PHD/SCD COMPLETION FORM **2020-2021**

This form is to be completed by EECS graduate students upon submission of a doctoral thesis to the department. **Please attach a CV or resume...thank you.**

STUDENT NAME: Jason S. Gross

CITIZENSHIP (circle) (United States) OTHER:

AREA (circle): [EE] **or** ([CS])

DATE of THESIS SUBMISSION: January 24, 2021

THESIS SUPERVISOR(S): Adam Chlipala

DATE of MIT DEGREE LIST: February 2021

Please notify us of your immediate future plans, by responding to the questions below:

1. Please check the type of job you are taking within the following broad categories:

   - Academic/faculty position
   - Academic/researcher
   - Academic/postdoc
   - ✔ Industry
   - Government
   - Medical
   - Financial
   - Management Consulting
   - Self-Employed
   - Other
   - Un-Employed

2. If you can let us know specifically where you are going, that would be most helpful:

   Institution:

   Title:

   Location of Employment:

3. Check the area within EECS that best describes your area of employment:

   - Communications
   - Systems, Decision and Control
   - Signal Processing
   - Bioelectrical/Medical Engineering
   - Circuit Design
   - Devices and Materials
   - Electromagnetics and Energy
   - Artificial Intelligence/Robotics
   - Hardware/ Architecture
   - Numerical Analysis/Scientific
   - ✔ Programming Language/Compilers
   - OS/Networks
   - Software Engineering
   - Theory/ Algorithms
   - Graphics/Human Interface
   - Database/Information Systems
   - Other:

THANK YOU, and ALL GOOD WISHES!

Jason Gross

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Research Interests

Programming Languages, Formal Verification, Performance of Automation in Interactive Proof Assistants, Homotopy Type Theory, Category Theory, Program Synthesis, Cryptography

Key Contributions

Fiat Cryptography

- Collaboratively working on one of the world's first algorithm-level-optimizing compilers
- Collaboratively implemented proven-correct cryptographic code now used by Google Chrome, and in the majority of secure connects from web browsers

Interactive Proof Assistants

- Researching performance issues that impact scalability of automated verification
- Reporting the plurality of bugs in the proof assistant Coq

Education

Massachusetts Institute of Technology 2013–2021
PhD in Computer Science Cambridge, MA
Advisor: Adam Chlipala
Thesis: Performance Engineering of Proof-Based Software Systems at Scale
MA Thesis: An Extensible Framework for Synthesizing Efficient, Verified Parsers

Massachusetts Institute of Technology 2009–2013
BS in Mathematics and Physics Cambridge, MA
GPA: 4.6/5

Internships

Machine Intelligence Research Institute June 2019–August 2019
Type Theory Intern Berkeley, CA

- Worked on formalizing type theories and on proving things within proof assistants

Google June 2018–August 2018
Software Engineering Intern Cambridge, MA

- Worked with BoringSSL on integration of proven-correct low-level ECC primitives into Chrome

Google June 2016–September 2016
Software Engineering Intern Mountain View, CA

- Formalized low-level ECC primitives with proofs of correctness

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 CSAIL 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`)
- Made progress towards an interface for databases and database migration on top of category theory in Coq with David Spivak and Adam Chlipala

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.

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.

Computer Skills

- Proficient skills – Coq, Mathematica, git, Python, JavaScript, BASIC
- Working knowledge – C, C++, Agda, OCaml, Haskell, Scheme, HTML, CSS, Perl, Java
- Basic knowledge – Matlab, Idris, Ruby, Ur/Web, x86 Assembly

Teaching

- Instructor at Monsoon Math: Classes on category theory, linear logic, and Löb's theorem
- TA for 6.172 (Performance Engineering): Led recitations, analyzed and explained assembly output of `gcc -O3` to teach vectorization
- TA for 8.012 (Physics I) and 8.022 (Physics II) in Experimental Study Group
- Volunteer for MIT ESP: Classes on LaTeX, philosophy, linear algebra, and quantum mechanics

Extracurricular Activities

- Co-maintainer of the homotopy type theory Coq repository (`HoTT/HoTT` on GitHub)
- MIRI Decision Theory Workshop Attendee: Formalized various versions of Löb's theorem in Agda and Coq
- Commiter to the SIPB BarnOwl project (`https://barnowl.mit.edu`)
- SIPB (Student Information and Processing Board) Member
- Canada/USA Mathcamp (Summers 2006–2009)

Selected Presentations and Publications