

## GIORDANO POLA - CV

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Last name: Pola  
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Place of birth: Chieti, Italy  
Date of birth: July 22<sup>nd</sup>, 1975

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### WORKING POSITIONS

- Assistant Professor at the Department of Electrical and Information Engineering, Center of Excellence DEWS, University of L'Aquila, Italy, October 1<sup>st</sup> 2008 - Present
- Postdoctoral Researcher at the Department of Electrical and Information Engineering, University of L'Aquila, Italy, February 1<sup>st</sup> - September 30<sup>th</sup> 2008
- Postdoctoral Researcher at the Department of Electrical Engineering, University of California at Los Angeles, USA, October 9<sup>th</sup> 2006 - December 31<sup>st</sup> 2007
- Postdoctoral Researcher at the Department of Electrical and Information Engineering, University of L'Aquila, Italy, April 1<sup>st</sup> 2005 - September 31<sup>st</sup> 2006
- External Collaborator at the Department of Electrical and Information Engineering, University of L'Aquila, Italy, May 25<sup>th</sup> 2004 - September 25<sup>th</sup> 2004
- Assistant Researcher at the University of Twente, The Netherlands, October 1<sup>st</sup> 2003 - December 31<sup>st</sup> 2003
- External Collaborator at the Center of Excellence DEWS, University of L'Aquila, Italy, September 2002 - September 2003

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### VISITING POSITIONS

- Department of Electrical Engineering , University of California at Los Angeles, USA, February 22<sup>nd</sup>-April 25<sup>th</sup> 2009
- Department of Applied Mathematics, University of Twente, The Netherlands, September 6<sup>th</sup> -December 11<sup>th</sup> 2004, Research Fellow
- Engineering Department, University of Cambridge, UK, October - November 2002 and February 2003, Visiting Scholar

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### EDUCATION

- PhD Degree in Electrical Engineering and Computer Science, June 11<sup>th</sup> 2004, Department of Electrical and Information Engineering, University of L'Aquila, Italy, Thesis: 'Switching Systems: Analysis and Control' , Research Advisor: Prof. Maria D. Di Benedetto, Research Co-Tutor: Prof. Elena De Santis
- Laurea Degree in Electronic Engineering, summa cum laude, July 21<sup>st</sup> 2000, Department of Electrical and Information Engineering, University of L'Aquila, Italy, Thesis: 'Control of switching systems: approximation of invariant sets', Research Advisor: Prof. Maria D. Di Benedetto, Research Co-Tutor: Prof. Elena De Santis

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### RESEARCH INTERESTS

My research interests focus on modeling, analysis and control of embedded and hybrid systems. The main focus of the current research is on the integration of non-idealities of the process and of the controller in the control design of continuous and hybrid systems

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## PROFESSIONAL AND EDITORIAL ACTIVITIES

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- IEEE member
- Member of the Program Committee of the International Workshop Hybrid Systems: Computation and Control 2009
- Co-Chair of the Regular Session Modeling and Control of Hybrid Systems, 46th IEEE Conference on Decision and Control, New Orleans, USA, December 12<sup>th</sup> - 14<sup>th</sup> 2007
- Chair of the Regular Session: Stochastic Optimal Control I, 45th IEEE Conference on Decision and Control, San Diego, USA, December 12<sup>th</sup> - 15<sup>th</sup> 2006
- Reviewer (2002 - present) of IEEE Transaction on Automatic Control, SIAM Journal on Control and Optimization, Automatica, Systems & Control Letters, International Journal of Robust and Nonlinear Control, International Journal of Control and various international conferences and workshops

