

# SCIENTIFIC AND PROFESSIONAL CURRICULUM VITAE

MARIA PRANDINI

## Brief biography

Maria Prandini was born in Brescia, Italy, on September 8, 1969. She received the Laurea degree cum laude in Electrical Engineering from the Politecnico di Milano (1994), and the Ph.D. degree in Information Technology from the Università degli Studi di Brescia (1998). After her Ph.D. studies, she was a visiting postdoctoral researcher at the Electronics Research Laboratory, University of California, Berkeley, from 1998 to 2000. She also held visiting positions at Delft University of Technology (1998), Cambridge University (2000), University of California, Berkeley (2005), and Swiss Federal Institute of Technology, Zurich (2006).

From December 2002 to January 2011, she was Assistant Professor at the Dipartimento di Elettronica e Informazione of the Politecnico di Milano. From February 2011 to February 2018, she was Associate Professor at the same department, which is now named Dipartimento di Elettronica, Informazione e Bioingegneria, where she is currently Full Professor.

Her research interests include randomized methods for system analysis and design; modeling, verification and control of stochastic and hybrid systems; and multi-agent systems, involving distributed optimization and game theoretic solutions for cooperative and noncooperative decision making. Her research studies were motivated mainly by applications to the transportation and energy domains.

Since 1999, she has been teaching courses in control at the undergraduate and graduate levels, in Italy as well as at international institutions abroad. In particular, she was lecturer of a Ph.D. course on Stochastic Systems: Estimation and Control at the University of California, Berkeley (spring 1999), a master course on Hybrid systems at the University of Stuttgart (first semester 2014-15), and a Ph.D course on Hybrid systems at Lund University (October 2015). She is lecturer of a master course on Nonlinear control at her institution, where she has also been teaching advanced courses for Ph.D. students on Hybrid Systems. Next year she will be teaching a Ph.D. course on Cooperative and Noncooperative Optimization and Control.

She is currently principal investigator in the EC-funded H2020 project UnCoVerCPS “Unifying Control and Verification of Cyber-Physical Systems” (2015–2018), being responsible for the scientific activities of the PoliMi team, which include the development of distributed optimization techniques for networked systems. Previously, she contributed to EC-funded projects on modeling, verification and control of stochastic and hybrid systems with application to the energy and transportation domains. More specifically, she was workpackage leader in the FP5 project HYBRIDGE “Distributed control and stochastic analysis of hybrid systems, supporting safety critical real-time systems design” (2002–2005), and principal investigator in the FP6 project iFly “Safety, Complexity and Responsibility based design and validation of highly automated Air Traffic Management” (2007–2011) and in the FP7 project MoVeS “Modelling, verification and control of complex systems: From foundations to power network applications” (2010–2013).

She has been a member of the editorial boards of leading journals in control as an associate editor (IEEE Transactions on Automatic Control, 2009–2013, IEEE Transactions on Control Systems Technology, 2009–2015, and Nonlinear Analysis: Hybrid Systems, 2011–2015) and as a discussion editor (European Journal of Control, 2007–2013). She is a member of the IEEE Control Systems Society (CSS) Conference Editorial Board (since 2007) and of the European Control Association (EUCA) Conference Editorial Board (since 2013) as an associate editor.

She has been active in the IEEE CSS and the International Federation of Automatic Control (IFAC). She is a member of the IFAC Technical Committee on Discrete Event and Hybrid Systems (since 2008). She has been appointed member of the IFAC Policy Committee for the term of office 2017 – 2020. She has been contributing to the activities and governance of the IEEE CSS in different roles. From 2013 to 2015, she was editor for the CSS Electronic Publications. She was elected member of the IEEE CSS Board of Governors

for a three-year term (2015-2017). She was IEEE CSS Vice-President for Conference Activities in 2016 and 2017. She has been elected member of the CSS nominating committee for the year 2018.

She has been member of the program committees of several international conferences and either organizing or contributing to invited sessions, workshops, and tutorials. Finally, she was co-chair of the 21st ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2018).

## Personal data and contact information

Date of birth: September 8, 1969  
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## Current position

**Full professor of Automatic Control** **5 February 2018 –**  
 Politecnico di Milano, Italy

## Other academic, research, and teaching positions

**Associate professor of Automatic Control** **February 2011 – February 2018**  
 Politecnico di Milano, Italy

**Lecturer of a M.Sc. course** **First semester 2014 – 2015**  
 Stuttgart University, Germany

**Assistant professor of Automatic Control** **December 2002 – January 2011**  
 Politecnico di Milano, Italy

**Visiting researcher** **September 2006**  
 Swiss Federal Institute of Technology, Zurich, Switzerland

**Visiting researcher** **August 2005**  
 University of California, Berkeley, USA

**Research assistant in Automatica** **April 2000 – December 2002**  
 Università  $\frac{1}{2}$  degli Studi di Brescia, Italy

**Visiting researcher** **September 2001 & October 2001**  
 Cambridge University, UK

**Post-doctoral researcher in Automatica** **September 1998 – March 2000**  
 Università  $\frac{1}{2}$  degli Studi di Brescia, Italy

<b>Visiting post-doctoral researcher</b> University of California, Berkeley, USA	<b>November 1999 – February 2000</b>
<b>Visiting post-doctoral researcher</b> University of California, Berkeley, USA	<b>August 1998 – June 1999</b>
<b>Lecturer of a Ph.D. course</b> University of California, Berkeley, USA	<b>Spring 1999</b>
<b>Visiting post-doctoral researcher</b> Delft University of Technology, The Netherlands	<b>March 1998 – July 1998</b>
<b>Ph.D. student in Information Technology (Automatic Control)</b> Università degli Studi di Brescia, Italy	<b>1994 – 1997</b>

## Education

<b>Ph.D. in Information Technology (Automatic Control)</b> Università degli Studi di Brescia, Italy Dissertation title: Adaptive LQG control: optimality analysis and robust controller design Ph.D. advisor: Prof. Marco C. Campi	<b>April 17, 1998</b>
<b>Laurea in Electrical Engineering (cum laude)</b> Politecnico di Milano, Italy Dissertation title: “Correnti endogene dell’osso: misure sperimentali e modellizzazione” (Endogenous currents in bones: measurements and modeling) Thesis advisor: Prof. Luigi Divieti	<b>February 23, 1994</b>

## National qualifications

<b>Scientific qualification as full professor in Automatica</b> Politecnico di Milano, Italy She received the national scientific qualification to practice pursuant to art. 16 of Law 240/2010 for the Competition Sector (Italian “Settore Concorsuale”) 09/G1 - Automatica as full professor	<b>2012</b>
<b>Title as a qualified engineer</b> Politecnico di Milano, Italy She passed the “Esame di Stato” that allows one to practice as an engineer in Italy.	<b>April 1994</b>

## Research interests

The research interests of Maria Prandini comprise the following three main topics:

- ◇ *randomized methods for system analysis and design*
- ◇ *modeling, verification, and control of stochastic and hybrid systems*
- ◇ *multi-agent systems.*

The first topic includes studies on *scenario based optimization and its connection to learning theory*, the development of *cautious adaptive controllers* for systems affected by parametric uncertainty based on statistical learning, *nonlinear identification* methods using randomization for model structure selection, *stochastic constrained control* strategies based on the scenario approach to chance-constrained optimization, and randomized strategies for *large scale two-players games*; the second topic includes *model reduction and abstraction* and the extension of *model checking and reachability analysis* from Markov decision processes to stochastic hybrid systems by using numerical approximation techniques, and also *approximate dynamic programming* methods for the optimal control of stochastic and hybrid systems; and the last topic includes *multi-agent centralized coordination*, and the development of (cooperative) *distributed optimization* and (noncooperative) *game theoretic solutions* for multi-agent systems.

