Farnam Jahanian is Professor, Chair for Computer Science and Engineering at the University of Michigan, and co-founder of Arbor Networks, Inc. Prior to joining academia, he was a Research Staff Member at the IBM T.J. Watson Research Center in New York. Farnam's research is aimed at the study of scalability, dependability and security of networked systems and applications. His interests include distributed computing, network security, and network protocols and architectures. Farnam’s research at the University of Michigan has been funded by the National Science Foundation, US Department of Homeland Security, DARPA, National Security Agency, ONR, Cisco, Intel, Hitachi, Hewlett-Packard and IBM.

Farnam has led several research efforts aimed at developing new protocols and architectures for ensuring dependability of network infrastructures in the presence of security attacks, hardware and software failures, and operational faults. In the mid 90’s, Farnam launched the Internet Performance Measurement and Analysis (IPMA) project, a joint research effort of the University of Michigan and Merit Network, aimed at studying the growth and scalability of the Internet backbone routing infrastructure. This work, sponsored by the National Science Foundation, was motivated by the explosive growth in size and topological complexity of the Internet and the increasing strain on the underlying infrastructure. The project deployed the first backbone routing probes across the major Internet public exchange points in 1995. The analysis of inter-domain routing behavior based on this data led to the discovery of BGP routing instability and inter-domain delayed convergence. This research on routing stability and convergence properties has been highly influential within both the network research community and the Internet operational community. It served as a catalyst for significant changes in commercial Internet routing software implementation and impacted routing policies employed by Internet Service Providers throughout the world. Furthermore, this work was the first research to uncover the fragility of the Internet routing infrastructure, and led to a body of work that has been built on by numerous networking infrastructure researchers over the last decade. This work was recently recognized with an ACM SIGCOMM Test of Time Award in 2008.

In early 2000, Farnam led a research effort (the Lighthouse Project, sponsored in part by DARPA and Cisco Systems) aimed at developing a flow-based system for detecting, backtracing and resolving network-wide anomalies such as distributed denial-of-service (DDoS) attacks and routing exploits. Working from a granular understanding of normal network traffic flows, the anomaly detection technique introduced by this effort can rapidly spot distributed attacks, closing a costly gap between detection of a threat and its resolution. This approach does not require any changes to the existing Internet routing infrastructure and has changed how large-scale network security attacks are addressed by today's Internet Service Providers.

These breakthroughs were the pillars on which Farnam co-founded Arbor Networks with former UM graduate student G. Robert Malan. During a two-year leave, serving as Arbor’s President, Farnam led the management team of the company and raised over $33 million in two rounds of funding from venture capital firms and strategic investors. The Internet security solutions based
on this work have been widely deployed by more than 200 Internet Service Providers, cable operators, content providers, and numerous mission-critical networks around the globe, and have won numerous awards in recent years. As one illustration of the impact of this research in practice, more than 70% of the Internet transit traffic in 2007 was protected against DDoS attacks by this technology. As Chairman of Arbor Networks, he is responsible for setting the strategic direction of the company and working with the company’s board of directors.

Farnam is currently leading the Internet Motion Sensor Project, a collaborative research project (with Merit Network) aimed at observing and characterizing security threats on a global scale. The key idea is that by monitoring unused IP addresses (dark spaces), one could gain a network-wide understanding of cyber threats and their impact globally. The current IMS deployment consists of more than 60 distinct monitored blocks at 18+ organizations across the Internet, monitoring over 17 million unique IP addresses corresponding to more than 1.25% of all routed IPv4 space. The IMS system is being used by the ISP operational community as a reconnaissance tool, serving as an early warning system for brewing attacks. The data from the IMS project has been used to gain new insights into subtle characteristics of several recent Internet attacks and their impact on the underlying global infrastructure. With a significant grant from DHS, Farnam’s group is currently involved in a research effort in developing a framework and tools for “Understanding, Detecting, and Disrupting Botnets.”

