

ANNALISA SCACCHIOLI

Work Address

School of Aerospace Engineering
Georgia Institute of Technology
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SUMMARY OF TECHNICAL SKILLS

- **Analysis:** stability analysis, parameter and system identification, sensitivity analysis
- **Modeling:** nonlinear ordinary differential equations; hybrid dynamical systems
- **Control:** linear and nonlinear feedback control, model-based diagnostics, reachability analysis
- **Laboratory:** testing and data acquisition for parameter identification and algorithm validation purpose in energy storage system, multi-phase electrical machines and electromagnetic actuators laboratories, including some experience with hardware-in-the-loop engine control systems
- **Programming:** C, Matlab, Fortran
- **Writing:** strong experience writing and managing projects, proposals, and grants with federal agencies (US DoD, US DoT, US NSF) and industrial partners (Ford, GM)
- **Knowledge:** strong knowledge of problems related to the automotive and transportation field (safety, energy and environment).

EDUCATION

Postdoctorate, Vehicle Mechanics and Controls

Georgia Institute of Technology, Department of Aerospace Engineering
Research topic: Vehicle dynamics and control during abnormal driving conditions

2008-today
Atlanta, Georgia

Postdoctorate, Systems Engineering

University of California at Berkeley, Department of Civil and Env. Engineering
Research topic: Prediction of uncertainty propagation in hybrid simulations

2007-2008
Berkeley, California

Postdoctorate, Automotive Engineering

The Ohio State University, Department of Mechanical Engineering
Research topic: Diagnosis of electrical vehicles

2005-2006
Columbus, Ohio

Doctorate of Philosophy, Electrical Engineering and Computer Sciences

University of L'Aquila, Department of Electrical Engineering
Area of study: Modeling and control of automotive systems
Dissertation: *Hybrid Regulation of Electromagnetic Valves in Automotive Systems*

May 2005
L'Aquila, Italy

“Laurea” Degree (B.S. and M.S., 5 years degree), Electrical Engineering

University of L'Aquila, Department of Electrical Engineering
Area of study: Automatic controls and robotics
Dissertation: *Observer Design for Driveline Dynamics* (in Italian)

July 2000
L'Aquila, Italy

RESEARCH INTERESTS

Broad area of multidisciplinary physics-mathematical modeling, advanced control and diagnostic algorithms applied to complex-engineered systems, with focus on automotive and transportation systems for improving their impact in terms of energy, safety and environment. Current specific topics include: transportation electrification, including energy storage systems, advanced vehicle propulsion systems and vehicle active safety systems.

RESEARCH EXPERIENCE

Georgia Institute of Technology

Postdoctoral Researcher, School of Aerospace Engineering

Atlanta, Georgia

April 2008-present

- Conducted research on rally drivers-inspired ground vehicle active safety control systems during maneuvers in environments with loose surfaces and at high-speed under the supervision of Professor Panagiotis Tsiotras and in collaboration with Ford Motor Company (Ford Research and Innovation Center, Dearborn, Michigan) and US Army (Cold Regions Research and Engineering, Hanover, New Hampshire).
- Research projects funded by 1) the US NSF (National Science Foundation) through the GOALI (Grant Opportunities for Academic Liaison with Industry) research program, by 2) the Ford Motor Company under the URP (University Research Program) research program and by 3) the US Army under the SAVE (Synthetic Automotive Virtual Environments) program.
- Developed an inversion-model-based feed-forward control for controlling vehicle posture for crash mitigation.
- Developed a flatness-based feed-forward control algorithms for ground vehicles during extreme maneuvers for crash mitigation and obstacle avoidance.
- Developed nonlinear feedback control algorithm for traction force of active vehicle safety systems for high-speed vehicles over a low friction surface.
- Analyzed state-of-the-art research on transportation systems (including traffic signal control, traffic flow models, driver models and driver-in-the-vehicle systems) in terms of their impact on safety and congestion.
- Served as collaborator/co-author in reporting final researches developed in a project, led by Professor John-Paul Clarke, in collaboration between Georgia Institute Technology (GaTech), Southern California Tracon (SCT) and Federal Aviation Administration (FAA) for the application of Continuous Descent Arrival (CDA) for aircrafts arriving at Los Angeles international airport (LAX) in order to reduce the environmental impact of aircraft operations, while improving safety and efficiency of aerial transportation; the first publicly-charted CDA procedure was implemented at LAX on December 20, 2007 and it has been showed that CDA at LAX annually saves 2 million gallons of jet fuel and mitigates 41 million pounds of Carbon Dioxide.
- Served as a collaborator for two Ford-URP (University Research Program) research proposals preparation on advanced brake controls for active safety systems for improving accident avoidance performances and on advanced controls for the driver interfacing with vehicle.
- Served as GaTech leader/collaborator for two US DOT-FHWA (US Department of Transportation-Federal Highway Administration) proposals on multi-scale traffic flow modeling an integrated transportation architecture for active safety and traffic management.
- Served as a collaborator for two NSF-CPS (National Science Foundation-Cyber-Physical Systems) proposals on an unified control treatment for cyber-physical automotive transportation systems.
- Served as a collaborator/writer for a DARPA (Defense Advanced Research Projects Agency) proposal preparation, under the META program, on integration, manufacturing and verification of Cyber-Physical Systems with application to air and ground vehicles, as part of research collaboration between Georgia Institute of Technology, Massachusetts Institute of Technology, Northeastern University, Rockwell-Collins, Aurora.