Some of the topics partly overlap since, for instance, scenario based optimization is adopted for model abstraction of stochastic hybrid systems in [J.23]<sup>1</sup>, and is extended to the context of distributed multi-agent optimization in the recent work [J.9].

Notably, a connection between cooperative and noncooperative optimization, showing how by an appropriate price signal an authority can drive a population of selfish agents minimizing their own cost to the social welfare solution as the size of the population grows, has been proven recently in the conference paper [C.13]. The first author of this paper was awarded the *2017 IFAC Young author prize*.

Most contributions are methodological. They have been worked out within projects funded by the European Commission (see the section “Scientific coordination roles in international research projects”) and motivated by applications to the transportation and energy domains, and, in particular, aircraft conflict detection and resolution in air traffic management, energy management of a microgrid, and electric vehicles charging control.

Some of the theoretical investigations have been developed in collaboration with international academic institutions (the University of California, Berkeley, the Swiss Federal Institute of Technology, Zurich, the RWTH Aachen University, and the University of Oxford), and with research centers in the aeronautic sector (the National Aerospace Laboratory, Amsterdam, and L’Ecole Nationale de l’Aviation Civile, Toulouse). Collaborations on more applied research activities were established with Honeywell, Prague, and General Electric, Munich.

We next provide some general overview of the main research topics of Maria Prandini.

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<sup>1</sup>citation numbers refer to the Complete list of publications at the end of this document, where publications are classified in categories and ordered chronologically within each category

## Randomized methods for system analysis and design

Many design problems in systems and control can be rephrased as optimization problems, possibly subject to constraints. Typically, uncertainty enters the problem description, through e.g., some parameters that are not perfectly known or some signals that act as disturbances. One approach to deal with uncertainty is through robust optimization. In this case, a decision is made such that the constraints are satisfied for all admissible values of the uncertainty. Tractability of the developed techniques relies heavily on the geometry of the uncertainty set. On the other hand, chance constrained optimization allows for constraint violation but with an a-priori specified probability. Different approximations to chance constraint optimization problems are proposed in the literature under certain assumptions on the dependency of the constraints on the uncertainty and on the underlying probability distribution. However, uncertainty is typically not precisely known and characterized based on data. The challenge is then to define an optimal solution in this data-based setting and to introduce algorithmic approaches to construct this solution.

Randomized methods have gained increasing popularity among the control community in recent years since they allow to perform a design when more standard approaches fail due to computational difficulties. More importantly, they permit to realize a data driven decision making paradigm by suitably exploiting the information about the uncertainty that is hidden in data, rendering randomized algorithms an alternative to robust and chance constrained techniques. This is the case, in particular, of scenario based optimization, which involves solving an optimization problem whose constraints depend only on a finite number of uncertainty instances called “scenarios”. It does not require any specific assumption on the probability distribution of the uncertainty neither on the way in which the uncertainty enters the problem, but generalizes the properties of the solution to unseen uncertainty instances, providing guarantees on the probability of constraint satisfaction.

Theoretical advances of many randomized approaches have been extensively reported in a number of papers, and successful applications have confirmed the potentials and usefulness of these methods.

In particular, the research activity of Maria Prandini on this topic involves establishing a connection between scenario based optimization and compression learning, and extending scenario based optimization to cascading optimization problems, game theory and stochastic distributed optimization.

Randomized approaches proved useful in addressing model abstraction, nonlinear identification and classification, and constrained control design.

## Modeling, verification, and control of stochastic and hybrid systems

Stochastic Hybrid Systems (SHS) involve the interaction of continuous dynamics, discrete dynamics and probabilistic uncertainty. Because of this versatility, they are widely recognized as an ideal framework for capturing the intricacies of complex large scale systems. Numerous case studies in the literature have illustrated the potential of SHS in diverse application domains such as control of telecommunication networks, air traffic, manufacturing, power networks, biology and finance. As a price for their enhanced modeling flexibility and expressiveness, the problems arising in SHS are in general extremely challenging. Analytical solutions are difficult or impossible to obtain, and, compared with the many software packages for the verification of deterministic hybrid systems, few effective general algorithms exist for stochastic hybrid systems. Many problems that are very well characterized in the deterministic case remain open in the context of SHS.

A considerable research effort has been devoted to the development of modelling, analysis, and control methods for SHS, partly driven by computer scientists (giving rise to theorem proving and model checking methods) and partly by control engineers (giving rise to optimal control based on stochastic approximation

and dynamic programming, and randomized methods). Each of the approaches (model checking, optimal control and randomized methods) has its own advantages and disadvantages and has been applied successfully to several application areas. Despite numerous success stories, however, none of the methods currently available are powerful enough to deal with real life applications. A key reason for this is that the methods have been developed by different communities in relative isolation, motivated by different applications. Synergies still need to be deeply explored and fully exploited in order to address the challenges posed by real life applications.

The main goal of the research activity of Maria Prandini on this topic has been to systematically exploit such synergies, establishing links between model checking, optimal control, stochastic analysis, and randomized methods. Leveraging on their complementary strengths has potential for developing combined strategies and tools to enable novel applications to complex, large scale systems.

## Multi-agent systems

Multi-agent systems are pervasive in many sectors, encompassing energy and transportation systems which are among the most critical components of modern infrastructures, at the backbone of our society. Ensuring a safe, reliable, but on the same time high performance operation of such systems is then crucial from a societal point of view. To address these contemporary challenges, traditional methods need to be revisited, and conceptually new approaches need to be developed. The issues involved are immense, since the underlying systems are growing ever more complex. This is because they include the interconnection of many subsystems (agents) that can interact either physically or via information exchange through a communication network, thus bringing networked systems into the picture.

In our research we address explicitly the interacting and distributed nature of multi-agent systems arising in the energy and transportation application domains. There are three main complexity features that are prominent in such systems: i) heterogeneity – the composing a large scale system may have different parameters, objectives, physical and/or technological constraints, ii) uncertainty – each subsystem is affected by both endogenous (e.g., incomplete knowledge of some of the underlying processes) and exogenous (e.g., environmental) uncertainties, and iii) locality of information – not all interacting subsystems are willing to share information relevant to their processes and/or not all communication links may be available.

According to the type of application, the interacting subsystems may cooperate to achieve some overall objective, or they may act in a non-cooperative manner, seeking to achieve their individual objectives. Each case poses different information constraints and calls for different algorithmic solutions. Therefore, to capture all types of objectives that may underly decision making problems in complex interacting systems, both cooperative and non-cooperative algorithms need to be developed.

The ambitious goal of this research activity is the development of algorithms that set a new paradigm for cooperative and non-cooperative decision making in systems of interacting complex subsystems, ensuring a safe and reliable operation, dealing with all aspects of complexity, i.e., heterogeneity, uncertainty, and locality of information, while maintaining a high level of system performance. This goal is motivated by applications to the energy and transportation domains (energy management of buildings in a district network, transportation systems operation, electric vehicles charging control), and will be realized by transiting to smart operational concepts, bringing intelligence to state of the art methods by merging tools from optimization, control theory, and machine learning.

