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 –*

Massachusetts Institute of Technology
Research Affiliate — *2019 –*

Boston College
Assistant Professor — *2019 – 2022*

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

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:

- Compiler Construction (Spring 2023, Spring 2024)
- 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 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.

NSF Collaborative Research: FMitF: Track I: The Phlox framework for verifying a high-performance distributed database. CCF-2319168.
PI: 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. Subaward 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: Joseph Tassarotti. $249,998.
October 2021 – September 2025

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. September 2019

Advising

Current PhD Students:
- Markus de Medeiros (2023–)
- Chaitanya Agarwal (2023–)

Current Postdoctoral Advisees:
- Simon Oddershede Gregersen (2024–)

Ph.D. Thesis Committees:
- Ding Ding (NYU)
- Nisarg Patel (NYU)
- Anish Athalye (MIT)
- Xiangyu Gao (NYU)
- 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:
- Tarakaram Gollamudi (Boston College, 2021–2022)
  First Position: Postdoc, Carnegie Mellon University

Undergraduate Research Advising:
- 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

- 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 F 2011
- Detur Book Prize, 2010
- Robert C. Byrd Honors Scholarship, 2009

External Academic Service

Organizing:

- 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:
- 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.

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.