur, Adithya Murali, Paul Krogmeier, P. Madhusudan, Mahesh Viswanathan. "Deciding Memory Safety for Single-Pass Heap-Manipulating Programs." *Proceedings of the ACM on Programming Languages (POPL)*, 2020. [pdf]
12. [POPL'19] Umang Mathur, P. Madhusudan, Mahesh Viswanathan. "Decidable Verification of Uninterpreted Programs." *Proceedings of the ACM on Programming Languages 3 (POPL)*, 2019. [pdf]
11. [ESEC/FSE'18] Dileep Kini, Umang Mathur, Mahesh Viswanathan. "Data Race Detection on Compressed Traces." *Proceedings of the 26th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE)*, 2018. **ACM SIGSOFT Distinguished Paper Award** [pdf]
10. [OOPSLA'18] Umang Mathur, Dileep Kini, Mahesh Viswanathan. "What Happens-After the First Race? Enhancing the Predictive Power of Happens-Before Based Dynamic Race Detection." *Proceedings of the ACM on Programming Languages 2 (OOPSLA)*, 2018. [pdf]
9. [CSL'18] P. Madhusudan, Umang Mathur, Shambwaditya Saha, Mahesh Viswanathan. "A Decidable Fragment of Second Order Logic With Applications to Synthesis." *Proceedings of the 27th EACSL Annual Conference on Computer Science Logic (CSL)*, 2018. [pdf]
8. [CAV'18] Chuchu Fan, Umang Mathur, Sayan Mitra, Mahesh Viswanathan. "Controller Synthesis Made Real: Reach-Avoid Specifications and Linear Dynamics." *Proceedings of the 30th International Conference on Computer Aided Verification (CAV)*, 2018. [pdf]
7. [FMCAD'17] Matthew S. Bauer, Umang Mathur, Rohit Chadha, A. Prasad Sistla, Mahesh Viswanathan. "Exact Quantitative Probabilistic Model Checking Through Rational Search." *Proceedings of the 17th Conference on Formal Methods in Computer-Aided Design (FMCAD)*, 2017. **Invited to appear in FMSD** [pdf]
6. [CAV'17] Adria Gascon, Ashish Tiwari, Brent Carmer, Umang Mathur. "Look for the Proof to Find the Program: Decorated-Component-Based Program Synthesis." *Proceedings of the 29th International Conference*

on *Computer Aided Verification (CAV)*, 2017. [\[pdf\]](#)

5. **[PLDI'17]** Dileep Kini, [Umang Mathur](#), Mahesh Viswanathan. “Dynamic Race Prediction in Linear Time.” *Proceedings of the 38th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI)*, 2017. [\[pdf\]](#)
4. **[FSTTCS'14]** Rohit Chadha, [Umang Mathur](#), Stefan Schwoon. “Computing Information Flow Using Symbolic Model-Checking.” *Proceedings of the 34th International Conference on Foundation of Software Technology and Theoretical Computer Science (FSTTCS)*, 2014. [\[pdf\]](#)
3. **[FORMATS'14]** S. Krishna, [Umang Mathur](#), Ashutosh Trivedi. “Weak Singular Hybrid Automata.” *Proceedings of the 12th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS)*, 2014. [\[pdf\]](#)

MANUSCRIPTS IN PREPARATION

2. [Umang Mathur](#), David Mestel, Mahesh Viswanathan. “The Decision Problem for Regular First-Order Theories.” 2024.