- Point of contact with our industrial partners (Ford Motor Company, Mechanical Simulation Corporation, SimCraft Corporation, Vehicle Control Training, Southeastern Engineering): worked with faculty to prepare and coordinate meetings or teleconferences about the sponsored research program or in preparation of proposals for new research programs.

University of California at Berkeley

Berkeley, California

Postdoctoral Researcher, Civil and Environmental Engineering

January 2007-March 2008

- Conducted research, in collaboration with Professor Bozidar Stojadinovic at the EERC (Earthquake Engineering Research Center) and with Professor Alexandre M. Bayen at the LSSL (Lagrangian Sensor Systems Laboratory) on reachability-based approaches for examining the response of structural systems to seismic excitation during specific experimental tests (hybrid-dynamical simulations); project funded by the G. E. Brown Jr. NEES (Network for Earthquake Engineering Simulation) through the NSF (National Science Foundation).
- Developed an ellipsoidal reachability-based tool for evaluating the stability and error bounds of the experimental hybrid simulation process for evaluating the response of single-degree-of-freedom structural systems, in the presence of disturbances and uncertainties on the inputs and on the initial conditions, to seismic excitations.
- Extended the ellipsoidal reachability-based tool for evaluating the stability and error bounds of the hybrid simulation process for evaluating the response of single-degree-of-freedom structural systems under earthquake excitation to multi-degree-of-freedom structural systems affected by disturbances and uncertainties on the inputs and on the initial conditions.
- Analyzed state-of-the-art research on reachability analysis theory for linear and nonlinear systems affected by parametric uncertainty and disturbances.

The Ohio State University

Columbus, Ohio

Postdoctoral Researcher, Center for Automotive Research

June 2005-December 2006

- Conducted research on diagnostics and prognostics of automotive electrical systems with Professor Giorgio Rizzoni in a joint project between General Motors Corporation (GM R&D, Warren, Michigan) and the Center for Automotive Research.
- Developed and experimentally validated physics-based mathematical models and simulators of automotive electrical systems, including multi-phase electrical machines and electrochemical batteries.
- Developed and partially experimentally validated diagnostics and prognostics algorithms for onboard integration of the modeled power generator and storage automotive systems following a model-based and hierarchical approach.
- Supervised the design of model-based diagnostic algorithms for engines under speed control.
- Supervised the design of model-based diagnostic algorithms for lead-acid battery in automotive electrical systems.
- Analyzed state-of-the-art research on model-based diagnostics with adaptive threshold design and methods for prognostic.
- Served as a collaborator for a NSF-GOALI (National Science Foundation-Grant Opportunities for Academic Liaison with Industry) proposal writing on adaptive threshold approach for model-based fault diagnosis and prognostic methods for automotive energy storage systems as part of research collaboration between The Ohio State University, Clemson University and General Motors Corporation.
- Point of contact with our industrial partner (General Motors Corporation): worked with faculty, technical staff and students to prepare and coordinate weekly team teleconferences about the sponsored research program for the benefit of our industrial partner.

