Pradyumna Shome

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Education

University of Illinois at Urbana-Champaign — Champaign-Urbana, Illinois, USA
Bachelor of Science in Computer Science, Grainger College of Engineering — *August 2017 - May 2021*
Advisor: Prof. Christopher W. Fletcher

National Public School, HSR Layout — Bangalore, Karnataka, India
All India Senior Secondary Certificate, Science with Computer Science — *June 2013 - May 2017*

Awards and Distinctions

- Malwarebytes Cybersecurity Scholarship (2020)
- Illinois Engineering Achievement Scholarship, Grainger College of Engineering (2020)
- CS Outstanding Course Assistant Award (5 out of ∼600) (2020)
- Kleiner Perkins Engineering Fellowship Finalist (2019)
- Forbes Under 30 Scholar (2019)
- Illinois Engineering Achievement Scholarship, Grainger College of Engineering (2019)
- Illinois Engineering Achievement Scholarship, Grainger College of Engineering (2018)
- Edmund J. James Scholar (2017)
- AP Scholar with Distinction, College Board (2017)

Papers, Talks, Etc.

Publications (In Submission)

[1] Jose Rodrigo Sanchez Vicarte, Pradyumna Shome, Nandeeka Nayak, Caroline Trippel, 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 submission to International Symposium for Architecture (ISCA) '21.

Talks

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

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

Research Experience

FPSG, Security and Privacy Research at Illinois — Champaign-Urbana, IL, USA
Research Assistant — *August 2019–Present*

- Advisor: Prof. Christopher W. Fletcher
- **Project: 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
- **Project: 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
- **Project: 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 Experience

Facebook Seattle, WA, USA
Software Engineering Intern, Privacy Control Infrastructure, Privacy and Data Use Org *September 2020 - December 2020*

- Building a highly structured, loosely coupled, and decentralized framework to support 2 billion daily mutations to profile-level privacy settings, using Ent, an internal entity framework and Hack (PHP)
- Framework simplifies legal compliance, improves developer experience, and reduces the impact of high-severity incidents
- Creating data migration scripts to transition users to the new framework, and ensuring privacy policies have identical behaviors through trace equivalence checking

Salesforce San Francisco, CA, USA
Software Engineering Intern, Records Experience, Platform Cloud *June 2019 - August 2019*

- Created recommendation system for automatic test case suggestions; reduced 13 work days per sprint planning session, using JavaScript (ES2017), Apex, SOQL, Web Components, and Jest for unit tests
- Developed UI for Einstein Modeling's first Business Card Scanner, that used OCR and NER
- Ideated and built intern-matching social app that helps bolster personal connections and surfaces common interests.

Virtusa New York, NY, USA
Software Engineering Intern, Media & Content Division *July 2018 - August 2018*

- Created serverless cloud app and data lake that enabled semantic and fine-grained video search through time series analysis on computer vision data, using Python, Boto 3, 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 AWS data science and visualization services

HackIllinois Urbana, IL, USA
Systems Staff *April 2018 - February 2019*

- Developed Go microservices to enable user authentication, authorization, event registration, and notifications via mobile app clients, including CI / CD pipeline, using MongoDB for persistence
- Built features such as user mocking, OAuth single sign-on, multi-tier decision review, templated mail, and created QR code scanner in Android app to manage event check-in and track participant statistics for meals and mini-events

Reflections | Projections 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 Experience

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 Q&A 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

University of Illinois Computer Science 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

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
- Mentees: Ashna Arya (B.S. CS '24), Meghna Mavila (B.S. CS '24), Minal Singh (B.S. CS '24), Niki Modi (B.S. CS '24)

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 '24), Tony Chang (B.S. CS '24)

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.

Other Involvement

USENIX Security Mentorship Program Boston, MA, USA
Mentee *August 2020*
Symposium on Usable Privacy and Security (SOUPS) Mentorship Program Boston, MA, USA
Mentee *August 2020*
Illinois CS Research Experiences for Undergraduates (REU) Urbana, IL, USA
Researcher *May 2020–August 2020*
Jane Street Electronic Trading Competition San Francisco, CA
Participant *July 2019*
HackIllinois Urbana, IL, USA
Participant *February 2018*

Technical Skills

- **Programming Languages**: Python, Go, Java, C, C++, Kotlin, Haskell, Scala, HTML, CSS, JavaScript
- **Tools + Frameworks**: Cloud (AWS, Firebase, Travis, Serverless, Docker); Databases (MongoDB, MySQL); Web (React, Node.js, Web Components); Version Control (Git, SVN); Machine Learning (PyTorch, Scikit-learn, NumPy); Misc. (Intel VTune, gem5)

Languages

- **English**: Full professional proficiency
- **Hindi**: Native or bilingual proficiency
- **French**: Elementary proficiency

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 and Interests

- **Hobbies**: Board games, piano performance, reading, tennis, table tennis
- **Interests**: Academia, bubble tea/pearl milk tea, coffee, dining, education, electronic music, investing, memes, mental health, music production, technology news, theatrical productions

Last updated: November 2, 2020.