Divya Sharma, PhD

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▬▬▬ Interests

- Data privacy, security, user experience, accountability, causality, applied machine learning, HCI
- Broadly interested in technology-related opportunities with high user impact
- Background in privacy from technical, policy and user-centric perspectives, worked at intersection of fields

▬▬▬ Education

Sep 2015 **Carnegie Mellon University** (CMU), Pittsburgh, PA
Ph.D., Electrical and Computer Engineering
Thesis: *Interaction-aware Actual Causation: A Building Block for Accountability in Security Protocols*
Advisor: Prof. Anupam Datta

May 2015 **Carnegie Mellon University** (CMU), Pittsburgh, PA
M.S., Electrical and Computer Engineering

May 2009 **PEC University of Technology** (formerly Punjab Engineering College), India
B.E., Electronics and Electrical Communication Engineering
Graduated with Honors, amongst top 5 in the department (out of 60)

▬▬▬ Research and Industry Experience

Feb 2017 – **Google**, Mountain View, CA
Present Privacy Engineer
- Working with teams to find and solve technical and product privacy problems
- Designing and building new infrastructure to make existing systems better and building privacy-related product features, shared libraries. Generalizing privacy solutions for scale

Sep 2015 – **Thomson Reuters**, New York, NY
Feb 2017 Technology Associate – Research and Technology Strategy
The Technology Associate Program is a highly selective program for recent PhDs, focused on developing innovation and technology leadership within the company, and to influence technology leadership in making strategic decisions for different business units.

- *Technology Strategy/ Data Governance*:
  Leading the 'Privacy by Design' initiative for the entire company:
  - Organized workshop on best practices for 'privacy by design' for company's Privacy, Security and Information Architecture teams
  - Proposed recommendation plans to integrate appropriate privacy checks in the design process for all products. Working collaboratively with key decision makers in order to create and implement relevant solutions
  - Developed appropriate guidance for internal business and technical processes
  - Developed learning modules for product owners, developers and other technical roles

- ○ *Research and Development*:
  Leveraging big data analytics from social media (Reuters Tracer) for business units such as finance, news, legal:
    - Utilized machine learning algorithms to analyze large streams of Twitter data – user profiles, tweets, network information for $130,000$ users
    - Developed a domain classifier for verified accounts on Twitter. Submitted a research manuscript to top-tier conference in the field
    - Collaborated with multiple business units to develop feasible use-cases

Aug 2009 – Sep 2015   **Carnegie Mellon University**, Pittsburgh, PA
Graduate Research Assistant, Department of Electrical and Computer Engineering
Cylab, CMU Security and Privacy Institute

Project: Accountability/ blame assignment for security violations
- ○ Formalized definition to find causes of violations in interacting systems
- ○ Analyzed failures of public key authentication protocols, which use certificates
- ○ Combined viewpoints on causation from theoretical, philosophical, security and privacy-centric perspectives

Project: Linking attacks
- ○ Identified background information and database characteristics that enable de-anonymization
- ○ Determined provable mathematical bounds showing extent of possible de-anonymization
- ○ Verified theoretical assumptions empirically on 'anonymized' Netflix database ($\sim$500,000 users)

Project: Privacy of online records
- ○ Analyzed implications of moving court records online on individual privacy
- ○ Demonstrated empirically that cost of information retrieval is significantly lower online as compared to physical records. Identified factors which contribute to differences
- ○ Evaluated the level of privacy protection provided by removal of 'Search by name' feature in Allegheny property assessment database through user studies

Summer 2014   **Microsoft Research**, Cambridge, UK
Research Intern
Mentors: Cedric Fournet, Olya Ohrimenko
- ○ Demonstrated *information leakage* when multiple MapReduce cloud computations are performed on real datasets, for instance a census dataset with $\sim$2.5 million records
- ○ Developed a solution that mitigates composition attacks

Summer 2013   **Symantec Research Labs**, Mountain View, CA
Research Intern
Mentors: Sanjay Sawhney, Sharada Sundaram, Darren Shou
- ○ Automated compliance checking with privacy laws for *unstructured data*
- ○ Developed a method for specifying privacy laws and rules for access control in enterprises

Fall 2008   **D-ITET, ETH Zurich**, Switzerland
Guest Researcher
Mentor: Prof. Bernhard Plattner, Mario Strasser, Computer Engineering & Networks Laboratory
- ○ Developed approaches for enhancing security of ad-hoc routing protocols for wireless networks.

