

Bradley N. Bond

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EDUCATION

Massachusetts Institute of Technology Cambridge, MA
Ph.D. in Electrical Engineering, *expected 2010* Spring 2006- Present
Thesis: *Reduced Modeling of Nonlinear and RF Analog Circuits*
Ph.D. thesis supervised by Prof. Luca Daniel

Massachusetts Institute of Technology Cambridge, MA
S.M. in Electrical Engineering, Spring 2006 Fall 2004 - Spring 2006
Thesis: *Parameterized Model Order Reduction for Nonlinear Dynamical Systems*
Masters thesis supervised by Prof. Luca Daniel

Pennsylvania State University State College, PA
B.S. in Engineering Science and Mechanics, Spring 2004 Fall 2000 - Spring 2004
Thesis: *Development of a Spin-Based Universal CNOT Gate for Quantum Computing*
Honors Senior Thesis supervised by Prof. P.M. Lenahan
Graduated with Honors in Engineering Science

RESEARCH EXPERIENCE

- **Research Assistant for Prof. Luca Daniel - MIT** Sept. 2004 - Present
Computational Prototyping Group: My research focuses on developing techniques for the automatic extraction of compact dynamical models of analog circuits for the purpose of design optimization. Specifically, I have developed model reduction techniques that preserve parameter dependence and stability in models of nonlinear systems, and techniques that preserve passivity for models of linear systems. I have also applied my techniques to mechanical and fluidic systems such as MEMS devices and the cardiovascular circulatory system, and have extensive experience developing and using modeling and simulation tools.
- **Research Intern - MIT Lincoln Labs, Lexington MA** June 2008 - Aug. 2008
Embedded Digital Systems Group: My work focused on developing nonlinear signal processing tools for nonlinear digital predistortion. I developed a nonlinear system identification technique for this purpose and tested it on measured power amplifier data.
- **Research Intern - Cadence Research Labs, Berkeley CA** June 2007 - Sept. 2007
Modeling and Simulation Group: My work focused on developing tools for fast simulation of analog circuits. I developed and implemented new model reduction algorithms, with emphasis on systems containing large numbers of parameters.
- **Research Assistant for Prof. P.M. Lenahan - Penn State University** Aug. 2003 - Aug. 2004
Semiconductor Spectroscopy Lab: My research used Electron Spin Resonance (ESR) and Spin-Dependent Recombination (SDR) techniques to characterize defects in semiconductor devices. This was work towards the development of a spin-based universal CNOT gate for quantum computing using electrically-detected Electron Paramagnetic Resonance (EPR).
- **Research Assistant for Prof. B.R. Tittmann - Penn State University** Oct. 2001 - Aug. 2003
Engineering Nano Characterization Center: My work focused on developing non-destructive evaluation techniques for mechanical systems. I designed and built an Electronic Speckle Pattern Interferometry (ESPI) system for non-destructive evaluation of deformations in elastomeric compounds and alumina substrates, utilized non-contact ultrasound for the analysis of aerated confections and elastomeric compounds, and used Fabry-Perot interferometry to measure surface velocity caused by ultrasonic excitement.

TEACHING EXPERIENCE

- **Teaching Assistant** 6.336: Introduction to Numerical Simulation, MIT Fall 2005, 2008, 2009
I have been a teaching assistant for an interdisciplinary graduate class on numerical simulation attended by over fifty students on average. I held office hours, wrote problem sets, substitute lectured, and gave a special guest lecture on Model Order Reduction.
- **Tutor** Tutoring Plus, Cambridge MA Mar. 2008 - Present
I am a volunteer tutor and mentor for public high school students in Cambridge, focusing mostly on science and math.
- **Student** Teaching College-Level Engineering and Science, MIT Spring 2009
MIT course designed for graduate students interested in an academic career.

HONORS AND AWARDS

- Kambourides Fellowship in Computational Engineering, MIT Jan 2009 - Jan 2010
- IEEE/ACM William J. McCalla Best Paper Award, ICCAD 2008.
- Nominated for IEEE/ACM William J. McCalla Best Paper Award, ICCAD 2007.
- PFVUMC Scholarship, State College PA, 2003.

RELEVANT COURSES

Numerical Simulation (4 classes), Linear and Nonlinear System Analysis (3 classes), Optimization (2 classes), Electromagnetics (2 classes), Real Analysis, Teaching College-Level Engineering and Science

PROFESSIONAL ACTIVITIES

- IEEE Student Member.
- Reviewer (Journals) - *IEEE Transactions on Computer-Aided Design*, *IEEE Transactions on Circuits and Systems I*, *IEEE Transactions on Circuits and Systems II*.
- Reviewer (Conferences) - *ICCAD*, *DAC*, *CDC*.