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## COLLABORATIONS

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- Academic Institutions: Alessandro Abate (Delft University of Technology, The Netherlands), Luca Benvenuti (University La Sapienza of Rome, Italy), Alessandro Borri (University of L'Aquila, Italy), Manuela Bujorianu (University of Manchester, UK), Alessandro D'Innocenzo (University of L'Aquila, Italy), Maria D. Di Benedetto (University of L'Aquila, Italy), Elena De Santis (University of L'Aquila, Italy), Stefano Di Gennaro (University of L'Aquila, Italy), Antoine Girard (Université Joseph Fourier, France), Giovanni Girasole (University of L'Aquila, Italy), John Lygeros (ETH, Switzerland), Manuel Mazo, Jr. (University of California at Los Angeles, USA), Pierdomenico Pepe (University of L'Aquila, Italy), Alessandro Petriccone (University of L'Aquila, Italy), Jan W. Polderman (University of Twente, The Netherlands), Claudia Rinaldi (University of L'Aquila, Italy), Fortunato Santucci (University of L'Aquila, Italy), Shankar Sastry (University of California at Berkeley, USA), Paulo Tabuada (University of California at Los Angeles, USA), Arjan J. van der Schaft (University of Groningen, The Netherlands), Majid Zamani (University of California at Los Angeles, USA), Oliver Watkins (University of Cambridge, UK)
- Companies and Research Institutions: Gianni Pola (Crédit Agricole Asset Management SGR, Milan, Italy), Andrea Balluchi (PARADES, GEIE, Rome, Italy)

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## SEMINARS

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- Symbolic models for nonlinear control systems, given at the European Embedded Control Institute (EECI) Seminars Series 2008, University of L'Aquila, Italy, January 24<sup>th</sup> 2008
- Symbolic models for nonlinear control systems, given at the UCLA Systems, Dynamics and Control (SyDyc) Seminars Series 2007, University of California at Los Angeles, USA, October 19<sup>th</sup> 2007
- On-the-fly synthesis of correct-by-design embedded control software, given at the Electrical Engineering Annual Research Review, University of California at Los Angeles, USA, February 16<sup>th</sup> 2007
- Structural Properties in Analysis and Control of Hybrid Systems, given at the University of Notre Dame, Indiana, USA, April 3<sup>rd</sup> 2006
- Achievable bisimilar behaviour of abstract state systems, given at the University of California at Berkeley, USA, December 6<sup>th</sup> 2005
- Equivalence of Switching Linear Systems by Bisimulation, given at the CWI, Amsterdam, The Netherlands, November 17<sup>th</sup> 2004

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## TEACHING EXPERIENCE

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Teaching experience in the Department of Electrical and Information Engineering, University of L'Aquila

Lecturer in:

- Networked Embedded Control, Academic Year: 2007/2008, For: Master in Tecnologie, Applicazioni e Servizi in Reti Eterogenee (Technologies, Applications and Services in Heterogeneous Networks)
- Fondamenti di Automatica (Elements of Linear Systems Theory), Academic Year: 2008/2009-2009/2010, For: Bachelor Degree in Electrical Engineering, Master Degree in Ingegneria dei Sistemi

Energetici (Energetic Systems Engineering), Master Degree in Progettazione e Sviluppo del Prodotto Industriale (Industrial Product Design and Development)

Co-Lecturer in:

- Sistemi Embedded (Embedded Systems), Academic Year: 2008-2009

## PUBLICATIONS

Journal Papers :

- Approximately bisimilar symbolic models for incrementally stable switched systems, Girard, A., Pola, G., Tabuada, P., IEEE Transaction on Automatic Control, 55(1):116-126, January, 2010.
- A structural approach to detectability for a class of hybrid systems, De Santis, E., Di Benedetto, M.D., Pola, G., Automatica, 45(5):1202-1206, 2009
- Symbolic models for nonlinear control systems: Alternating approximate bisimulations, Pola, G., Tabuada, P., SIAM Journal on Control and Optimization, 48(2):719-733, 2009
- Approximately bisimilar symbolic models for nonlinear control systems, Pola, G., Girard A., Tabuada, P., Automatica, 44(10):2508-2516, October 2008
- Stabilizability of linear switching systems, De Santis, E., Di Benedetto, M.D., Pola, G., Nonlinear Analysis, Special Issue Hybrid Systems 2 (2008) 750-764
- Digital Idle Speed Control of Automotive Engine: A Safety Problem for Hybrid Systems, De Santis, E., Di Benedetto, M.D., Pola, G., Nonlinear Analysis, Special Issue Hybrid Systems and Applications, 65 (2006) 1705-1724
- Equivalence of Switching Linear Systems by Bisimulation, Pola, G., Van der Schaft, A.J., Di Benedetto, M.D., International Journal of Control, 79, 74-92, January 2006

Book Chapters:

- Observability of linear switched systems, De Santis, E., Di Benedetto, M.D., Pola, G., Handbook of Hybrid Systems Control, Theory, Tools, Application, J. Lunze and F. Lamnabhi-Lararrigue, Eds., Cambridge University Press, 2009, pp. 106-112.
- Approximately bisimilar symbolic models for Incrementally Stable Switched Systems, Girard, A., Pola, G., Tabuada, P., Hybrid Systems: Computation and Control 2008, M. Egerstedt and B. Mishra, Eds., Volume no. 4981 in Lecture Notes on Computer Information Sciences, Springer Verlag, pp. 201-214
- The Concepts of Deadlock and Livelock in Hybrid Control Systems, Abate, A., D'innocenzo, A., Pola, G., Sastry, S., Di Benedetto, M.D., Hybrid Systems: Computation and Control 2007, A. Bemporad, A. Bicchi and G. Buttazzo Eds., Volume no. 4416 in Lecture Notes on Computer Information Sciences, Springer Verlag, pp. 628-632, (Short Paper)
- Stabilizability of affine switching systems: A Kalman-like approach, De Santis, E., Di Benedetto, M.D., Pola, G., F. Lamnabhi-Lagarrigue, S. Laghrouche, A. Loria, and E. Panteley, Eds., International Scientific & Technical Encyclopedia (ISTE), London, 2006, pp. 263-276
- Positive switching systems, De Santis, E., Pola, G., Positive Systems: Theory and Applications (POSTA 2006), C. Commault and N. Marchand Eds., Volume no. 341 in Lecture Notes on Control and Information Sciences, Springer Verlag, pp. 49 - 56
- Critical Observability of a Class of Hybrid Systems and Application to Air Traffic Management, De Santis, E., Di Benedetto, M.D., Di Gennaro, S., D'Innocenzo, A., Pola, G., Stochastic Hybrid Systems: Theory and Safety Critical Applications, H.A.P. Blom and J. Lygeros Eds., Volume no. 337 in Lecture Notes on Control and Information Sciences, Springer Verlag, pp. 141 - 170
- Approximations of maximal controlled safe sets for hybrid systems, Berardi, L., De Santis, E., Di Benedetto, M.D., Pola, G., Nonlinear and Hybrid Systems in Automotive Control, R. Johansson and A. Rantzer Eds., Springer Verlag, London, 2003, pp. 335 - 349

Peer Reviewed Conference Papers:

- A symbolic model approach to the digital control of nonlinear time-delay systems, Pola, G., Pepe, P., Di Benedetto, M.D., Tabuada, P., Accepted for publication to the 48th IEEE Conference on Decision and Control and 28th Chinese Control Conference, Shanghai, China, December 2009