UNPUBLISHED MANUSCRIPTS

1. [Umang Mathur](#), Matthew S. Bauer, Mahesh Viswanathan. “Sound Dynamic Deadlock Prediction in Linear Time.” 2019. [\[pdf\]](#)

TEACHING

Data Structures and Algorithms (CS2040C), NUS

Autumn 2023

Foundations of Logic in Computer Science (CS4269/5469), NUS

Spring 2023, Spring 2022

Topics in Prog. Languages & Software Engineering (CS6217), NUS

Autumn 2022

STUDENT SUPERVISION

Zhendong Ang, PhD (NUS)	Aug. 2022 - present
Zheng Shi, PhD (NUS)	Jan. 2023 - present
Tianyu Li, PhD (NUS), co-advised with Prof. Prateek Saxena	Aug. 2023 - present
Zheng Shi, MComp (NUS)	May 2022 - Dec 2022
Ho Wei Haw, BComp (NUS)	Aug 2022 - May 2023
Illio Suardi, BComp (NUS)	Jan 2023 - present
Jed Koh Jin Keat, BComp (NUS)	Jan 2023 - present
Richard Willie, BComp (NUS)	May 2023 - present
Dasco Gabriel, BComp (NUS)	May 2023 - present
Huang Hongyi, BComp (NUS)	August 2023 - present
David Zhu Haoyuan, BComp (NUS)	May 2023 - present
Lee Zheng Han, BComp (NUS)	August 2023 - present

SERVICE

Programming Languages Mentoring Workshop, Junior Chair, PLDI 2024

NSF Review Panel, 2023

Program Committee Member, CAV 2024

Program Committee Member, ICSE 2024
Program Committee Member, PLDI (SRC) 2023
Program Committee Member, POPL 2023
Program Committee Member, APLAS 2022
Artifact Evaluation Committee Member, OOPSLA 2020
Artifact Evaluation Committee Member, PLDI 2020
Artifact Evaluation Committee Member, CAV 2020
Brief Announcements Program Committee Member, PPOPP 2020
Artifact Evaluation Committee Member, POPL 2020
Repeatability Evaluation Committee Member, HSCC 2017
Reviewer for peer-reviewed conferences and journals : STACS 2024, ICALP 2023, FoSSaCS 2023, TSE 2022, CONCUR 2021, SOSP 2019, PLDI 2019, POPL (2018 & 2019), CAV (2016 - 2018), FM 2018, ICALP 2017, HSCC 2017, FORTE (2016 & 2018), FSTTCS (2014 & 2017), and FORMATS 2016.
Head, Department Academic Mentorship Program, CSE, IIT Bombay (2013-2014)
Mentor, Department Academic Mentorship Program, CSE, IIT Bombay (2012-2013)

RECENT INVITED TALKS AND TUTORIALS

Dynamic Data Race Prediction: Fundamentals, Theory and Practice. Tutorial co-located with POPL 2021, ASPLOS 2021, FSE 2022 and SOSP 2023

Dynamic Data Race Prediction : Fundamentals and Advances. George Mason University, IARCS Verification Seminar Series, IISc Bangalore, IST Austria, IIT Delhi, Uppsala University, ETH Zurich, NUS, HKUST, Microsoft Research India, Huawei Hong Kong Formal Methods Workshop 2023

Decidable Verification of Uninterpreted and Partially Interpreted Programs. Aarhus University, Simons Institute for the Theory of Computing, Online Worldwide Logic Seminar

Efficient Data Structures for Dynamic Analysis of Concurrent Programs, NUS SoC Colloquium

Faster Algorithms and Data-Structures for Detecting Concurrency Bugs, Huawei Sentosa Summit 2023

Exposing Concurrency Bugs from their Hiding Places, Huawei Strategy and Technology Workshop 2023, CMI (India), MPI-SWS (Kaiserslautern)

Rethinking Timestamping in Distributed Computing Through a Data-Structure Lens, Online Special Seminar for HKUST CSE Postgraduate Students

Timestamping through a Data-Structure Lens, Global Software Technology Summit 2023, Huawei Labs

Weakening Mazurkiewicz Traces, Commute Workshop, 2022

Sampling for Dynamic Race Detection, Workshop on Research Highlights in Programming Languages (FSTTCS 2023)

Dynamic Race Detection with $O(1)$ Samples, LaBRI (2023)

Formal Methods and Logic for Reasoning about Software, International Research Workshop in Computer Science and Information Systems, Prince of Songkla University, Phuket, Thailand, 2022