

CURRICULUM VITAE

Marco Lovera

Dipartimento di Scienze e Tecnologie Aerospaziali
Politecnico di Milano

EDUCATION

PhD in Computer Science and Control Engineering, Politecnico di Milano, Milano, Italy, 1998.
MSc in Electronics Engineering, Politecnico di Milano, Milano, Italy, 1993.

PROFESSIONAL EXPERIENCE

- *January 2015-Present*: Full Professor, Dipartimento di Scienze e Tecnologie Aerospaziali, Politecnico di Milano (POLIMI), Milano, Italy. Coordinator of the Aerospace Systems and Control Laboratory (ASCL).
- *August 2011-December 2014*: Full Professor, Systems and Control Section, Dipartimento di Elettronica, Informazione e Biongegneria (DEIB), Politecnico di Milano (POLIMI), Milano, Italy.
- *January 2004-July 2011*: Associate Professor, Systems and Control Section, Dipartimento di Elettronica e Informazione (DEI), Politecnico di Milano (POLIMI), Milano, Italy.
- *August 1999-December 2003*: Assistant Professor (Ricercatore), Systems and Control Section, Dipartimento di Elettronica e Informazione, Politecnico di Milano, Milano, Italy.
- *May 1998-July 1999*: at Carlo Gavazzi Space S.p.A. (Milano, Italy), Attitude Determination and Control Specialist, Small Satellite Missions.
- *October 1993-May 1998*: Dipartimento di Elettronica e Informazione, Politecnico di Milano, Milano, Italy, Graduate Assistant (1993-1994) and PhD student (1995-1998).
- *January-May 1997*: visiting scientist at the Systems and Control Laboratory of Delft University of Technology, The Netherlands.
- *July 1992-August 1993*: intern at Westland Helicopters Ltd., Yeovil, UK.

TEACHING AND ADVISING

Current teaching activities:

- Course (80 hrs) "Estimation in Aerospace", for the MSc programs in Aeronautical Engineering and Space Engineering, Politecnico di Milano.
- Course (60 hrs) "Advanced Aerospace Control", for the MSc program in Aeronautical Engineering, Politecnico di Milano.
- Course (100 hrs) "Flight Dynamics", for the MSc program in Aeronautical Engineering, Politecnico di Milano.
- Course (25 hrs) "Identification and control for rotary-wing aircraft", for the PhD program in Aerospace Engineering, Politecnico di Milano.
- "Passion in action" course (24 hrs) "UAV Lab", for the MSc programs in Aeronautical Engineering, Space Engineering, Computer Engineering and Automation Engineering, Politecnico di Milano.

Past teaching activities - as primary instructor:

- Course (total of 50 hrs of lectures) "Fundamentals of Automatic Controls" for the Diploma di Laurea in Biomedical Engineering, Politecnico di Milano, Academic year 1999-2000.
- Course (100 hrs) "Fundamentals of Automatic Controls" for the Diploma di Laurea in Computer Engineering, Electronic and Telecommunications Engineering, Politecnico di Milano, Academic year 2000-2001.
- Course (100 hrs) "Fundamentals of Automatic Controls" for the Laurea in Computer Engineering, Electronic and Telecommunications Engineering, Politecnico di Milano, Academic year 2001-2002.