University of L'Aquila

Graduate Research Assistant, Electrical Engineering

L'Aquila, Italy

March 2001-March 2005

- Doctoral thesis as part of research collaboration between the Center of Excellence DEWS (Design methodologies for Embedded controllers, Wireless interconnect and System-on-chip) at the University of L'Aquila and Magneti-Marelli Powertrain (Bologna, Italy) under the supervision of Professor Maria D. Di Benedetto and Professor Stefano Di Gennaro.
- Developed and experimentally validated physics-based mathematical models of actuators for electromagnetic valves for gasoline camless engine (at the R&D Center of Magneti-Marelli Powertrain, Bologna, Italy).
- Developed and validated, through numerical simulations, a nonlinear feedback control algorithm, based on the nonlinear output regulation, for the "soft landing" of the electromagnetic valves on the valve seats.
- Developed hybrid models of electromagnetic valve actuators in order to propose a formulation of the valve "soft landing" as a hybrid regulation problem in light of a benchmark problem for a new theoretical framework for the control theory.

PARADES Laboratories

Visiting Undergraduate Student Researcher

Rome, Italy

January-July 2000

- Conducted research for my *laurea's* thesis as part of Professor Alberto Sangiovanni-Vincentelli's research team at PARADES (Project for Advanced Research of Architecture and Design of Electronic Systems) laboratories (a European Group funded by Cadence, Magneti-Marelli Powertrain and ST Microelectronics) in a joint project with Magneti-Marelli Powertrain (Bologna, Italy) and University of L'Aquila, under the supervision of Professor Maria D. Di Benedetto and of Dr. Andrea Balluchi.
- Developed a hybrid observer for driveline dynamics based on experimentally validated physical-based mathematical models developed by Magneti-Marelli Powertrain.
- Results of research served as framework for a new hybrid observer design method devised by the University of L'Aquila and PARADES and as part of implemented software in Electronic Control Unit (ECU) of *Diesel Multijet* Engine by Magneti-Marelli Powertrain.

INDUSTRY EXPERIENCE

Ford Motor Company

Visiting Researcher, Ford Research and Innovation Center

Dearborn, Michigan

Sept. 2008, May-August 2010

- Integration and validation of the vehicle posture control system algorithm for crash mitigation and obstacle avoidance (planned for May-August 2010).
- Proposed future vehicle control strategies for crash avoidance with vehicle-driver dynamics integration (September 2008).

Magneti-Marelli Powertrain

Control Systems Engineer, R&D Diesel Engine Division

Bologna, ITALY

October 2002-April 2004

- Produced software control for the *Diesel Multijet* Engine for Fiat, Opel and Suzuki under research collaboration among Magneti-Marelli Powertrain (Bologna, Italy), Fiat-GM Powertrain (Torino, Italy) and Fiat Research Center (Orbassano, Italy).
- Developed control algorithms for different parts of engine control (exhaust gas recirculation valve, fuel multi-injection) and for auxiliary components (air conditioning, cooling fan, alternator, pump and spark plugs) and studied their interactions.

Daimler-Chrysler

Resident Engineer for Magneti-Marelli Powertrain

Stuttgart, GERMANY

September 2002

- Supervised testing of software for valve control application in mechanical laboratory.

Magneti-Marelli Powertrain

Control Systems Engineer, R&D Gasoline Engine Division

Bologna, ITALY

November 2000-August 2002

- Conducted research for IVC (Innovative Valve Control) project for Gasoline Camless Engine as part of collaboration between Magneti-Marelli Powertrain (Bologna, Italy) and Daimler-Chrysler (Stuttgart, Germany).
- Performed numerical simulations and experimental validation for modeling and control algorithms design of electromagnetic valve' actuators for gasoline cam-less engines in order to improve their impact in terms of consumption and gas emissions with respect to the standard gasoline engines.

PATENTS

A. Scacchioli, J. Lu, P. Tsiotras, and E. Velenis, "An active safety system using vehicle posture control for mitigating severe accidents ," *US Patent* with Ford Motor Company, in preparation, May 2010.

A. Scacchioli, G. Gaviani, M. D. Di Benedetto and S. Di Gennaro, "Control strategy of an electromagnetic valve actuator for gasoline camless engines," *Italian Patent* no. B02005A000209, assigned to Magneti-Marelli Powertrain, issued April 1, 2005, Bologna, Italy.

