

Kurt R. Rohloff

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BBN Technologies
Cambridge, MA 02138

PROFESSIONAL SKILLS

- **Areas of Technical Expertise:** information retrieval, distributed computing, data analytics, data mining, pattern discovery and recognition, MapReduce computing, Semantic Web, graph algorithms, machine learning, prototype system building.
- **Technologies, Languages and Environments:** Hadoop, Java, Matlab, Python, SemanticWeb, SPARQL, EC2, C, CUDA, Semantic Web Triple-Stores.

WORK EXPERIENCE

Scientist, BBN Technologies, Cambridge, MA (Sept. 2005 - present)

I initiate and execute research projects for large-scale distributed computing and data analysis. I develop technologies and proof-of-concept prototypes to solve some of the federal government's hardest technology problems. I identify customers and develop new business with DARPA and members of the US intelligence community.

Key project achievements include:

- **SHARD:** Developed an innovative cloud-based, highly scalable Semantic Web triple store and information retrieval technology that performs better than current best-of-breed commercial technologies.
- **ICEWS (Integrated Crisis Early-Warning System):** Led the research and development of innovative distributed data mining techniques to identify patterns of behavior in news feeds that precede socio-political violence. Led the deployment of these technologies in a distributed computing environment to forecast socio-political violence.
- **ARMS (Adaptive and Reflective Middleware System):** Led the research and development of resource allocation and risk modeling technologies for high-assurance, highly dynamic military distributed computing environments. My developed technologies were deployed in a large-scale naval computing environment and transitioned to a DoD program of record.

Postdoctoral Research Associate: Coordinated Science Laboratory, The University of Illinois at Urbana-Champaign (July 2004 – Aug. 2005).

Supervised by Prof. Tamer Başar, member of the US National Academy of Engineering and European Academy of Sciences

Researched and developed innovative stochastic modeling and detection techniques for the automated detection of computer worm epidemics based on information network measurements during Internet worm propagation.

Visiting Researcher: CWI (Center for Mathematics and Computation), Amsterdam, The Netherlands (Summer 2003).

Supervised by Prof. Dr. Jan H. van Schuppen.

Researched and developed risk models and algorithms to solve real-time optimal sensor selection problems for supervisory control in risk-averse distributed systems.

Visiting Researcher, MIT Lincoln Laboratory, Lexington, MA (Summers of 1999, 2000)

Developed control and simulation models of ICBM flights for the THAAD missile defense system program. Researched and developed machine-learning pattern recognition techniques to for target identification and tracking in the NMD missile defense system program.

EDUCATION

- **Ph.D. in Electrical Engineering: Systems**
The University of Michigan, Ann Arbor, MI (4/04)
 - Thesis: Computations on Distributed Discrete-Event Systems
 - Advisor: Prof. Stéphane Lafortune
 - Honorable Mention, University of Michigan Distinguished Dissertation Award (University-wide award, one nomination per department.)
 - Thesis work resulted in new approaches to the automated analysis, diagnosis and control of distributed systems.
- **M.A. in Information Technology (ongoing)**
Harvard University, in Extension
 - Major Area: Software Engineering
- **M.S. of Electrical Engineering: Systems**
The University of Michigan, Ann Arbor, MI (4/01)
 - Major Area: Control
 - Minor Area: Computers: Intelligent Systems
- **B. of Electrical Engineering**
Georgia Institute of Technology (6/99)
 - GPA: 3.83/4.00
 - Graduated with Highest Honors

ACADEMIC AWARDS AND HONORS

- BBN Business Development Awards, 2008, 2009, 2010.
- BBN Publication Awards, 2006, 2008.
- Honorable Mention for the University of Michigan Distinguished Dissertation Award, 2004 (University-wide award, one nomination per academic department.)
- GAANN (Graduate Assistance in Areas of National Need) Fellowship, 2001.
- Graduated with Highest Honors, Georgia Tech, Spring 1999.
- Georgia Tech ECE Sophomore of the Year, 1997.
- Dean's List or Faculty Honors every academic session at Georgia Tech 1995-1999.

