

Vyas Sekar

CONTACT INFORMATION

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RESEARCH INTERESTS

I am broadly interested in design, implementation, and analysis of large-scale networked systems with specific applications to monitoring, diagnosis, and system security. My thesis research focuses on an architecture for efficiently monitoring traffic in large networks with applications to several aspects of network management including network security, anomaly detection, gaining a better understanding of end-to-end traffic patterns, and improving network performance.

EDUCATION

Carnegie Mellon University, Pittsburgh, Pennsylvania USA

Ph.D. Candidate, Computer Science Department, expected completion Spring 2010
Advisors: Michael K. Reiter and Hui Zhang

Indian Institute of Technology, Madras

B. Tech, Computer Science and Engineering, Minor in Operations Research, May 2003

HONORS AND AWARDS

- CMU SCS Graduate Fellowship, 2003 – Present
- President of India Gold Medal, awarded to the student with the highest GPA among graduating students, Indian Institute of Technology Madras
- B. Ravichandran Memorial Prize, awarded to the B. Tech student with the best academic record in Computer Science and Engineering, Indian Institute of Technology Madras
- Visveswaraya Memorial Prize, to the B. Tech student with the highest GPA, Indian Institute of Technology Madras
- Recipient of Narasimhan Fellowship for the year 2000-2001 for the CS student with best GPA for the year.
- CBSE Merit Certificate for being among the top 0.1% of all graduands in India in Maths, Physics, and Chemistry in AISSCE 1999
- CBSE Merit Certificate for being among the top 0.1% of all graduands in India in Maths, English, and Hindi in AISSE 1997
- Invited to attend the Republic Day Parade from the Prime Minister's box for outstanding performance in AISSCE 1999 and AISSE 1997

PROFESSIONAL EXPERIENCE

- **Aug 2003 – Present, Graduate Student**
Dissertation on “Coordinated Sampling: An Architecture for Effective Network-Wide Monitoring and Management”. Other projects include network forensics for worm origin identification, detecting stealthy worm attacks, remote profiling of web servers, entropy-based anomaly detection, algorithms for traffic measurement, building robust P2P systems etc.
- **Summer 2004, Summer Intern AT&T Labs-Research, Florham Park**
Designed and implemented a framework for compressing historical traffic measurements using techniques based on theory of sparse approximations using redundant dictionaries.

- **Summer 2005, Summer Intern AT&T Labs-Research, Florham Park**
Designed and implemented *LADS* a scalable, automated system for large-scale DDoS detection in a tier-1 ISP backbone by intelligently combining multiple sources of network traffic measurements.
- *Making Contribution-Aware Peer-Assisted Content Distribution Robust to Collusion Attacks Using Bandwidth Puzzles*, Michael K. Reiter, Vyas Sekar, Chad Spensky, Zhenghao Zhang, to appear in *ICISS 2009*.
- *Inside the Birds Nest: Measurements of Large-Scale Live VoD from the 2008 Olympics*, Hao Yin, Xuening Liu, Feng Qiu, Ning Xia, Chuang Lin, Hui Zhang, Vyas Sekar, Geyong Min, to appear in *IMC 2009*
- *Design and Deployment of a Hybrid CDN-P2P System for Live Video Streaming: Experiences with LiveSky*, Hao Yin, Xuening Liu, Tongyu Zhan, Vyas Sekar, Hui Zhang, to appear in *ACM Multimedia 2009*
- *SmartRE: An Architecture for Coordinated Network-wide Redundancy Elimination*, Ashok Anand, Vyas Sekar, Aditya Akella in *ACM SIGCOMM 2009*
- *Scalable Long-term Network Forensics for Epidemic Attacks*, Li Ming Chen, Meng Chang Chen, Yeali S. Sun, Mike Hsiao, Vyas Sekar, Hui Zhang to appear in *IFIP/IEEE N2S 2009*
- *Remote Profiling of Resource Constraints of Web Servers Using Mini-Flash Crowds*, Pratap Ramamurthy, Vyas Sekar, Aditya Akella, Balachander Krishnamurthy, Anees Shaikh in *USENIX Annual Technical Conference 2008*
- *An Empirical Evaluation of Entropy-based Anomaly Detection*, George Nychis, Vyas Sekar, David G. Andersen, Hyong Kim, Hui Zhang in *Internet Measurement Conference 2008*
- *cSamp: A System for Network-Wide Flow Monitoring*, Vyas Sekar, Michael K. Reiter, Walter Willinger, Hui Zhang, Ramana Rao Kompella, David G. Andersen in *USENIX/ACM NSDI 2008*
- *Using Mini-Flash Crowds to Infer Resource Constraints in Remote Web Servers*, Pratap Ramamurthy, Vyas Sekar, Aditya Akella, Balachander Krishnamurthy, Anees Shaikh in *ACM SIGCOMM Worksop on Internet Network Management (INM) 2007*
- *Forensic Analysis for Epidemic Attacks in Federated Networks*, Yinglian Xie, Vyas Sekar, Michael K. Reiter, Hui Zhang, in *IEEE ICNP 2006*
- *LADS: Large-scale Automated DDoS detection System*, Vyas Sekar, Nick Duffield, Kobus van der Merwe, Oliver Spatscheck, Hui Zhang, in *USENIX Annual Technical Conference 2006*.
- *A Multi-Resolution Approach for Worm Detection and Containment*, Vyas Sekar, Yinglian Xie, David A. Maltz, Michael K. Reiter, Hui Zhang, in *IEEE/IFIP DSN 2006*.
- *Analyzing Large DDoS Attacks using Multiple Data Sources*, Z. Morley Mao, Vyas Sekar, Oliver Spatscheck, Jacobus van der Merwe, Rangarajan Vasudevan, in *ACM SIGCOMM Workshop on Large-Scale Attack Defense (LSAD) 2006*
- *Data Streaming Algorithms for Estimating Entropy of Network Traffic*, Ashwin Lall, Vyas Sekar, Jim Xu, Mitsu Ogihara, Hui Zhang, in *ACM SIGMETRICS/IFIP Performance 2006*.
- *Sparse Approximations for High Fidelity Compression of Network Traffic Data*, William Aiello, Anna Gilbert, Brian Rexroad, Vyas Sekar, in *ACM/USENIX Internet Measurement Conference 2005*.
- *Worm Origin Identification Using Random Walks*, Yinglian Xie, Vyas Sekar, David A Maltz, Michael K Reiter, Hui Zhang, in *IEEE Symposium on Security and Privacy 2005*.
- *Toward a Framework for Internet Forensic Analysis*, Vyas Sekar, Yinglian Xie, David A Maltz, Michael K Reiter, Hui Zhang, in *ACM Hotnets III 2004*.