## Scientific coordination roles in international research projects

### Principle investigator

Responsible for the scientific activities of the Politecnico di Milano team in the following projects funded by the European Commission:

#### **UnCoVerCPS** **2015-2018**

Unifying Control and Verification of Cyber-Physical Systems, H2020, research contract H2020-ICT-2014-1/643921

#### **MoVeS** **2010-2013**

Modelling, verification and control of complex systems: From foundations to power network applications, FP7, research contract FP7-ICT-2009-257005

#### **iFly** **2007-2011**

Safety, Complexity and Responsibility based design and validation of highly automated Air Traffic Management, FP6, research contract TREN/07/FP6AE/S07.71574/037180

### Workpackage leader

Leader of the scientific workpackage 3 on Reachability Analysis of Probabilistic Hybrid Systems in the following project funded by the European Commission:

#### **HYBRIDGE** **2002-2005**

Distributed control and stochastic analysis of hybrid systems, supporting safety critical real-time systems design (HYBRIDGE), FP5, research contract IST-2001-32460

## Team member in national research projects

- ◇ Innovative techniques and applications of system identification and adaptive control, Italian Ministry for Education, University and Research (MIUR) 2007–2008 & 2010–2011
- ◇ Innovative methods and algorithms for the identification and adaptive control of technological systems, MIUR 2005–2006
- ◇ Innovative methods for the identification and adaptive control of industrial systems, MIUR 2003–2004
- ◇ Identification and adaptive control of industrial systems, MIUR 2001–2002
- ◇ Adaptive and robust controllers design, MIUR 1999–2000
- ◇ Identification, control and adaptive predictors, MIUR 1995–1997

## Team member in research projects at foreign institutions

- ◇ Probabilistic Collision Avoidance for Air Traffic Control, University of Cambridge, UK 2001
- ◇ Stochastic hybrid automata, University of California, Berkeley 1998-2000
- ◇ Air traffic management systems, University of California, Berkeley 1998-2000

## Collaboration with industry

### Research contract

Two year contract entitled “Studio e implementazione di algoritmi per la verifica di sistemi dinamici a tempo discreto affini a tratti e non lineari”, Leonardo SpA 2017-2019

### Three-year grant

Grant for supporting Ph.D. studies on the automatic verification and input design for dynamical systems with application to the helicopter autopilot testing, AgustaWestland 2012-2015

### Research contract

One year contract entitled “Analisi e sviluppo di algoritmi per la stima d’assetto di veicoli marini”, BASE srl, jointly with S. Bittanti and S. Savaresi 2007-2008

## Fellowships and supporting grants

She received some fellowships and grants to support her temporary research positions both in Italy, from national and governmental entities (through some selection procedure), and abroad, from funding agencies, namely DARPA and EPSRC. Note that she resigned from her Research fellowship in Automatica at the Università di Brescia before the end of the term of her fellowship, since she started her position as an Assistant professor at the Politecnico di Milano in 2002.

**Research fellowship in Automatica (two years plus two)** 2000 – 2004  
Università degli Studi di Brescia, Italy

**Visiting post-doctoral fellowships** 2001, 1998 – 1999  
Engineering and Physical Sciences Research Council (EPSRC), UK (September & October 2001)  
Defense Advanced Research Projects Agency (DARPA), USA (1998 – 1999)

**Two-year post-doctoral fellowship** 1998 – 2000  
Università degli Studi di Brescia, Italy

**One-year fellowship for studies abroad** 1997 – 1998  
Università degli Studi di Brescia, Italy

**One-year fellowship as a teaching assistant** 1997 – 1998  
Università degli Studi di Brescia, Italy

**Three-year Ph.D. fellowship** 1994 – 1997  
Italian Ministry for Education, University and Research, Italy

## Awards

**SYSID conference prize (co-author)** 2018  
Co-author of the paper entitled “A randomized approach to switched nonlinear systems identification” presented at the 18th IFAC Symposium on System Identification (SYSID 2018). The first author F. Bianchi was one of the three finalists of the 2018 Young Author Award.



**Unlock Your Ability Challenge (winning team member) 2017**

Member of the BEE (Beyond Energy Efficiency) team, which was one of winners of the Unlock Your Ability Challenge organized by ABB in collaboration with PoliHub to promote ideas with potential to revolutionize energy distribution

**IFAC conference prize (co-author) 2017**

Co-author of the paper entitled “On the connection between Nash equilibria and social optima in electric vehicle charging control games” presented at the 20th World Congress of the International Federation of Automatic Control (IFAC 2017). The first author L. Deori was awarded the 2017 IFAC Young Author Prize.

**Visiting professorship 2017**

Awarded an August-Wilhelm Scheer Visiting Professorship and a Honorary fellowship of the TUM Institute for Advanced Studied (2017)

**IEEE Senior member 2015**

Elevated to the grade of IEEE Senior member

**Outstanding reviewer 2004 – 2006**

Nominated outstanding reviewer of the IEEE Transactions on Automatic Control (2005) and Automatica (2004, 2005, and 2006)

**Invited presentations****Plenary speaker**

“A big-data approach to decision making under uncertainty”, plenary talk at the 16th International Conference on Control, Automation, and Systems (ICCAS), HICO, Gyeongju, Korea, 16-19 October 2016.

Plenary talk at 12th International Conference on Reachability Problems (RP’18), Marseille, France, 24-26 September 2018.

**Panel sessions**

Discussant in the panel session “The role of robustness in hybrid systems”, 17th International Conference on Hybrid Systems: Computation and Control (HSCC 2014), Berlin, Germany, April 2014.

Moderator in the joint ICCPS-HSCC panel session “What are the challenges posed to CPS theory by modern applications?”, 21st International Conference on Hybrid Systems: Computation and Control (HSCC 2018), Porto, Portugal, 12 April 2018.

**Invited speaker**

*Invited to deliver a tutorial at:*

“A set-based approach to model checking of nonlinear systems”, 20th Symposium on Symbolic and Numerical Algorithms for Scientific Computation (SYNASC 2018), Timisoara, Romania, September 20-23, 2018

*Contribute with a presentation to the following workshops:*

“A set-based approach to robust control and verification of piecewise affine systems subject to safety specifications”, MORE on Automotive: Cyber-Physical-Systems (Control, Robustness, Security), Modena, Italy, May 28, 2018

“Distributed optimization over networks: application to multi-building energy management”, Hybrid dynamical systems: Optimization, stability and applications, Trento, Italy, January 9–11, 2017

“Verification and Control of Stochastic Hybrid Systems”, European Control Conference, Zurich, Switzerland, July 2013

“Automation of air traffic processes and air transportation systems”, Thematic Workshop, Belgrade, Serbia, June, 2013

“Airborne self separation in air transportation”, 4th International Conference on Research in Air Transportation, Budapest, Hungary, June 2010

“Innovative approaches to handling uncertainty in air traffic management”, tailored to experts in ATM (Air Traffic Management), Eurocontrol Experimental Centre, Bretigny-sur-Orge, France, February 2005

“Stochastic hybrid systems: theory and applications”, 43rd Conference on Decision and Control, Paradise Island, Bahamas, December 2004

“Stochastic and Hybrid Systems: Theory and Applications to Air Traffic Management”, European Control Conference, Cambridge, UK, September 2003

“Unmanned Air Vehicles: Coordination, Sensing, and Control”, IEEE International Conference on Control Applications & IEEE International Symposium on Computer-Aided Control Systems Design, Anchorage, Alaska, USA, September 2000

“Unmanned Air Vehicles: Coordination, Sensing, and Control”, 38th Conference on Decision and Control, Phoenix, USA, December 1999

*Contributed with a talk/discussion session to the following events, which are by invitation only:*

Dagstuhl Seminar 14031, “Randomized Timed and Hybrid Models for Critical Infrastructures”, Schloss Dagstuhl, Germany, January 12–17, 2014

Dagstuhl Seminar 14441, “Modeling, Verification, and Control of Complex Systems for Energy Networks”, Schloss Dagstuhl, Germany, October 26–31, 2014

11th Cloud Control Workshop, Swedish Castle Haga Slott, June 12-14, 2017

*Delivered a seminar on her research topics at the following institutions:*

Technical University of Munich, Germany (2017, 2016); Oxford University, UK (2016); University of Genova, Italy (2015); Stuttgart University, Germany (2014); Lund University, Sweden (2014); University of Belgrade, Serbia (2013); Swiss Federal Institute of Technology, Zurich, Switzerland (2006, 2000); Eurocontrol Experimental Centre, Bretigny-sur-Orge, France (2005); Royal Institute of Technology, Stockholm, Sweden (2001, 2017); Delft University of Technology, The Netherlands (2000, 1998); George Mason University, USA (2000); University of Pennsylvania, USA (2000); Stanford University, USA (2000); Simon Fraser University, Canada (1999); University of California, Berkeley, USA (1999, 1998).

