

Daniel Liberzon

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EXPERIENCE

University of Illinois at Urbana-Champaign, Urbana, IL, 2006–present

Associate Professor, Department of Electrical and Computer Engineering
Research Associate Professor, Coordinated Science Laboratory

University of Illinois at Urbana-Champaign, Urbana, IL, 2000–2006

Assistant Professor, Department of Electrical and Computer Engineering
Research Assistant Professor, Coordinated Science Laboratory

Yale University, New Haven, CT, 1998–2000

Postdoctoral Associate, Laboratory for Control Science and Engineering (director: A. Stephen Morse),
Department of Electrical Engineering

EDUCATION

Brandeis University, Waltham, MA, 1993–1998

Graduate student, Department of Mathematics

Ph.D. awarded in Feb 1998

Advisor: Roger W. Brockett, Division of Engineering and Applied Sciences, **Harvard University**, Cambridge, MA

Thesis: “Asymptotic Properties of Nonlinear Feedback Control Systems”

Moscow State University, Moscow, Russia, 1989–1993

Undergraduate student, Department of Mechanics and Mathematics

Advisor: Andrei A. Agrachev (currently at S.I.S.S.A., Trieste, Italy)

AWARDS

- AACC Donald P. Eckman Award, 2007
- Xerox Award for Faculty Research, UIUC College of Engineering, 2007
- IFAC Young Author Prize, 2002
- NSF CAREER Award, 2002
- UIUC List of Teachers Ranked as Excellent by Students, Spring 2002, Fall 2004, Spring 2005, Fall 2005, Spring 2007, Fall 2007, Spring 2009
- Senior Member of IEEE, since 2004
- Outstanding Reviewer for *Automatica*, 2003 and 2005, and *IEEE Transactions on Automatic Control*, 2003 (not formally announced awards)

RESEARCH INTERESTS

- Switched systems and switching control
- Nonlinear systems and control theory
- Control under limited information and modeling uncertainty
- Stochastic differential equations and control

FUNDED PROJECTS

- “Invertibility of hybrid systems,” NSF EECS-0821153, 2008–2011
- “Control and sensing under limited information” (with Y. Ma), NSF EECS-0701676, 2007–2010
- “Verification of probabilistic hybrid systems: stability and beyond” (with N. Lynch at MIT), NSF CNS-0614993, 2006–2009
- “Compositional technology for safety-critical modular systems” (PI: P. Voulgaris), NSF CNS-0834409, 2008–2009
- “Hybrid control of nonlinear systems,” NSF ECS-0134115 CAR, 2002–2007
- “Cooperative networked control of dynamical peer-to-peer vehicle systems” (PI: G. Dullerud), DARPA/AFOSR MURI F49620-02-1-0325, 2002–2007
- “A hybrid systems view of inverse problems in power system dynamics” (PI: I. Hiskens), NSF ECS-0114725, 2001–2004

TEACHING

University of Illinois at Urbana-Champaign, Department of Electrical and Computer Engineering, 2000–present

- Hybrid Systems and Control (ECE 586 DL, newly developed course, graduate)
- Optimum Control Systems (ECE 553, graduate)
- Analysis of Nonlinear Systems (ECE 528, graduate)
- Nonlinear and Adaptive Control (ECE 517, graduate)
- Control System Theory and Design (ECE 515, graduate)
- Introduction to Optimization (ECE 490, undergraduate)
- Control Systems I (ECE 486, undergraduate)

Brandeis University, Department of Mathematics, 1994–1997

- Applied Linear Algebra (Math 15a, undergraduate)
- Integral Calculus (Math 10b, undergraduate)
- Differential Calculus (Math 10a, undergraduate)
- Precalculus (Math 5a, undergraduate)
- Delivered lectures on probability theory to high school students participating in the annual Brandeis Summer Odyssey directed research program

