Sarthak Grover

PhD. Student

Contact Information

Network Operations and Internet Security Lab
School of Computer Science
Georgia Institute of Technology
Atlanta, GA

Phone: (408) 220-5735
Email: sgrover@gatech.edu
Web: gtnoise.net/~sarthak

Research Interests

Wireless Performance Analysis, Home Network Security, Software Defined Networking, Internet of Things, Network Measurement

Education

Georgia Institute of Technology (GaTech) **2012 Onwards**
Ph.D in Computer Science with Major in Networking and Communications
- Advisor: Prof. Nick Feamster
- CGPA: 3.871/4.00 (Current)

Indian Institute of Technology (IIT) Roorkee, India **2005 – 2010**
B. Tech, Electronics and Communication Engineering & M. Tech, Wireless Communication
- Dissertation: Performance Evaluation of WBAN using Cross Layer Approach
- CGPA: 8.062/10.00 (India)

Publications

B. Jones, S. Burnett, N. Feamster, S. Donovan, **S. Grover**, S. Gunasekaran, K. Habak, "Facade: High-Throughput, Deniable Censorship Circumvention Using Web Search", Submitted to *USENIX Workshop on Free and Open Communications on the Internet (FOCI)*, August 2014.

M. S. Seddiki, M. Shahbaz, S. Donovan, **S. Grover**, M. Park, N. Feamster, Y. Song, "FlowQoS: QoS for the Rest of Us", *ACM SIGCOMM 2014 Workshop on Hot Topics in Software Defined Networking (HotSDN)*, Poster and Demonstration, August 2014.

S. Grover, M. Park, S. Sundaresan, S. Burnett, H. Kim, N. Feamster, "Peeking Behind the NAT: An Empirical Study of Home Networks", *ACM SIGCOMM Internet Measurement Conference (IMC)*, October 2013.

S. Grover, N. Feamster, "Panoptes: Detecting Malware Activity in Home Networks", *HomeSys: Workshop on Design, Technology, Systems and Applications for the Home (UbiComp)*, Poster and Demonstration, September 2013.

A. Gupta, **S. Grover**, "mPaaS: Delivering Mobile Platforms as a Cloud Service", *USENIX Symposium on Networked Systems Design and Implementation (NSDI)*, Poster and Demonstration, April 2013.

V. Sivaraman, A. Dhamdhere, H. Chen, A. Kurusingal, **S. Grover**, "An Experimental Study of Wireless Connectivity and Routing in Ad-hoc Sensor Networks for Real-Time Soccer Player Monitoring", *Ad Hoc Networks (Elsevier)*, Vol. 11 Issue 3, pp.798-817, May 2013.

V. Sivaraman, **S. Grover**, A. Kurusingal, A. Dhamdhere, A. Burdett, "Experimental Study of Mobility in the Soccer Field with Application to Real-Time Athlete Monitoring", *Proceedings of IEEE Wireless & Mobile Computing, Networking and Communications (WiMob)*, pp.337-345, November 2010. **(Best Paper Award)**

S. Grover, "Performance Evaluation of Wireless Body Area Network using Cross Layer Approach", *Master's Thesis*, Indian Institute of Technology Roorkee, June 2010.

V. Saxena, **S. Grover**, S. Joshi, "A Real Time Face Tracking System using Rank Deficient Face Detection and Motion Estimation", *Proceedings of IEEE Cybernetic Intelligent Systems (CIS)*, pp.1-6, September 2008.

Academic Positions

Research Engineer at *Laboratoire dInformatique de Paris 6,* UPMC **May 2014 – Aug 2014**
- Home network diagnosis for performance bottleneck detection;

Teaching Assistant at *School of Computer Science,* Georgia Tech
CS3251: Computer Networks **Fall 2013**
- Creating and grading assignments, conducting TA hours;

Research Engineer at *Laboratoire dInformatique de Paris 6,* UPMC **Jun 2013 – Sep 2013**
- Home network measurement to create a troubleshooting platform using Fathom and BISmark;

Graduate Research Assistant at *School of CS,* Georgia Tech **Aug 2012 Onward**
- QoS control using SDN for home networks;
- HTTP Pluggable transport protocols to avoid censorship and detection for Tor;

- Analysis of home network availability, infrastructure, and traffic using BISmark;
- Home network security from the point of view of a gateway by detecting malware in Internet traffic;
- End-to-end routing in the Internet and broadband performance analysis using BISmark;

Visiting Research Scholar at *Department of CS,* NC State University **Jan 2012 – Mar 2012**
- Indoor Localization for Samsung and wireless network system design and implementation;

