Joseph Tassarotti

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Education

Carnegie Mellon University
Ph.D. in Computer Science   2013 – 2018
Advisor: Robert Harper
(Dissertation approved: Jan. 2019)

Harvard College
A.B. in Computer Science, Summa Cum Laude   2009 – 2013

Employment and Appointments

New York University
Assistant Professor   2022 –

Amazon Web Services
Amazon Scholar   2025 –

Boston College
Assistant Professor   2019 – 2022

Massachusetts Institute of Technology
Research Affiliate   2019 – 2024

Massachusetts Institute of Technology
Postdoctoral Associate   2019
Advisors: M. Frans Kaashoek and Nickolai Zeldovich

Max Planck Institute for Software Systems
Intern   Summer 2014
Advisors: Derek Dreyer and Viktor Vafeiadis

Oracle Labs
Intern   Summer 2013
Advisors: Jean-Baptiste Tristan and Guy Steele

INRIA Paris-Rocquencourt
Intern   Summer 2012
Advisor: Xavier Leroy

Publications

All for One and One for All: Program Logics for Exploiting Internal Determinism in Parallel Programs.
Alexandre Moine, Sam Westrick, and Joseph Tassarotti.
In *Principles of Programming Languages* (*POPL*), 2026.
Distinguished Paper Award.

Probabilistic Concurrent Reasoning in Outcome Logic: Independence, Conditioning, and Invariants.

Noam Zilberstein, Alexandra Silva, and Joseph Tassarotti.
In *Principles of Programming Languages* (*POPL*), 2026.
Distinguished Paper Award.

Logical Relations for Formally Verified Authenticated Data Structures.
Simon Oddershede Gregersen, Chaitanya Agarwal, and Joseph Tassarotti.
In *Computer and Communications Security* (*CCS*), 2025.

Modular Reasoning about Error Bounds for Concurrent Probabilistic Programs.
Kwing Hei Li, Alejandro Aguirre, Simon Oddershede Gregersen, Philipp G. Haselwarter, Joseph Tassarotti, and Lars Birkedal.
In *International Conference on Functional Programming* (*ICFP*), 2025.

ParserHawk: Hardware-aware parser generator using program synthesis.
Xiangyu Gao, Jiaqi Gao, Karan Kumar G, Muhammad Haseeb, Ennan Zhai, Bili Dong, Joseph Tassarotti, Srinivas Narayana, and Anirudh Sivaraman.
In *SIGCOMM*, 2025.

Verified Foundations for Differential Privacy.
Markus de Medeiros, Muhammad Naveed, Tancrède Lepoint, Temesghen Kahsai, Tristan Ravitch, Stefan Zetzsche, Anjali Joshi, Joseph Tassarotti, Aws Albarghouthi, and Jean-Baptiste Tristan.
In *Programming Language Design and Implementation* (*PLDI*), 2025.
Distinguished Artifact Award.

Approximate Relational Reasoning for Higher-Order Probabilistic Programs.
Philipp G. Haselwarter, Kwing Hei Li, Alejandro Aguirre, Simon Oddershede Gregersen, Joseph Tassarotti, and Lars Birkedal.
In *Principles of Programming Languages* (*POPL*), 2025.

A Demonic Outcome Logic for Randomized Nondeterminism.
Noam Zilberstein, Dexter Kozen, Alexandra Silva, and Joseph Tassarotti.
In *Principles of Programming Languages* (*POPL*), 2025.

Modular Verification of Secure and Leakage-Free Systems: From Application Specification to Circuit-Level Implementation.
Anish Athalye, Henry Corrigan-Gibbs, Frans Kaashoek, Joseph Tassarotti, and Nickolai Zeldovich.
In *Symposium on Operating Systems Principles* (*SOSP*), 2024.

Tachis: Higher-Order Separation Logic with Credits for Expected Costs.
Philipp G. Haselwarter, Kwing Hei Li, Markus de Medeiros, Simon Oddershede Gregersen, Alejandro Aguirre, Joseph Tassarotti, and Lars Birkedal.
In *Object-oriented Programming, Systems, Languages, and Applications* (*OOPSLA*), 2024.

Error Credits: Resourceful Reasoning about Error Bounds for Higher-Order Probabilistic Programs.
Alejandro Aguirre, Philipp G. Haselwarter, Markus de Medeiros, Kwing Hei Li, Simon Oddershede Gregersen, Joseph Tassarotti, and Lars Birkedal.
In *International Conference on Functional Programming* (*ICFP*), 2024.
Distinguished Paper Award.

Almost-Sure Termination by Guarded Refinement.
Simon Oddershede Gregersen, Alejandro Aguirre, Philipp G. Haselwarter, Joseph Tassarotti, and Lars Birkedal.
In *International Conference on Functional Programming* (*ICFP*), 2024.