CONTRACTS AND GRANTS

As Principal Investigator:

- ATA (Technical Association for Automobiles) Grant for "*Laurea's* thesis on automotive control systems," amount equivalents to around \$3,000, Turin, Italy, January-July 2000.

As Co-Principal Investigator:

- "GOALI: Next generation active safety control systems for crash-avoidance of passenger vehicles using expert driver knowledge," (PI: Professor P. Tsiotras, Co-PIs: Dr. J. Lu, Dr. Efstathios Velenis), US NSF, total amount \$274,000, April 2008-July 2010.
- "Model-based diagnosis design for automotive electrical systems," (PI: Professor G. Rizzoni, Co-PI: Dr. M. A. Salman), General Motors Corporation, total amount \$150,000, April 2005-December 2006.

As Member of the Team Project:

- "Advanced Control of Traffic at Intersections Operating via Networked Signals (ACTIONS)," (in preparation).
- "CPS: Medium: A unified control-theoretic treatment of automotive transportation" (PI: P. Tsiotras, co-PIs: A. Bayen, E. Feron, J. A. Laval), US NSF (submitted, March 10th, 2010).
- "An integrated transportation architecture for active safety and traffic management for the 21st century" (PI: P. Tsiotras, co-PIs: A. Bayen, E. Feron, J. A. Laval), US DOT-FHWA (submitted, June 24th, 2009).

PUBLICATIONS

Theses:

- **A. Scacchioli**, *Hybrid Regulation of Electromagnetic Valves in Automotive Systems*. Ph. D. Thesis, University of L'Aquila, *Biblioteca Nazionale di Roma* and *Biblioteca Nazionale di Firenze*, Italy, March 2005.
- **A. Scacchioli**, *Observer Design for a Driveline Dynamics*. M. Sc. Thesis, University of L'Aquila, Italy, July 21, 2000 (in Italian).

Peer-Reviewed Journal Articles:

- J.-P. Clarke, J. Brooks, H.-H. Chang-Chien, **A. Scacchioli**, W. White, G. Nagle, and S. Liu, “Continuous descent arrivals at Los Angeles International Airport,” to be submitted for publication to the *AIAA Journal of Aircraft*.
- **A. Scacchioli**, A. M. Bayen and B. Stojadinović, “Propagation of uncertainty in dynamics of structures using reachability analysis - PART II: multi-degree-of-freedom systems,” to be submitted for publication to *Journal of Earthquake Engineering and Structural Dynamics* (available upon request).
- **A. Scacchioli**, A. M. Bayen and B. Stojadinović, “Propagation of uncertainty in dynamics of structures using reachability analysis - PART I: single-degree-of-freedom systems,” submitted for publication to *Journal of Earthquake Engineering and Structural Dynamics*, May 2010 (available upon request).
- **A. Scacchioli**, G. Rizzoni, M. A. Salman, W. Li, S. Onori, X. Zhang, “Experimental implementation of an on-board-oriented model-based diagnosis for an electric power generation and storage automotive system,” submitted for publication to *ASME Journal of Dynamic Systems, Measurement, and Control*, January 11, 2010 (available upon request).

Manuscripts in Preparation:

- **A. Scacchioli**, E. Velenis, P. Tsiotras, and J. Lu, “An inversion-model-based approach for controlling vehicle posture for mitigating and avoiding collisions at the limit of handling conditions,” in preparation.
- **A. Scacchioli**, P. Tsiotras, E. Velenis and J. Lu, “A differential flatness-based vehicle posture control for collision mitigation,” in preparation.

Book Chapters:

- W. Yan, **A. Scacchioli** and G. Rizzoni, “Model-based fault diagnosis for an engine under speed control,” in *Electronic Engine Controls 2007*, SAE International, April 2007.