PROFESSIONAL ACTIVITIES

- Associate Editor for the IEEE Transactions on Automatic Control, since 2007
- Served on the IFAC Technical Committees on Robust Control (2003–2008), Discrete Event and Hybrid Systems (2005–2008), and Nonlinear Systems (2006–2008)
- Served on the Program Committee of the Workshop on Hybrid Systems Computation and Control in 2000, 2007, 2008, and 2009
- Served on the Program Committee of the IEEE Conference on Decision and Control in 2002 and 2007
- Served on the Program Committee of the 7th IFAC Symposium on Nonlinear Control Systems (NOLCOS), 2007
- Member of the editorial board for the journal Nonlinear Analysis: Hybrid Systems and Applications, 2005–2007
- Served on the Program Committee of the 14th Mediterranean Conference on Control and Automation, 2006
- Served on the Program Committee of the 15th International Symposium on Mathematical Theory of Networks and Systems (MTNS), 2002
- Guest-edited a special issue “Switching and logic in adaptive control” of the International Journal of Adaptive Control and Signal Processing, 2001
- Served on the Program Committee of the 39th IEEE Conference on Decision and Control, 2000
- Served as Associate Editor on the IEEE Control Systems Society Conference Editorial Board, 1999–2000
- Served on the panel for the Student Best Paper Award of the 39th IEEE Conference on Decision and Control, 2000
- Organized invited sessions at the IEEE Conference on Decision and Control, the American Control Conference, the International Symposium on Mathematical Theory of Networks and Systems (MTNS), and the Allerton Conference on Communication, Control, and Computing.
- Reviewer for the Mathematical Reviews of the American Mathematical Society, since 2005
- Reviewed book proposals for Springer and McGraw-Hill, grant proposals for NSF and several foreign funding agencies, and technical papers for numerous journals and conferences

MAJOR PUBLICATIONS

Book

- *Switching in Systems and Control*, Birkhäuser, Boston, 2003, volume in series Systems and Control: Foundations and Applications, ISBN 0-8176-4297-8

Journal articles

- “A unified framework for design and analysis of networked and quantized control systems” (with D. Nešić), IEEE Transactions on Automatic Control, vol. 54, pp. 732–747, 2009
- “Nonlinear control with limited information,” Communications in Information Systems (Roger Brockett Legacy special issue), vol. 9, pp. 41–58, 2009
- “Verifying average dwell time of hybrid systems” (with S. Mitra and N. Lynch), ACM Transactions on Embedded Computing Systems, vol. 8, pp. 1–37, 2008

- “Lyapunov conditions for input-to-state stability for impulsive systems” (with J. P. Hespanha and A. R. Teel), *Automatica*, vol. 44, pp. 2735–2744, 2008
- “Invertibility of switched linear systems” (with L. Vu), *Automatica*, vol. 44, pp. 949–958, 2008
- “Input-to-state stabilization of linear systems with quantized state measurements” (with D. Nešić), *IEEE Transactions on Automatic Control*, vol. 52, pp. 767–781, 2007
- “Input-to-state stability of switched systems and switching adaptive control” (with L. Vu and D. Chatterjee), *Automatica*, vol. 43, pp. 639–646, 2007
- “On stability of randomly switched nonlinear systems” (with D. Chatterjee), *IEEE Transactions on Automatic Control*, vol. 52, pp. 2390–2394, 2007
- “Quantization, time delays, and nonlinear stabilization,” *IEEE Transactions on Automatic Control*, vol. 51, pp. 1190–1195, 2006
- “Stability analysis of deterministic and stochastic switched systems via a comparison principle and multiple Lyapunov functions” (with D. Chatterjee), *SIAM Journal on Control and Optimization*, vol. 45, pp. 174–206, 2006
- “Lie-algebraic stability conditions for nonlinear switched systems and differential inclusions” (with M. Margaliot), *Systems and Control Letters*, vol. 55, pp. 8–16, 2006
- “Quantized control via locational optimization” (with F. Bullo), *IEEE Transactions on Automatic Control*, vol. 51, pp. 2–13, 2006
- “Stabilization of nonlinear systems with limited information feedback” (with J. P. Hespanha), *IEEE Transactions on Automatic Control*, vol. 50, pp. 910–915, 2005
- “Nonlinear norm-observability notions and stability of switched systems” (with J. P. Hespanha, D. Angeli, and E. D. Sontag), *IEEE Transactions on Automatic Control*, vol. 50, pp. 154–168, 2005
- “Common Lyapunov functions for families of commuting nonlinear systems” (with L. Vu), *Systems and Control Letters*, vol. 54, pp. 405–416, 2005
- “Output-input stability implies feedback stabilization,” *Systems and Control Letters*, vol. 53, pp. 237–248, 2004
- “Switched systems, common Lyapunov functions, and gradient algorithms” (with R. Tempo), *IEEE Transactions on Automatic Control*, vol. 49, pp. 990–994, 2004
- “Hybrid feedback stabilization of systems with quantized signals,” *Automatica*, vol. 39, pp. 1543–1554, 2003
- “On stabilization of linear systems with limited information,” *IEEE Transactions on Automatic Control*, vol. 38, pp. 304–307, 2003
- “Overcoming the limitations of adaptive control by means of logic-based switching” (with J. P. Hespanha and A. S. Morse), *Systems and Control Letters*, vol. 49, pp. 49–65, 2003
- “Hysteresis-based switching algorithms for supervisory control of uncertain systems” (with J. P. Hespanha and A. S. Morse), *Automatica*, vol. 39, pp. 263–272, 2003
- “Output-input stability and minimum-phase nonlinear systems” (with A. S. Morse and E. D. Sontag), *IEEE Transactions on Automatic Control*, vol. 47, pp. 422–436, 2002
- “Supervision of integral-input-to-state stabilizing controllers” (with J. P. Hespanha and A. S. Morse), *Automatica*, vol. 38, pp. 1327–1335, 2002
- “Universal construction of feedback laws achieving ISS and integral-ISS disturbance attenuation” (with E. D. Sontag and Y. Wang), *Systems and Control Letters*, vol. 4, pp. 111–127, 2002

