Sarthak **Grover**

Network Analysis and Security Researcher

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Education

MA (PhD Incomplete) in Computer Science *Princeton, New Jersey, USA*
Princeton University *Apr. 2016*

- Received research assistance for work on Network Performance Analysis and Home Network Security.
- Awarded STEM Chateaubriand Fellowship by the Embassy of France for work on Internet of Things (2015 - 2016).
- Advisor: Prof. Nick Feamster
- GPA: 3.8/4.0

BTech and MTech in Electronics and Communication Engineering *Roorkee, INDIA*
Indian Institute of Technology, Roorkee *Dec. 2010*

- Specialization in Wireless Communication.
- Thesis: Performance Evaluation of Cross-Layer Wireless Body Area Networks.
- GPA: 8.06/10.00

Skills

Programming Python v2.7, v3.3 – v3.7, iPython v7.8, Scala v2.11, Java v12.0, PostgreSQL, C/C++, R, Matlab, Node.js
Analytics Pandas v0.13 – v0.23, Scikit-Learn v0.21, Tensorflow v1.15, Pyspark (Apache Spark), Numpy, Scipy, Matplotlib
Networking Wireshark/Tshark v2.0, Iperf v2.0 – v3.7, Nmap v7.8, Scapy v2.4, Urllib3, Requests, Beautiful Soup 4, Networkx
Tools PyCharm, PyLint, IntelliJ IDEA SBT, Eclipse, Git, Linux, Adobe Photoshop, Corel Draw, MS Office, LaTeX

Work Experience

Sugandhaa Co., Ltd. *New Delhi, INDIA*
Business Manager *Apr. 2018 - Present*

- Managed family owned business. Responsible for inventory, account management, directing sales and delivery. Lead sales team, interacted directly with customers, and managed finances to ensure smooth business operations.
- Completed extra coursework in deep learning and functional programming through Coursera MOOCs.
- **CDN performance analysis:** Designed and implemented a CDN estimation algorithm for websites using xcache, whois data, and DNS information; Tested reachability of top websites; Comparing CDN page-load times with website ASN showed that performance can be improved by moving to different CDNs. [Link]
- **Network anomaly detection:** Designed and implemented an anomaly detection algorithm for netflow data; Extracted volumetric and distribution features from batches of flows every 10s; Successfully identified port scans and DoS activity using statistical, information-theoretic, and clustering based approaches. [Link]

Princeton University *Princeton, NJ, USA*
Graduate Research Assistant *Jan. 2015 - Sep. 2017*

- **IoT fingerprinting and real-time query system:** Analyzed packets of various IoT devices in lab using pcap, extracted relevant features to identify devices and outliers; Simulated user behavior and captured activity periods and background traffic for 10 different IoTs. [Link]
- Developed a filtering algorithm to discard non-IoT traffic at ISP; Transformed network traffic using FFT and PCA, and utilized clustering techniques to successfully fingerprint different IoT devices in lab. Implemented data pipeline in Spark to cluster IoT traffic and detect outlier devices. [Link]
- **Security and privacy of the Internet of Things:** Tested multiple IoT devices in lab and exposed security and privacy issues at PrivacyCon 2016; Found that a digital photoframe was susceptible to eavesdroppers and fails to encrypt photographs, and nest thermostat exposed private location information of nearest weather stations to the ISP (now patched); [Link]
- **Broadband traffic analysis:** Analyzed broadband usage patterns of a user group offered higher speed broadband without their knowledge; Found that difference in traffic demand was higher for moderate users as compared to high-volume subscribers; Presented at CableLabs (Jul 2016) and FCC (Oct 2016); [Link]
- **Fog Networks and the Internet of Things:** Teaching Assistant for Coursera MOOC; [Link]

Comcast Cable Communications, LLC *Philadelphia, PA, USA*
Research Intern *May. 2016 - Aug. 2016*

- Mentors: Jason Livingood and Nirmal Mody
- Customer Owned and Managed (COAM) Internet of Things (IoT) security: Used DPI to study connectivity, security, and privacy of a subset of Comcast smart homes; Developed script to search for PII in unencrypted IoT data and identified a malfunctioning XBOX in one of the subscribers.