- Course (100 hrs) "Fundamentals of Automatic Controls" for the Laurea in Computer Engineering, Politecnico di Milano, Academic years 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015.
- Course (50 hrs) "Numerical methods for control engineering", for the Laurea in Automation Engineering, Academic years 2005-2006, 2006-2007, 2007-2008, 2008-2009.
- Course (50 hrs) "Advanced and multivariable control", for the Laurea Magistrale in Automation Engineering, Academic years 2010-2011, 2011-2012, 2012-2013, 2013-2014.
- Course (50 hrs) "ICT for control systems engineering", for the Laurea Magistrale in Computer Engineering, Academic years 2011-2012, 2012-2013, 2013-2014, 2014-2015.
- Course (80 hrs) "Estimation in Aerospace", for the Laurea Magistrale in Aeronautical Engineering, Academic years 2015-2016, 2016-2017, 2017-2018, 2018-2019, 2019-2020.
- Course (60 hrs) "Advanced Aerospace Control", for the Laurea Magistrale in Aeronautical Engineering, Academic years 2016-2017, 2017-2018, 2018-2019, 2019-2020.
- Course (100 hrs) "Flight Dynamics", for the Laurea Magistrale in Aeronautical Engineering, Academic years 2018-2019, 2019-2020.
- Course (25 hrs) "Nonlinear control" for the PhD School in Information Technology, Politecnico di Milano, Academic years 2004-2005, 2005-2006 and the Laurea in Computer Engineering, Academic years 2004-2005, 2005-2006, 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011.
- Course (25 hrs) "Numerical methods for identification, control and signal processing", for the PhD School in Information Technology, Politecnico di Milano, Academic years 2003-2004 and 2009-2010.
- Course (20 hrs) "LPV/LFT modelling and identification" – in cooperation with Prof. K. Poolla (UC Berkeley) - for the PhD School in Information Technology, Politecnico di Milano, Academic year 2007-2008.
- Course (25 hrs) "Identification and control for rotary-wing aircraft", for the PhD School in Rotorcraft Vehicles, Politecnico di Milano, Academic years 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2015-2016, 2016-2017, 2017-2018.

Past teaching activities - as teaching assistant:

- Lectures (12 hrs) for the course "Model identification and data analysis", given Prof. S. Bittanti at the Politecnico di Milano, Academic year 1994-1995.
- Lectures (30 hrs) for the course "Fundamentals of Automatic Controls", given by Prof. A. De Marco at the Politecnico di Milano, Academic year 1997-1998.
- Lectures (30 hrs) for the course "Fundamentals of Automatic Controls" given by Prof. A. Astolfi at the Politecnico di Milano, Academic years 1999-2000, 2000-2001, 2001-2002.
- Lectures (20 hrs) for the course "Fundamentals of Automatic Controls" given by Prof. S. Bittanti at the Politecnico di Milano, Academic years 1999-2000, 2000-2001.
- Lectures for the course "Automation in transportation systems" given by Prof. S. Bittanti at the Politecnico di Milano, Academic year 1999-2000.
- Lectures for the course "Automation in transportation systems" given by Prof. S. Savaresi at the Politecnico di Milano, Academic years 2001-2002, 2002-2003, 2003-2004, 2005-2006.

Other teaching activities:

- Short course "Fundamentals in Automatic Controls" (16 h) given at MEMC Electronic Materials (Novara, Italy) in September 1996.
- Course "Subspace identification: theory, algorithms, applications" (12 h) given in March 1998 at the Politecnico di Milano (in cooperation with S. Bittanti).
- Lectures (3 hours) for the PhD summer school on "Identification and control of LPV systems" (12 h) given in June 2006 in Eindhoven (The Netherlands) (organized by C. Scherer for the Dutch Institute of Systems and Control).
- Lectures (9 hours) for the Politecnico Postgraduate Course in Rotary Wing Technologies, February 2010 (first edition), May 2011 (second edition), January 2013 (third edition), May 2014 (fourth edition).
- Lectures (3 hours) for the 2011 International summer school of Automatic Control, on Robust Control and Linear Parameter Varying Approaches: application to vehicle dynamics, GIPSA-lab, Grenoble (France).

- Lectures (3 hours) for the 2011 ISAEA International School of Aerospace Engineering Applications, Bertinoro (Italy).
- Organiser of the 2012 SIDRA PhD Summer School on “Flight control systems”, Bertinoro (Italy).
- Lectures (3 hours) for the ESA European Student Earth Observer Summer School, Bertinoro (Italy): September 2013 edition; February 2014 edition.
- “Passion in action” course (24 hrs) “UAV Lab”, for the MSc programs in Aeronautical Engineering, Space Engineering, Computer Engineering and Automation Engineering, Politecnico di Milano, Academic years 2018-2019, 2019-2020.