Peer-Reviewed Conference Proceedings:

- **A. Scacchioli**, P. Tsiotras and J. Lu, “Nonlinear-feedback traction force control with load transfer,” in *Proceedings of the 2nd ASME Dynamic Systems and Control Division Conference* (Hollywood, California), October 12-14, 2009.
- C. Whyte, **A. Scacchioli**, A. M. Bayen and B. Stojadinović, “Assessment of quality of hybrid simulation using reachability analysis,” in *Proceedings of the 14th Conference on Earthquake Engineering*, paper no. S16-02-009 (Beijing, China), October 12-17, 2008.
- **A. Scacchioli**, G. Rizzoni and P. Pisu, “Hierarchical model-based fault diagnosis of an electrical power generation automotive storage system,” (invited paper) in *Proceedings of the 26th IEEE American Control Conference*, pp. 2991-2996 (New York City, New York), July 11-13, 2007.
- **A. Scacchioli**, A. M. Bayen and B. Stojadinović, “Quality of hybrid simulation: a reachability analysis approach,” in *Proceedings of the 18th ASCE Engineering Mechanics Division Conference* (Blacksburg, Virginia), June 3-6, 2007.
- P. Pisu, W. Li, N. Picciano, G. Rizzoni, **A. Scacchioli** and M. Salman, “Fault diagnosis of lead-acid battery for an automotive electrical system,” in *SAE (Society of Automotive Engineering) Conference*, paper no. 2007-01-1475 (Detroit, Michigan), April 16-19, 2007.
- W. Yan, **A. Scacchioli** and G. Rizzoni, “Model-based fault diagnosis for an engine under speed control,” in *SAE (Society of Automotive Engineering) Conference*, paper no. 2007-01-0775 (Detroit, Michigan), April 16-19, 2007.
- **A. Scacchioli**, G. Rizzoni and P. Pisu, “Model-based fault diagnosis design for an electrical automotive system,” in *Proceedings of IMECE-ASME 2006 International Mechanical Engineering Congress and Exposition, Dynamic Systems and Control Division*, paper no. 14504 (Chicago, Illinois), November 5-10, 2006.

Technical Reports¹:

- **A. Scacchioli**, P. Tsiotras and J. Lu. *A Differential flatness-based vehicle posture control for collisions mitigation*, FORD-URP Technical Report, Daniel Guggenheim School of Aerospace Engineering, Georgia Institute of Technology, Atlanta, Georgia, January 2010.
- **A. Scacchioli**, P. Tsiotras and J. Lu. *Nonlinear-feedback traction force control with load transfer effect*, FORD-URP Technical Report, Daniel Guggenheim School of Aerospace Engineering, Georgia Institute of Technology, Atlanta, Georgia, March 2009.
- P. Pisu, **A. Scacchioli** and G. Rizzoni, *Experimental validation of diagnostic algorithms for an automotive electrical systems*, GM Technical Report CAR-GM-12-15-06, Center for Automotive Research, The Ohio State University, Columbus, Ohio, December 2006.
- **A. Scacchioli**, G. Rizzoni and P. Pisu, *Hierarchical Model-Based Fault Diagnosis of an EPGS (Electric Power Generation Storage) Automotive System,* GM Technical Report CAR-GM-09-30-06, Center for Automotive Research, The Ohio State University, Columbus, Ohio, September 2006.
- **A. Scacchioli**, G. Rizzoni and P. Pisu, *Fault Diagnosis Design of an Automotive Electrical System with Restricted Sensors Set,* GM Technical Report, Center for Automotive Research GM-05-30-06, The Ohio State University, Columbus, Ohio, May 2006.
- **A. Scacchioli**, G. Rizzoni P. Pisu and W. Li, *Fault Diagnosis Design of an Automotive Electrical System with Unrestricted Sensors Set,* GM Technical Report CAR- GM-04-28-06, Center for Automotive Research, The Ohio State University, Columbus, Ohio, April 2006.
- **A. Scacchioli**, G. Rizzoni and P. Pisu, *Fault Diagnosis Methods for Automotive Electrical Systems,* GM Technical Report CAR-GM-09-30-05, Center for Automotive Research, The Ohio State University, Columbus, Ohio, September 2005.
- **A. Scacchioli**, G. Rizzoni P. Pisu, and A. Fasih, *Models and Simulators of an Automotive Electrical System,* GM Technical Report, Center for Automotive Research CAR-GM-09-26-05, The Ohio State University, Columbus, Ohio, September 2005.