Summer 2007 **Indian Institute of Technology**, Mumbai, India
Research Intern
Mentor: Prof. Abhay Karandikar, Department of Electrical Engineering
○ Evaluated performance of a scheduler in WiMAX on the basis of fairness in allocation of slots

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Selected Honors and Awards

2015 – **Certified Information Privacy Technologist (CIPT)**, International Association of Privacy
Present Professionals (IAPP)

Aug 2013 **Winner**, Symantec Graduate Intern showcase event

2009 – 2010 **Dean Tuition Fellowship**, awarded by Carnegie Institute of Technology, CMU

2005 – 2009 **Merit Scholarship** (full tuition waiver), PEC University of Technology, India. Awarded for
academic excellence

2009 **Silver Medal** for Senior Design project, Department of Electronics & Electrical Communication
Engineering, PEC University of Technology, India

2003 **National Talent Search Scholarship** (NTSE), awarded by the National Council of Education,
Research and Training (NCERT), India

Refereed Publications

Oct 2015 *Observing and Preventing Leakage in MapReduce,* with Olya Ohrimenko, Cedric Fournet, Manuel
Costa, Christos Gkantsidis, Markulf Kohlweiss, in 22nd ACM Conference on Computer and
Communications Security **(CCS)**

Jul 2015 *Program Actions as Actual Causes: A Building Block for Accountability*, with Anupam Datta,
Deepak Garg, Dilsun Kaynar, Arunesh Sinha, in Proceedings of 28th IEEE Computer Security
Foundations Symposium **(CSF)**

Jul 2014 *Actual Causes of Security Violations* (Extended Abstract), with Anupam Datta, Dilsun Kaynar,
Arunesh Sinha, in Joint Workshop on Foundations of Computer Security and Formal and
Computational Cryptography **(FCS-FCC)**, affiliated with Computer Security Foundations (CSF)

Jul 2012 *Sustaining Privacy and Open Justice in the Transition to Online Court Records: A Multidisciplinary
Inquiry,* with Amanda Conley, Anupam Datta, Helen Nissenbaum, in 71 Md. L. Rev. 772
(**Maryland Law Review Journal**)

Mar 2012 *Provable De-anonymization of Large Datasets with Sparse Dimensions,* with Anupam Datta,
Arunesh Sinha, in ETAPS First Conference on Principles of Security and Trust **(POST)**

Oct 2011 *I Know Where You Live: Analyzing Privacy Protection in Public Databases,* with Manya Sleeper,
Lorrie Faith Cranor, in Workshop on Privacy in the Electronic Society **(WPES)**

Jun 2011 *The Obligation of Courts to Post Records Online – A Multidisciplinary Study,* with Amanda
Conley, Anupam Datta, Helen Nissenbaum, in Privacy Law Scholars Conference **(PLSC)**

Aug 2010 *Privacy Challenges in Patient-Centric Health Information Systems,* with Anupam Datta, Nipun
Dave, John Mitchell, Helen Nissenbaum. Position paper in 1st USENIX Workshop on Health
Security & Privacy **(HealthSec'10)**

Jul 2010 *Constraining Credential Usage in Logic-based Access Control,* with Lujo Bauer, Limin Jia, in
Proceedings of the 23rd IEEE Computer Security Foundations Symposium **(CSF)**

Patents

Aug 2015 *Data center privacy,* with Olya Ohrimenko, Cedric Fournet, Manuel Costa, Christos Gkantsidis,
(filed) Markulf Kohlweiss (pending)

Refereed Posters

May 2012   *Defining Accountability using Causation and Evidence*, with Anupam Datta, Dilsun Kaynar, Arunesh Sinha, in IEEE Symposium on Security and Privacy **(IEEE S&P)**

Technical Reports

2015   *Interaction-aware Actual Causation: A Building Block for Accountability in Security Protocols*, **PhD thesis,** Department of Electrical and Computer Engineering, Carnegie Mellon University