## Contribution to the organization of international scientific events

### Program chair

Program chair of the 60th IEEE Conference on Decision and Control (CDC 2021).

### Vice-program chair

Vice-program chair of the 59th IEEE Conference on Decision and Control (CDC 2020).

### Program chair

Co-program chair of the 21st ACM International Conference on Hybrid Systems: Computation and

Control (HSCC 2018). Note that HSCC has no general chair but only two program chairs who are selected yearly by the steering committee of the HSCC series.

### **Vice Program Chair**

Vice program chair of the 59th IEEE Conference on Decision and Control (CDC 2020).

### **Senior roles in the IPC**

Senior member of the International Program Committee of the European Control Conference 2019 (ECC 2019); regional chair of the 15th International Conference on Control, Automation, Robotics and Vision (ICARCV 2018)

### **IEEE CSS vice-president for conference activities**

As IEEE CSS vice-president for conference activities in 2016 and 2017, she has been contributing to setting up the financially sponsored IEEE CSS conferences (Conference on Decision and Control and Conference on Control Technology and Applications) by deciding general chair, program chair, venue, and defining the preliminary budget, and has been awarding other conferences with the IEEE CSS technical co-sponsorship.

### **International program committee member**

Member of the Program Committee of the following conferences:

International Conference on Control, Automation, Robotics and Vision (ICARCV 2018); Indian Control Conference (ICC 2019);

IEEE Conference on Control Technology and Applications (CCTA 2018);

International Conference on Cyber Physical Systems (ICCP 2014, 2015, and 2016);

International Conference on Hybrid Systems: Computation and Control (HSCC 2002, 2006, 2007, 2008, 2015, 2016, 2017, 2018);

IFAC Conference on the Analysis and Design of Hybrid Systems (ADHS 2006, 2012, 2015 and 2018);

IEEE International Symposium on Intelligent Control (ISIC 2004 and 2005);

IEEE Conference on Automation Science and Engineering (IEEE CASE 2008);

18th IFAC Symposium on Automatic Control in Aerospace (ACA 2010);

Mediterranean Conference on Control and Automation (MED 2011, 2012, 2015, 2016, 2017, and 2018);

IFAC World Congress 2011 and 2017;

European Control Conference 2013 (ECC 13);

IEEE International Meeting on Analysis and Applications of Nonsmooth Systems (AANS 2014);

Cyber-Physical Systems within the SPIE International Symposium on Microtechnologies 2015 (SPIE 2015);

2016 IEEE First International Conference on Control, Measurement and Instrumentation (CMI 2016);

International Workshop on Symbolic and Numerical Methods for Reachability Analysis (SNR 2016 and 2017);

4th International Conference on Control, Decision and Information Technologies 2017 (CoDIT 2017)

### **Conference editorial board member**

Associate editor of the IEEE CSS Conference Editorial Board since 2007

Associate editor of the EUCA Conference Editorial Board since 2013

### **Conference award selection committee member**

ECC best student paper award 2016

ACC Hugo Schuck award 2013, 2015 and 2018

CDC-ECC best student paper award 2011

**Co-organizers of workshops/tutorials/symposia at international conferences**

*Co-organizers of the following workshops:*

“Computation-aware Algorithmic Design for Cyber-Physical Systems”, IEEE Conference on Decision and Control, Miami, USA, December 16, 2018 (with R. Jungers, R. Sanfelice, M. Zamani)

“Verification and control of cyber-physical systems: theory and applications”, IEEE Conference on Decision and Control, Las Vegas, USA, December 11, 2016 (with A. Busboom)

“Distributed and Stochastic Optimization: Theory and Applications”, European Control Conference 2016, Aalborg, Denmark, June 28, 2016 (with K. Margellos)

“2nd Workshop on Formal Methods for Aerospace (FMA@CDC’2010)”, IEEE Conference on Decision and Control, Atlanta, USA, December 14, 2010 (with M.L. Bujorianu and M. Fisher)

*Co-organizer of the following full-day tutorials:*

“Cooperative and noncooperative decision making in multi-agent systems: An operator theoretic perspective”, IFAC World Congress, Toulouse, France, July 8, 2017 (with S. Grammatico, K. Margellos, G. Notarstefano)

“Randomized methods for analysis and design of control systems”, IFAC World Conference, Cape Town, South Africa, August 24, 2014 (with M. Campi, F. Dabbene, S. Garatti, R. Tempo)

*Co-organizers of the following mini-symposium:*

Co-organizer of the Mini-symposium “Stochastic Systems and Applications”, 2015 SIAM Conference on Control and Its Applications (CT15), Paris, France, July 8-10, 2015 (with B. Pasik-Duncan)

**Co-organizer of invited sessions at international conferences**

“Multi-agent Distributed Optimization over Networks”, IEEE Conference on Decision and Control, Miami, USA, December 2018 (with G. Notarstefano)

“Advances in stochastic systems, estimation and control - Part I”, IEEE Conference on Decision and Control, Melbourne, Australia, December 2017 (with B. Pasik-Duncan)

“Advances in stochastic systems, estimation and control - Part II”, IEEE Conference on Decision and Control, Melbourne, Australia, December 2017 (with B. Pasik-Duncan)

“Multi-agent Games and Optimization over Networks”, IEEE Conference on Decision and Control, Melbourne, Australia, December 2017 (with S. Grammatico and K. Margellos)

“Multi-agent and networked systems”, 20th IFAC World Congress, Toulouse, France, July 2017 (with S. Grammatico and K. Margellos)

“Advances in control, game theory, and identification for stochastic systems”, IEEE Conference on Decision and Control, Las Vegas, USA, December 2016 (with B. Pasik-Duncan)

“Challenges for Optimization and Control in Power Systems and Networks”, American Control Conference, Boston, USA, July 2016 (with L. Piroddi)

“Coordination and Communication Issues in Energy Networks”, American Control Conference, Boston, USA, July 2016 (with L. Piroddi)

“New Developments in Stochastic Systems, Control and Their Applications”, IEEE Conference on Decision and Control, Osaka, Japan, December 2015 (with B. Pasik-Duncan)

“Developments in Stochastic Systems, Control and Their Applications”, IEEE Conference on Decision and Control, Los Angeles, USA, December 2014 (with B. Pasik-Duncan)

“Developments in Stochastic Systems, Control and Their Applications”, IEEE Conference on Decision and Control, Florence, Italy, December 2013 (with B. Pasik-Duncan)

“New Developments in Stochastic Systems, Identification and Control”, IEEE Conference on Decision and Control, Maui, Hawaii, December 2012 (with B. Pasik-Duncan)

“A learning approach to identification and control”, IFAC World Congress, Barcelona, Spain, July 2002  
(with M. Campi)

## Editorial activity

### Editor

Electronic publications of the IEEE Control Systems Society 2013 – 2015

### Associate editor

IEEE Transactions on Control of Network systems 2018 –

Nonlinear Analysis: Hybrid Systems 2011 – 2015

IEEE Transactions on Control Systems Technology 2009 – 2015

IEEE Transactions on Automatic Control 2009 – 2013

### Discussion Editor

European Journal of Control 2007 – 2013

### Guest editor

Organized the special issue on Stochastic hybrid systems of the European Journal of Control, vol. 16 no. 6, 2010 (with J. Lygeros).