Junior Research Fellow at *Department of ECE,* IISc Bangalore **Mar 2011 – Dec 2011**
Indo-Brazil WINSON Project
- Research on wireless sensor networks for societal needs and disaster management; prepared work-plan proposal for submission to the Department of Science and Technology (DST), Govt of India;

SmartConnect: DIT-ASTEC WSN Project
- Deployment of industrial wireless sensor networks, project demonstrations and experimental data analysis;

Teaching Assistant at *Department of ECE,* IIT Roorkee
EC311: Principles of Digital Communication **Fall 2009**
EC102: Fundamentals of Electronics **Spring 2010**
- Teaching beginner level digital communication to a class of 25 students;
- Preparing assignments, conducting tutorial classes, creating and grading examination papers;

Professional Experience

- Summer Intern at **University of New South Wales**, Sydney, Australia under *Prof. Vijay Sivaraman*
  Wireless Body Area Networks for Athlete Monitoring **May 2009 – Aug 2009**
- Summer Intern at **Aricent Technologies Ltd.**, Gurgaon, India under *Mr. Mandeep S. Bedi*
  Alarm Handling for Nokia Epsilon Flexi EDGE Base Transceiver System (BTS) **May 2008 – Jul 2008**

Research Projects

FlowQoS: Providing Per-Flow Quality of Service for Broadband Access Networks *(GTNoise)*
Advisor: Nick Feamster (School of CS, Georgia Institute of Technology) **Jan 2013**
FlowQoS/CS 8001: Software Defined Networking
- Designed an SDN based system to allocate QoS based on application and devices in a home network. My main contribution was the DNS based flow classifier, which forwards traffic through appropriate traffic shapers in a home router.
- Results published at HotSDN 2014, Chicago, IL.

Facade: High-Throughput, Deniable Censorship Circumvention Using Web Search *(GTNoise)*
Advisor: Nick Feamster (School of CS, Georgia Institute of Technology) **Jan 2013**
CS 6250: Computer Networks
- Designed and implemented a new encoding technique that uses web search terms to encode hidden messages in an upstream channel for censorship circumvention to resist fingerprinting attacks.
- Results published at FOCI 2014, San Diego, CA.

Browserlab: Home Network Diagnosis and Bottleneck Detection *(LIP6)*
Advisor: Renata Teixeira (INRIA, University Pierre and Marie Curie) **May 2013**
Fathom/BISmark
- Detect the performance bottleneck in a home network by collaborating between home devices. Created a monitoring system to collect detailed wireless measurements from synchronized devices in a home, and manage and upload this data to the centralized server for analysis.
- We develop the browserlab daemon that listens on multiple network devices in a home, and propose collaborative bottleneck detection algorithm to identify if the access link is the bottleneck or the wireless is. Next, the daemon will be ported as a browser extension to scale the solution and collect large scale home wireless measurements.

Performance Analysis of Home Broadband Networks *(GTNoise)*
Advisor: Nick Feamster (School of CS, Georgia Institute of Technology) **Jan 2013**
Project BISmark
- Empirical study and analysis of availability, infrastructure, and usage of home broadband networks based on active and passive measurement data collected from the BISmark gateways. First large scale measurement and analysis work which provides us a view of home networks behind the NAT and discusses the differences observed in kind of devices used, and the distribution of usage with time, in developed and developing countries.
- Results published at ACM SIGCOMM IMC 2013, Barcelona, Spain.

SAZO: Constant Guard for Home Network Security *(GTNoise)*
Advisor: Nick Feamster (School of CS, Georgia Institute of Technology) **Jan 2013**
Comcast

- Proposed that security management of home networks be outsourced to an expert third party. Extended BISmark's passive monitoring capability to monitor customer traffic for suspicious activity from specific network devices. On detecting suspicious traffic, the traffic is automatically redirected through Comcast's VPN for security analysis and the home owner is notified.
- Preliminary work presented as a poster at the Homesys '13 workshop, Ubicomp.

End-to-end Routing Behavior in the Internet: A Re-Appraisal from Access Networks *(GTNoise)*
Advisor: Nick Feamster (School of CS, Georgia Institute of Technology) **Aug 2012**
Project BISmark

- Analyzed traceroute data from access networks to a variety of Internet destinations and examined route persistence and prevalence. Our aim is to associate home network performance metrics with path changes due to traffic engineering policies.
- Preliminary results were presented in a talk at Active Internet Measurement Symposium (AIMS), CAIDA.

