

# Jason Gross

jgross@mit.edu — (631) 790-8962 — <http://people.csail.mit.edu/jgross/>

## PRESENT ADDRESS

258 Prospect Street, Apt # 1L  
Cambridge, MA 02139

## PERMANENT ADDRESS

126 Hayrick Lane  
Commack, NY 11725

## EDUCATION

**Massachusetts Institute of Technology**, Cambridge, MA

Began Doctorate of Philosophy in Computer Science in September 2013

Research Interests: Homotopy Type Theory, Category Theory, Program Synthesis, Type Theory

Current G.P.A. 4.8/5.0

Bachelor of Science in Mathematics and Physics, June 2013

G.P.A. 4.6/5.0

### Coursework:

- Computer Science: Inference and Information, Computer Systems Security, Geometric Computing, Foundations of Program Analysis, Performance Engineering of Software Systems, Structure and Interpretation of Computer Programs
- Mathematics: Paradox and Infinity, Category Theory for Scientists, Algebraic Topology I, Seminar in Topology, Introduction to Topology, Real Analysis, Abstract Algebra I & II, Differential Equations, Calculus I & II, Linear Algebra
- Physics: Statistical Physics I & II, Quantum Physics I, II, & III, Classical Mechanics II, Waves and Vibrations, Special Relativity and the Physics of Spacetime
- Other Sciences: Introductory Biology, Introductory Chemistry, Design a Concentrated Solar Power Water Heater (seminar)
- Other: The Art and Science of Happiness, Metaphysics, Introduction to Musical Composition, Capitalism and Its Critics, Moral Psychology, Philosophy of Quantum Mechanics, Moral Problems and the Good Life, Philosophy of Love

## EXPERIENCE

### MIT

September 2013–Present

#### *Researcher*

Cambridge, MA

- Researching program synthesis and verification with Adam Chlipala
- Collaboratively working on implementing one of the world's first algorithm-level-optimizing compilers
- Collaboratively implemented proven-correct crypto code now used by Google Chrome

### Google

June 2016–September 2016

#### *Software Engineering Intern*

Mountain View, CA

- Formalized low-level ECC primitives with proofs of correctness

### MIT

Fall 2009–Present

#### *Teacher*

Cambridge, MA

- Taught classes on L<sup>A</sup>T<sub>E</sub>X, philosophy, linear algebra, and quantum mechanics for MIT Educational Studies Program's Splash, Spark, and Summer HSSP (High School Studies Program)
- Teaching Assistant for 8.012 (Physics I) and 8.022 (Physics II) in Experimental Study Group

### MIT

September 2015–December 2015

#### *TA for 6.172 (Performance Engineering)*

Cambridge, MA

- Created and led recitations, taught students, and helped run class
- Analyzed and explained assembly output of `gcc -O3` to teach vectorization

**MIRI**

June 12–14, 2015

*Decision Theory Workshop Attendee*

Berkeley, CA

- Formalized various versions of Löb’s theorem in Agda and Coq
- Learned about and worked on problems on the frontiers of decision theory

**Microsoft Research**

June 2014–August 2014

*Intern*

Cambridge, United Kingdom

- Created a language for specifying input/output behavior of x86 assembly programs with Andrew Kennedy and Nick Benton; Verified the I/O behavior of a number of simple programs
- Improved automation of the x86proved library

**MIT**

April 2012–June 2014

*Researcher*

Cambridge, MA

- Entered a significant amount of category theory into the automated proof assistant Coq (<https://github.com/HoTT/HoTT/tree/master/theories/categories>)
- Working on building an interface for databases and database migration on top of category theory in Coq with David Spivak and Adam Chlipala
- Presented “Building Database Management on top of Category Theory in Coq”, January 25, 2013, POPL 2013: 40th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages
- Presented “Experience Implementing a Performant Category-Theory Library in Coq”, July 14, 2014, Interactive Theorem Proving 2014 Conference

**MIT CSAIL**

November 2009–September 2011

*Researcher*

Cambridge, MA

- Designed from scratch a data collection webpage, collected data for, and helped with research of Brenden Lake, Ruslan Salakhutdinov, and Josh Tenenbaum, on categorical and transfer learning (<http://jgross.scripts.mit.edu/alphabets/>).
- Co-author of “One shot learning of simple visual concepts” published in *Proceedings of the 33rd Annual Meeting of the Cognitive Science Society*.