Invited talks:

- Magnetic attitude control of satellites: an overview and some new results, Institute of System Dynamics and Control, DLR (Oberpfaffenhofen, Germany), 2005.
- Magnetic attitude control of spacecraft, Imperial College (London, UK), 2006.
- Optimal periodic output feedback control: theory and space applications, University of Sherbrooke (Sherbrooke, Quebec, Canada), 2008.
- LPV model identification: overview and perspectives, Identification and MOSAR working groups joint meeting (Paris, France), 2008.
- Towards automated LFT modelling and identification, TU Delft (Delft, The Netherlands), 2008.
- LPV/LFT modelling and identification: overview, applications and perspectives, plenary talk, 3èmes Journées Nationales MACS (Angers, France), 2009.
- Worst-case analysis for linear time-periodic systems: theory and application to magnetic attitude control, Institut Aéronautique et Spatial (Toulouse, France), 2009.
- Predictor-based subspace identification in continuous-time, with application to rotorcraft dynamics, Lund University (Lund, Sweden), 2013.

Thesis advising

Advisor or co-advisor of more than 100 Laurea (MSc) theses.

Advising at PhD level

(until 2012 the PhD program in Information Technology at the Politecnico di Milano required each candidate to develop at least two independent research activities, one “major”, and one “minor”; each “minor” corresponds to about 6-8 months of full time work)

PhD Theses

- *Damiana Losa*, “Station-keeping maneuver planning for geostationary satellites”, 2003-2007, PhD in Real-Time Computer Science, Robotics, Control Engineering - Ecole Nationale Supérieure des Mines de Paris, in cooperation with Alcatel Alenia Space France. Co-supervised with J.-P. Marmorat, Ecole Nationale Supérieure des Mines de Paris.
- *Tiziano Pulecchi*, “Advanced techniques for satellites modeling and attitude control”, 2005-2008, PhD in Information Technology - Politecnico di Milano.
- *Delia Desiderio*, “Guidance and control issues in planetary entry descent and landing missions”, 2008-2010, PhD in Information Technology - Politecnico di Milano.
- *Marco Bergamasco*, “Continuous-time model identification with applications to rotorcraft dynamics”, 2010-2012, PhD in Information Technology - Politecnico di Milano.
- *Fabio Riccardi*, “Identification and control of rotorcraft UAVs”, 2012-2014, PhD in Aerospace Engineering - Politecnico di Milano. Co-supervised with Prof. C. Bottasso, Politecnico di Milano.
- *Roberto Mura*, “Active control of vibrations in helicopters”, 2013-2015, PhD in Information Technology - Politecnico di Milano.
- *Farooq Haydar*, “State estimation for rotorcraft UAVs”, 2014-2017, PhD in Aerospace Engineering - Politecnico di Milano.
- *Davide Invernizzi*, “Nonlinear modelling and control for rotorcraft UAVs”, 2014-2017, PhD in Aerospace Engineering - Politecnico di Milano.

- *Pietro Panizza*, “Control of formations of multirotor UAVs”, 2014-2017, PhD in Aerospace Engineering - Politecnico di Milano.
- *Simone Panza*, “Structured flight control law design for helicopters and tiltrotors”, 2014-2017, PhD in Aerospace Engineering - Politecnico di Milano.
- *Meiliwen Wu*, “System identification, control and dynamic analysis of a small-scale compound helicopter”, to be completed by the end of 2019, PhD in Aerospace Engineering - Politecnico di Milano.
- *Mattia Giurato*, “Advanced modelling and control for multirotor UAVs”, started in 2016, to be completed by the end of 2019, PhD in Aerospace Engineering - Politecnico di Milano.
- *Gabriele Roggi*, “Autonomous Motion Planning and Pose Estimation in GNSS-denied Environment of an Unmanned Aerial System.”, started in 2019, to be completed by the end of 2022, PhD in Aerospace Engineering - Politecnico di Milano.
- *Salvatore Meraglia*, “Learning-Based Identification And Control For Aerospace Systems”, started in 2019, to be completed by the end of 2022, PhD in Aerospace Engineering - Politecnico di Milano.

