Stanford

Caroline Trippel

Assistant Professor of Computer Science and of Electrical Engineering

Bio

BIO

Caroline Trippel is an Assistant Professor in the Computer Science and Electrical Engineering Departments at Stanford University, where she leads the High Assurance Computer Architectures Lab. Following her PhD, prior to starting at Stanford, Trippel spent nine months as a Research Scientist at Facebook in the FAIR SysML group. Trippel's research fits broadly in the area of computer architecture and focuses on promoting high assurance —correctness, security, and reliability—as a first-order computer architecture design goal. A central theme of her work is leveraging formal methods, especially automated reasoning, techniques to design and verify hardware systems. Trippel research has influenced the design of the RISC-V ISA memory consistency model both via her formal analysis of its draft specification and her subsequent participation in the RISC-V Memory Model Task Group; prompted Intel to update their Software Security Guidance to confirm that two Intel microarchitectures satisfy assumptions made by the Seberus Spectre defense that her lab developed; and produced a novel methodology and tool that synthesized two new variants of the famous Meltdown and Spectre attacks. Trippel's research has been recognized with IEEE Top Picks distinctions, a Sloan Research Fellowship, an NSF CAREER Award, the inaugural Google ML and Systems Junior Faculty Award, the Intel Rising Star Faculty Award, an Intel Outstanding Researcher Award, the 2020 ACM SIGARCH/IEEE CS TCCA Outstanding Dissertation Award, the 2020 CGS/ProQuest® Distinguished Dissertation Award in Mathematics, Physical Sciences, & Engineering, and more.

ACADEMIC APPOINTMENTS

- Assistant Professor, Computer Science
- Assistant Professor, Electrical Engineering

PROGRAM AFFILIATIONS

- Stanford SystemX Alliance

Teaching

COURSES

2025-26

- Computer Systems Architecture: CS 282, EE 282 (Spr)
- Formal Methods for Computer Systems: CS 357S (Win)
- Introduction to Automated Reasoning: CS 257 (Win)

2024-25

- Computer Systems Architecture: CS 282, EE 282 (Spr)

- Digital Systems Architecture: CS 180, EE 180 (Win)
- Formal Methods for Computer Systems: CS 357S (Win)

2023-24

- Computer Systems Architecture: EE 282 (Spr)
- Introduction to Automated Reasoning: CS 257 (Aut)

2022-23

- Computer Systems Architecture: EE 282 (Spr)
- Introduction to Automated Reasoning: CS 257 (Aut)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Saranyu Chattopadhyay, Rubens Lacouture, Gina Sohn

Postdoctoral Faculty Sponsor

Mingfei Yu

Doctoral Dissertation Advisor (AC)

Samantha Archer, Yao Hsiao, Daniel Mendoza, Nicholas Mosier, Ioanna Vavelidou

Master's Program Advisor

Atem Aguer, Adam Alhousiki, Austin Brown, Adhi Daiv, Alek Farmer, Irene Geng, Zhen Jia, Joelle Jung, Jack Le, Annie Lee, Tanush Talati, Ellie Tanimura, David Zhang

Doctoral (Program)

Samantha Archer, Yao Hsiao, Nicholas Mosier

Publications

PUBLICATIONS

- **Specification and Formal Verification of Hardware-Software Contracts for High-Assurance Computer Architectures** *COMPUTER*
  Trippel, C., Jones, T., Mullins, R.
  2025; 58 (8): 86-91
- **Towards Memory Specialization: A Case for Long-Term and Short-Term RAM**
  Li, P., Abdurrahman, M., Cleaveland, R., Legtchenko, S., Levis, P., Stefanovici, I., Tambe, T., Tennenhouse, D., Trippel, C., Wong, H., ACM
  ASSOC COMPUTING MACHINERY.2025: 27-36
- **Serberus: Protecting Cryptographic Code from Spectres at Compile-Time**
  Mosier, N., Nemati, H., Mitchell, J. C., Trippel, C., IEEE COMPUTER SOC
  IEEE COMPUTER SOC.2024: 4200-4219
- **Model Selection for Latency-Critical Inference Serving**
  Mendoza, D., Romero, F., Trippel, C., ACM
  ASSOC COMPUTING MACHINERY.2024: 1016-1038
- **RTL2MμPATH: Multi-μPATH Synthesis with Applications to Hardware Security Verification**
  Hsiao, Y., Nikoleris, N., Khyzha, A., Mulligan, D. P., Petri, G., Fletcher, C. W., Trippel, C., IEEE COMPUTER SOC
  IEEE COMPUTER SOC.2024: 507-524
- **G-QED: Generalized QED Pre-silicon Verification beyond Non-Interfering Hardware Accelerators**

Chattopadhyay, S., Devarajegowda, K., Zhao, B., Lonsing, F., D'Agostino, B. A., Vavelidou, I., Bhatt, V. D., Prebeck, S., Ecker, W., Trippel, C., Barrett, C., Mitra, S., IEEE
IEEE.2023

- **RecShard: Statistical Feature-Based Memory Optimization for Industry-Scale Neural Recommendation**
  Sethi, G., Acun, B., Agarwal, N., Kozyrakis, C., Trippel, C., Wu, C.
  edited by Falsafi, B., Ferdman, M., Lu, S., Weinisch, T.
  ASSOC COMPUTING MACHINERY.2022: 344-358

- **Axiomatic Hardware-Software Contracts for Security**
  Mosier, N., Lachnitt, H., Nemati, H., Trippel, C., ACM
  ASSOC COMPUTING MACHINERY.2022: 72-86

- **Opening Pandora's Box: A Systematic Study of New Ways Microarchitecture Can Leak Private Data**
  Vicarte, J., Shome, P., Nayak, N., Trippel, C., Morrison, A., Kohlbrenner, D., Fletcher, C. W., IEEE Comp Soc
  IEEE COMPUTER SOC.2021: 347-360

- **Porcupine: A Synthesizing Compiler for Vectorized Homomorphic Encryption**
  Cowan, M., Dangwal, D., Alaghi, A., Trippel, C., Lee, V. T., Reagen, B.
  edited by Freund, S. N., Yahav, E.
  ASSOC COMPUTING MACHINERY.2021: 375-389

- **TransForm: Formally Specifying Transistency Models and Synthesizing Enhanced Litmus Tests**
  Hossain, N., Trippel, C., Martonosi, M., IEEE
  IEEE COMPUTER SOC.2020: 874–87