**MIT OCW**

May–August 2010

Cambridge, MA

- Evaluated and categorized videos of Walter Lewin solving physics problems for updating the 8.01 (Physics I) OpenCourseWare (OCW) website.

**Commack High School**

Fall 2006–Summer 2009

*Independent Researcher*

Commack, NY

- Independently researched circuits over sets of natural numbers for three years.
- Won fourth place award in mathematics in ISEF (Intel International Science and Engineering Fair) in 2009, third place award in ISEF 2008.

**Turnpike Total Appliance**

Fall 2006–Summer 2009

*Web Page Designer*

Commack, NY

- Designed and improved main company website, took initiative to make more improvements.

**COMPUTER SKILLS**

- Proficient skills – Coq, T<sub>E</sub>X macro language, Mathematica, git, Python, JavaScript, BASIC
- Working knowledge – L<sup>A</sup>T<sub>E</sub>X, C, C++, Agda, Haskell, Scheme, HTML, CSS, Perl, Java
- Basic knowledge – Matlab, OCaml, Idris, Ruby, Ur/Web, x86 Assembly

**HONORS AND AWARDS**

- Mathematics Honor Society (Commack High School)
- Collection of 12 original K'NEX synagogue models exhibited in various museums (2004–2008)
- Graduated Cum Laude from Commack High School (June 2009)

#### EXTRACURRICULAR ACTIVITIES

- Co-maintainer of the homotopy type theory Coq repository (HoTT/HoTT on GitHub)
- Committer to the SIPB BarnOwl project (<http://barnowl.mit.edu>)
- SIPB (Student Information and Processing Board) Member
- Was project leader for MITeX, an online interface for composing L<sup>A</sup>T<sub>E</sub>X
- HMMT Solutions Editor (2010)
- Canada/USA Mathcamp (Summers 2006–2009)

#### INTERESTS

- Philosophy
- Programming
- Dancing, especially tango, contra, and square dancing
- Psychology
- Hiking
- MIT Mystery Hunt, Participated on Manic Sages Team, January 2008–2012

#### PRESENTATIONS AND PUBLICATIONS

- [1] Andres Erbsen, Jade Philipoom, Jason Gross, Robert Sloan, and Adam Chlipala. “Simple High-Level Code For Cryptographic Arithmetic – With Proofs, Without Compromises”. In: *Proceedings of the 40th IEEE Symposium on Security and Privacy (S&P'19)*. May 2019. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/2019-fiat-crypto-ieee-sp.pdf>.
- [2] Jason Gross, Andres Erbsen, and Adam Chlipala. “Reification by Parametricity: Fast Setup for Proof by Reflection, in Two Lines of Ltac”. In: *Proceedings of the 9th International Conference on Interactive Theorem Proving (ITP'18)*. July 2018. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/2018-reification-by-parametricity-itp-camera-ready.pdf>.
- [3] Andrej Bauer, Jason Gross, Peter LeFanu Lumsdaine, Michael Shulman, Matthieu Sozeau, and Bas Spitters. “The HoTT Library: A Formalization of Homotopy Type Theory in Coq”. In: *Proceedings of the 6th ACM SIGPLAN Conference on Certified Programs and Proofs. CPP 2017*. Paris, France: ACM, Jan. 2017, pp. 164–172. ISBN: 978-1-4503-4705-1. DOI: 10.1145/3018610.3018615. eprint: 1610.04591. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/2017-HoTT-formalization.pdf>.
- [4] Jason Gross. *The HoTT/HoTT Library in Coq: Designing for Speed*. Presented at The 5th International Congress on Mathematical Software (ICMS 2016). July 2016. URL: <https://people.csail.mit.edu/jgross/personal-website/presentations/icms-2016/hott-hott-and-category-coq-experience.pdf>.
- [5] Jason Gross. “An Extensible Framework for Synthesizing Efficient, Verified Parsers”. MA thesis. Massachusetts Institute of Technology, Sept. 2015. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/2015-jgross-thesis.pdf>.