2011   *I Know Where You Live: Analyzing Privacy Protection in Public Databases,* with Manya Sleeper, Lorrie Faith Cranor. **Technical report,** CMU-CyLab-11-015, Carnegie Mellon University

2008   *Security of Field Based Routing.* **Student thesis,** SA-2008-08, ETH Zurich

Working Papers

2016   *Interaction-aware Actual Causation,* with Anupam Datta, Deepak Garg, Dilsun Kaynar

Graduate Coursework

- Foundations of Security and Privacy
- Privacy, Policy, Law and Technology
- Pattern Recognition Theory
- Mathematical Logic
- Applied Cryptography
- Designing Human Centered Systems
- Formal Languages, Automata, Computability
- Modal Logic

Technical Skills

Programming languages   Python, C (Prior experience), Java (Prior experience)

Tools   Eclipse, IntelliJ, Version control (SVN, Git, Mercurial), LaTeX

Teaching

Teaching Experience

Teaching Assistant, Carnegie Mellon University

Spring 2013   Secure Software Systems (Graduate Level)

Fall 2011   Foundations of Security and Privacy (Graduate Level)

Professional Development

2012 – 2016 Completed *Future Faculty Program* offered through the Eberly Center for Teaching Excellence and Educational Innovation, Carnegie Mellon University (transcript available).

The Future Faculty Program is designed to help graduate students develop their teaching skills and document their teaching-related professional development activities in preparation for a faculty career. The program activities include:

Seminars
- Course and Syllabus Design
- Encouraging Intellectual Development and Critical Thinking
- Teaching Problem Solving
- Planning and Delivering Effective Lectures
- Leveraging Diversity and Promoting Equity in Your Classroom
- Conducting Productive and Engaging Discussions
- Supporting Student Learning Through Good Assessment Practices
- Crafting a Teaching Philosophy Statement

Teaching Observations
- Classroom teaching
- Microteaching workshop

Projects
- Designed syllabus for graduate course on *Perspectives on Privacy*
- Completed teaching statement project

Professional Activities and Responsibilities

Program Committee

Mar 2017 Scholarship Review Committee, Grace Hopper Conference for Women in Computing

Mar 2016 Tiny Transactions on Computer Science (Vol IV)

Mar 2015 Tiny Transactions on Computer Science (Vol III)

Reviewer for Journals

2015 Journal of Computer Security

External Reviewer for Conferences (selected)

2014, 2013 ACM Conference on Computer and Communications Security (CCS)

2014, 2013 IEEE Symposium on Security and Privacy (IEEE S&P)

2014 Principles of Security and Trust, ETAPS Conference (POST)

2013, 2012 Workshop on Privacy in the Electronic Society (WPES)

2012 IEEE Computer Security Foundations Symposium (CSF)

2012 European Symposium on Research in Computer Security (ESORICS)

Memberships in Professional Societies

- International Association of Privacy Professionals (IAPP), Certified Information Privacy Technologist (CIPT).
- Institute of Electrical and Electronics Engineers (IEEE), Society of Women Engineers (SWE)

Other Honors and Awards

Jul 2015 Awarded student travel grant for CSF, Italy

Jul 2014 Awarded Federated Logic Conference (FLoC) student travel grant for attending FLoC'14, co-located with Vienna Summer of Logic, Vienna

May 2014 Selected for Second Summer School on Formal Techniques (SSFT), CA

May 2014 Selected for Women in Theory (WIT) workshop, co-located with STOC, New York

Apr 2012, 2011	Selected for Graduate Cohort Workshops organized by CRA Committee on the Status of Women in Computing Research (CRA-W)
Oct 2011	Awarded student travel grant for ACM CCS, Chicago
2005	Selected for Indian National Mathematics Olympiad
2005	Selected for Indian National Chemistry Olympiad (Theory)