“Minor” projects:

- *Andrea Ridolfi*, "Consistency of bootstrap estimates of model uncertainty in subspace identification methods", 1999.
- *Matteo Rossi*, "A multirate predictive approach to orbit control of small spacecraft", 2001.
- *Enrico Silani*, "Predictive attitude control techniques for satellites with magnetic actuators", 2001.
- *Luca Viganò*, "Numerical methods for optimal tuning of periodic static output feedback controllers", 2005.
- *Matteo Corno*, “AMS-02: Attitude Control System Design”, 2006.
- *Daniele De Vito*, "Robust LPV control for flexible spacecraft", 2007.
- *Carlo Romani*, "LPV modeling and identification for nonlinear systems", 2008.
- *Andrea Zanchettin*, “Optimisation-based design for linear control systems”, 2010.
- *Giulio Panzani*, “Identification of linear models from time domain and frequency domain data”, 2010.
- *Simone Formentin*, “Control system design for unmanned rotorcraft vehicles”, 2010.
- *Pierpaolo De Filippi*, “Specification and design of Linear Parameter-Varying control systems”, 2010.
- *Marco Bonvini*, “Continuous-time identification of grey-box models with aerospace applications”, 2011.
- *Andrea Corti*, “Advanced design techniques for attitude control of spacecraft with magnetic actuators”, 2011.
- *Andrea Dardanelli*, “Attitude control of spacecraft using Control Moment Gyros”, 2011.
- *Paolo Giani*, “LPV model identification, analysis and control of autonomic web service systems”, 2012.
- *Amir Ghalamzan Esfahani*, “Active control systems for vibration attenuation in helicopters”, 2013.
- *Daniilo Caporale*, “Global magnetic attitude control of spacecraft”, 2013.

RESEARCH AND SCHOLARLY ACTIVITIES

In the last few years the research activity has dealt mainly with two areas: **system identification** and advanced modeling and control methods for **aerospace applications**, with specific reference to helicopter dynamics, modeling and control issues in space vehicles and multirotor UAVs. More recently a new activity associated with the modeling and control of **computing systems** has been started, in cooperation with the Computer Engineering section of DEI-POLIMI and with IBM’s T.J. Watson Research Center (US) and with the support of IBM Italia.

Concerning **system identification**, I am currently active in the following areas:

- *Subspace model identification*: subspace methods have been an active area of research since the early 1990s and represent now a valid and reliable alternative to classical prediction error minimization methods, particularly when dealing with multivariable problems. Current work is exploring the issues related with the use of subspace model identification methods of the so-called predictor-based type to the estimation of state space models for continuous-time systems.
- *Identification of Linear Parametrically Varying (LPV) models*: the LPV paradigm has been proposed in the robust control community as a means to formulate gain-scheduled controller design problems in a technically sound way. In this area the current research aims at the development of identification methods for state space

LPV models (initiated during my PhD, under the supervision of Prof. Michel Verhaegen (Delft University of Technology)).

- *Integrated modeling, simulation and identification*: object-oriented modeling, symbolic manipulation and parameter estimation for LFT structures are the main ingredients of a research effort, in cooperation with Dr. Francesco Casella (DEI-POLIMI), aimed at defining a new class of control-oriented modeling tools capable of combining prior physical knowledge and information from experiments.

As far as **aerospace applications** are concerned, in the last few years the research activity has focused on problems related to satellite attitude and orbit control systems (AOCS) and to the identification and control of rotorcraft dynamics, with reference to both full scale and small scale helicopters. These research areas share a very important common feature from the system theoretic point of view, i.e., they both give rise to problems characterized by time-periodic or parametrically-varying dynamics, so they can be faced by resorting to a common theoretical background.

