

STEFAN ZETZSCHE

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PROFILE

Applied Scientist at Amazon Web Services and former Meta intern, developing AI systems for code reasoning, reliable program synthesis, and formal verification in production-scale environments. Published at NeurIPS, PLDI, POPL, and ICML.

EXPERIENCE

Amazon Web Services, Applied Scientist Dec 2022 - Present

- Use high-quality formal verification data to pre-train and fine-tune LLMs, enhancing their reasoning over low-level code and program behavior.
- Reduce LLM hallucinations in Amazon Bedrock and improve code generation in Kiro, Amazon's agentic IDE.
- Apply fully autonomous, agentic testing to detect correctness and security issues in software, uncovering multiple previously unknown Python standard library bugs.
- Contribute to Dafny's design and verification infrastructure and formally verify probabilistic algorithms in the Lean theorem prover for AWS Clean Rooms.

Meta, Software Engineer Intern Jul 2022 - Sep 2022

- Enhanced a static analyzer for the Hack programming language, improving code reliability in Meta's core infrastructure.

Amazon Web Services, Applied Scientist Intern Aug 2021 - Nov 2021

- Developed a formally verified quantum circuit optimizer in Dafny, enabling reliable quantum program compilation in collaboration with Braket, Amazon's quantum computing service.

EDUCATION

PhD Computer Science, University College London 2018 - 2023

- Conducted research on automata learning, Kleene algebra, and category theory, culminating in the thesis *Canonical Algebraic Generators in Automata Learning*.
- Funded by VeTTs and ERC grants; member of the Programming Principles, Logic, and Verification (PPLV) Group. Advised by Alexandra Silva and Matteo Sammartino.

MSc Mathematics, University of Hamburg 2016 - 2018

- Thesis on category theory (*Generalised Duality Theory for Monoidal Categories and Applications*), awarded top mark (1.0); graduated with highest distinction (overall grade 1.0).

BSc Mathematics, University of Hamburg 2014 - 2016

- Thesis on group and graph theory (*Isomorphism Classes of Vertex-Transitive Tournaments*), awarded top mark (1.0); minor in Computer Science.

PUBLICATIONS

Conferences

- [C1] **CLEVER: A Curated Benchmark for Formally Verified Code Generation** 2025
A. Thakur, J. Lee, G. Tsoukalas, M. Sistla, M. Zhao, S. Zetsche, G. Durrett, Y. Yue, S. Chaudhuri
Conference on Neural Information Processing Systems (NeurIPS)
- [C2] **Verified Foundations for Differential Privacy** 2025
M. Medeiros, M. Naveed, T. Lepoint, T. Kahsai, T. Ravitch, S. Zetsche, A. Joshi, J. Tassarotti,
A. Albarghouthi, J. Tristan
Distinguished Artifact Award
Conference on Programming Language Design and Implementation (PLDI)
- [C3] **Compiler Fuzzing in Continuous Integration: a Case Study on Dafny** 2025
K. Boonriong, S. Zetsche, A. F. Donaldson
International Conference on Software Testing, Verification and Validation (ICST)

- [C4] **Well-Behaved (Co)algebraic Semantics of Regular Expressions in Dafny** 2024
 S. Zetsche, W. Różowski
 International Colloquium on Theoretical Aspects of Computing (ICTAC)
- [C5] **Generators and Bases for Monadic Closures** 2023
 S. Zetsche, A. Silva, M. Sammartino
 Conference on Algebra and Coalgebra in Computer Science (CALCO)
- [C6] **Guarded Kleene Algebra with Tests: Automata Learning** 2022
 S. Zetsche, A. Silva, M. Sammartino
 Conference on Mathematical Foundations of Programming Semantics (MFPS)
- [C7] **Canonical Automata via Distributive Law Homomorphisms** 2021
 S. Zetsche, G. v. Heerdt, M. Sammartino, A. Silva
 Conference on Mathematical Foundations of Programming Semantics (MFPS)

Workshops

- [W1] **ATLAS: Automated Toolkit for Large-Scale Verified Code Synthesis** 2026
 M. Bakšys, S. Zetsche, O. Bouissou, S. Kong, R. Delmas
 Dafny Workshop at the Symposium on Principles of Programming Languages (POPL)
- [W2] **MiniF2F-Dafny: LLM-Guided Mathematical Theorem Proving via Auto-Active Verification** 2026
 M. Bakšys, S. Zetsche, O. Bouissou
 Dafny Workshop at the Symposium on Principles of Programming Languages (POPL)
- [W3] **DafnyPro: LLM-Assisted Automated Verification for Dafny Programs** 2026
 D. Banerjee, O. Bouissou, S. Zetsche
 Dafny Workshop at the Symposium on Principles of Programming Languages (POPL)
- [W4] **CLEVER: A Curated Benchmark for Formally Verified Code Generation** 2025
 A. Thakur, J. Lee, G. Tsoukalas, M. Sistla, M. Zhao, S. Zetsche, G. Durrett, Y. Yue, S. Chaudhuri
 AI for Math Workshop at the International Conference on Machine Learning (ICML)
- [W5] **Well-Behaved (Co)algebraic Semantics of Regular Expressions in Dafny** 2025
 S. Zetsche, W. Różowski
 Dafny Workshop at the Symposium on Principles of Programming Languages (POPL)
- [W6] **Verifying the Fisher-Yates Shuffle Algorithm in Dafny** 2025
 S. Zetsche, T. Lepoint, J. Tristan, M. Mayer
 Dafny Workshop at the Symposium on Principles of Programming Languages (POPL)
- [W7] **Dafny as Verification-Aware Intermediate Language for Code Generation** 2025
 Y. C. Li, S. Zetsche, S. Somayyajula
 Dafny Workshop at the Symposium on Principles of Programming Languages (POPL)
- [W8] **Randomised Testing of the Dafny Compiler: Into the CI** 2025
 K. Boonriong, A. F. Donaldson, S. Zetsche
 Dafny Workshop at the Symposium on Principles of Programming Languages (POPL)
- [W9] **VMC: a Dafny Library for Verified Monte Carlo Algorithms** 2024
 F. Zaiser, S. Zetsche, J. Tristan
 Dafny Workshop at the Symposium on Principles of Programming Languages (POPL)