PRESENTATIONS

Invited Talks:

- *Harvard University, Department of Electrical Engineering and Computer Sciences*, Cambridge, Massachusetts, January 7th, 2010. Host: Professor R. J. Wood. “Diagnostics of automotive electrical systems.”
- *Georgia Institute of Technology, School of Aerospace Engineering*, Atlanta, Georgia, December 18th, 2007. Host: Professor P. Tsiotras. “Diagnosis of automotive electrical systems.”
- *University of Washington, Department of Aeronautic and Astronautics*, Seattle, Washington, December 3rd, 2007. Host: Professor M. Mesbahi. “Advanced control and diagnostics in automotive applications.”
- *Politecnico di Milano, Department of Electrical Engineering and Computer Sciences*, Milano, Italy, May 13th, 2005. Host: Professor M. Prandini. “Hybrid regulation of electromagnetic valves in automotive systems.”
- *University of L’ Aquila, Department of Electrical Engineering*, L’ Aquila, Italy, May 28th, 2002. Host: Professor M. D. Di Benedetto. “Designing a digital control for gasoline camless engine.”

¹All listed reports are available upon request.

Industry and Government Talks:

- *John A. Volpe National Transportation Systems Center, Research and Innovative Technology Administration, US Department of Transportation, Cambridge, Massachusetts, January 23rd, 2009.* Host: Dr. Wassim G. Najm. “Automotive control applications: cam-less engines, electrical vehicles, vehicle active safety and vehicular networks.”
- *Ford Motor Company, Ford Research and Innovation Center, Dearborn, Michigan, September 3rd, 2008.* Host: Dr. J. Lu. “Active safety for automotive applications using expert driver knowledge.”

Internal Seminars:

- *Georgia Institute of Technology, Department of Aerospace Engineering, Atlanta, Georgia, January 9, 2009:* talk on “Overview on modeling and control of traffic flow in transportation systems.”
- *Georgia Institute of Technology, Department of Aerospace Engineering, Atlanta, Georgia, June 27, 2008:* talk on “Robust nonlinear feedback control of optimal traction force distribution in racing cars.”
- *University of California at Berkeley, Department of Civil and Environmental Engineering, Berkeley, California, September 6, 2007:* talk on “Dynamics of structures under seismic excitation using reachability analysis.”
- *University of California at Berkeley, Department of Civil and Environmental Engineering, Berkeley, California, March 7, 2007:* talk on “Reachability analysis for hybrid simulations in earthquake engineering.”
- *The Ohio State University, Center for Automotive Research, Columbus, Ohio, October 17, 2006:* talk on “Hierarchical model-based diagnosis for automotive applications.”
- *The Ohio State University, Center for Automotive Research, Columbus, Ohio, November 22, 2005:* talk on “Diagnosis design for automotive electrical systems.”
- *University of L’Aquila, Department of Electrical Engineering, L’Aquila, Italy, May 6, 2004:* talk on “Nonlinear feedback control of electromagnetic valves for cam-less engines.”

Conference and Workshop Presentations:

- *2nd ASME Dynamic Systems and Control Division Conference, Hollywood, California, October 12-14, 2009:* “Nonlinear-feedback vehicle traction force control with load transfer.” Note: joint work with P. Tsiotras and J. Lu.
- *14th World Conference on Earthquake Engineering, Beijing, China, October 12-17, 2008:* “Assessment of quality of hybrid simulation using reachability analysis.” Note: joint work with C. Whyte, A. M. Bayen and B. Stojadinovic and presented by B. Stojadinovic.
- *2007 IEEE American Control Conference, New York City, New Jersey, USA, July 11-13, 2007:* “Hierarchical model-based fault diagnosis of an electrical power generation automotive storage system.” Note: joint work with G. Rizzoni and P. Pisu and presented by P. Pisu.
- *2007 SAE Conference, Detroit, Michigan, USA, April 16-19, 2007:* “Fault diagnosis of lead-acid battery for an automotive electrical system.” Note: joint work with P. Pisu, W. Li, N. Picciano, G. Rizzoni, A. Scacchioli and M. Salman and presented by P. Pisu.
- *2006 International Congress and Exposition on Mechanical Engineering, ASME Dynamic Systems and Control Division Conference, Chicago, Illinois, November 9, 2006:* “Model-based fault diagnosis design for an electrical automotive system.” Note: joint work with G. Rizzoni and P. Pisu.
- *2006 CAR-IAB meeting (Center for Automotive Research -Industrial Advisory Board), Eaton, Michigan, September 11th, 2006:* “Diagnosis of automotive electrical systems.” Note: joint work with G. Rizzoni and P. Pisu and presented by G. Rizzoni.