AOCS research at the Dipartimento di Elettronica e Informazione started in 1999 under my supervision, along a number of parallel activity lines, both of fundamental and applied type, and has reached the following status:

- *Spacecraft modelling and simulation*: proprietary tools for modelling and simulation have been developed using the innovative object-oriented concepts for physical system modelling embedded in the well known Modelica language and the Dymola simulation environment.
- *Spacecraft attitude determination and parameter estimation*: both simulation and in-flight experience (design of the attitude determination system for the first Italian small satellite mission - MITA) have been gathered in the design and implementation of attitude determination systems.
- *Spacecraft attitude control*: the focus in this activity is on attitude control problems arising in spacecraft using magnetic torquers as primary or sole actuators. In particular, such problems have been and are investigated: in a global perspective, in order to analyse the stability properties of magnetic control schemes in, e.g., attitude acquisition or large angles manoeuvres (in cooperation with Prof. Astolfi, Imperial College); in a local perspective, using periodic systems theory in order to improve the stability and performance characteristics of magnetic-based ACS (in cooperation with Dr. Andras Varga, DLR, Germany).
- *Spacecraft orbit control*: a number of applications have been investigated in this area:
 - Electric station-keeping techniques for geostationary satellites (in cooperation with Alcatel Alenia Space France and Ecole des Mines de Paris);
 - Stability analysis for formation-flying control algorithms (in cooperation with Alcatel Alenia Space France and Ecole des Mines de Paris);
 - Beam steering control for inter-satellite laser ranging (in cooperation with Thales Alenia Space Italia).
- *Entry, descent and landing (EDL) problems*: EDL is currently one of the main challenges for the European space community, in view of the Mars missions (ExoMars, Mars Sample Return) planned for the next decade. In this field, the following activities are being carried out:
 - Robustness and worst-case analysis of the powered descent guidance, navigation and control system for the ExoMars mission (in cooperation with Thales Alenia Space Italia). In particular, methods from the field of hybrid evolutionary optimisation are being used to develop efficient tools for worst case analysis for the powered descent and landing phase of the mission;
 - Design of advanced analytical guidance laws for planetary descent and landing.

The research work on **rotorcraft dynamics and control** is aimed at the development of methods and tools for advanced integrated vehicle design, aimed at exploring tradeoffs between performance and environmental impact (e.g., noise, emissions, etc) and improving safety and comfort. The following topics are being investigated:

- *Active control of vibrations in helicopters* (in cooperation with the Rotorcraft Center of Excellence at the University of Maryland (US), and AgustaWestland). The main results obtained in this research can be summarized as follows: first study of the effect of periodic zeros in rotorcraft aeromechanics; first study of the effects of closed-loop active control of vibrations on the aeroelastic stability of a helicopter rotor; first study of the effects of closed-loop active control of vibrations on the aeroelastic stability of a helicopter, considered as a discrete system.
- *Identification for helicopter flight mechanics* (in cooperation with AgustaWestland and the AgustaWestland-Politecnico Advanced Rotorcraft Center, AWPARC): the research activity is developing of a state-of-the-art set of methods and tools for the parametric identification of linear models for helicopter flight mechanics, mainly oriented towards control system design, by means of a suitable combination of time and frequency-domain methods for parameter estimation and model validation.

- *Conceptual design of helicopters* (in the framework of the GARTEUR Exploratory group HC/EG-31): the purpose of the research activity is the development of multidisciplinary design methods for rotorcraft tackling issues such as the inclusion of flight control system design at the conceptual design level
- *Rotorcraft Flight Control System (FCS) design using rotor state feedback*: in the framework of the CleanSky Manoeuvres project, the research aims at assessing the benefits in terms of increased stability margins and/or dynamic performance which can be achieved by providing the FCS additional information coming from the direct or indirect measurement of rotor state variables by means of a combination of innovative sensing technologies and advanced control law design methods.
- *Advanced Tiltrotor FCS design*: in the framework of the Aerospace Cluster TiltrotorFX project, the research goals are to investigate the advantages of synergic use of existing controls for tiltrotor aircraft; to develop the capability to design innovative rotary wing aircraft with aeroelasticity, handling qualities and control laws in the conceptual design loop; to investigate the possibility to develop advanced methods and tools for flight control systems design for rotary wing aircraft, especially of unconventional design.

