

# Jorge M. Gonçalves

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- Education**
- Massachusetts Institute of Technology** Cambridge, MA  
*Doctor of Philosophy* in Electrical Engineering and Computer Science  
September 2000  
Dissertation Title: *Constructive Global Analysis of Hybrid Systems*.  
Advisers: Professors Munther Dahleh and Alexandre Megretski.  
Minor in Mathematics. Area Exam in “Congestion Control in the Internet.”
- Massachusetts Institute of Technology** Cambridge, MA  
*Master of Science* in Electrical Engineering and Computer Science  
June 1995  
Dissertation Title: *Robust Stability of a Class of Nonlinear Systems*.  
Adviser: Professor Munther Dahleh. GPA: 5.0 out of 5.0.
- Faculty of Engineering of University of Porto** Porto, Portugal  
*Licenciatura* (5-year S.B.) in Electrical Engineering and Computer Science  
August 1993  
Senior design project: *Optimal Control: Applications and Algorithms*  
Supervisor: Professor Fernando Lobo Pereira.
- Awards**
- *Best Student Paper Award* at the Automatic Control Conference, Chicago, IL June 2000  
Paper title: Global Stability of Relay Feedback Systems
  - Best session presentation awards in *all* American Control Conferences and Conferences on Decision and Control where a paper was presented.
  - Postdoctoral Fellowship from Portuguese Foundation for Science and Technology 2000–2001
  - Doctoral Fellowship from Portuguese Foundation for Science and Technology (JNICT) 1993–1997
  - Undergraduate Young Researcher Fellowship from JNICT 1993
  - Valedictorian of Gaia High School (V. N. de Gaia, Portugal), graduating class 1988 1988
- Research Interests**
- Modeling, analysis, and control of complex systems. Applications to interdisciplinary fields like biological metabolic networks, economic markets, communication networks, and statistical mechanics. Analysis and control of hybrid and nonlinear systems. Robotic manipulators and walking robots.
- Research Experience**
- California Institute of Technology, CDS** Pasadena, CA  
Postdoctoral Scholar April 2001–present  
Research in complex systems with application to several multidisciplinary areas like biological metabolic networks, economic markets, statistical mechanics, communication networks. Proof methods and algorithmic complexity. Constructive analysis and control of nonlinear and hybrid systems. Involved in the preparation of most research funding proposals.
- Massachusetts Institute of Technology, LIDS** Cambridge, MA  
Postdoctoral Fellow Fall 2000–Spring 2001  
Analysis of hybrid systems. Theoretical developments of constructive and systematic global analysis tools and then used in certain applications. Robustness of nonlinear systems. Analysis of uncertain linear systems in feedback with static nonlinearities like saturations and hysteresis.
- Research Assistant Fall 1995–Summer 2000  
Global stability, robustness, and performance analysis of hybrid systems. Development of an entirely new constructive methodology to efficiently globally analyze classes of hybrid systems.
- Research Assistant Fall 1993–Summer 1995  
Robustness analysis of nonlinear systems. Necessary conditions for monotone stability of nonlinear systems.

<b>Teaching Experience</b>	<b>California Institute of Technology</b>	Pasadena, CA
	Lecturer of <i>Robust Control</i> .	Winter 2003
	In all courses lectured at Caltech, the responsibilities included establishment of course outline and contents, and development of new homework assignments and final examinations.	
	Lecturer of <i>Introduction to Modern Control</i> .	Fall 2002
	Lecturer of <i>Robust Control</i> .	Winter 2002
	Lecturer of <i>Introduction to Modern Control</i> .	Fall 2001
	Resident Associate	Fall 2001–present
	Responsible for the academic and social well-being of Fleming House, an undergraduate dormitory with 80 students. Involves not only academic guidance, but also crises intervention, leadership, counseling, etc.	
	<b>Massachusetts Institute of Technology</b>	Cambridge, MA
	Recitation Instructor in <i>Intro. to Communication, Control, and Signal Processing</i>	Spring 2000
Invited by the Department to teach a recitation section, which is typically assigned to a faculty member. Responsible for the creation of a fairly large number of new problems, especially for exams.		
Teaching Assistant in <i>Signals and Systems</i>	Fall 1998	
Taught tutorials and assisted the recitation instructor. For every tutorial, prepared handouts with a brief overview of the week's material and a careful selection of problems with respective solutions. Created new problems for both exams and problem sets.		
Teaching Assistant in <i>Dynamic Systems</i>	Fall 1996	
Responsible for the problem sets, including creation of solutions and new problems. Created new problems for exams. Produced handouts with relevant material.		
Graduate Resident Tutor	1996–2001	
Responsible for the academic and social well-being of an undergraduate floor (about 36 students) in a dormitory.		
<b>INESC - Institute of Systems and Control Engineering</b>	Porto, Portugal	
Teaching Assistant in <i>Eng. Economic Analysis and Project Management</i>	1992–1993	
<b>Journal Publications</b>	Tau-Mu Yi, B. Ingalls, Jorge Gonçalves, H. M. Sauro, and John Doyle. <i>A Conservation of Fragility Law and Consequences for Biological Systems</i> , submitted for publication on Science.	
	Jorge Gonçalves, Alexandre Megretski, and Munther A. Dahleh. <i>Global Analysis of Piecewise Linear Systems Using Impact Maps and Quadratic Surface Lyapunov Functions</i> , accepted for publication on IEEE Transactions on Automatic Control.	
	Jorge Gonçalves. <i><math>\mathcal{L}_2</math>-Gain of Double Integrators with Saturation Nonlinearity</i> , IEEE Transactions on Automatic Control, Vol. 47, No. 12, December 2002.	
	Jorge Gonçalves, Alexandre Megretski, and Munther Dahleh. <i>Global Stability of Relay Feedback Systems</i> , IEEE Transactions on Automatic Control, Vol. 46, No. 4, April 2001.	
	Jorge Gonçalves and Munther Dahleh. <i>Necessary Conditions for Robust Stability of a Class of Nonlinear Systems</i> , Automatica, Vol. 34, No. 6, 1998.	
<b>Selected Conference Publications</b>	Jorge Gonçalves. <i>Regions of Stability for Limit Cycles of Piecewise Linear Systems</i> , IEEE Conference on Decision and Control, Maui, Hawaii, December 2003.	
	Demetri P. Spanos and Jorge Gonçalves. <i>High-Order-Polynomial Surface Lyapunov Functions for Global Stability Analysis of Limit Cycle Oscillations in Piecewise Linear Systems</i> , submitted to the IEEE Conference on Decision and Control, Maui, Hawaii, December 2003.	
	Jorge Gonçalves. <i><math>\mathcal{L}_2</math>-Gain of Double Integrators with Saturation Nonlinearity</i> , IFAC, Barcelona, Spain, July 2002.	
	Jorge Gonçalves. <i>Global Asymptotic Stability of Oscillations with Sliding Modes</i> , IFAC, Barcelona, Spain, July 2002.	