PROFESSIONAL AFFILIATIONS AND SERVICE

Membership:

- IEEE (1997-present)
- AAAI (2009-present)

Professional Service:

- Organizer of BBN Distributed Systems Seminar Series (2007-present)
- Member of International Federation of Automatic Control (IFAC) Technical Committee on Discrete Event and Hybrid Systems (2005-present)
- Contributing Reviewer to AMS Mathematical Reviews (2006-present)
- Reviewer for several international conferences and journals

Conference Service:

- Research-Industry Chair:
 - International Conference on Advanced Engineering Computing and Applications in Sciences (ADVCOMP), 2009
- Track Chair:
 - IFAC Symposium, 2005
 - Conference on Decision and Control (CDC) 2005
- Track Co-chair:
 - Conference on Automation Science and Engineering (CASE), 2009
- Program Committee Membership:
 - Workshop on Discrete-Event Systems (WODES) 2006-2008
 - American Control Conference (ACC) 2008
 - International Conference on Computer Communications and Networks (ICCCN) 2007-2008
 - Conference on Automation Science and Engineering (CASE) 2008-2009
 - International Conference on Advanced Engineering Computing and Applications in Sciences (ADVCOMP) 2007-present
 - International Conference on Informatics in Control, Automation and Robotics (ICINCO) 2007-present

MEDIA EXPOSURE

- **Dr. Dobb's**. "Movement on the Big Data Front", Apr. 8, 2010.
- **Cloudera Blog**, "How Raytheon BBN Technologies Researchers are Using Hadoop to Build a Scalable, Distributed Triple Store", Mar. 22, 2010
- **MIT Technology Review**, "A Plan to Catch the Conficker Worm", Mar. 30, 2009
- **MIT Technology Review**, "Containing Internet Worms", Jun. 12, 2008

OTHER INFORMATION

- **Citizenship:** United States of America
- **Language Ability:** Native speaker of English, basic Turkish, Spanish.
- **Extra-curricular Activities:** Master's Swim Club, Long-Distance Hiking.

PUBLICATIONS

Journals

- J1. Kurt Rohloff and Tamer Başar. "Deterministic and Stochastic Models for the Detection of Random Constant Scanning Worms." ACM TOMACS (Transactions on Modeling and Computer Science) Special Issue on Simulation, Modeling and Security. Volume 18, Number 2, April 2008.
- J2. Kurt Rohloff, Samir Khuller and Guy Kortsarz. Approximating Optimal Sensor Selections and Connections to Colored st-cut Problems, Discrete-Event Dynamic Systems: Theory and Applications. Volume 16, Number 1, Jan. 2006.
- J3. Kurt Rohloff and Stephane Lafortune. The Verification and Control of Interacting Similar Discrete-Event Systems, SIAM Journal on Control and Optimization. Volume 45, Number 2, Jan. 2006.
- J4. Kurt Rohloff, Joseph Loyall, Richard Schantz. Quality Measures for Embedded Systems and Their Application to Control and Certification, ACM SIGBED Review, Special Issues on Workshop on Innovative Techniques for Certification of Embedded Systems. Volume 3, Number 4, October 2006.
- J5. Kurt Rohloff, Stéphane Lafortune. PSPACE-completeness of Automata Intersection with Applications to Supervisory Control of Discrete-Event Systems. Discrete-Event Dynamic Systems, 15:2 June, 2005.
- J6. Kurt Rohloff, Tae-Sic Yoo, Stéphane Lafortune. Deciding Coobservability is PSPACE-complete. Transactions of Automatic Control, 48:11. November, 2003
- J7. Kurt Rohloff, Stéphane Lafortune. On the Synthesis of Safe Control Policies in Decentralized Control of Discrete Event Systems. Transactions of Automatic Control. 48:6, pg.1064-1068. June, 2003

Conferences

- C1. Partha Pal, Rick Schantz, Michael Atighetchi, Kurt Rohloff, Nathan Dautenhahn and William Sanders. "Fighting Through Cyber Attacks: An Informed Perspective Toward the Future." Workshop on Survivability in Cyberspace, Part of CPS Week 2010, April 2010.
- C2. Kurt Rohloff, Partha Pal, Michael Atighetchi, Richard Schantz, Kishor Trivedi and Christos Cassandras. "Approaches to Modeling and Simulation for Dynamic, Distributed Cyber-Physical Systems." Workshop on Grand Challenges in Modeling, Simulation, and Analysis for Homeland Security (MSAHS-2010), March 2010.