Indoor Localization using FM *(Networking Research Lab)*
Advisor: Prof. Injong Rhee (Department of CS, North Carolina State University) **Jan 2012**
Samsung Localization Project

- Implemented FM/AM transmitter and receiver systems using GNURadio. Aim is to utilize RDS information and track stereo component to enable indoor localization of SmartPhones.

Design of Multi-Hop Wireless Networks for In-Hospital Applications *(Network Architecture Lab)*
Advisor: Prof. Anurag Kumar (Chairman, Electrical Sciences Div., IISc Bangalore) **Mar 2011**
Indo-Brazil WINSON Project funded by DST, Govt. of India

- Computed closed form expressions for network reliability in hexagonal (lattice) hybrid wireless networks with link failures and fading. Proposed tier-rank based routing protocol. Evaluated information-theoretic bounds for random hybrid networks (Poisson RGG).
- Applications include mobile patients and equipment tracking and sensing, home health care, baby monitoring, electronic boarding passes, and lost child tracking. *(Work on publication in progress)*

Performance Evaluation of a Wireless Body Area Network *(Network Security Lab)*
Advisor: Mr. S. Chakravorty (Department of ECE, IIT Roorkee) **Aug 2009**
Dual Degree project for submission of Master's Dissertation

- Implemented cross layer protocol to auto-regressively predict PHY parameters and control MAC level queue for mobile nodes in Rayleigh fading environment. Modeled human body channel for intra BAN (on-body network). Comprehensive simulations on NS2 showed improved network throughput and lifetime.
- Applications include energy efficient athlete monitoring and remote health care for mobile users.

Implementation of a Soft Decision Decoder using Trellis on FPGA *(Signal Processing Lab)*
Advisor: Mr. S. Chakravorty (Department of ECE, IIT Roorkee) **Aug 2009**

- Implemented a real-time trellis decoder for BCH codes using VHDL on Xilinx ISE and configured it on FPGA. Dedicated hardware was shown to achieve higher data rate compared to software implementation.

Wireless Body Area Networks for Athlete Monitoring *(School of EE&T)*
Advisor: Dr. Vijay Sivaraman (University of New South Wales, Sydney) **May 2009**
Collaboration with Toumaz Technology Ltd., U.K.

- Monitored inter-connectivity between players using wireless bio-medical sensors and multiple base stations during soccer games. Analyzed time-series experimental data and developed encounter based model to capture user mobility, and generate synthetic network topologies. Simulated encounter based real-time routing scheme for dynamic multi-hop networks. Applications include providing referee-assist and enhanced television broadcast services during games.
- Awarded the best student paper at *IEEE WiMob 2010*, Niagara Falls, Canada (Acceptance: 28.9).

Real Time Human Face Tracking System *(Electronics Section)*
Student Project, Annual Hobbies Club Exhibition 'Sristi', IIT Roorkee **Dec 2007 – Mar 2008**

- Developed a robust real-time face tracking algorithm using rank deficient face detection to iteratively search and track the human face in each video frame. Demonstrated the system by mounting camera on robotic arm. Potential applications include focusing on speaker during conferences, and recording lectures.
- Results published in proceedings of *IEEE CIS 2008*. Demonstration awarded first prize at *'Sristi'*.

Technical Skills

Languages: Python, C/C++, JavaScript, VHDL, Tcl/Tk, Assembly 8085/8086, HTML, CSS, VBScript
Platforms: Openwrt, Node.js, iPython, GNURadio, MATLAB, NS-2, TinyOS, Xilinx ISE, GPSS
Others: Unix, Adobe Photoshop, Corel Draw, Adobe Flash, Dreamweaver, MS Office, LaTeX

Honors and Awards

Graduate Research Assistantship at GaTech	**Aug 2012 Onwards**
Research Fellowship at NCSU	**Jan 2012 – Mar 2012**
Research Fellowship at IISc, Bangalore	**Mar 2011 – Dec 2011**
Best Student Paper Award at IEEE WiMob 2010	**Oct 2010**
Half-Time Teaching Assistant Scholarship at IIT Roorkee	**Aug 2009 – Jun 2010**
Student Exchange Program Scholarship at UNSW, Sydney	**May 2009 – Aug 2009**
Awarded **First Prize** at Annual Hobbies Club Exhibition, IIT Roorkee	**Mar 2008**
14th position at National Mathematical Olympiad (Delhi)	**Feb 2004**

References

Available on request.

For more information and details, please visit my website http://gtnoise.net/~sarthak