- *Routing for a Single Interface MCN Architecture and Pricing Schemes for Data Traffic in Multihop Cellular Networks*, Vyas Sekar, B. S. Manoj, C. Siva Ram Murthy, in *Proc. of IEEE ICC 2003*.

WORKING PAPERS
AND TECHNICAL
REPORTS

- *A Case for a RISC Architecture for Network Flow Monitoring*, Vyas Sekar, Michael K Reiter, Hui Zhang, under submission to IMC 2009. Also as Technical Report, CMU-CS-09-125
- *Coordinated Sampling sans Origin-Destination Information: Algorithms, Analysis, and Evaluation*, Vyas Sekar, Anupam Gupta, Michael K. Reiter, Hui Zhang, Technical Report, CMU-CS-09-104
- *Is Host-based Anomaly Detection + Temporal Correlation = Worm Causality?*, Vyas Sekar, Yinglian Xie, Michael K. Reiter, Hui Zhang, Technical Report, CMU-CS-07-112

CONFERENCE AND
INVITED TALKS

- *SmartRE: An Architecture for Coordinated Network-Wide Redundancy Elimination*, Aug 2009, SIGCOMM 2009
- *Rethinking NetFlow: A Coordinated "RISC" Architecture for Flow Monitoring*, Aug 2009, Max Planck Institute for Software Systems, Saarbruecken
- *Rethinking NetFlow: A Coordinated "RISC" Architecture for Flow Monitoring*, May 2009, Cisco Research
- *Rethinking NetFlow: A Coordinated "RISC" Architecture for Flow Monitoring*, May 2009, Microsoft Research, Silicon Valley Research Center
- *cSamp: A System for Network-Wide Flow Monitoring*, June 2008, Department of Computer Science and Engineering, IIT Madras
- *cSamp: A System for Network-Wide Flow Monitoring*, May 2008, DIMACS/DyDAn Workshop on Internet Tomography
- *cSamp: A System for Network-Wide Flow Monitoring*, May 2008, AT&T Labs-Research Florham Park
- *cSamp: A System for Network-Wide Flow Monitoring*, April 2008, NSDI 2008
- *A Multi-Resolution Approach for Worm Detection and Containment*, DSN 2006
- *LADS: Large-scale Automated DDoS detection System*, USENIX Annual Technical Conference 2006
- *Sparse Approximations for High Fidelity Compression of Network Traffic Data*, IMC 2005

PATENTS FILED

- *Method and apparatus for large-scale automated distributed denial of service attack detection*, provisional patent filed June 2006
- *System and Method for Profiling Resource Constraints of Web Servers*, provisional patent filed Sept 2007
- *Architecture and System for Coordinated Network-wide Redundancy Elimination*, provisional patent filed June 2009

SERVICE ACTIVITIES

- Student Representative on CMU CSD Ph.D Admissions Committee (2004,2005)
- External reviewer for IWQoS 2004, Infocom 2005, SIGCOMM 2006, ASIACCS 2006, Infocom 2007, IEEE Transactions on Multimedia (Special issue on Peer-to-Peer Video Streaming 2007), SIGCOMM 2007, Infocom 2008, NSDI 2009, ACM Computer Communications Review, IEEE Transactions on Networking
- Executive Committee of Indian Graduate Student Association, CMU

TEACHING
EXPERIENCE

Teaching Assistant for 15744: Computer Networks, Spring 2009
Instructor: Hui Zhang, Carnegie Mellon University

Teaching Assistant for 15441: Computer Networks, Fall 2006
Instructors: David G. Andersen, Srinivasan Seshan, Carnegie Mellon University

Teaching Assistant for 15744: Computer Networks, Fall 2004
Instructor: Srinivasan Seshan, Carnegie Mellon University

Teaching Assistant for Introduction to Computing, Fall 2002 and Spring 2003
Department of Computer Science and Engineering, IIT Madras, India
Instructors: C. Siva Ram Murthy, S. Raman, Deepak Khemani

OTHER DETAILS Nationality: Indian, Visa Status: F1

REFERENCES Available on request.