Georgia Institute of Technology *Atlanta, GA, USA*

Graduate Research Assistant *Aug. 2012 - Dec. 2014*

- **Analysis of home network availability, infrastructure, and traffic using BISmark:** Analyzed active and passive network data from multiple homes to study network availability in various countries, popular devices in homes, and traffic usage with time; [Link]
- Found most home traffic is exchanged from a few devices to a small number of popular domains;
- **QoS control using SDN for home networks:** Identified application and programmed appropriate rate shaper based on a set of filtering rules to map traffic to outgoing network flow; [Link]
- **SAZO: Constant guard for home network security:** Used bloom-filters and DPI on home routers to create a blacklist based malware identification and notification system for Comcast; [Link]
- **Analysis of end-to-end routing behavior:** Analyzed traceroute data from access networks to a variety of Internet destinations and examined route persistence and prevalence. Presented talk at AIMS, CAIDA.

INRIA *Paris, FRANCE*

Research Intern *May. 2014 - Sep. 2014*

- Mentor: Prof. Renata Teixeira
- Home network diagnosis for performance bottleneck detection: Tested uplink and downlink broadband performance from devices to detect if bottleneck is in the local wireless network or at the edge router.

LIP6, UPMC *Paris, FRANCE*

Research Intern *Jun. 2013 - Sep. 2013*

- Mentor: Prof. Renata Teixeira
- Home network troubleshooting platform using Fathom and BISmark: Programmed active traceroute test on bismark router and analyzed latency and throughput performance from routers.

North Carolina State University *Raleigh, NC, USA*

Research Scholar *Dec. 2011 - Apr. 2012*

- Mentor: Prof. Injong Rhee
- Indoor Localization for Samsung Smartphones using Radio: Implemented FM/AM transceiver systems on GNURadio to utilize RDS information for indoor localization;

Indian Institute of Science *Bangalore, INDIA*

Junior Research Fellow *Apr. 2011 - Dec. 2011*

- Mentor: Prof. Anurag Kumar
- *WSNs for Societal Needs and Disaster Management:* Prepared work-plan proposal for submission to the Department of Science and Technology (DST), Govt of India; Computed closed-formed expressions for network reliability, and evaluated information theoretic bounds for random hybrid networks.
- *SmartConnect: DIT-ASTEC WSN Project*: Deployment of industrial wireless sensor networks, project demonstrations and experimental data analysis; Studied tessellation algorithm for WSN drop and placement to ensure end-to-end connectivity in the wild;

Selected Publications

A Case Study of Traffic Demand Response to Broadband Service-Plan Upgrades
Sarthak Grover, Roya Ensafi, and Nick Feamster
Proceedings of 17th International Conference on Passive and Active Measurement (PAM), 2016, Heraklion, Greece

The Internet of Unpatched Things
Sarthak Grover and Nick Feamster
Proceedings of FTC PrivacyCon, 2016, Washington, DC, USA

Facade: High-Throughput, Deniable Censorship Circumvention Using Web Search
Ben Jones, Sam Burnett, Nick Feamster, Sean Donovan, Sarthak Grover, Sathya Gunasekaran, and Karim Habak
4th USENIX Workshop on Free and Open Communications on the Internet (FOCI), 2014, San Diego, CA, USA

Panoptes: Detecting Malware Activity in Home Networks
Sarthak Grover and Nick Feamster
HomeSys: Workshop on Design, Technology, Systems and Applications for the Home (UbiComp), 2013, Zurich, Switzerland

Peeking Behind the NAT: An Empirical Study of Home Networks
Sarthak Grover, Mi Seon Park, Srikanth Sundaresan, Sam Burnett, Hyojoon Kim, Bharath Ravi, and Nick Feamster
Proceedings of the ACM Internet Measurement Conference (IMC), 2013, Barcelona, Spain