Posters:

- *ASTRI-AEIT National Congress (Associazione Scienze e Tecnologie per la Ricerca e l'Industria-Federazione Italiana di Elettrotecnica, Elettronica, Automazione, Informatica e Telecomunicazioni)*, Genoa, Italy, June 10-12, 2004: "Nonlinear regulation for electromagnetic valves in automotive systems." Note: joint work with M. D. Di Benedetto and S. Di Gennaro.
- *CIRA National Congress (Centro Interuniversitario per le Ricerche in Automatica)*, Modena, Italy, September 10-12, 2003: "Nonlinear control for the management of electromagnetic valves for camless engines." Note: joint work with M. D. Di Benedetto and S. Di Gennaro.

TEACHING INTERESTS

System dynamics and control, nonlinear feedback control, adaptive control, technology of control systems, system theory, diagnosis of mechatronic systems, modeling and simulation, vehicle dynamics and control, power-train dynamics, modeling and control of electrical energy storage systems.

TEACHING EXPERIENCE

The Ohio State University

Columbus, Ohio

Teaching Assistant, Mechanical Engineering Department

January-March 2006

- Assigned to the graduate level-course *ME874 Fault Diagnosis for Mechatronic Systems* (Professor Giorgio Rizzoni) for 2006 winter quarter.
- Expanded course material, redacted and updated lecture notes and prepared and graded homework.
- Assisted students with their homework and in the development of final research projects.

University of L'Aquila

L'Aquila, Italy

Electrical Engineering Department

April 2004-February 2005

- Gave some recitations and guest lectures for the undergraduate-level courses *Automatic Controls* and *Technology of Control Systems* (Professors M. D. Di Benedetto, E. De Santis, S. Di Gennaro).
- Specific topics included: hybrid observers in automotive systems (February 9, 2005), Bode's diagrams (October 22, 2004), examples of hybrid system models (June 4, 2004), examples of real-time control systems (June 4, 2004), modeling and control in automotive applications (May 6, 2004).

MENTORING EXPERIENCE

Georgia Institute of Technology

Atlanta, Georgia

Postdoctoral Researcher, School of Aerospace Engineering

April 2008-present

- Coordinated bi-weekly group research meetings with three PhD Students involved in research on vehicle dynamics and control, while they gave informal talks about relevant literature in the field for their benefit but also for the benefit of other students (February 2010-present).
- Co-advised graduate student (with Professor Panagiotis Tsiotras): Zhao Yiming on "Reachability analysis approach for aircraft landing in safety-critical conditions" (May-September 2008).

University of California at Berkeley

Berkeley, California

Postdoctoral Researcher, Civil and Environmental Engineering

January 2007-March 2008

- Co-advised students (with Professor Alexandre M. Bayen): ME PhD Candidate Benjamin T. Fine on "Reachability analysis for hybrid simulations" and MS CEE Student Matthew Vaggione on "Reachability analysis for hybrid simulations" (August-December 2007) in preparation of the final project of the course *CE291F-ME236-EE291c: Control and Optimization of Distributed Parameters Systems* during the 2007 Fall Semester.

- Co-advised students (with Professor Bozidar Stojadinovic): MS Student from *École Polytechnique* of Paris Franklin Gedalof on “Experimental validation of dynamics of structure under dynamical loads using the shaking table technique”(April-June 2007).

The Ohio State University

Postdoctoral Researcher, Center for Automotive Research

Columbus, Ohio

June 2005-Dec. 2006

- Co-advised students (with Professor Giorgio Rizzoni): BS ECE Student Ahmed Fasih on “Modelling and Fault Diagnosis of Automotive Lead-Acid Batteries (June 2005-May 2006) and PhD ECE Student Wenguang Yan on “Model Based Fault Diagnosis for Engine under Speed Control” (January-March 2006).

ACADEMIC SERVICE

University of California at Berkeley

LSSL Student Seminar Series 2007-2008, Systems Engineering

Civil and Environmental Engineering Department

Berkeley, California

April 2007-March 2008

- Coordinated a weekly LSSL (Lagrangian Sensor Systems Laboratory) laboratory seminar series related to research developed under the Systems Engineering program at the Department of Civil and Environmental Engineering.
- Worked with PhD and MS students while they gave informal talks about their respective research for their benefit but also for the benefit of the students and visitors involved in the laboratory’s activities.