The research work on **multirotor UAVs** is aimed at the development of methods and tools for advanced integrated vehicle design, aimed at exploring tradeoffs between performance and environmental impact (e.g., noise, emissions, etc) and improving safety and comfort.

- *Identification and control of rotorcraft UAVs*. The research focuses on various issues arising in the design of feedback control systems for UAVs in quadrotor configuration, namely: integrated modeling and identification of vehicle dynamics; autonomous inertial and visual navigation; linear and nonlinear controller design for high performance hovering capability and maneuvering. In addition, the application of rotorcraft UAVs to cultural and environmental heritage monitoring in urban environments will be investigated.

Sponsored research

- Agusta SpA (1994): Modelling and simulation of helicopter rotor dynamics.
- Agusta SpA (1995): Design and implementation of active noise control algorithms.
- MEMC Electronic Materials (1996): Development and implementation of algorithm for process capability estimation.
- ENEL (1997): Parametric estimation of electro-mechanical oscillations in synchronous generators.
- Carlo Gavazzi Space SpA (1999-2000): Magnetic spacecraft attitude determination and control. *Principal investigator.*
- Carlo Gavazzi Space SpA (2003): Estimation algorithms for transmission delays between ground station and satellite. *Principal investigator.*
- Alcatel Alenia Space France (2003-2006): Stationkeeping of geostationary satellites using electrical propulsion. *Principal investigator.*
- Carlo Gavazzi Space SpA (2004): Validation of the detumbling algorithm for the AGILE satellite. *Principal investigator.*
- Piazza Effepi s.r.l. (2004): Feasibility study for a temperature control system based on Peltier cells.
- Alcatel Alenia Space France (2005): Stability analysis of formation flying control systems. *Principal investigator.*
- ESA-ESTEC (2005-2006): Analysis and design of the nominal control mode for the SWARM mission. *Principal investigator.*
- ESA-ESTEC (2007): Periodic Control Toolboxes for Spacecraft Attitude and Orbit Control Applications. *Principal investigator.*
- Thales Alenia Space Italia (2007): Preliminary design of the attitude control system for the AMS-2 mission. *Principal investigator.*
- NGC Aerospace (2007-2009): Development and validation of advanced design techniques for high performance satellite attitude control systems. *Principal investigator.*
- Thales Alenia Space Italia (2008): Verification of the ExoMars Descent Module GNC design for the final descent phase. *Principal investigator.*
- AgustaWestland (2009): Time- and frequency-domain model identification for rotorcraft applications. *Principal investigator.*
- AWPARC (2011-2013): Time- and frequency-domain model identification for rotorcraft applications. *Principal investigator.*

- Aermatica (2012): Performance review of the attitude control system for the ANTEOS UAS. *Principal investigator.*
- VVN (2013): Design of the attitude control system for a small satellite mission. *Principal investigator.*
- AgustaWestland (2015): Time- and frequency-domain model identification for rotorcraft applications. *Principal investigator.*
- ESA-ESTEC (2015-2016): Very high accuracy attitude determination for LOS steering. *Principal investigator.*
- Leonardo Helicopters Division (2016): Helicopter Closed Loop Residual Oscillation/Coupling Analysis. *Principal investigator.*
- FlyToons (2016): Sviluppo di metodi e sistemi di collision avoidance per piccoli velivoli multirottore. *Principal investigator.*
- Leonardo Helicopters Division (2017-2018): Analysis of rotorcraft flight dynamics for AFCS development and flight-test activity optimisation. *Principal investigator.*
- FlyToons (2017-2018): Controllo del volo per formazioni di piccoli velivoli multirottore. *Principal investigator.*
- ENI Progetti (2017-2018): Feasibility assessment of a fugitive emission detection drone. *Principal investigator.*
- DroneDesign (2018): Preliminary design for the AGRI300 multirotor UAV. *Principal investigator.*
- Leonardo (2019-2021): Guidance, Navigation and Control for autonomous multirotor UAVs. *Principal investigator.*
- OHB Italia (2019-2020): CIMR active balancing system. *Principal investigator.*
- ENI Progetti (2019-2020): Autonomous navigation drone platform: navigation system.
- ESA-ESTEC (2019-2020): Simscape model and library generation. *Principal investigator.*