## Contribution to international organizations

### International Federation of Automatic Control

Appointed member of the Policy Committee 2017 – 2020

Member of the Technical Committee on Discrete Event and Hybrid Systems since 2008

Member of the Technical Committee on Stochastic Systems 2003 – 2008

### IEEE Control Systems Society

Elected member of the nominating committee 2018

Vice-president for conference activity 2016 and 2017

Member elected of the Board of Governors for a triennium 2015 – 2017

## Member of evaluation committees at national/international level

### Scientific proposals evaluator

Reviewer of projects submitted to the following funding agencies/institutions:

Netherlands Organisation for Scientific Research 2017

ERC Starting, Consolidator and Advanced Grant Calls 2016 2016

Swedish Research Council (member of the Review Panel NT-14 Signals and Systems) 2013 – 2016

FP6 Information society technologies (evaluator of proposals on Embedded Systems) 2003

### Selection/promotion committee member for academic positions

Subject expert providing an assessment of candidates for Assistant/Associate Professor in Computer Science at Halmstad University, Sweden 2018

Domain chair in Computer Engineering of the tenure-track selection committee for the Faculty of Informatics at the Vienna University of Technology, Austria 2014

Member as an expert of the committee for the evaluation of the application of Dimos Dimarogonas for promotion to Associate Professor in Automatic Control at the Royal Institute of Technology, Stockholm, Sweden 2013

#### **Ph.D. committee member**

Member of the Committee of the Ph.D. Program in Information Technology (Automatic Control) of the Dipartimento di Elettronica e Informazione, Politecnico di Milano, Italy, 2011 – 2012

Examiner of Ph.D. candidates in Automatica, Politecnico di Milano, April 2009, and in Computer sciences and automatica, Università degli Studi di Brescia, March 2013

Ph.D. examiner of the following candidates at foreign institutions:

G. Giordano, “Inference techniques for stochastic nonlinear system identification with application to the Wiener-Hammerstein models”

Chalmers University of Technology, Goteborg, Sweden October 1, 2018

M. Kimmel, “Constrained Nonlinear Control for Safe Human-Robot Interaction”

TUM, Munich, Germany July 4, 2018

N. Everitt, “Module identification in dynamic networks: parametric and empirical Bayes methods”

Royal Institute of Technology, Stockholm, Sweden September 1, 2017

P. Mattsson, “Modeling and identification of nonlinear and impulsive systems with applications”

Uppsala University, Sweden November 25, 2016

K. Margellos, “Constrained Optimal Control for Complex Systems - Analysis and Applications”

Swiss Federal Institute of Technology Zurich, Switzerland November 9, 2012

O.J. Watkins, “Stochastic Reachability, Conflict Detection and Air Traffic Management”

Cambridge University, UK April 29, 2005

## **Institutional coordination roles**

#### **Vice-coordinator of study programme**

**March 2015 –**

Vice-Coordinator of the study programme in Automation and Control Engineering, Politecnico di Milano, Italy.

#### **International study programs coordinator**

**November 2011 – February 2015**

Departmental coordinator for the International Study Programs (Erasmus, double degree agreements, etc.) in Automation and Control Engineering, Politecnico di Milano, Italy.

## Teaching activity at foreign institutions

### Organizer and lecturer of Ph.D. courses

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Title: Hybrid Systems  
 Duration: 19 hours  
 Dates: October 5-8, 2015  
 Venue: Lund University, Sweden

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Title: EECS 223 Stochastic Systems: Estimation and Control  
 Duration: 45 hours  
 Dates: Spring 1999  
 Venue: University of California, Berkeley, USA

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### Organizer and lecturer of M.Sc. courses

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Title: Hybrid Systems  
 Duration: 14 time slots, 90 minutes each  
 Dates: First semester 2014-2015: November 17, 2014 – March 17, 2015  
 Venue: Stuttgart University, Germany

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## Invited lecturer at national and international Ph.D. schools

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Title: Analisi e Controllo di Sistemi Ibridi  
 CIRA (Centro Interuniversitario di Ricerca in Automatica) national Ph.D. School  
 Lecture: Identificazione di sistemi ibridi  
 Dates: July 17-19, 2003  
 Venue: Bertinoro

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Title: 4th International Summer School on Modern Computational Science: Optimization  
 Dates: August 20-31, 2012  
 Venue: Oldenburg, Germany  
 Lecture: Design in the presence of uncertainty: the scenario approach

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Title: 1st HYCON Ph.D. School on Hybrid Systems  
 Dates: July 19-22, 2005  
 Venue: Siena, Italy  
 Lecture: Stochastic hybrid systems

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Title: Hybrid systems: A formal paradigm for safety critical embedded systems  
 International Ph.D. and Post-doctoral School  
 Dates: September 22-24, 2004  
 Venue: University of Patras, Greece  
 Lecture: Reachability analysis with application to aircraft conflict prediction

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## Teaching activity at academic institutions in Italy

### Politecnico di Milano

Optimization Methods for Decision Making over Networks Coordinatori: Giuseppe Notarstefano (Università  $\frac{1}{2}$  del Salento) e Maria Prandini (Politecnico di Milano) Docenti: Giuseppe Notarstefano (Università  $\frac{1}{2}$  del Salento), Kostas Margellos (University of Oxford), Maria Prandini (Politecnico di Milano), Sergio Grammatico (Delft University of Technology)

#### Organizer and lecturer of the following Ph.D. courses:

Title:	Hybrid Systems
Credits:	5
Dates:	July 1-5, 2019 – academic year 2018-2019
Lecturers:	A. Girard, J. Lygeros, M. Prandini
Title:	Optimization Methods for Decision Making over Networks SIDRA summer Ph.D. School
Venue:	Bertinoro, Italy
Dates:	July 12-14, 2018
Coordinators:	G. Notarstefano, M. Prandini
Lecturers:	S. Grammatico, K. Margellos, G. Notarstefano, M. Prandini
Title:	Cooperative and Noncooperative Optimization and Control
Credits:	5
Dates:	October 2-5, 2018 – academic year 2017-2018
Lecturers:	S. Grammatico, K. Margellos, G. Notarstefano, M. Prandini
Title:	Hybrid Systems
Credits:	5
Dates:	February 20-24, 2017 – academic year 2016-2017
Lecturers:	G. Frehse, M. Prandini, O. Stursberg
Title:	Hybrid Systems
Credits:	5
Dates:	June 15-19, 2015 – academic year 2014-2015
Lecturers:	J. Lygeros, M. Prandini
Title:	Hybrid Systems
Credits:	5
Dates:	July 8-15, 2013 – academic year 2012-2013
Lecturers:	J. Hu, M. Prandini
Title:	Hybrid Systems
Credits:	5
Dates:	June 16-21, 2011 – academic year 2010-2011
Lecturers:	J. Lygeros, M. Prandini
Title:	Sistemi ibridi
Credits:	5
Dates:	June 8-12, 2009 – academic year 2008-2009
Lecturers:	J. Lygeros, M. Prandini
Title:	Sistemi ibridi
Credits:	5
Dates:	May, 3-9 2006 – academic year 2005-2006
Lecturers:	M.D. Di Benedetto, J. Lygeros, M. Prandini, A. Sangiovanni-Vincentelli