Asynchronous Probabilistic Couplings in Higher-Order Separation Logic.
Simon Oddershede Gregersen, Alejandro Aguirre, Philipp G. Haselwarter, Joseph Tassarotti, and Lars Birkedal.
In *Principles of Programming Languages* (*POPL*), 2024.

Grove: a Separation-Logic Library for Verifying Distributed Systems.
Upamanyu Sharma, Ralf Jung, Joseph Tassarotti, M. Frans Kaashoek, and Nickolai Zeldovich.
In *Symposium on Operating Systems Principles* (*SOSP*), 2023.

Verifying vMVCC, a high-performance transaction library using multi-version concurrency control.
Yun-Sheng Chang, Ralf Jung, Upamanyu Sharma, Joseph Tassarotti, M. Frans Kaashoek, and Nickolai Zeldovich.
In *Symposium on Operating Systems Design and Implementation* (*OSDI*), 2023.

Verified Density Compilation for a Probabilistic Programming Language.
Joseph Tassarotti and Jean-Baptiste Tristan.
In *Programming Language Design and Implementation* (*PLDI*), 2023.

Later credits: resourceful reasoning for the later modality.
Simon Spies, Lennard Gäher, Joseph Tassarotti, Ralf Jung, Robbert Krebbers, Lars Birkedal, and Derek Dreyer.
In *International Conference on Functional Programming* (*ICFP*), 2022.

Verifying the DaisyNFS concurrent and crash-safe file system with sequential reasoning.
Tej Chajed, Joseph Tassarotti, Mark Theng, M. Frans Kaashoek, and Nickolai Zeldovich.
In *Operating Systems Design and Implementation* (*OSDI*), 2022.

A Separation Logic for Negative Dependence.
Jialu Bao, Marco Gaboardi, Justin Hsu, and Joseph Tassarotti.
In *Principles of Programming Languages* (*POPL*), 2022.

Rabia: Simplifying State-Machine Replication Through Randomization.
Haochen Pan, Jesse Tuglu, Neo Zhou, Tianshu Wang, Yicheng Shen, Xiong Zheng, Joseph Tassarotti, Lewis Tseng, and Roberto Palmieri.
In *Symposium on Operating System Principles* (*SOSP*), 2021.

GoJournal: a Verified, Concurrent, Crash-safe Journaling System.
Tej Chajed, Joseph Tassarotti, Mark Theng, Ralf Jung, M. Frans Kaashoek, and Nickolai Zeldovich.
In *Operating Systems Design and Implementation* (*OSDI*), 2021.

Transfinite Iris: Resolving an Existential Dilemma of Step-Indexed Separation Logic.
Simon Spies, Lennard Gäher, Daniel Gratzer, Joseph Tassarotti, Robbert Krebbers, Derek Dreyer, and Lars Birkedal.
In *Programming Language Design and Implementation* (*PLDI*), 2021.

A Formal Proof of PAC Learnability for Decision Stumps.
Joseph Tassarotti, Koundinya Vajjha, Anindya Banerjee, and Jean-Baptiste Tristan.
In *Certified Programs and Proofs (CPP)*, 2021.

Verifying Concurrent Go Code in Coq with Goose.
Tej Chajed, Joseph Tassarotti, M. Frans Kaashoek, and Nickolai Zeldovich.
In *Workshop on Coq for Programming Languages (CoqPL)*, 2020.

Verifying Concurrent Crash-Safe Systems with Perennial.
Tej Chajed, Joseph Tassarotti, M. Frans Kaashoek, and Nickolai Zeldovich.
In *Symposium on Operating System Principles (SOSP)*, 2019.

Argosy: Verifying Layered Storage Systems with Recovery Refinement.
Tej Chajed, Joseph Tassarotti, M. Frans Kaashoek, and Nickolai Zeldovich.
In *Programming Language Design and Implementation (PLDI)*, 2019.

Scaling Hierarchical Coreference with Homomorphic Compression.
Michael L. Wick, Swetasudha Panda, Joseph Tassarotti, and Jean-Baptiste Tristan.
In *Conference on Automated Knowledge Base Construction (AKBC)*, 2019.

Sketching for Latent Dirichlet-Categorical Models.
Joseph Tassarotti, Jean-Baptiste Tristan, and Michael Wick.
In *International Conference on Artifical Intelligence and Statistics (AISTATS)*, 2019.

A Separation Logic for Concurrent Randomized Programs.
Joseph Tassarotti and Robert Harper.
In *Principles of Programming Languages (POPL)*, 2019.

MoSeL: A General, Extensible Modal Framework for Interactive Proofs in Separation Logic.
Robbert Krebbers, Jacques-Henri Jourdan, Ralf Jung, Joseph Tassarotti, Jan-Oliver Kaiser, Amin Timany, Arthur Charguéraud, and Derek Dreyer.
In *International Conference on Functional Programming (ICFP)*, 2018.