National, European and international research programs:

- ASI (Italian Space Agency) (1998-1999): Feasibility study for the design of a support system for neurosciences.
- OHB Systems (1999): Design and implementation of star sensor-based spacecraft attitude determination algorithms (European project TRIP_DELCOSI).
- ENEL HYDRO SpA (2000-2001): Modelling and control applications of magnetorheological dampers (European project IND DAMPERS).
- U.S. Army Research Office – University of Maryland (2001-2004): Control of systems with periodic coefficients, with application to active rotor control.
- ASI (Italian Space Agency) (2002-2003): Global attitude determination and control using magnetic sensors and actuators. *Principal investigator.*
- Team member for the European Research Training Networks NACO (Nonlinear and Adaptive Control) and NACO2.
- Team member for the Italian national MURST (Ministry of University and Scientific and Technological Research) project "Identification, control and signal processing" in 1994, 1995, 1996.
- Team member for the Italian national MURST project "Algorithms and architectures for identification and control of industrial systems" in 1998, 1999, 2000.
- Team member for the Italian national MIUR project "Algorithms for identification and control of industrial systems" in 2001, 2002.
- Team member for the Italian national MIUR project "Innovative techniques for identification and adaptive control of industrial systems" in 2003, 2004.
- Team member for the Italian national MIUR project "Innovative techniques for identification and adaptive control of industrial systems" in 2005, 2006.
- Advisor for the Aerospace sector for the call preparation of the European INTERREG IIC MATEO project, 2005-2007.
- Team member for the Italian national MIUR project "Techniques and innovative applications of identification and adaptive control" in 2007, 2008.
- Team member for the Italian national MIUR project "Identification and process control" in 2010, 2011.
- Member of the GARTEUR Exploratory Group HC/EG-31 Conceptual Design of Helicopters, 2013.
- Team member for the Regione Lombardia SINOPIAE "Sistema prototipale multi-sorgente Integrante tecniche di Osservazione multispettrale da satellite, aeromobile e a terra per il monitoraggio multi-scala della variazione di Indicatori ambientali legata ai costituenti Atmosferici e dispersione Energetica" project, 2013-2014.

- Team member for the CleanSky project “Manoeuvring Noise Evaluation Using Validated Rotor State Estimation Systems”, 2013-2015.
- Team member for the Italian Aerospace Cluster project “TiltrotorFX”, 2014-2016.
- Supervisor for the Marie Skłodowska-Curie individual fellowships ReMOVE “Rendezvous Modelling Visiting and Enhancing”, 2019-2021.

EDITORIAL AND PROFESSIONAL ACTIVITIES

Editorship:

- Associate editor, Automatica (2011-2017).
- Member of the Editorial Board, IET Control Theory and Applications (2007-2015).
- Corresponding Editor for Europe and Africa, IEEE Control Systems Magazine (2009-2014).
- Associate editor, IEEE Transactions on Control Systems Technology (2006-2012).
- Moderator for the cs.SY and math.OC categories of the arXiv (since 2010).
- Guest editor, special issue on “Applied LPV modeling and identification”, IEEE Transactions on Control Systems Technology (Vol. 19, N. 1, 2011).

Services:

- Member of the IEEE CSS Technical Committees on Computer-Aided Control Systems Design (since 2005) and on System Identification and Adaptive Control (since 2006).
- Member of the IFAC Technical Committees on Control Design (from 2005) and on Aerospace (since 2008).
- Member of the CEAS Technical Committee on Guidance, Navigation and Control (since 2015).
- Deputy Chair of the CEAS Technical Committee on Guidance, Navigation and Control (from 2017 to 2019).
- Chair of the CEAS Technical Committee on Guidance, Navigation and Control (since 2017).
- Member of the IEEE CSS Conference Editorial Board (from 2005 to 2012).
- Chair of the Membership & Admissions Committee of the IEEE CSS (from 2007 to 2011).
- Elected member of the Board of Governors of the IEEE CSS (2013-2015).