The author of over 80 published research papers, Farnam has served on dozens of advisory boards and government panels in recent years, including Internet2’s External Relations Advisory Council, National Advisory Board for UM Office of Technology Transfer, and the SparkZone Advisory Board. He is the recipient of a National Science Foundation CAREER Award, the Amoco Teaching Award, the University of Michigan College of Engineering Teaching Excellence Award, the EECS Outstanding Faculty Achievement Award, the EECS Department Teaching Excellence Award, the IBM Faculty Development Award, an IEEE Service Award, the Eta Kappa Nu Professor of the Year Award, and an IBM Outstanding Technical Innovation Award. He has been an active advocate for regional economic development efforts over the last decade, working with entrepreneurs, frequently lecturing on the topic and serving on numerous advisory boards. He was the 2005 recipient of the Governor’s University Award for Commercialization Excellence. He was an associate editor of IEEE Transactions on Computers from 1995-99, and is serving on the editorial board of the International Journal of Time-Critical Computing Systems. Farnam holds a master’s degree and a Ph.D. in Computer Science from the University of Texas at Austin.
FARNAM JAHANIAN
Computer Science and Engineering Division
Department of EECS
University of Michigan
2260 Hayward Street
Ann Arbor, MI 48109-2121
e-mail: farnam@umich.edu
http://www.eecs.umich.edu/~farnam

TECHNICAL INTERESTS

Distributed Computing; Network Security; Network Protocols and Architectures.

EDUCATION

UNIVERSITY OF TEXAS AT AUSTIN

UNIVERSITY OF TEXAS AT SAN ANTONIO

PROFESSIONAL EXPERIENCE

UNIVERSITY OF MICHIGAN
Chair, Computer Science and Engineering (July 2007–Present)
Professor, EECS Department (2001–Present)
Director, Software Systems Research Lab (1997–2000)
Associate Professor, EECS Department (1995–2001)
Assistant Professor, EECS Department (1993–1995)

ARBOR NETWORKS
Chairman of the Board, 2005 – Present
Chief Scientist, 2003 – 2005
Founder and President, 2000 – 2002 (on leave from UM)

IBM T.J. WATSON RESEARCH CENTER
Research Staff Member, 1989-1991

UNIVERSITY OF TEXAS AT AUSTIN (1984 - 1989)
Research Assistant with the Real-Time Systems Group.

MICROSOFTWARE DEVELOPMENT ASSOCIATES, INC. (1982 - 1983)
Systems analyst responsible for design and development of application software.
HONORS AND AWARDS

- ACM SIGCOMM Test of Time Award, 2008.
- Governor's University Award for Commercialization Excellence (U-ACE), 2005.
- EECS Outstanding Faculty Achievement Award, 2005.
- Ernst & Young Entrepreneur of the Year Finalist, 2003.
- Amoco Faculty Teaching Award, University of Michigan, 2000.
- IBM Faculty Development Award, 2000.
- College of Engineering Teaching Excellence Award, University of Michigan, 1998.
- IBM University Partnership Program Research Award, 1998.
- ACM SIGCOMM Best Student Paper Award (Craig Labovitz), 1997.
- EECS Department Teaching Excellence Award, University of Michigan, 1996.
- National Science Foundation CAREER Award, 1995.
- Eta Kappa Nu Honor Society EECS Professor of the Year, 1995.
- IEEE Service Award, 1993.
- IBM Research Division Award, 1992.
- Elected to Eta Kappa Nu, Phi Kappa Phi and Alpha Chi honor societies.
- More than 20 company and innovation awards granted to Arbor Networks since 2001 including Techworld Award for Security Product Of The Year, Information Security Product Award, and Inc 500 Award.
**RESEARCH PROJECTS**

- “Virtual Center for Network and Security Data,” Department of Homeland Security, Farnam Jahanian (PI), Michael Bailey, Morley Mao (UM); Paul Barford (U. Wisconsin); Nick Femster (Georgia Tech); Internet2; Manish Karir (Merit Network), 2005-2008.


- “New Frameworks for Detecting and Minimizing Information Leakage in Anonymized Network Data,” Department of Homeland Security, Fabian Monrose (PI) Johns Hopkins University; Farnam Jahanian and Michael Bailey (UM); and Mike Reiter (CMU), 2008-2010.