- C3. Kurt Rohloff, Robert Battle, Jim Chatigny, Rick Schantz and Victor Asal. "A Trend Pattern Approach to Forecasting Socio-Political Violence." Third International Conference on Computational Cultural Dynamics, Dec. 2009.
- C4. Kurt Rohloff. "Automated Discovery and Modeling Of Sequential Patterns Preceding Events of Interest." ModSim World, Oct. 2009.
- C5. Kurt Rohloff and Paul Rubel. "Discovering Automated Sequential Patterns the Precede Outbreaks of Socio-Political Violence." HSCB Focus 2010, August, 2009.
- C6. Partha Pal, Rick Schantz, Kurt Rohloff and Joseph Loyall. Cyber-physical Systems Security - Challenges and Research Ideas. Workshop on Future Directions in Cyber-physical Systems Security, July 2009.
- C7. Kurt Rohloff and Wayne Thornton. "A Knowledge Environment for Social Science Exploration." Human Behavior-Computational Intelligence Modeling Conference, June 2009.
- C8. Rick Schantz, Jake Beal, Joe Loyall, Partha Pal, Kurt Rohloff and Azer Bestavros. "Research Challenges in Information Systems for the Next Generation Electric Grid." National Workshop on New Research Directions for Future Cyber-Physical Energy Systems, June 2009.
- C9. Kurt Rohloff and Victor Asal. "Computational Methods to Discover Sets of Patterns of Behaviors that Precede Political Events of Interest." AAAI Spring Symposium on Technosocial Predictive Analytics, March 2009.
- C10. Joseph Loyall, Partha Pal, Kurt Rohloff and Matthew Gillen. "Issues in Context-Aware and Adaptive Middleware for Wireless, Mobile Networked Systems." Workshop on Research Directions in Situational-aware Self-managed Proactive Computing in Wireless Adhoc Networks, March 2009
- C11. Robert Battle, Douglas Reid, Kurt Rohloff. "CWEST: Disruptive Integration of Computation Technology for Data Analysis and Visualization." Visualizing the Past: Tools and Techniques for Understanding Historical Processes, February 2009.
- C12. Kurt Rohloff and Victor Asal. "The Identification of Sequential Patterns Preceding the Occurrence of Political Events of Interest." Second International Conference on Computational Cultural Dynamics, September 2008.
- C13. Kurt Rohloff. "Directions for Cost-Effective Certification of High-Assurance Cyber Physical Systems." Fourth Annual Carnegie Mellon Conference on the Electricity Industry, March 2008.
- C14. Kurt Rohloff, Mike Dean, Ian Emmons, Dorene Ryder, John Sumner "An Evaluation of Triple-Store Technologies for Large Data Stores" 3rd

International Workshop On Scalable Semantic Web Knowledge Base Systems (SSWS '07), Vilamoura, Portugal, Nov 27, 2007

- C15. Matthew Gillen, Kurt Rohloff, Prakash Manghwani, and Richard Schantz. "Scalable, Adaptive, Time-Bounded Node Failure Detection" 10th IEEE High Assurance Systems Engineering (HASE) Symposium, Dallas, Texas, November 14 - 16, 2007
- C16. Kurt Rohloff, Joseph Loyall, Partha Pal, and Richard Schantz. "High-Assurance Distributed, Adaptive Software for Dynamic Systems" 10th IEEE High Assurance Systems Engineering (HASE) Symposium Dallas, Texas November 14 - 16, 2007.
- C17. Kurt Rohloff, Richard Schantz and Yarom Gabay. "High-Level Dynamic Resource Management for Distributed, Real-Time Embedded Systems." 5th Symposium on Design, Analysis and Simulation of Distributed Systems (DASD), San Diego, CA, 2007.
- C18. Kurt Rohloff, Yarom Gabay, Jianming Ye and Richard Schantz. "Scalable, Distributed, Dynamic Resource Management for the ARMS Distributed Real-Time Embedded System." International Workshop on Parallel and Distributed Real-Time Systems (WPDRTS) Long Beach, CA, 2007.
- C19. Kurt Rohloff, Richard Schantz, Partha Pal and Joseph Loyall. "Software Certification for Distributed, Adaptable Medical Systems: Position Paper on Challenges and Paths Forward." Joint Workshop On High Confidence Medical Devices, Software, and Systems (HCMDSS) and Medical Device Plug-and-Play (MD PnP) Interoperability, June 25-27, 2007, Boston, MA.
- C20. Kurt Rohloff, Richard Schantz and Joseph Loyall. Dynamic, High Confidence Certifiable Embedded Software: Position Paper, 2006 National Meeting, Beyond SCADA: Networked Embedded Control for Cyber Physical Systems, November 8 & 9, 2006, Pittsburgh, Pennsylvania.
- C21. Kurt Rohloff, Jianming Ye, Joseph Loyall, Richard Schantz. A Hierarchical Control System for Dynamic Resource Management, 2006 IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2006), Work in Progress Symposium. April 7, 2006, San Jose, CA.
- C22. Kurt Rohloff, Joseph Loyall, Richard Schantz. Quality Measures for Embedded Systems and Their Application to Control and Certification, 2006 IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2006), Workshop on Innovative Techniques for Certification of Embedded Systems. April 4, 2006, San Jose, CA.