**Invited lecturer at Ph.D. courses**


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Title:	Advanced methods of identification and data analysis: Optimal filtering and data analysis
Lecture:	Asymptotic Kalman filter
Dates:	September 12-16, 2016

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Title:	Advanced methods of identification and data analysis: Filtering, data analysis and optimization of uncertain systems
Lecture:	Asymptotic Kalman filter
Dates:	September 28-30, 2009

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Title:	Metodi Innovativi di Analisi dei Dati: Problemi e metodi di stima per sistemi stocastici
Lecture:	Il filtro di Kalman di regime
Dates:	November 23-25, 2005

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Title:	Stima e Filtraggio alla Kalman
Lecture:	Impiego della teoria di Kalman nei problemi di deconvoluzione
Dates:	April 8-10, 2002

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**M.Sc. courses:**


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Title:	Nonlinear control Automation and Control Engineering M.Sc. Study Program
Credits:	5
Academic year:	2015-2016, 2016-2017, 2017-2018 course assigned for 2018-2019

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Title:	Controllo non lineare Automation and Control Engineering M.Sc. Study Program
Credits:	5
Academic year:	2013-2014, 2014-2015

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**B.Sc. courses:**


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Title:	Fondamenti di Automatica
Credits:	10
Academic year:	from 2011-2012 to 2017-2018 course assigned for 2018-2019

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Title:	Fondamenti di Automatica (per ingegneria biomedica)
Credits:	7
Academic year:	from 2009-2010 to 2015-2016

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Title:	Fondamenti di Automatica
Credits:	5
Academic year:	2009-2010, 2010-2011

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Title:	Automatica 1
Credits:	5
Academic year:	from 2005-2006 to 2008-2009

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Title:	Fondamenti di Automatica (per telecomunicazioni)
Credits:	5
Academic year:	2003-2004, 2007-2008, 2008-2009

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Title:	Fondamenti di Automatica (per il settore dell'informazione)
Credits:	10
Academic year:	from 2004-2005 to 2006-2007

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Corso:	Progetto di Identificazione dei Modelli e Analisi dei Dati (sett.inf.)
Credits:	2.5
Academic year:	2003-2004

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Title:	Fondamenti di Automatica II (per ingegneria gestionale)
Credits:	5
Academic year:	2002-2003

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**Università degli Studi di Brescia****M.Sc. courses:**


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Title:	Teoria dei Fenomeni Aleatori (per ingegneria delle telecomunicazioni) Telecommunication Engineering M.Sc. Study Program
Credits:	5
Academic year:	2004-2005, 2005-2006, 2006-2007

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**B.Sc. courses:**


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Title:	Controlli Automatici (per ingegneria gestionale)
Credits:	10
Academic year:	2002-2003, 2003-2004

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## Research supervision

### Ph.D. students

- ◇ R. Desimini. Computational approaches to verification and control of hybrid systems. Ph.D. program in Information Technology, Systems and Control area, Politecnico di Milano, Italy, XXXIII Cycle, 2017-2020.
- ◇ A. Falsone. Distributed decision making with application to energy systems. Ph.D. program in Information Technology, Systems and Control area, Politecnico di Milano, Italy, XXX Cycle, 2014-2017.
- ◇ R. Vignali. Automatic verification and input design for dynamical systems: an optimization-based approach to the detection of non-influential inputs. Supported by AgustaWestland. Ph.D. program in Information Technology, Systems and Control area, Politecnico di Milano, Italy, XXVIII Cycle, 2012-2015.
- ◇ L. Deori. A model predictive control approach to aircraft motion control, Italy, XXVIII Cycle, Ph.D. program in Information Technology, Systems and Control area, Politecnico di Milano, Italy, XXVIII Cycle, 2012-2015 (co-advisor).
- ◇ G. Manganini. Optimal control of large scale stochastic hybrid systems with a finite control space. Ph.D. program in Information Technology, Systems and Control area, Politecnico di Milano, Italy, XXVIII Cycle, 2012-2015.
- ◇ Y. Yang. Work on Air Traffic Management related topics. Visiting Ph.D. scholar from the School of Electronic and Information Engineering, Beihang University, China, September 2013 – September 2014.

### Post-Doctoral researchers

- ◇ A. Falsone. Distributed MPC with application to energy and transportation systems. Politecnico di Milano, Italy, 2017-18.
- ◇ R. Vignali. Development of algorithms for verification and testing of piecewise affine and nonlinear discrete time systems. Politecnico di Milano, Italy, 2016.
- ◇ L. Deori. Distributed control techniques for systems affected by stochastic uncertainty, with application to charging control of multiple electric vehicles. Politecnico di Milano, Italy, 2016.
- ◇ A.V. Papadopoulos. Switched control for quantized control systems and microgrid modeling for optimal energy management. Politecnico di Milano, Italy, 2016.
- ◇ K. Margellos. Distributed model predictive control of large scale networked systems affected by stochastic uncertainty, with application to next generation power networks. Politecnico di Milano, Italy, 2015.

### After-Master researchers

- ◇ D. Ioli. Microgrid modeling and control for the energy management of next generation power networks. Politecnico di Milano, Italy, 2015 – 2018.
- ◇ A. Falsone. Randomized algorithms for nonlinear systems identification. Politecnico di Milano, Italy, 2014.

## List of publications

### International journal publications

- [J.1] A. Falsone, K. Margellos, M. Prandini. A distributed iterative algorithm for multi-agent MILPs: finite-time feasibility and performance characterization. *The IEEE Control Systems Letters*, vol.2(4), October 2018, Early Access version available. doi:10.1109/LCSYS.2018.2844353.
- [J.2] L. Deori, K. Margellos, M. Prandini. Price of anarchy in electric vehicle charging control games: When Nash equilibria achieve social welfare, *Automatica*, 1-10. To appear, 2018.
- [J.3] L. Deori, K. Margellos, M. Prandini. Regularized Jacobi Iteration for Decentralized Convex Quadratic Optimization with Separable Constraints, *IEEE Transactions on Control Systems Technology*, 1-9. To appear, 2018.
- [J.4] L. Deori, S. Garatti, M. Prandini. 4-D flight trajectory tracking: a receding horizon approach integrating feedback linearization and scenario optimization, *IEEE Transactions on Control Systems Technology*. Accepted as a regular paper, 2018.
- [J.5] A. Falsone, K. Margellos, M. Prandini. A decentralized approach to multi-agent MILPs: finite-time feasibility and performance guarantees. *Automatica*. Provisionally accepted as a regular paper, January 6, 2018.
- [J.6] F. Terraneo, A.V. Papadopoulos, A. Leva, M. Prandini. FLOPSYNC-QACS: Quantization-Aware Clock Synchronization for Wireless Sensor Networks. *Journal of Systems Architecture*, vol. 80, pp. 77-84, October 2017.
- [J.7] D. Ioli, A. Falsone, A.V. Papadopoulos, M. Prandini. A compositional modeling framework for the optimal energy management of a district network. *Journal of Process Control*, 2017, doi:10.1016/j.jprocont.2017.10.005.
- [J.8] A.V. Papadopoulos, F. Terraneo, A. Leva, M. Prandini. Switched control for quantized feedback systems: invariance and limit cycles analysis. *IEEE Transactions on Automatic Control*. Accepted as a Paper, August 10, 2018. doi: 10.1109/TAC.2018.2797246. Published on-line January 24, 2018
- [J.9] K. Margellos, A. Falsone, S. Garatti, M. Prandini. Distributed Constrained Optimization and Consensus in Uncertain Networks via Proximal Minimization. *IEEE Transactions on Automatic Control*. Accepted as a Paper, August 9, 2017. Published on-line August 30, 2017. Scheduled issue of publication (tentative) Volume 63 (2018), Issue 5 (May).
- [J.10] A. Falsone, K. Margellos, S. Garatti, M. Prandini. Dual decomposition for multi-agent distributed optimization with coupling constraints. *Automatica*, vol. 84, pp. 149-158, October 2017, ISSN 0005-1098, doi: 10.1016/j.automatica.2017.07.003. Accepted as a regular paper, May 9, 2017. Published online 17 August 2017, early access version.
- [J.11] A. Brankovic, A. Falsone, M. Prandini, L. Piroddi. A Feature Selection and Classification Algorithm Based on Randomized Extraction of Model Populations. *IEEE Transactions on Cybernetics*, vol. PP, no. 99, pp. 1-12. doi: 10.1109/TCYB.2017.2682418. Published online 30 March 2017, early access version.
- [J.12] A. Falsone and M. Prandini. A Randomized Approach to Probabilistic Footprint Estimation of a Space Debris Uncontrolled Reentry. *IEEE Transactions on Intelligent Transportation Systems*, vol. PP, no. 99, pp. 1-10. doi: 10.1109/TITS.2017.2654511 Published online 8 February 2017, early access version.
- [J.13] A. Falsone, K. Margellos, S. Garatti, M. Prandini. Finite time distributed averaging over gossip-constrained ring networks. *IEEE Transactions on Control of Network Systems*, vol. PP, no. 99, pp. 1-9. doi: 10.1109/TCNS.2017.2653418, 2017. Scheduled issue of publication (tentative) Volume 5 (2018), Issue 3 (September). Published online 16 January 2017, early access version.