- “Collaborative Research: Enabling Security and Network management Research for Future Networks,” National Science Foundation, Morley Mao (PI), Farnam Jahanian (UM); Wenke Lee and Nick Femster (Georgia Tech); Manish Karir (Merit Network); Southern Crossroads, 2008-2011.

- “Detecting and Dismantling Botnet Command and Control Infrastructure using Behavioral Profilers and Bot Informants,” Department of Homeland Security, Farnam Jahanian (PI), Morley Mao (UM); Greg Travis (Indiana University); Manish Karir (Merit Network), 2006-2008.

- “Internet Motion Sensor,” Gift from Intel Corporation, Farnam Jahanian (PI), 2006-present.


- “Experimentation with Multi-Threaded, Distributed Routing Technology in the Internet,” National Science Foundation, Farnam Jahanian (PI) and Craig Labovitz (Merit Network), 1997-2000.
• “Development of Ultra High Speed Next Generation Internet Technology,” Sponsored by Hitachi Corporation, Farnam Jahanian (PI); Craig Labovitz and Hirabaru Masaki (Merit Network), 1999-2000.


• National Science Foundation CAREER Award, 1995-1999. Farnam Jahanian.

• “End-to-End Performance Studies of Web-Based Groupware and Collaborative Applications over the Internet,” Sponsored by Hewlett-Packard Company, Farnam Jahanian (PI) and Sugih Jamin, 1997-1998.


• “Enabling Multimedia-Based Collaboration over Computer networks,” Sponsored by the AT&T Foundation, Atul Prakash (PI) and Farnam Jahanian.

DOCTORAL COMMITTEES CHAIRED

• Wu-chi Feng – August 96
  “Video-on-Demand services: Efficient Transportation and Decompression of Variable Bit Rate Video”

• Scott Dawson – December 97
  “Message Level Fault Injection in Distributed Systems”

• Monica Brockmeyer – May 99
  “Monitoring, Testing, and Abstractions of Real-Time Specifications”

• Craig Labovitz – August 99
  “Scalability of Internet Backbone Routing Infrastructure”

• Hengming Zou – December 99
  “Dynamic Active-Passive Replication”

• G. Robert Malan – December 99
  “Transparent Measurement and Manipulation of Internet Protocols”

• Scott Johnson – December 2001
  “Scalable Group Composition”

• David Watson – May 2004
  “Measurement and Analysis of Routing Protocol Behavior on Production Networks”

• Junghhee Han – December 2004
  “Enhancing End-to-end Availability and Performance by Leveraging Internet Redundancy”

• Michael D. Bailey – May 2006
  “A Scalable Hybrid Network Monitoring Architecture for Measuring, Characterizing, and Tracking Internet Threat Dynamics”

• Evan Cooke – May 2007
  “Exposing Internet Address Use to Enhance Network Security”

• 25+ doctoral dissertation committees (1993-2007)
## TEACHING ASSIGNMENTS

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<th>Term</th>
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- Supervised 20+ undergraduates in my research group since joining UM.
REPRESENTATIVE PROFESSIONAL ACTIVITIES AND SERVICES

Recent Broad Memberships and Advisory Committees:
- Arbor Networks, Chairman of the Board, 2001 – present.
- Internet2 External Relations Advisory Council (ERAC), Member, 2007 – present.
- UM Center for Entrepreneurship, Advisory Board, 2008 – present.
- Worldwide Observatory of Malicious Behaviors and Attack Threats (WOMBAT), European Community Project, Advisory Board, 2007-present.
- WSU, Computer Science Department Advisory Committee Member, 2005 – present.
- Ann Arbor IT Zone, Board Member, 2004 – 2008.
- Member of NSF Working Group on “Future Scenarios for Networking Research and Associated Infrastructure Support.”