- Symbolic models for nonlinear control systems affected by disturbances, Pola, G., Tabuada, P., Proc. of 47th IEEE Conference on Decision and Control, Cancun, Mexico, December 2008, pp. 251-256
- Symbolic models for nonlinear control systems using approximate bisimulations, Pola, G., Girard A., Tabuada, P., Proc. of 46th IEEE Conference on Decision and Control, New Orleans, USA, December 2007, pp. 432-437
- Symbolic models for linear control systems with disturbances, Pola, G., Tabuada, P., Proc. of 46th IEEE Conference on Decision and Control, New Orleans, USA, December 2007, pp. 4643-4647
- Observability of discrete-time linear switching systems, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of the First IFAC Workshop on Dependable Control of Discrete Systems, June 13th - 15th 2007, Cachan, Paris, France
- Observability of Internal Variables in Interconnected Switching Systems, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of the 45th IEEE Conference on Decision and Control (CDC'06), San Diego, USA, December 12th - 15th 2006, pp. 4121 – 4126
- Optimal Dynamic Asset Allocation: A Stochastic Invariance Approach, Pola, G., Pola, G., Proc. of the 45th IEEE Conference on Decision and Control (CDC'06), San Diego, USA, December 12th - 15th 2006, pp. 2589 – 2594
- Stabilizability based state space reductions for hybrid systems, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of the 2nd IFAC Conference on Analysis and Design of Hybrid Systems (ADHS 2006), Alghero, Italy, June 7th - 9th , 2006
- Detectability based state space reductions for hybrid systems, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of 17th International symposium on Mathematical Theory of Network and Systems, Kyoto, Japan, July 24th – 28th , 2006
- A Theoretical Framework for Control over Wireless Networks, Di Benedetto, M.D., D'Innocenzo, A., Pola, G., Rinaldi, C., Santucci, F., Proc. of 17th International symposium on Mathematical Theory of Network and Systems, Kyoto, Japan, July 24th – 28th , 2006
- Invariance in Stochastic Dynamical Systems, Pola, G., Lygeros, J., Di Benedetto, M.D., Proc. of 17th International symposium on Mathematical Theory of Network and Systems, Kyoto, Japan, July 24th – 28th, 2006
- Achievable bisimilar behaviour of abstract state systems, Pola, G., Van der Schaft, A.J., Di Benedetto, M.D., Proc. of the Joint 44th IEEE Conference on Decision and Control and European Control Conference (CDC-ECC'05), Seville, Spain, December 12th - 15th 2005, pp. 1535-1540
- Digital control of continuous-time switching systems with safety constraints, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of the 43rd IEEE Conference on Decision and Control (CDC 04), Paradise Island, Bahamas, USA, December 14th - 17th 2004, pp. 1878-1883
- Bisimulation Theory for Switching Linear Systems, Pola, G., Van der Schaft, A.J., Di Benedetto, M.D., Proc. of the 43rd IEEE Conference on Decision and Control (CDC 04), Paradise Island, Bahamas, USA, December 14th - 17th 2004, pp. 1406-1411
- Balancing dwell times for switched linear systems, Pola, G., Polderman, J.W., Di Benedetto, M.D., Proc. of the 16th International symposium on Mathematical Theory of Networks and Systems (MTNS 04), Leuven, Belgium, July 5th -9th 2004
- Can linear stabilizability analysis be generalized to switching systems?, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of the 16th International symposium on Mathematical Theory of Networks and Systems (MTNS 04), Leuven, Belgium, July 5th – 9th 2004
- Structural discrete state space decompositions for a class of hybrid systems, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of the Mediterranean Conference on Control and Automation (MED 04), Kysadasi, Aydin, Turkey, June 6th – 9th 2004
- On Observability and Detectability of continuous-time Switching Linear Systems, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of the 42nd IEEE Conference on Decision and Control (CDC'03), Maui, Hawaii, USA, December 9th – 12th 2003, pp. 5777-5782
- Safety and stabilizability conditions for switching linear systems, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of the 14th International Workshop on Operator Theory and Applications (IWOTA 03), Cagliari, Italy, June 24th-27th, 2003

- Stochastic Hybrid Models: An Overview, Pola, G., Bujorianu, M.L., Lygeros, J., Di Benedetto, M.D., Pola, G., Proc. of Analysis and Design of Hybrid System, (ADHS 03), St. Malo, France, June 16th - 18th 2003, pp. 45 - 50
- Engine idle speed control via maximal safe-set computation in the crank-angle domain, Balluchi, A., Benvenuti, L., Berardi, L., De Santis, E., Di Benedetto, M.D., Girasole, G., Pola, G., Proc. of the IEEE International Symposium of Industrial Electronics (IEEE-ISIE 02), L'Aquila, Italy, July 8th-11th 2002, pp. 618 - 622
- Equivalence entre stabilisabilité et sécurité pour les systèmes à commutation, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of Conference Internationale Francophone d'Automatique (CIFA 02), Nantes, France, July 8th - 10th 2002, pp. 337 - 341
- Approximations of the maximal controlled invariant set for a continuous time linear system, De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of American Control Conference (ACC 02), Anchorage, Alaska, USA, May 8th - 10th 2002, pp. 1216 - 1221
- Approximations of maximal controlled safe sets for hybrid systems, Berardi, L., De Santis, E., Di Benedetto, M.D., Pola, G., Workshop on Hybrid Control and Automotive Applications, Berlin, June 7th-8th 2001
- Controlled safe sets for continuous time linear systems, Berardi, L., De Santis, E., Di Benedetto, M.D., Pola, G., Proc. of European Control Conference (ECC 01), Porto, Portugal, September 4th - 7th 2001, pp. 803 - 808

Theses:

- Switching Systems: Analysis and Control, PhD Thesis, Research Advisor: Prof. Di Benedetto M.D., Co-Tutor: Prof. De Santis, E., June 11th 2004, L'Aquila, Italy
- Controllo di sistemi a commutazione: approssimazione di insiemi invarianti, (Control of switching systems: approximation of invariant sets), Master Thesis, Research Advisor: Prof. Di Benedetto, M.D., Co-Tutor: Prof. De Santis, E., July 21st 2000, L'Aquila, Italy (In Italian)