- C23. Kurt Rohloff "Sensor Failure Tolerant Supervisory Control" 44th IEEE Conference on Decision and Control, 2005 and 2005 European Control Conference. CDC-ECC '05. Dec. 12-15, 2005.
- C24. Kurt Rohloff and Tamer Başar. The detection of RCS worm epidemics. In Proceedings of the 2005 ACM Workshop on Rapid Malcode (WORM), November 11, 2005.
- C25. Kurt Rohloff and Tamer Başar. "Stochastic behavior of random constant scanning worms," 14th International Conference on Computer Communications and Networks (ICCCN) Oct. 17-19, 2005.
- C26. Kurt Rohloff, The Diagnosis of Failures via the Combination of Distributed Observations, Mediterranean Conference on Decision and Control, 2005.
- C27. Kurt Rohloff, Jan H. van Schuppen. Approximating Minimal Communicated Event Sets for Decentralized Supervisory Control, IFAC World Congress, 2005.
- C28. Kurt Rohloff, Tansu Alpcan, Tamer Başar. A Discrete-Event Systems Model for Congestion Control, IFAC World Congress, 2005.
- C29. Kurt Rohloff. Information Acquisition, Approximation Algorithms and Supervisory Control. Workshop on Control of Hybrid and Discrete Event Systems (CHyDES'05), a satellite event of the 26th International Conference On Application and Theory of Petri Nets and Other Models of Concurrency (ATPN 2005). Miami Florida, June 21, 2005.
- C30. Kurt Rohloff, Samir Khuller, Guy Kortsatz. Approximating Optimal Sensor Selections for Supervisory Control, Workshop on Discrete-Event Systems, 2004. (Invited to submit a journal version of this paper to a special edition of the journal Discrete Event Dynamic Systems.)
- C31. Kurt Rohloff, Stéphane Lafortune. Symmetry Reductions for a Class of Modular Discrete-Event Systems, Conf. on Decision and Control, 2004.
- C32. Kurt Rohloff, Stéphane Lafortune. The Control and Verification of Similar Agents Operating in a Broadcast Network, Conf. on Decision and Control, 2003.
- C33. Kurt Rohloff, Stéphane Lafortune. Supervisor Existence for Modular Discrete-Event Systems, Proc. of the 2nd IFAC Conf. on Control Systems Design, 2003.
- C34. Kurt Rohloff, Stéphane Lafortune. Recent Results on Computational Issues in Supervisory Control, Proc. of the ATPN-Workshop Discrete Event Systems Control, 2003.

- C35. Kurt Rohloff, Stéphane Lafortune. On the Computational Complexity of the Verification of Modular Discrete-Event Systems, Conf. on Decision and Control, 2002.

Book Chapters

- B1. Stéphane Lafortune, Kurt Rohloff, Tae-Sic Yoo. Recent Advances on the Control of Partially-Observed Discrete-Event Systems. In Synthesis and Control of Discrete Event Systems. Benoît Caillaud, Philippe Darondeau, Luciano Lavagno and Xiaolan Xie, eds.,

Technical Reports

- T1. Kurt Rohloff, Stéphane Lafortune. Advances in State Estimation and Controller Synthesis for General Decentralized Control of Discrete Event Systems, University of Michigan EECS Technical Report CGR-01-11
- T2. Kurt Rohloff, Stéphane Lafortune. Deciding Coobservability is PSPACE-complete, University of Michigan EECS Technical Report CGR-03-06
- T3. Kurt Rohloff, Stéphane Lafortune. Space Efficient Methods for Testing Reachability with Applications to Coobservability and Decentralized Control, University of Michigan EECS Technical Report CGR-03-08
- T4. Kurt Rohloff, Stéphane Lafortune. Symmetry Reductions for a Class of Distributed Discrete-Event Systems, University of Michigan EECS Technical Report CGR-04-02
- T5. Kurt Rohloff, Jan H. van Schuppen. Approximating the Minimal-Cost Sensor-Selection for Discrete-Event Systems. CWI Report MAS-R0404, CWI, Amsterdam, The Netherlands, December 2004.