PROFESSIONAL SERVICE

Technical Committee (TC) Member:

- Automotive Controls TC of the Institute of Electrical and Electronics Engineers Dec. 2009-present
- Automotive Control TC of the International Federation of Automatic Control July 2005-present

Technical Committee (TC) Meetings:

- ASME Automotive and Transportation Hollywood, California, Oct. 2009
- ASME-IMECE Automotive and Transportation Chicago, Illinois, Nov. 2006

Reviewer Activities:

- Journal referee:
 - *ASME Journal of Dynamic Systems, Measurement and Control* 2006-2007
 - *IEEE Transaction on Automatic Control* 2006-2007
 - *IEEE Transaction on Control Systems Technology* 2006-2007
 - *IFAC Automatica* 2008
 - *IFAC Control Engineering Practice* 2009-2010
 - *IJVAS International Journal of Vehicle Autonomous Systems* 2009
 - *IMA Journal of Mathematical Control and Information* 2009
 - *Vehicle System Dynamics* 2009-2010
- Conference referee:
 - *ASME DSCC Dynamic Systems and Control Conference* 2009
 - *ASME International Congress and Exposition on American Society of Mechanical Engineering* 2006
 - *IEEE ACC American Control Conference* 2007
 - *IEEE CDC Conference on Decision and Control* 2007-2010
 - *IEEE SMC Conference on Systems, Man, and Cybernetics* 2009-2010
 - *IFAC Symposium on Advances in Automotive Control* 2010
 - *SAE Society of Automotive Engineers World Congress* 2005-2006

PROFESSIONAL DEVELOPMENT

Georgia Institute of Technology **Atlanta, Georgia**
NSF Summer School on Cyber-Physical Systems **June 22-26, 2009**

- Lectures include: Formal Methods, Distributed and Embedded Systems, Networked Control Systems, Embedded Software, Scheduling, Platforms and Applications.

University of Patras **Patras, Greece**
HYBRIDGE Summer School on Hybrid Systems **September 22-24, 2004**

- Summer School on Hybrid Systems as a Formal Paradigm for Safety Critical Embedded Systems, funded by HYBRIDGE, European project on the Distributed Control and Stochastic Analysis of Hybrid Systems Supporting Safety Critical Real-Time Systems Design.

University of Bologna **Bologna, ITALY**
Advanced Courses for Ph.D. Students in Automatics **May-July, 2002**

- Lectures include: Nonlinear Control Systems I (May 30-31, 2002), Nonlinear Control System II (June 24-26, 2002), Introduction to the Combinatorial Optimization (May 14-16, 2002), Applications of the Combinatorial Optimization (July 10-12, 2002), and Multivariable Models (May 21, 2002).

Centro Interuniversitario di Ricerche in Automatica (CIRA) **Bertinoro, Forlì, ITALY**
National Doctoral School of Automatics “Antonio Ruberti” **July 2004, 2003, 2002, 2001**

- Attended special summer courses for doctoral students in automatics on Diagnosis and Fault Tolerant Control (July 15-17, 2004), Analysis and Control of Hybrid Systems (July 17-19, 2003), Analysis and Control based on Polynomial and Geometric Approach (July 15-17, 2002), Analysis and Control for Automotive Application (July 16-19, 2001) and Predictive Control (July 19-21, 2001).

AWARDS

- ASTRI-AEIT Award for “Doctoral thesis for research in automotive industry,” Milan, Italy, 2004.

ADDITIONAL INFORMATION

- **Languages:** Italian (native), English (fluent), German (advanced), French and Spanish (basic).
- **Professional skills:** Operating Systems (UNIX, LINUX, WinXP/NT/2000), Languages (Fortran, C/C++, Assembler, HTML), Toolboxes (Matlab and its toolboxes, XMath, Mathematica, Maple, SimNon, EZopt, SABER, SPICE, OpenSees, Bispec, CarSim).
- **Personal skills:** Excellent social, empathetic, communication, decision-making and leadership skills.

PROFESSIONAL AFFILIATIONS

- American Society of Mechanical Engineers (ASME)
- Institute of Electrical and Electronics Engineers (IEEE)
- International Federation of Automatic Control (IFAC)

REFERENCES

References from academia and from industria are available upon request.