Conference organisation:

- Organised invited sessions:
 - “Advanced Control Techniques for Future Space Applications”, together with S. Bennani (ESA-ESTEC), 2006 IEEE International Conference on Control Applications, Munich, Germany.
 - “LPV/LFT Modelling and Identification”, together with J.-M. Biannic (ONERA, France), 2008 IEEE Multi-conference on Systems and Control, San Antonio, USA.
 - “Water Systems Management”, together with L. Bako and E. Duviella (Ec. des Mines de Douai, France), 16th IFAC Symposium on System Identification, Brussels, Belgium, 2012.
- Member of the National Organising Committee for the 2001 IFAC Workshop on Periodic Control Systems.
- Publicity Chair for the 2006 IEEE International Conference on Control Applications, IEEE International Symposium on Computer-Aided Control Systems Design and IEEE International Symposium on Intelligent Control.
- IPC member for the 2007 IEEE International Conference on Control Applications.
- Program Chair for the 2008 IEEE International Symposium on Computer-Aided Control Systems Design.
- IPC member and Area Editor for the 2008 IEEE Conference on Decision and Control.
- IPC member for the 2009 IFAC Workshop on Aerospace Guidance, Navigation and Flight Control Systems.
- IPC member for the Sixième Conférence Internationale Francophone d’Automatique, 2010.
- IPC member for the 18th IFAC Symposium on Automatic Control in Aerospace, 2010.
- IPC member for the 2010 IEEE International Symposium on Computer-Aided Control Systems Design.
- IPC member for the 1st CEAS Specialist Conference on Guidance, Navigation & Control, 2011.

- IPC member for the 2nd CEAS Specialist Conference on Guidance, Navigation & Control, 2013.
- Program coChair, 5th IFAC Symposium on System Structure and Control, 2013.
- IPC member for the 19th IFAC Symposium on Automatic Control in Aerospace, 2013.
- IPC member for the 2013 IEEE International Symposium on Computer-Aided Control Systems Design.
- IPC member for the 10th UKACC International Conference on Control, 2014.
- IPC member for the 3rd CEAS Specialist Conference on Guidance, Navigation & Control, 2015.
- IPC member for the IFAC Workshop on Advanced Control and Navigation for Autonomous Aerospace Vehicles, 2015.
- Program Chair, 1st IFAC Workshop on Linear Parameter Varying systems, Grenoble, France, 2015.
- IPC member for the 20th IFAC Symposium on Automatic Control in Aerospace, 2016.
- IPC member for the 4th CEAS Specialist Conference on Guidance, Navigation & Control, 2017.
- IPC member for the 3rd IFAC Workshop on Linear Parameter Varying systems, 2019.
- General Chair for the 5th CEAS Specialist Conference on Guidance, Navigation & Control, 2019.

Served as reviewer for the scientific journals *Automatica*, *IEEE Transactions on Automatic Control*, *IEEE Transactions on Control Systems Technology*, *International Journal of Control*, *European Journal of Control*, *ASME Journal on Dynamic Systems, Measurement and Control*, *International Journal on Adaptive Control and Signal Processing*, *Journal of Sound and Vibration*.

LIST OF RELEVANT PUBLICATIONS

Books:

[1] M. Lovera (editor), *Control-oriented modeling and identification: theory and practice*, The Institution of Engineering and Technology (IET), 2015.

[2] M. Lovera, *Magnetic attitude control of spacecraft*, Springer (in preparation).

Refereed journals:

[1] S. Bittanti, M. Lovera, "On the zero dynamics of helicopter rotor loads", *European Journal of Control*, Vol. 2, N. 1, 1996.

[2] S. Bittanti, M. Lovera, L. Moiraghi, "Application of non normal process capability indices to semiconductor quality control", *IEEE Transactions on Semiconductor Manufacturing*, Vol. 11, N. 2, pp. 296-303, 1998.

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