Verified Tail Bounds for Randomized Programs.
Joseph Tassarotti and Robert Harper.
In *International Conference on Interactive Theorem Proving (ITP)*, 2018.

A Higher-Order Logic for Concurrent Termination-Preserving Refinement.
Joseph Tassarotti, Ralf Jung, and Robert Harper.
In *European Symposium on Programming (ESOP)*, 2017.

Efficient Training of LDA on a GPU by Mean-for-Mode Estimation.
Jean-Baptiste Tristan, Joseph Tassarotti, and Guy L. Steele Jr.
In *International Conference on Machine Learning (ICML)*, 2015.

Verifying Read-Copy-Update in a Logic for Weak Memory.
Joseph Tassarotti, Derek Dreyer, and Viktor Vafeiadis.
In *Programming Language Design and Implementation (PLDI)*, 2015.

Augur: Data-Parallel Probabilistic Modeling.

Jean-Baptiste Tristan, Daniel Huang, Joseph Tassarotti, Adam Craig Pocock, Stephen J. Green, and Guy L. Steele Jr.
In *Neural Information Processing Systems (NIPS)*, 2014.

RockSalt: better, faster, stronger SFI for the x86.
Greg Morrisett, Gang Tan, Joseph Tassarotti, Jean-Baptiste Tristan, and Edward Gan.
In *Programming Language Design and Implementation (PLDI)*, 2012.

Teaching

NYU:
○ Programming Languages (Fall 2024, Fall 2025)
○ Compiler Construction (Spring 2023, Spring 2024, Spring 2025)
○ Special Topics: Verification (Fall 2024)

Boston College:
○ Topics in Computer Science: Formal Verification (Fall 2020, Fall 2021)
○ Principles of Programming Languages (Spring 2021, Spring 2022)
○ Randomness and Computation (Fall 2019, Spring 2020)

Tutorial at POPL 2021: Iris – A Modular Foundation for Higher-Order Concurrent Separation Logic (with Tej Chajed and Ralf Jung)

Grants and Funding

NSF Collaborative Research: FMitF: Track I: Verifying distributed systems for liveness with Byzantine participants. CCF-2524669.
PI for NYU Award: Joseph Tassarotti. $303,209.
October 2025 – September 2029.

NSF Collaborative Research: SHF: Medium: Probabilistic Concurrent Outcome Logic (pcOL) – Expressive Specifications for Concurrent Randomized Programs. CCF-2504143.
PI for NYU Award: Joseph Tassarotti. $450,000.
October 2025 – September 2029.

NSF CAREER: Verifying Security and Privacy of Distributed Applications. CCF-2338317.
PI: Joseph Tassarotti. $600,000.
May 2024 – April 2029.

Amazon Research Award. $50,000. 2023 Application Cycle.

NSF Collaborative Research: FMitF: Track I: The Phlox framework for verifying a high-performance distributed database. CCF-2319168.
PI for NYU Award: Joseph Tassarotti. $249,867.
October 2023 – September 2027.

NSF SaTC: CORE: Medium: Verifying Hardware Security Modules with Information-Preserving Refinement. CNS-2225441.
PI: Nickolai Zeldovich. Co-PIs: M. Frans Kaashoek, Joseph Tassarotti, Henry Corrigan-Gibbs. NYU Sub-award amount: $297,278.
October 2022 – September 2026

NSF Collaborative Research: FMitF: Track I: Composable Verification of Crash-Safe Distributed Systems with Grove. CCF-2123842 (transferred as CCF-2318722).
PI for NYU Award: Joseph Tassarotti. $249,998.
October 2021 – May 2026

NSF SHF: Medium: Formally Verified Compilation of Probabilistic Programs. CCF-2106659.
PI: Jean-Baptiste Tristan. Co-PI: Joseph Tassarotti. $963,189.
Initial: May 2021 – April 2025. Revised: May 2021 – June 2023, due to departure of PI.

NSF EAGER: SHF: Verified Audit Layers for Safe Machine Learning. CCF-2035314 (transferred as CCF-2318724).
PI: Joseph Tassarotti. $199,547.
October 2020 – March 2023

Gift from Oracle Labs. $100,000. 2019

Advising

Current PhD Students:
○ Chaitanya Agarwal (2023–)
○ Alexander Bai (2025–)
○ Markus de Medeiros (2023–)
○ Zichen Zhang (2024–)

Current Postdoctoral Advisees:
○ Jinkun Geng (co-Advised with Anirudh Sivaraman. January 2026–)
○ Alexandre Moine (October 2024–)

Ph.D. Thesis Committees:
○ Ekanshdeep Gupta (NYU)
○ Ding Ding (NYU)
○ Elaine Li (NYU, Thesis: Decision Problems for Global Protocol Specifications)
○ Nisarg Patel (NYU, Thesis: Verification of Concurrent Search Structures)
○ Anish Athalye (MIT, Thesis: Formally verifying secure and leakage-free systems: From application specification to circuit-level implementation)
○ Xiangyu Gao (NYU, Thesis: Solver-Aided Compiler Design for Programmable Network Devices)
○ Tej Chajed (MIT, Thesis: Verifying a concurrent, crash-safe file system with sequential reasoning.)
○ Julian Sutherland (Imperial College London, Thesis: Compositional termination verification for fine-grained concurrency.)