Jorge Gonçalves. *Quadratic Surface Lyapunov Functions in the Analysis of Feedback Systems with Double Integrators and Saturations*, Mediterranean Control Conference, Lisbon, Portugal, July 2002.

Jorge Gonçalves, Alexandre Megretski, and Munther A. Dahleh. *Global Analysis of Piecewise Linear Systems Using Impact Maps and Quadratic Surface Lyapunov Functions*, European Control Conference, Porto, Portugal, September 2001.

Jorge Gonçalves. *Quadratic Surface Lyapunov Functions in Global Stability Analysis of Saturation Systems*, American Control Conference, Arlington, VA, June 2001.

Jorge Gonçalves. *Global Stability Analysis of On/Off Systems*, IEEE Conference on Decision and Control, Sydney, Australia, December 2000.

Jorge Gonçalves, Alexandre Megretski, and Munther Dahleh. *Global Stability of Relay Feedback Systems*, American Control Conference, Chicago, IL, June 2000.

Jorge Gonçalves, Alexandre Megretski, and Munther Dahleh. *Semi-Global Analysis of Relay Feedback Systems*, IEEE Conference on Decision and Control, Tampa, FL, December 1998.

Jorge Gonçalves and Munther Dahleh. *Necessary and Sufficient Conditions for Robust Stability of a Class of Nonlinear Systems*, IEEE Conference on Decision and Control, New Orleans, LA, December 1995.

**Invited Talks** INRIA–Paris, University of California at Los Angeles, University of California at Santa Barbara, Yale University, California Institute of Technology, Technical Institute of Lisbon, MIT, Royal Institute of Technology (KTH), University of Lund, University of Liège.

**Other Presentations** *Lyapunov Stability and Sum of Squares*, Workshop on Robustness Analysis Tools with Applications to the Biological and Physical Sciences: The Challenge of Complexity, UCSB, March 2003.

*Conservation of Robustness and Application to Biological Systems*, 4th Southern California Non-Linear Control Workshop, UCSB, June 2002.

*Analysis of Switching Systems*, LIDS Student Conference, Cambridge, MA, January 2000.

*Global Quadratic Stability of Limit Cycles is Common in Relay Feedback Systems*, Workshop on the Dynamics of Switching, Liège, Belgium, August 1999.

**Activities** – Organizer of the *Workshop on Robustness Analysis Tools with Applications to the Biological and Physical Sciences: The Challenge of Complexity*, Kavli Institute for Theoretical Physics, UCSB, March 2003. More information at: [http://online.kitp.ucsb.edu/online/bionet\\_w03/](http://online.kitp.ucsb.edu/online/bionet_w03/)

– Co-chair of IEEE Technical Committee on Robust Control.

– Member of the Program Committee of the 41st IEEE Conference on Decision and Control, Las Vegas, NV, December 2002.

– Referee for “IEEE Transactions on Automatic Control”, “Automatica”, “IEEE Transactions on Circuits and Systems”, “IEEE Transactions on Control Systems Technology”, “International Journal of Control”, “International Journal of Robust and Nonlinear Control”, “ASME Journal of Dynamic Systems, Measurement, and Control”, “Systems, Man, and Cybernetics”, “Mathematics of Control, Signals, and Systems”, “IEEE Transactions on Control Systems Technology”, “Journal of Guidance, Control, and Dynamics”, and major control and related conferences like ACC, CDC, ECC, IFAC, ISCAS.

**References** Professor John Doyle  
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