Significant Editorship and Technical Committees:
- General Chair, 40th IEEE Int. Conf. on Dependable Systems and Networks (DSN).
- Student Forum Chair, IEEE Int. Conf. on Dependable Systems and Networks, 2007.
- Program Chair, ACM Workshop on Recurring Malcode (WORM), 2006.
- Chair, IFIP Workshop on ”Infrastructure Security and Operational Challenges of Service Provider Networks,” June 2006.
- Program Chair, IEEE Int. Conf. on Dependable Systems and Networks (DSN), 2002.
- Program Committee Vice Chair, Fault-Tolerance Track, 21st ICDCS, 2000.
- Associate Editor, Real-Time Systems Journal, 1997-present.
- Program Committee Vice-Chair, Distributed Real-Time Systems, 16th ICDCS, 1996.
- Over 30 program committees of technical conferences and symposia, including:
  o 2009 IEEE Symposium on Security and Privacy.
  o 2008 ACM Computer and Communications Security Conference.
  o 2007 IEEE Internet Measurement Conference.

National Science Foundation Review Panels, 2000-2007:
- CAREER Panel, NSF CISE Directorate.
- Site Visit Member, Research Infrastructure, CISE Directorate.
- Site Visit Member, Science and Technology Center.
- SBIR Panel, CISE Directorate.
- NSF Infrastructure Panel, CISE Directorate.
- Combined Research-Curriculum Development Panel, Engineering Directorate.
- Operating Systems and Compiler Panel, CISE Directorate.
- Cyber Security ITR, CISE Directorate.
- NeTS Networking of Sensor Systems, CISE Directorate.
- CyberTrust Program, CISE Directorate.
- FIND Panel, NSF CISE Directorate.
- Site Visit Member, TRUST, CISE Directorate.

**MAJOR UNIVERSITY COMMITTEE ASSIGNMENTS**

*College and University-level Assignments:*

- OVPR Committee on UM Research Cyber Infrastructure, 2007.
- UM Office of Technology Transfer National Advisory Board, 2006–present.
  - Chair, Committee on “Business Engagement Center,” Fall 2007
- Chair, EECS Internal Review Committee, Chair, 2004.
- University Digital Strategies Council, 2003–2005
  - Chair, subcommittee on IT Infrastructure.
  - Co-chair with John Laird, subcommittee on Research.
- Faculty Associate to OVPR, IBM Relationship, 1997–2000.
- Rackham Panel on Life Beyond Graduate School, 1999.

*Department-level Assignments:*

- Chair, CSE Division, 2007–present.
- Chair, Executive Committee, CSE Division, 2007–present.
- EECS Awards and Honors Committee, 2007–present.
- Faculty Search Committee, CSE Division, 2005–present.
- Executive Committee, Computer Science and Engineer, 2003–05.
- Director of Software Systems Lab, 1997-2000.
- Faculty Search Committee, CSE Division, 1997-2000.
- Fellowships and Financial-aid Chair, Computer Science & Engineering, 1994-98.
- Graduate Admissions Committee, 1994-98.
- EECS Department Graduate Affairs Committee, 1994-98.
RECENT KEYNOTES AND INVITED TALKS (2003-present)

- NSF Invitational Workshop on Future Directions for the CyberTrust Program, Pittsburgh, PA, October 2006.
- “Worm research and Internet Motion Sensors,” Colloquium for Information System Security Education, Georgia Tech University, June 2005.


• “Network Engineering Case Study: Advanced Network Security Solutions,” Internet2 Member Meeting, Indianapolis, IN, October 2003.


• DARPA CoNE Program, “Fleet Battle Experiment and Joint Warrior Interoperability,” Invited Presentation and Demonstration, July 2003.
REPRESENTATIVE MEDIA EXPOSURE

- **MIT Technology Review.** August 26, 2008. “Moving Security to the Cloud” An article on recent Cloud-AV research.
  
  
  
  
- **SC Magazine.** “Two vulnerabilities found in VMware virtualization products,” Interview with my student Jon Oberheide on our new result on virtual machine vulnerability. Feb. 25, 2008.
  
  
  
  
  
  
  
- **www.chinaview.cn,** March 29, 2005. “Communication firms join forces to confront hacker attacks”
  
- **Detroit News.** April 18, 2004. “Arbor Networks software keeps hackers at bay.”
  
  
SELECTED REFEREEED PUBLICATIONS 1994-2008


• Junghee Han, David Watson, and Farnam Jahanian, "Topology Aware Overlay Networks," IEEE Infocom, Miami, FL, March 2005.