PUBLICATIONS

<http://web.mit.edu/bnbond/www/pubs>

JOURNAL PAPERS

1. B. Bond and L. Daniel, "Stable Reduced Models for Nonlinear Descriptor Systems through Piecewise-Linear Approximation and Projection", *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, Oct. 2009, vol 28, no. 10, pp. 1467-1480.
2. B. Bond and L. Daniel, "A Piecewise-Linear Moment Matching Approach to Parameterized Model Order Reduction for Highly Nonlinear Systems", *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, Dec. 2007, vol 26, no. 12, pp. 2116-2129.

PEER-REVIEWED CONFERENCE PAPERS

3. B. Bond and L. Daniel, "Guaranteed Stable Projection-Based Model Reduction for Indefinite and Unstable Linear Systems", *Proceedings of the IEEE Conference on Computer-Aided Design*, San Jose, CA, 2008.
Recipient of IEEE/ACM William J. McCalla Best Paper Award
4. B. Bond and L. Daniel, "Stabilizing Schemes for Piecewise-Linear Reduced-Order Models via Projection and Weighting Functions", *Proceedings of the IEEE Conference on Computer-Aided Design*, San Jose, CA, 2007.
Nominated for IEEE/ACM William J. McCalla Best Paper Award
5. B. Bond and L. Daniel, "Parameterized Model Order Reduction for Nonlinear Dynamical Systems", *Proceedings of the IEEE Conference on Computer-Aided Design*, San Jose, CA, 2005.

PAPERS UNDER REVIEW

6. B. Bond, Z. Mahmood, R. Sredojevic, Y. Li, A. Megretski, V. Stojanovic, Y. Avniel, and L. Daniel, "Compact Modeling of Nonlinear Analog Circuits using System Identification via Semi-Definite Programming and Robustness Certification". *Submitted to IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*.
7. J. Goodman, M. Herman, B. Bond, and B. Miller, "A Log-Frequency Approach to the Identification of the Wiener-Hammerstein Model". *Submitted to IEEE Signal Processing Letters*

OTHER PUBLICATIONS

8. P.M. Lenahan, B.Bond, "EPR: Progress towards spin-based quantum computing", *SPIE Nanotechnology E-Bulletin*, Nov. 2004.

TALKS

<http://web.mit.edu/bnbond/www/talks>

INVITED TALKS

1. *B. Bond*, "Stabilizing Schemes (and other advances) for Trajectory-Based Models of Nonlinear Systems", Symposium on Recent Advances in Model Order Reduction, TU Eindhoven, The Netherlands, Nov. 2007.

CONFERENCE TALKS

2. "Guaranteed Stable Projection-Based Model Reduction for Indefinite and Unstable Linear Systems" *IEEE/ACM International Conference on Computer-Aided Design*, San Jose, CA, 2008.
3. "Stabilizing Schemes for Piecewise-Linear Reduced-Order Models via Projection and Weighting Functions", *IEEE/ACM International Conference on Computer-Aided Design*, San Jose, CA, 2007.
4. "Parameterized Model Order Reduction for Nonlinear Dynamical Systems" *IEEE/ACM International Conference on Computer-Aided Design*, San Jose, CA, 2005.
5. "Toward the Development of High-Speed ESPI System for Monitoring Heating/Drilling of Alumina Substrates", *39th Annual Technical Meeting of the Society of Engineering Science*, State College, PA, Oct. 2002.
6. "Investigations of Ultrasonic Characterization of Elastomers by Non-contact and Air-coupled Ultrasonic Technique", *39th Annual Technical Meeting of the Society of Engineering Science*, State College, PA, Oct. 2002.

INDUSTRY TALKS

7. "Identification of Wiener-Hammerstein Systems for Nonlinear Predistortion" *MIT Lincoln Labs*, Lexington, MA, Aug. 2008.
8. "Accelerated Circuit Sensitivity Analysis via Approximate Low-Rank, Time-Varying Balanced Truncation", *Cadence Research Labs*, Berkeley, CA, Sept. 2007.
9. "Parameterized Model Order Reduction for Nonlinear Dynamical Systems" *Intel, Interconnect Modeling Group*, Santa Clara, CA, Nov. 2005.