- “Lie-algebraic stability criteria for switched systems” (with A. A. Agrachev), *SIAM Journal on Control and Optimization*, vol. 40, pp. 253–269, 2001
- “Multiple model adaptive control with safe switching” (with B. D. O. Anderson, T. S. Brinsmead, and A. S. Morse), *International Journal of Adaptive Control and Signal Processing* (invited paper), vol. 15, pp. 445–470, 2001
- “Multiple model adaptive control, part 2: Switching” (with B. D. O. Anderson, T. S. Brinsmead, F. De Bruyne, J. P. Hespanha, and A. S. Morse), *International Journal on Robust and Nonlinear Control* (invited paper), vol. 11, pp. 479–496, 2001
- “Multiple model adaptive control, part 1: Finite controller coverings” (with B. D. O. Anderson, T. S. Brinsmead, F. de Bruyne, J. P. Hespanha, and A. S. Morse), *International Journal on Robust and Nonlinear Control* (invited paper), vol. 10, pp. 909–929, 2000
- “Quantized feedback stabilization of linear systems” (with R. W. Brockett), *IEEE Transactions on Automatic Control*, vol. 45, pp. 1279–1289, 2000
- “Nonlinear feedback systems perturbed by noise: steady-state probability distributions and optimal control” (with R. W. Brockett), *IEEE Transactions on Automatic Control*, vol. 45, pp. 1116–1130, 2000
- “Spectral analysis of Fokker-Planck and related operators arising from linear stochastic differential equations” (with R. W. Brockett), *SIAM Journal on Control and Optimization*, vol. 38, pp. 1453–1467, 2000
- “Stability of switched systems: a Lie-algebraic condition” (with J. P. Hespanha and A. S. Morse), *Systems and Control Letters*, vol. 37, pp. 117–122, 1999
- “Basic problems in stability and design of switched systems” (with A. S. Morse), *IEEE Control Systems Magazine*, vol. 19, pp. 59–70, 1999
- “Logic-based switching control of a nonholonomic system with parametric modeling uncertainty” (with J. P. Hespanha and A. S. Morse), *Systems and Control Letters*, vol. 38, pp. 167–177, 1999

Book chapters

- “Input-to-state stabilization with quantized output feedback” (with Y. Sharon), *Lecture Notes in Computer Science*, vol. 4981 (M. Egerstedt and B. Mishra, Eds.), Springer, pp. 500–513, 2008
- “Stability analysis of hybrid systems via small-gain theorems” (with D. Nešić), *Lecture Notes in Computer Science*, vol. 3927 (J. Hespanha and A. Tiwari, Eds.), Springer, pp. 421–435, 2006
- “Verifying average dwell time by solving optimization problems” (with S. Mitra and N. Lynch), *Lecture Notes in Computer Science*, vol. 3927 (J. Hespanha and A. Tiwari, Eds.), Springer, pp. 476–490, 2006
- “On quantization and delay effects in nonlinear control systems,” *Lecture Notes in Control and Information Sciences*, vol. 331 (P. J. Antsaklis and P. Tabuada, Eds.), Springer, pp. 219–229, 2005
- “Switched systems,” *Handbook of Networked and Embedded Control Systems* (D. Hristu-Varsakelis and W. S. Levine, Eds.), Birkhäuser, 2005
- “Lie algebras and stability of switched nonlinear systems,” *Unsolved Problems in Mathematical Systems Theory and Control* (V. D. Blondel and A. Megretski, Eds.), Princeton University Press, pp. 203–207, 2004
- “Nonlinear stabilization by hybrid quantized feedback,” *Lecture Notes in Computer Science*, vol. 1790 (N. Lynch and B. H. Krogh, Eds.), Springer-Verlag, pp. 243–257, 2000