SUPERVISION

Interns at Amazon Web Services

- Jonas Bayer (PhD Student at the University of Cambridge) 2025
- Mantas Bakšys (PhD Student at the University of Cambridge) 2025
- Debangshu Banerjee (PhD Student at the University of Illinois Urbana-Champaign) 2025
- Yue Chen Li (Undergraduate Student at MIT) 2024
- Wojciech Różowski (PhD Student at the University College London) 2024
- Fabian Zaiser (PhD Student at the University of Oxford) 2023
- Yann Herklotz (PhD Student at the Imperial College London) 2022

TEACHING

Teaching Assistant at University College London

- Logic and Database Theory 2020
- Discrete Mathematics for Computer Scientists 2020
- Computability and Complexity 2020
- Theory of Computation 2019
- Principles of Programming 2019
- Discrete Mathematics for Computer Scientists 2018

Teaching Assistant at University of Hamburg

- Analysis I 2017
- Linear Algebra and Analytic Geometry II 2016
- Linear Algebra and Analytic Geometry I 2015

TALKS

- [T1] COMP0010 Software Engineering module at the University College London 2025
- [T2] Dafny Workshop at the Symposium on Principles of Programming Languages (POPL) 2025
- [T3] International Colloquium on Theoretical Aspects of Computing (ICTAC) 2024
- [T4] South of England Regional Programming Languages Seminar (SREPLS) at Jane Street 2024
- [T5] Theoretical Computer Science Seminar Series at the University of Birmingham 2023
- [T6] Oxford Advanced Seminar on Informatic Structures at the University of Oxford 2023
- [T7] Programming Languages Discussion Group at Cornell University 2023
- [T8] Lectures on Logic and its Mathematical Aspects Seminar at the University of Amsterdam 2023
- [T9] Programming Principles, Logic, and Verification Seminar at the University College London 2023
- [T10] Conference on Algebra and Coalgebra in Computer Science (CALCO) 2023
- [T11] Conference on the Mathematical Foundations of Programming Semantics (MFPS) 2022
- [T12] Programming Principles, Logic, and Verification Seminar at the University College London 2022
- [T13] Lectures on Logic and its Mathematical Aspects Seminar at the University of Amsterdam 2022
- [T14] Symposium on Compositional Structures (SYCO) at the Tallinn University of Technology 2021
- [T15] Conference on the Mathematical Foundations of Programming Semantics (MFPS) 2021
- [T16] Programming Principles, Logic, and Verification Seminar at the University College London 2021
- [T17] Programming Principles, Logic, and Verification Reading Group at the University College London 2020
- [T18] VeTSS Verified Software Workshop at the Isaac Newton Institute for Mathematical Sciences 2019
- [T19] Scottish Programming Languages and Verification Summer School 2019
- [T20] School of Computer Science at the University of Birmingham 2018

PROFESSIONAL SERVICES

Program Committee Chair

- Dafny Workshop at the Symposium on Principles of Programming Languages (POPL) 2026
- Dafny Workshop at the Symposium on Principles of Programming Languages (POPL) 2025
- Dafny Workshop at the Symposium on Principles of Programming Languages (POPL) 2024

Program and (Sub-)Review Committee Member

- International Conference on Machine Learning (ICML) 2025

- International Conference on Computer-Aided Verification (CAV) 2025
- Conference on Algebra and Coalgebra in Computer Science (CALCO) 2023
- International Symposium on Model Checking of Software (SPIN) 2023

Mentor

- Symposium on Principles of Programming Languages (POPL) 2021
- Conference on Systems, Programming, Languages and Applications: Software for Humanity (SPLASH) 2020

Organizer

- Dafny Workshop at the Symposium on Principles of Programming Languages (POPL) 2026
- South of England Regional Programming Languages Seminar (SREPLS) 2025
- Dafny Workshop at the Symposium on Principles of Programming Languages (POPL) 2025
- Dafny Workshop at the Symposium on Principles of Programming Languages (POPL) 2024

Artifact Evaluator

- International Conference on Computer-Aided Verification (CAV) 2025
- Conference on Programming Language Design and Implementation (PLDI) 2025
- International Conference on Functional Programming (ICFP) 2025
- Symposium on Principles of Programming Languages (POPL) 2025
- Conference on Systems, Programming, Languages and Applications: Software for Humanity (SPLASH) 2025
- International Conference on Functional Programming (ICFP) 2024
- Conference on Programming Language Design and Implementation (PLDI) 2024
- Symposium on Principles of Programming Languages (POPL) 2024
- International Conference on Computer-Aided Verification (CAV) 2023
- International Conference on Computer-Aided Verification (CAV) 2022