Leadership Positions and Extra-curricular Activities

2016 – Present	**Technology diversity champion/ Mentoring,** Thomson Reuters, New York: Working with internal and external collaborators to encourage more diversity in STEM fields, by organizing events and spreading awareness. Mentor, CoderDojo
2016	Nominated for and completed **Dale Carnegie Leadership & Influence** program for Thomson Reuters, New York
2015 – Present	Completed levels 1-3 of **Improv** training at Magnet Theatre, New York. Performed for graduation shows
2016 – Present	Indian classical **dance** training/ volunteer at Navatman School, New York
2015, 2012	Long distance running: Completed Pittsburgh **Half marathon**
2013	**Vice President**, Indian Graduate Student Association, Carnegie Mellon University
2012 – 2013	**Organizer/ dance director,** Cultural event for Indian Graduate Student Association, Carnegie Mellon University
2011 – 2013	**Performer,** Cultural dance event for Indian Graduate Student Association, Carnegie Mellon University
2010 – 2015	Active member, **CyLab Social Engineering Committee,** Carnegie Mellon University ECE Graduate Organization, helped in organizing social events for students, staff and faculty
2005 – 2008	Completed level DELF A2 in **professional course in French,** Alliance Francaise, India
2009	Certificate of Excellence for contribution and **Executive Body Member**, Dramatics' Society and Speakers' Association, PEC University of Technology, India
Fall 2008	**President,** Les Amis, non-profit organization. Worked in several project teams and organized a multitude of events for college and school students in Chandigarh.
2005 – 2009	**Member,** Les Amis, non-profit organization.

Selected Talks

Dec 2016	Data Protection in a Multinational Information Company. **MIT BigData@CSAIL Data Privacy Series**, Massachusetts Institute of Technology (MIT), USA
Nov 2016	Building blocks for accountability in security and privacy. **Visa Research,** California, USA
Jul 2015	Program Actions as Actual Causes: A Building Block for Accountability. **Computer Security Foundations (CSF)**, Verona, Italy
Nov 2014	Programs as Actual Causes. **CMU Usable Privacy and Security (CUPS) Seminar**, Carnegie Mellon University, USA
Oct 2014	Database Privacy: k-anonymity and de-anonymization attacks. **Guest Lecture for CMU Course**, Foundations of Privacy, Carnegie Mellon University, USA
Aug 2014	MapReduce with Secure Co-processors: Data Leakage via Composition Attacks and Mitigation. **Microsoft Research**, Cambridge, UK

Jul 2014	Actual Causes of Security Violations: A Building Block for Accountability. **FCS-FCC'14**, Vienna Summer of Logic, Italy
Jun 2014	Provable De-anonymization of Large Datasets with Sparse Dimensions. **Microsoft Research**, Cambridge, UK
Jun 2014	Finding Causes of Security Violations. **Three Minute Thesis Competition**, Carnegie Mellon University, USA
Sep 2013	ACiD: Automating Compliance in Data Insight. **Guest Lecture for CMU Course**, Foundations of Privacy, Carnegie Mellon University, USA
Aug 2013	Privacy related Compliance: Automating Compliance in Data Insight. **Symantec Research Labs**, Mountain View, CA
Jul 2013	Programs as Actual Causes. **Symantec Research Labs**, Mountain View, CA
Mar 2013	Defining Programs as Actual Causes. **Department of Philosophy, Carnegie Mellon University,** USA
Mar 2012	Provable De-anonymization of Large Datasets with Sparse Dimensions. **ETAPS First Conference on Principles of Security and Trust**, Estonia
Oct 2011	Database Privacy: k-anonymity and de-anonymization attacks. **Guest Lecture for CMU Course**, Foundations of Security and Privacy, Carnegie Mellon University, USA

Posters

Aug 2013	ACiD: Automating Compliance in Data Insight. **Symantec Research Labs**, Mountain View, California
Jan 2013	Actual Causes of Security Violations: A Building Block for Accountability. **Data Privacy Day** event, Carnegie Mellon University
Sep 2012	Defining Accountability using Causation and Evidence. Cylab Partners' Conference, **Carnegie Mellon University**
Apr 2012	Defining Accountability using Causation and Evidence. **Graduate Cohort Workshop**, organized by CRA-W
Sep 2011	Privacy Threats from Linked Information Retrieval. Cylab Partners' Conference, **Carnegie Mellon University**
Apr 2011	I Know Where You Live: Analyzing Privacy Protection in Public Databases. **Graduate Cohort Workshop**, organized by CRA-W

References

Available on request