SELECTED LECTURES

2009

- Featured main speaker, tutorial workshop “Switching in Systems and Control,” organized by the Israeli Association for Automatic Control, Herzlia, Israel
- Intensive short course “Switched Systems and Control,” HYCON-EECI Graduate School on Control, Supélec, France
- Department of Electrical and Computer Engineering (co-sponsored by Control Systems Society, IEEE Montreal Section), Concordia University, Montreal, Canada
- Signals and Systems Colloquium, University of Melbourne, Australia

2008

- *Plenary lecture* “Meeting the need for robustified nonlinear system theory concepts,” American Control Conference, Seattle, WA
- *Semi-plenary lecture* “The role of Lie brackets in stability of linear and nonlinear switched systems,” 18th International Symposium on Mathematical Theory of Networks and Systems, Blacksburg, VA
- Invited speaker, workshop “The Continuing Legacy of Roger W. Brockett,” 47th IEEE Conference on Decision and Control, Cancun, Mexico
- Invited speaker, Workshop on the Frontiers in Distributed Communication, Sensing and Control, Yale University, New Haven, CT
- Supélec, Gif-sur-Yvette, France
- GdR MACS Hybrid Systems Workshop, Paris, France
- INSA de Rouen, France

2007

- LIDS Colloquium, Massachusetts Institute of Technology
- Division of Engineering and Applied Sciences, Harvard University
- Intensive short course “Switched Systems and Control,” HYCON-EECI Graduate School on Control, Supélec, France

2006

- Institute for Systems Research, University of Maryland at College Park

2005

- Tel-Aviv University, Israel
- Weizmann Institute of Science, Rehovot, Israel
- Technion—Israel Institute of Technology, Haifa, Israel
- Invited speaker, Workshop on Integrated Control, Estimation and Communication, California Institute of Technology, Pasadena, CA
- University of Tokyo, Japan
- Kyoto University, Japan

2004

- College of Engineering, University of Michigan, Ann Arbor, MI
- University of Rome “La Sapienza,” Italy
- University of Florence, Italy
- University of Siena, Italy
- S.I.S.S.A., Trieste, Italy
- Politecnico di Torino, Italy
- Politecnico di Milano, Italy
- Department of Electrical and Computer Engineering, University of California at Santa Barbara
- Center for Applied Mathematics, University of Notre Dame

2003

- Principal invited lecturer, DISC Summer School “Modeling and Control of Hybrid Systems,” Veldhoven, Netherlands
- Department of Applied Mathematics, University of Waterloo, Canada

2002

- Co-organizer and principal speaker, tutorial workshop “Logic-Based Control,” 10th Mediterranean Conference on Control and Automation, Lisbon, Portugal

2001

- Co-organizer and principal speaker, tutorial workshop “Control Using Logic and Switching,” 40th IEEE Conference on Decision and Control, Orlando, FL
- GRASP Laboratory, University of Pennsylvania, Philadelphia, PA
- Department of Electrical and Computer Engineering, Queen’s University, Kingston, Canada
- LIDS Colloquium, Massachusetts Institute of Technology
- Department of Electrical and Computer Engineering, University of Toronto, Canada

2000

- Department of Electrical and Computer Engineering, University of California at Santa Barbara

1999

- Department of Mathematics, Rutgers University, New Brunswick, NJ
- Department of Mechanical Engineering, Princeton University

1998

- Division of Engineering and Applied Sciences, Harvard University
- Department of Mathematics, Rutgers University, New Brunswick, NJ

1997

- Teaching Assistants Workshop, Brandeis University

VISITING POSITIONS

- HYCON visiting researcher, Laboratory of Signals and Systems, Supélec, France, Feb–Apr 2008
- Super-Robust Computation Project visiting researcher, University of Tokyo, Japan, Jan 2005

PERSONAL

- Naturalized US citizen
- Bilingual in English and Russian, working knowledge of French