Pradyumna Shome

pradyumna.shome@gmail.com • https://pradyumnashome.com
pradyumna-shome • PradyumnaShome

Education

University of Illinois at Urbana-Champaign — **Champaign-Urbana, IL, USA**
Bachelor of Science - B.S., Computer Science — *August 2017–May 2021*

Advisor: Christopher W. Fletcher

Relevant Classes:

Graduate / Upper Division:

- Computer Security I (CS 461)
- Computer Security II (CS 463)
- Distributed Systems (CS 425)
- Machine Learning [PhD] (CS 446)
- Virtual Reality (CS 498 VR)
- Combinatorics (CS 413)
- Senior Thesis (CS 499)
- 2 x Independent Study (CS 397)

Undergraduate:

- System Programming (CS 241)
- Computer Architecture (CS 233)
- Algorithms and Models of Computation (CS 374)
- Numerical Methods (CS 357)

National Public School, HSR Layout — **Bangalore, KA, India**
High School Diploma, Science with Computer Science — *June 2013–May 2017*

Awards and Distinctions

- **2020**
  - Malwarebytes Cybersecurity Scholarship, Malwarebytes
  - Illinois Engineering Achievement Scholarship, UIUC College of Engineering
  - Outstanding Course Assistant Award, Department of Computer Science, UIUC
- **2019**
  - Kleiner Perkins Engineering Fellowship Finalist, Kleiner Perkins Caufield & Byers
  - Illinois Engineering Achievement Scholarship, UIUC College of Engineering
  - Forbes Under 30 Scholar, Forbes
- **2018**
  - Illinois Engineering Achievement Scholarship, UIUC College of Engineering
- **2017**
  - Edmund J. James Scholar Program, UIUC College of Engineering
  - AP Scholar with Distinction, College Board

Papers, Talks, Etc.

Publications (In Preparation/Submission)

[1] Jose Rodrigo Sanchez Vicarte, Pradyumna Shome, Adam Morrison, David Kohlbrenner, and Christopher W. Fletcher. "Opening Pandora's Box: A Systematic Study of New Ways Microarchitecture Can Leak Private Data". In: (). In preparation for ISCA '21.

Talks, Misc.

[1] *Broadway: Scaling Programming Education Through a Distributed Autograding Framework*. Undergraduate Research Symposium, University of Illinois at Urbana-Champaign, April 2020.

[2] *PRISM: Protections Impeding Side-channel Attacks in Microarchitecture*. Illinois Computer Science Research Experiences for Undergraduates (REU), August 2020.

Experience

Research

FPSG, Security and Privacy Research at Illinois — **Champaign-Urbana, IL, USA**

Research Assistant — *August 2019–Present*

- Advisor: Prof. Christopher W. Fletcher
- **Relationship Between Cache Compression and Dynamic Overclocking**
  - Investigating the effects of dynamic overclocking and cache compression on memory access times and CPU temperature
  - Using Intel VTune to analyze the program control flow and hot spots
- **Static and Dynamic IFT for Tracking Private Information Leakage**
  - Researching and using tools that perform static/dynamic code analysis and annotate code with security labels based on lattice-based access control models
  - Studying how modern computer architectural features such as speculative execution, multiple issue, and out of order execution make hardware increasingly prone to microarchitectural cache, timing, and contention-based side-channel attacks
  - Devising novel schemes and improving existing schemes to prevent data leakage on processors, through taint analysis, information flow tracking (IFT), and analysis of branch predictor design
- **Microarchitectural Optimizations Vulnerable To Side-channel Attacks**
  - Conducting extensive literature survey on vulnerabilities in hardware security topics
  - Identifying vulnerable code patterns in open-source software, and brainstorming real-world threat models that enable end-to-end exploitation
  - Implementing hardware optimizations in gem5 processor simulator's O3CPU
  - Analyzing pipeline diagrams to help debug instructions flow through various stages
  - Developing multiple iterations of litmus tests to ensure memory correctness
- UIUC CS Research Experiences for Undergraduates (REU) Participant, Summer 2020

Blender Lab, NLP Research at Illinois — **Champaign-Urbana, IL, USA**

Research Assistant — *August 2019–December 2019*

- Advisor: Prof. Heng Ji
- Conducting literature survey on event schema induction from multimedia, multilingual representations using graph neural nets, and one-shot learning
- Annotating videos for Yoga Robot; learning more about Attention Models and Transformers
- Participate in NLP Reading Group and Seminar - discussion of recent papers in the field of information extraction and natural language understanding

Professional

Facebook — **Seattle, WA, USA**
Software Engineering Intern — *September 2020–December 2020*
- PDU Product Platform, Privacy and Data Use Org

Salesforce — **San Francisco, CA, USA**
Software Engineering Intern — *June 2019–August 2019*
- Records Experience, Platform Cloud
- Created web app to automatically suggest test plans for a new user story, through natural language processing of the acceptance criteria, using JavaScript (ES2017), Apex, SOQL, Web Components, and Jest for unit tests
- Reduced 13 engineering work days spent manually compiling test plans per sprint planning session
- Developed UI for Einstein Modeling's first Business Card Scanner, that uses OCR and Named Entity Recognition to automate the organization of business contact information.
- Ideated and built intern-matching social app using Python and Jinja, that helps bolster personal connections and surfaces common interests.

