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

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)

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 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. 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: 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.
May 2021 – April 2025

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

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)

Ph.D. Thesis Committees:
- Tej Chajed (MIT, Thesis: Verifying a concurrent, crash-safe file system with sequential reasoning.)
- Julian Sutherland (Imperial College London)

Postdoctoral Advising:
- Tarakaram Gollamudi

Honors and Awards

- Robert C. Byrd Honors Scholarship, 2009
- Detur Book Prize, 2010
- Harvard College Program for Research in Science and Engineering Fellow, 2011
- Herchel Smith-Harvard Undergraduate Science Research Program Fellow, 2012
- Member of Phi Beta Kappa, Alpha-Iota Chapter, 2013
- NSF Graduate Research Fellowship Program Honorable Mention, 2013 and 2014
- Achievement Rewards for College Scientists Foundation (ARCS) Scholar, 2013-2016

- National Defense Science and Engineering Graduate (NDSEG) Fellow, 2014-2017
- Invited to Dagstuhl Seminar on *Compositional Verification Methods for Next-Generation Concurrency*, 2015
- Carnegie Mellon University Presidential Fellowship, 2018

External Academic Service

Program Committees:
- 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.

Patents

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.

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