- [6] Ben Delaware, Clément Pit-Claudel, Jason Gross, and Adam Chlipala. “Fiat: Deductive Synthesis of Abstract Data Types in a Proof Assistant”. In: *Proceedings of the 42nd ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL’15)*. Jan. 2015. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/2015-adt-synthesis.pdf>.
- [7] Jason Gross. *Coq Bug Minimizer*. Presented at The First International Workshop on Coq for PL (CoqPL’15). Jan. 2015. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/2015-coq-bug-minimizer.pdf>.
- [8] Tobias Tebbi and Jason Gross. *A Profiler for Ltac*. Presented at The First International Workshop on Coq for PL (CoqPL’15). Jan. 2015. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/2015-ltac-profiler.pdf>.
- [9] Jason Gross. *Presentation: Input, Output, and Automation in x86 Proved*. Presented at Microsoft Research, Cambridge, UK. Aug. 2014. URL: <https://people.csail.mit.edu/jgross/personal-website/presentations/msr-2014-final-talk/input-output-and-automation-in-x86proved.pdf>.
- [10] Jason Gross, Adam Chlipala, and David I. Spivak. “Experience Implementing a Performant Category-Theory Library in Coq”. In: *Proceedings of the 5th International Conference on Interactive Theorem Proving (ITP’14)*. July 2014. eprint: 1401.7694. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/category-coq-experience-ityp-submission-final.pdf>.
- [11] Jason Gross. *Presentation Proposal for of Three Neat Tricks in Coq 8.5*. Presented at the 6th Coq Workshop. Apr. 2014. URL: <https://people.csail.mit.edu/jgross/personal-website/presentations/coq-workshop-2014/coq-workshop-proposal-tactics-in-terms.pdf>.
- [12] Jason Gross. *Jason Gross’ Wishlist for Coq*. Jan. 2014. URL: <https://people.csail.mit.edu/jgross/personal-website/presentations/coq-8.6-wishlist/jgross-coq-8-6-wishlist-no-pause.pdf>.
- [13] Jason Gross. *POPL: Minute Madness: Category Theory in Coq, and Program Synthesis*. Presented at the 41st ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL’14). Jan. 2014. URL: <https://people.csail.mit.edu/jgross/personal-website/presentations/popl-2014-minute-madness/jason-gross-minute-madness.pdf>.
- [14] Jason Gross. *CSAIL Student Workshop 2013: Computational Higher Inductive Types: Computing with Custom Equalities*. Presented at the 2014 MIT CSAIL Student Workshop. Oct. 2013. URL: <https://people.csail.mit.edu/jgross/personal-website/presentations/csw-2013/jgross-presentation-no-pause.pdf>.
- [15] Jason Gross. *Building Database Management on top of Category Theory in Coq*. Presented as a student talk at the 40th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL’13). Jan. 2013. URL: <https://people.csail.mit.edu/jgross/personal-website/presentations/popl-2013/jgross-student-talk.pdf>.
- [16] Jason Gross. *POPL: Minute Madness: Database Management on top of Category Theory in Coq: Category of Relational Schemas = Category of Categories*. Presented at the 40th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL’13). Jan. 2013. URL: <https://people.csail.mit.edu/jgross/personal-website/presentations/popl-2013/minute-madness.pdf>.
- [17] Brenden M. Lake, Ruslan Salakhutdinov, Jason Gross, and Joshua B. Tenenbaum. “One shot learning of simple visual concepts”. In: *Proceedings of the 33rd Annual Conference of the Cognitive Science Society*. 2011. URL: <https://people.csail.mit.edu/jgross/personal-website/papers/LakeEtAl2011CogSci.pdf>.