Virtusa — **New York, NY, USA**
Software Engineering Intern — *July 2018–August 2018*
- Media & Content Division
- Created serverless cloud app and supporting data lake to model, process, and aggregate computer vision data for predictive analytics, using Python, AWS Lambda, Amazon API Gateway, and Amazon DynamoDB
- Implemented reference business intelligence (BI) tool, using NLP generative models (LDA, NTM) to gain insights on social media reactions to popular films and TV shows, using Boto 3, Amazon QuickSight, and Amazon SageMaker

HackIllinois — **Champaign-Urbana, IL, USA**
Systems Developer — *April 2018–February 2019*
- Developed Go microservices to enable user authentication, authorization, event registration, and notifications via mobile app clients, including CI / CD pipeline (Travis, AWS CodePipeline, Amazon ECS).
- Added features such as user mocking, OAuth single sign-on, multi-tier decision review, templated mail, error handling and CRUD (with MongoDB).
- Created QR code scanner in Android app to manage event check-in and track participant statistics for meals and mini-events.

Reflections | Projections — **Champaign-Urbana, IL, USA**
Director, Web Team and Lead Web Developer — *January 2018–September 2018*
- Principal full-stack developer of website written in ES6 using React, Webpack, and Nginx.
- Integrated microservices-based in-house registration API that brought in 2200+ applicants.
- Mentored junior developers through code review and pair programming.

Teaching

Coding Together / Harvard University — **Cambridge, MA, USA**
Section Leader, CS 50: Intro to Computer Science — *June 2020–August 2020*
A Stanford Rebuild project offering free computer science education during the time of the COVID-19 pandemic.
- Held weekly section teaching C programming to students having prior experience.
- Presented mini-lectures to re-iterate concepts, facilitated pair programming exercises for practice, and provided instruction in code decomposition and best practices in code style

Stanford University — **Stanford, CA, USA**
Section Leader, CS 106A: Programming Methodologies — *April 2020–June 2020*

- Instructors: Prof. Chris Piech, Prof. Mehran Sahami
- Held weekly section teaching introductory Python to students, and answered student questions on online QA forum Ed
- Presented mini-lectures to re-iterate concepts, facilitated pair programming exercises for practice, and provided instruction in code decomposition and best practices in code style
- Discussed CS applications for people outside the tech industry, and potential next steps for deepening knowledge in the field

UIUC Department of Computer Science **Champaign-Urbana, IL, USA**
Lead Course Assistant, CS 241: System Programming *January 2019–Present*

- Instructor: Prof. Lawrence C. Angrave
- Recipient of Computer Science Outstanding Course Assistant Award
- Lead a lab section, conduct office hours, and develop assignments teaching concepts of Linux system programming
- Contribute content to and maintain course textbook and website, and conduct technical and behavioral interviews for prospective course staff members
- Manage course logistics, onboard and mentor new staff, and answer student questions on online Q&A platform
- Liaise with instructor to determine direction of course, and ensuring learning objectives are being met via assignments, homework and lab sections etc.
- Helping build a new class Illinois CS 240: Introduction to Computer Systems, for non-majors and CS+X majors, that combines our system programming and computer architecture classes

UIUC Department of Computer Science **Champaign-Urbana, IL, USA**
Course Assistant, CS 233: Computer Architecture *August 2018–December 2018*

- Instructor: Prof. Geoffrey L. Herman
- Hold a discussion section, and conduct office hours to help students learn concepts about computer architecture such as caches, instruction set architectures, (MIPS) assembly programming, instruction-level parallelism, vectorization etc.

Service

Illinois Women in Computer Science Bits and Bytes Program **Urbana, IL, USA**
Mentor ("Byte") *September 2020-Present*

- Mentoring new undergraduate women majoring in Computer Science
- Helping women CS majors overcome gender imbalance in academia and the technology industry by providing information about career development opportunities and tips for succeeding as college students
- Participating in social events and helping students grow their personal network in a time of remote learning

Illinois CS Undergraduate Mentorship Program **Urbana, IL, USA**
Mentor *May 2020-Present*

- Mentored new freshmen and transfer students majoring in Computer Science.
- Offered guidance on college opportunities such as courses, research, internships, and teaching.
- Talked about housing and dining options, navigating campus, technology, and supplies to bring to college.
- Mentees: Saumil Thakore (B.S. CS, Class of 2024), Tony Chang (B.S. CS, Class of 2024)

CS@Illinois SAIL **Urbana, IL, USA**
Teacher *March 2019*

- Prepared class on functional programming, and parser generators
- The class was about learning the roles and applications of (recursive descent) parsers, as well as learning to write a JSON parser in Haskell that generates a Java class, given boilerplate code such as a Backus-Naur Form (BNF) grammar

CS@Illinois SAIL **Urbana, IL, USA**
Volunteer *March 2018*

- Helped serve meals, and set up tables for a outreach event that exposes high-schoolers from nearby districts to various aspects of computer science through classes taught by college students

Ashwini Charitable Trust **Bangalore, KA, India**
Web Development Volunteer *May 2016-July 2016*

- Built mockups of proposed new website from scratch.
- Migrated website to Wordpress, to allow non-technical staff to create and update content.
- Incorporated search engine optimization to better target volunteers and potential donors.

Languages

English: Full professional proficiency

Hindi: Native or bilingual proficiency

French: Elementary proficiency

Technical skills

Programming Languages: Python, C, Java, Go, C++, Kotlin, HTML, CSS, JavaScript

Tools + Frameworks: Cloud (AWS, Firebase, Travis, Serverless, Docker); Databases (MongoDB, MySQL); Web (React, Node.js, Web Components); Version Control (Git, SVN)

Organizations

- Asian American Association (AAA) at UIUC
- Association for Computing Machinery (ACM) at UIUC
- NLP Reading Group at UIUC
- Security and Privacy Research at Illinois (SPRAI)
- Women in Computer Science (WCS) at UIUC

Hobbies & Interests

Table-tennis, board games, piano performance

Last updated: September 18, 2020