- [J.14] R. M. Vignali, F. Borghesan, L. Piroddi, M. Strelec and M. Prandini. Energy Management of a Building Cooling System with Thermal Storage: An Approximate Dynamic Programming Solution. *IEEE Transactions on Automation Science and Engineering*, special issue on Automation and Optimization of Energy Systems, vol. 14, no. 2, pp. 619-633, 2017.
- [J.15] F. Bianchi, A. Falsone, M. Prandini, L. Piroddi. A randomised approach for NARX model identification based on a multivariate Bernoulli distribution. *International Journal of Systems Science*, vol. 48, no. 6, pp. 1203-1216, 2017.
- [J.16] R. Vignali and M. Prandini. Minimum resource commitment for reachability specifications in a discrete time linear setting. *IEEE Transactions on Automatic Control*, vol. 62, no. 6, pp. 3021-3028, June 2017.
- [J.17] L. Deori, S. Garatti, M. Prandini. Trading performance for state constraint feasibility in stochastic constrained control: A randomized approach. *Journal of the Franklin Institute*, vol. 354, no. 1, pp. 501-529, January 2017.
- [J.18] Y. Yang, J. Zhang, K. Q. Cai, M. Prandini. Multi-aircraft Conflict Detection and Resolution Based on Probabilistic Reach Sets. *IEEE Transactions on Control Systems Technology*, vol. 25, no. 1, pp. 309-316, January 2017.
- [J.19] A.V. Papadopoulos and M. Prandini. Model reduction of switched affine systems. *Automatica* vol. 70, pp. 57-65, 2016.
- [J.20] G. Manganini, M. Pirotta, M. Restelli, L. Piroddi and M. Prandini. Policy Search for the Optimal Control of Markov Decision Processes: A Novel Particle-Based Iterative Scheme. *IEEE Transactions on Cybernetics*, vol. 46, no. 11, pp. 2643-2655, November 2016.
- [J.21] A. Falsone, L. Piroddi, M. Prandini. A randomized algorithm for nonlinear model structure selection. *Automatica*, vol. 60, pp. 227-238, 2015.
- [J.22] K. Margellos, M. Prandini and J. Lygeros. On the Connection Between Compression Learning and Scenario Based Single-Stage and Cascading Optimization Problems. *IEEE Transactions on Automatic Control*, vol. 60, no. 10, pp. 2716-2721, October 2015.
- [J.23] M. Prandini, S. Garatti, R. Vignali. Performance assessment and design of abstracted models for stochastic hybrid systems through a randomized approach. *Automatica*, vol. 50, no. 11, pp. 2852-2860, 2014.
- [J.24] S. D. Bopardikar, A. Borri, J.P. Hespanha, M. Prandini, M. D. Di Benedetto. Randomized sampling for large zero-sum games. *Automatica*, vol. 49, no. 5, pp. 1184-1194, 2013.
- [J.25] M. Prandini, V. Putta, J. Hu. Air traffic complexity in future Air Traffic Management systems. *Journal of Aerospace Operations*, vol. 1, no. 3, pp. 281-299, 2012.
- [J.26] M. Prandini, L. Piroddi, S. Puechmorel, S.L. Brázdilová. Toward Air Traffic Complexity Assessment in New Generation Air Traffic Management Systems. *IEEE Transactions on Intelligent Transportation Systems*, vol. 12, no. 3, pp. 809-818, 2011.
- [J.27] J. Lygeros and M. Prandini. Stochastic hybrid systems: a powerful framework for complex, large scale applications. *European Journal of Control*, introductory paper to the special issue on Stochastic hybrid systems, vol. 16, no. 6, pp. 583-594, 2010.
- [J.28] A. Abate, J.P. Katoen, J. Lygeros, M. Prandini. Approximate model checking of stochastic hybrid systems. *European Journal of Control*, special issue on Stochastic hybrid systems, vol. 16, no. 6, pp. 624-641, 2010.
- [J.29] M. Prandini, V. Putta, J. Hu. A probabilistic measure of air traffic complexity in three-dimensional airspace. *International Journal of Adaptive Control and Signal Processing*, special issue on Air Traffic Management: Challenges and opportunities for advanced control, vol. 24, no. 10, pp. 813-829, 2010.
- [J.30] M.C. Campi, S. Garatti, M. Prandini. The scenario approach for systems and control design. *Annual Reviews in Control*, vol. 33, no. 2, pp. 149-157, 2009.

