Chirag Bharadwaj

Personal Information

Birthdate: 23 November 1996 **Email:** chiragb@cs.princeton.edu
Citizenship: United States **Phone:** +1 609-937-6050

Languages Spoken

English (native), Spanish (conversational), Mandarin (elementary)

Research Interests

programming languages, semantics, compilers, hardware accelerators, computer architecture

Education

Princeton University, Princeton, NJ

Master of Science, MSE, Computer Science 09/2017–

- GPA: 3.58/4.00

Cornell University, Ithaca, NY

Bachelor of Science, BSc, Computer Science 08/2014–05/2017

- GPA: 3.39/4.00
- Minor: Electrical and Computer Engineering

Research Experience

Graduate Research Assistant, Princeton University

Tools for Estimating the Performance of Decoupled Accelerators 12/2017–09/2018

Principal Investigator: Margaret Martonosi

Estimated the performance of decoupled architectures in specialized hardware accelerators (e.g. GPUs). Used LLVM compiler pass techniques to statically analyze IR dependency graphs in this software-defined simulation. Developed cycle-accurate pre-RTL models of accelerators' computation times in both idealistic and resource-limited settings.

Undergraduate Research Assistant, Cornell University

LambdaLab: Interactive λ-calculus for Learning 01/2017–05/2017

Principal Investigator: Adrian Sampson

Laid out a theoretical foundation for an interactive visual tool that students could utilize to aid in learning the lambda calculus. Considered pedagogical value for multiple-intelligence learners.

Investigating Behavioral Equivalence in Intermediate Representations 08/2016–12/2016

Principal Investigator: Adrian Sampson

Generated CPU-like LLVM IR equivalent in behavior to complex NVIDIA CUDA programs. Worked towards an high-level GPU synthesis tool for simplified RTL in a heterogeneous architecture.

Teaching Experience

Graduate Teaching Assistant, Princeton University 09/2017–

- ELE 206: Digital Logic Design
- ELE 375: Computer Organization and Architecture
- COS 326: Functional Programming

Undergraduate Teaching Assistant, Cornell University 01/2015–05/2017

- CS 3410: Digital Logic and Computer Organization (head TA)
- CS 3110: Functional Programming and Data Structures (head TA)
- CS 2800: Discrete Mathematics and Structures

Publications

Theses

- **C Bharadwaj**. *LambdaLab: Interactive λ-calculus for Learning.* Cornell University, May 2017.

Unpublished Works

- **C Bharadwaj**, SD Goré. *Reddit Comments via Generative Grammar Modelling*, May 2017.
- SK Somayyajula, **C Bharadwaj**. *Refined Logic: Implementing Constructive Logics*, Dec. 2016.

Talks

Princeton University

- *Special Topics: Laguerre Polynomials*, mathematics seminar, Apr. 2018.

Cornell University

- *Handy Techniques for Empirical Analysis*, mathematics seminar, Apr. 2017.
- *Musical Groups: Exploring Music with Math*, music seminar, Nov. 2016.
- *Special Topics: Legendre Polynomials*, mathematics seminar, Apr. 2016.
- *A Survey of Japanese Linguistics*, linguistics seminar, Oct. 2015.
- *A Treatise on Complex Analysis*, mathematics seminar, Apr. 2015.

Scholarships and Awards

Princeton University

- Teaching assistantship for engineering graduate study — 09/2017–

Cornell University

- Outstanding teaching assistant in Computer Science — 05/2016, 05/2017
- Best final project (`PokéSnowdown`) in CS 3110 — 12/2015
- Dean's List in the College of Engineering — 12/2014

Earlier Honors

- Outstanding achievement in chemistry (2/747) — 06/2014
- NJ VEX robotics semifinalist team: 750-R — 02/2014
- National Merit Finalist (1 of 15000) — 01/2014
- National AP Scholar (score of 4 or higher on eight AP exams) — 05/2013
- ASCAP Morton Gould Young Composer Honorable Mention (U18 category) — 04/2012

Projects

Research Projects

- `pythia`: A static pre-RTL tool for performance estimation in hardware accelerators — 07/2018
- `refinery`: A realization of various refinement logics in OCaml — 12/2016

Software and Implementations

- `redditcommentor`: Using generative grammars to model Reddit comments — 05/2017
- `PokéSnowdown`: A winter-themed single-player spin-off of Pokémon Showdown — 12/2015

Notes and Sketches

- Modern Linguistics: A comprehensive treatment of theoretical/applied linguistics — on hiatus
- Cornell Course Notes: A digitization project of notes taken from Cornell courses — on hiatus
- Calculus Done Right: A self-teaching approach to learning AP Calculus — 01/2011

Service and Outreach

Princeton University

- Graduate Engineering Council communications director — 09/2018–
- Political Engagement Initiative for Asian-American students — 10/2017–
- Graduate Engineering Council department representative — 09/2017–05/2018

Cornell University

- Co-mentor for URMs and women in Computer Science — 01/2017–05/2017
- Mentor for underclassmen in Computer Science — 08/2016–12/2016
- Freshman orientation leader (group leader) — 08/2015, 08/2016
- Engineering freshman peer advisor (lead advisor) — 08/2015–05/2017
- Volunteer piano instructor for adult beginners in local community — 08/2015–05/2017
- NY Science Olympiad invitational organizer and event moderator — 09/2014–02/2017

Earlier Volunteering Efforts

- Volunteer AP calculus teaching assistant in Monmouth Junction, NJ — 09/2010–05/2014
- High school badminton tournament co-organizer — 04/2012–04/2014

Skills

Programming and Scripting
- Java, Kotlin, C, C++, OCaml, Python, Ruby, `bash`, `awk`, `sed`

Verification and Solvers
- Coq, NuPRL, SystemVerilog

Web Development
- HTML5, CSS/SASS, JavaScript, Dropwizard, JDBC, SQL, Guice, Jekyll, Ruhoh, Nanoc

Hardware, Assembly, and ISAs
- CUDA, LLVM, ARM, MIPS, RISC-V, LC-3, Verilog, GTKWave, ModelSim, Quartus, SPICE

Tools and Libraries
- LaTeX, Markdown, CMake, Makefile, Maven, Gradle, Eclipse, IntelliJ, `vim`, `git`, `svn`, `hg`, `gdb`, `valgrind`, `gprof`, `lex`/`yacc`, `flex`/`bison`

Selected Coursework

Princeton University
- COS 320: Compiling Techniques
- COS 521: Advanced Algorithms
- COS 533: Advanced Cryptography
- COS 597E: Advanced NLP Techniques*
- ELE 575: Advanced Computer Architecture
- MAT 313: Category Theory for Scientists*

Cornell University
- CS 2043: UNIX and Scripting Tools
- CS 2112: Honors Data Structures and OOP
- CS 2800: Discrete Structures
- CS 3110: Functional Programming
- CS 3410: Computer Organization
- CS 4410: Operating Systems
- CS 4700: Artificial Intelligence
- CS 4750: Mathematical Robotics
- CS 4780: Machine Learning
- CS 4810: Theory of Computation
- CS 4820: Analysis of Algorithms
- CS 4860: Applied Logic
- CS 6110: Advanced Programming Languages
- CS 6810: Advanced Theory of Computation
- ECE 2100: Electrical Circuits
- ECE 2300: Digital Logic Design
- ECE 3140: Embedded Systems
- ECE 3150: Microlectronics
- ECE 4130: Nuclear Science and Engineering
- LING 1101: Introduction to Linguistics