Former Postdoctoral Advisees:

- Simon Oddershede Gregersen (2024–2025)
  First Position: Tenure-Track Faculty, CISPA Helmholtz Center for Information Security
- Tarakaram Gollamudi (Boston College, 2021–2022)
  First Position: Postdoc, Carnegie Mellon University

Master's Student Research Advising:
- Eshwar Kancherla
- Hrishit Chaudhuri
- Karan Kumar Gangadhar

Undergraduate Research Advising:
- Puming Liu (NYU Dean's Undergraduate Research Fund Award)
- Jacob Bennett (Thesis: A Machine-Verified Proof for Information Flow Typing.)
- Yinzhe Ma (Thesis: Evaluating the Empirical Performance of Sandwich Learned Bloom Filters and Adaptive Leaned Bloom Filters.)
- Brian Ward (Thesis: A Validated Parser for Stan. Co-advised with Jean-Baptiste Tristan)
- Haochen Pan (Boston College Undergraduate Research Fellow. Co-advised with Lewis Tseng)

Honors and Awards

- PLDI Distinguished Artifact Award, 2025
- ICFP Distinguished Paper Award, 2024
- NSF CAREER Award, 2024
- Amazon Research Award, 2023
- Carnegie Mellon University Presidential Fellowship, 2018
- National Defense Science and Engineering Graduate (NDSEG) Fellow, 2014-2017
- Achievement Rewards for College Scientists Foundation (ARCS) Scholar, 2013-2016
- NSF Graduate Research Fellowship Program Honorable Mention, 2013 and 2014
- Member of Phi Beta Kappa, Alpha-Iota Chapter, 2013
- Herchel Smith-Harvard Undergraduate Science Research Program Fellow, 2012
- Harvard College Program for Research in Science and Engineering Fellow, 2011
- Detur Book Prize, 2010
- Robert C. Byrd Honors Scholarship, 2009

Internal Academic Service

- NYU CS Department PhD Admissions Committee, 2024–2025 cycle
- NYU CS Department Fellowship Committee, 2024–

External Academic Service

Organizing:
- Web Co-Chair, Principles of Programming Languages (POPL), 2026
- Steering Committee, Dafny Workshop, 2025–
- Co-Program Chair, First Dafny Workshop, 2024.

○ Co-Organizer, Dagstuhl Seminar on *Formal Methods for Correct Persistent Programming*, 2023.
○ Co-Organizer, Third Iris Workshop, 2023.

Program Committees:
○ Principles of Programming Languages (POPL) 2026.
○ Logic in Computer Science (LICS) 2025.
○ Certified Programs and Proofs (CPP) 2025.
○ International Conference on Functional Programming (ICFP) 2024.
○ Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA) 2024.
○ Programming Language Design and Implementation (PLDI) 2023.
○ Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA) 2023.
○ Principles of Programming Languages (POPL) 2023.
○ European Symposium on Programming (ESOP) 2022.
○ Certified Programs and Proofs (CPP) 2022.
○ International Workshop on Languages for Inference (LAFI) 2022.
○ International Conference on Probabilistic Programming (PROBPROG) 2021.
○ International Symposium on Reliable Distributed Systems (SRDS) 2021.
○ AAAI Conference on Artificial Intelligence (AAAI) 2021.
○ International Workshop on Coq for Programming Languages (CoqPL) 2020.

External Reviewing: Transactions on Programming Languages and Systems (TOPLAS), Foundations of Software Science and Computation Structures (FoSSaCS), Logic in Computer Science (LICS), Interactive Theorem Proving (ITP), Principles of Programming Languages (POPL), International Conference on Functional Programming (ICFP), Certified Programs and Proofs (CPP), Journal of Automated Reasoning (JAR), Theoretical Computer Science (TCS).

NSF Review Panelist: 2022, 2023, 2024, 2025.

Patents

Data-parallel probabilistic inference.
  Jean-Baptiste Tristan, Guy L. Steele Jr., Daniel E. Huang, and Joseph Tassarotti.
  Number 10496929, 2019.

Sparse and data-parallel inference method and system for the latent Dirichlet allocation model.
  Jean-Baptiste Tristan, Guy L. Steele Jr., and Joseph Tassarotti.
  Number 9767416, 2017.