- [J.31] M. Prandini and J. Hu. Application of reachability analysis for stochastic hybrid systems to aircraft conflict prediction. *IEEE Transactions on Automatic Control*, vol. 54, no. 4, pp. 913-917, 2009.
- [J.32] A. Abate, M. Prandini, J. Lygeros, S. Sastry. Probabilistic reachability and safety for controlled discrete time stochastic hybrid systems. *Automatica*, vol. 44, no. 11, pp. 2724-2734, 2008.
- [J.33] J. Hu, M. Prandini, C. Tomlin. Conjugate Points in Formation Constrained Optimal Multi-Agent Coordination: A Case Study. *SIAM Journal on Control and Optimization*, vol. 45, no. 6, pp. 2119-2137, 2007.
- [J.34] J. Hu, M. Prandini, S. Sastry. Aircraft conflict prediction in presence of a spatially correlated wind field. *IEEE Transactions on Intelligent Transportation Systems*, vol. 6, no. 3, pp. 326-340, 2005.
- [J.35] M.C. Campi, J.P. Hespanha, M. Prandini. Cautious hierarchical switching control of stochastic linear systems. *International Journal of Adaptive Control and Signal Processing*, special issue on New approaches to adaptive control, vol. 18, no. 4, pp. 319-333, 2004.
- [J.36] R. Leonardi, P. Migliorati, M. Prandini. Semantic indexing of soccer audio-visual sequences: a multi-modal approach based on controlled Markov chains. *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 14, no. 5, pp. 634-643, 2004.
- [J.37] J. Hu, M. Prandini, S. Sastry. Optimal Coordinated Motions of Multiple Agents Moving on a Plane. *SIAM Journal on Control and Optimization*, vol. 42, no. 2, pp. 637-668, 2003.
- [J.38] M.C. Campi, M. Prandini. Randomized algorithms for the synthesis of cautious adaptive controllers. *Systems & Control Letters*, vol. 49, pp. 21-36, 2003.
- [J.39] J. Hu, M. Prandini, S. Sastry. Optimal Coordinated Maneuvers for Three-Dimensional Aircraft Conflict Resolution. *AIAA Journal of Guidance, Control, and Dynamics*, vol. 25, no. 5, pp. 888-900, 2002.
- [J.40] M. Prandini, M.C. Campi. Adaptive LQG Control of Input-Output Systems—A Cost-biased Approach. *SIAM Journal on Control and Optimization*, vol. 39, no. 5, pp. 1499-1519, 2000.
- [J.41] M. Prandini, J. Hu, J. Lygeros, S. Sastry. A probabilistic approach to aircraft conflict detection. *IEEE Transactions on Intelligent Transportation Systems*, special issue on Air Traffic Control - Part I, vol. 1, no. 4, pp. 199-220, 2000.
- [J.42] M. Prandini, M.C. Campi. A new recursive identification algorithm for singularity free adaptive control. *Systems & Control Letters*, vol. 34, no. 4, pp. 177-183, 1998.
- [J.43] M. Prandini, S. Bittanti, M.C. Campi. A penalized identification criterion for securing controllability in adaptive control. *Journal of Mathematical Systems, Estimation, and Control*, vol. 8, no. 4, pp. 1-19, 1998.
- [J.44] M. Prandini, M.C. Campi, R. Leonardi. Optimal delay estimation and performance evaluation in blind equalization. *International Journal of Adaptive Control and Signal Processing*, vol. 11, pp. 621-640, 1997.

## Interviews on magazines in control

- [I.1] Maria Prandini [People in Control]. *IEEE Control Systems*, 36 (2): 26-29, 2016

## International book chapters

- [B.1] M.C. Campi, S. Garatti, M. Prandini. Scenario optimization for MPC. In *Handbook of Model Predictive Control*, Springer, 2019
- [B.2] S. Garatti and M. Prandini. Design in the presence of uncertainty: the scenario approach. In *Lecture Notes Modern Computational Science*, Reinhard Leidl and Alexander Hartmann, editors, Oldenburger Universitätsverlag, 2012.

- [B.3] J. Lygeros, M. Prandini. Stochastic hybrid systems. In *The HYCON Handbook of Hybrid Systems Control: Theory, Tools, Applications*, pp. 249-278, Cambridge University Press, 2009.
- [B.4] S. Bittanti, M.C. Campi, M. Prandini. How many experiments are needed to adapt? In *Modeling, Estimation and Control. Festschrift in Honor of Giorgio Picci on the Occasion of his Sixty-Fifth Birthday*, Lecture Notes in Control and Information Sciences, vol. 364, pp. 7-17, Springer Verlag, 2007.
- [B.5] M. Prandini, M.C. Campi, S. Garatti. Controller design through random sampling: An example. In *Advances in Control Theory and Applications* Lecture Notes in Control and Information Sciences, vol. 353, pp. 201-212, Springer Verlag, 2007.
- [B.6] M. Prandini and J. Hu. Stochastic reachability: Theory and numerical approximation. In *Stochastic hybrid systems*, Automation and Control Engineering Series vol. 24, pp. 107-138, Taylor & Francis Group/CRC Press, 2006.
- [B.7] M. Prandini and J. Hu. A stochastic approximation method for reachability computations. In *Stochastic hybrid systems: theory and safety applications*, Lecture Notes in Control and Information Sciences, vol. 337, pp. 107-139, Springer-Verlag, 2006.

## Theses

- [T.1] M. Prandini. Adaptive linear quadratic Gaussian control: optimality analysis and robust controller design. *Ph.D. Thesis*, Università degli Studi di Brescia, Italy, February 1998.
- [T.2] R. Magni and M. Prandini. Correnti endogene dell'osso: misure sperimentali e modellizzazione. *Laurea thesis*, Politecnico di Milano, Italy, February 1994 (in Italian).

## International conference publications

- [C.1] A. Falsone, K. Margellos, M. Prandini. A distributed iterative algorithm for multi-agent MILPs: finite-time feasibility and performance characterization In *57th IEEE Conference on Decision and Control*, Miami, USA, December 2018.
- [C.2] F. Bianchi, M. Prandini, L. Piroddi. A randomized approach to switched nonlinear systems identification. In *18th IFAC Symposium on System Identification*, Stockholm, Sweden, July 9-11, 2018. F. Bianchi was finalist of the *SYSID Young Author Award*.
- [C.3] A. Casalino, M. Prandini, P. Rocco. Hybrid control of manipulators in human-robot coexistence scenarios. In *2018 American Control Conference*, Milwaukee, Wisconsin, USA, June 27-29, 2018.
- [C.4] V. Causevic, A. Falsone, D. Ioli, M. Prandini. Energy management in a multi-building set-up via distributed stochastic optimization. In *2018 American Control Conference*, Milwaukee, Wisconsin, USA, June 27-29, 2018.
- [C.5] R. Vignali, D. Ioli, M. Prandini. A data-driven approach to stochastic constrained control of piecewise affine systems. In *2018 American Control Conference*, Milwaukee, Wisconsin, USA, June 27-29, 2018.
- [C.6] B. Sakcak, L. Bascetta, G. Ferretti, M. Prandini. Using motion primitives to enforce vehicle motion constraints in sampling-based optimal planners. In *2018 IEEE International Symposium on Circuits and Systems*, Florence, Italy, May 27-30, 2018.
- [C.7] Y. Yang, X. Cao, M. Prandini. Fast Algorithm Based on Computational Geometry for Probabilistic Aircraft Conflict Detection. In *2017 International Conference on Robotics and Artificial Intelligence*, Shanghai, China, December 29-31, 2017.
- [C.8] A. Falsone, K. Margellos, S. Garatti, M. Prandini. Linear programs for resource sharing among heterogeneous agents: a probabilistic analysis of the maximum capacity in terms of number of agents. In *56th IEEE Conference on Decision and Control*, Melbourne, Australia, December 2017.

- [C.9] A. Falsone, L. Deori, D. Ioli, S. Garatti, M. Prandini. Optimally shaping the stationary distribution of a constrained discrete time stochastic linear system via disturbance compensation. In *56th IEEE Conference on Decision and Control*, Melbourne, Australia, December 2017.
- [C.10] S. Mutti, A. Falsone, K. Margellos, M. Prandini. A proximal minimization based distributed approach to power control in wireless networks: Performance and comparative analysis. In *56th IEEE Conference on Decision and Control*, Melbourne, Australia, December 2017.
- [C.11] G. Manganini, A. Falsone, J. Siroky, M. Prandini. A data-based approach to power capacity optimization. In *56th IEEE Conference on Decision and Control*, Melbourne, Australia, December 2017.
- [C.12] D. Ioli, A. Falsone, M. Hartung, A. Busboom, M. Prandini. A smart-grid energy management problem for data-driven design with probabilistic reachability guarantees. In *Workshop on Applied Verification for Continuous and Hybrid Systems*, satellite event of CPS Week 2017, Pittsburgh, USA, April 12, 2017.
- [C.13] L. Deori, K. Margellos, M. Prandini. On the connection between Nash equilibria and social optima in electric vehicle charging control games. In *20th World Congress of the International Federation of Automatic Control*, Toulouse, France, July, 2017. L. Deori was awarded the *IFAC Young Author Prize*.
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