

Antonella Ferrara's Curriculum Vitae



Antonella Ferrara, *Ph.D.*

Full Professor of Automatic Control

Department of Electrical, Computer and Biomedical Engineering (ECBE)

University of Pavia

Via Ferrata 5,

27100 Pavia – ITALY

Date of birth: 05/09/1963

Nationality: Italian

Office Phone: +39 0382 985362

Office Fax: +39 0382 985373

Mobile: +39 338 7508099

e-mail: antonella.ferrara@unipv.it

Antonella Ferrara was born in Genova, Italy. As a student at the Faculty of Engineering of the University of Genova, she got the "IEEE North Italy Section Electrical Engineering Student Award" in 1986. She received the Laurea Degree (5 years, MSc Program) in Electronic Engineering (Cum Laude and printing honors) in 1987, and the Ph.D. in Computer Science and Electronics in 1992, both from the University of Genova. She was Assistant Professor in the Department of Communication, Computer and System Sciences of the University of Genova (1992-1998). In November 1998 she became Associate Professor of Automatic Control at the University of Pavia. Since January 2005 she has been Full Professor of Automatic Control, first in the Department of Computer Engineering and Systems Science of the University of Pavia (2005-2011), and then in the newborn Department of Electrical, Computer and Biomedical Engineering (ECBE) of the same university.

Institutional Roles: She is the Head of the Intelligent Robotics Laboratory of her university. She was the President of the Research Standing Committee of the Department of Electrical, Computer and Biomedical Engineering (October 2021-Settembre 2024). She was the Delegate for International Mobility of Computer Engineering and Computer Science students (2006-2023). She is a member of several departmental governing bodies, committees and panels.

Teaching and PhD/PostDoc/Master students' Supervision: At the moment, she teaches "Process Control" (6 credits; one credit corresponds to 7.5 hours of teaching), "Robot Control" (6 credits), and "Nonlinear Control" (4 credits) in the MSc Programs in Computer Engineering and Industrial Automation Engineering. All the courses are in English. She also teaches "Control of Vehicle Dynamics" (10 hours) in the Post-Bachelor Program on Race Engineering, and "Control and State Estimation in Modern Power Networks" (2 hours) in the Intensive School for Advanced Graduate Studies entitled "A Smart Grid for Energy Management: the IoT approach". She is one of the creators and contributors of the courses "Systems and Control Colloquia I" (3 credits) and "Systems and Control Colloquia II" (3 credits) for PhD students, started in the academic year 2023-2024.

She supervised several PhD students (4 of them are now Professors in international institutions). In addition, she has guided numerous Postdoctoral and Visiting Research Fellows, including two

recipients of the highly competitive Marie Skłodowska-Curie Postdoctoral Fellowships. Her commitment to graduate education is further evidenced by her supervision of over 200 MSc students.

Research: Her research activities are mainly in the area of nonlinear control, with a special emphasis on control of uncertain systems and application to road traffic, automotive systems, electro-mobility, robotics and power systems. She is author and co-author of more than 450 publications including more than 170 journal papers, 2 monographs (published by Springer Nature and SIAM, respectively), one edited book (IET) and another one in preparation for Springer Nature. See <https://scholar.google.com/citations?user=r5JuMskAAAAJ> for a list of her publications.

Plenary Lectures, Invited Lectures and Visiting Positions: She was invited to give 10 Plenary Lectures and 1 Semi-plenary Lecture in international scientific conferences, including the European Control Conference 2023 and, in 2026, the annual flagship conference of the IEEE Intelligent Transportation Systems Society (IEEE ITSS).

She was Visiting Professor at Graz University of Technology, as well as Visiting Scholar and Invited Lecturer at Harvard University and at the University of Minnesota. She was Invited Lecturer at University of California at Los Angeles (UCLA), University of Stuttgart, Technical University of Delft, INRIA Grenoble, King Abdullah University of Science and Technology (KAUST) in Jeddah, Hanyang University in Seoul, Universidade Federal do Rio de Janeiro, Brazil, Dalian Maritime University in China, National Institute of Technology Silchar, Assam, India, IIIT Kharagpur, India, Murdoch University in Australia, École Polytechnique Fédérale de Lausanne, Nanjing University of Science and Technology in China, Imperial College London, University of Cambridge, University of Exeter, Maynooth University, CentraleSupélec at the Université Paris-Saclay, Brussels Institute for Advanced Studies, KU Leuven, among others. She was frequently invited to give lectures in International Schools for Ph.D. students.

She was Visiting Researcher at Université Libre De Bruxelles (ULB) and Vrije Universiteit Brussel (VUB) during the Brussels Institute for Advanced Studies (BrIAS) Programme 2025 “Sustainable Robotics, AI and Automation” (January-February 2025).

Participations in Editorial Boards: Antonella Ferrara was involved in several editorial boards. Specifically, she was Associate Editor of the *IEEE Transactions on Control Systems Technology*, of the *IEEE Transactions on Automatic Control*, and of the *IEEE Control Systems Magazine*. She was Subject Editor of the *International Journal of Robust and Nonlinear Control* and she is still a member of the Journal Editorial Board. She was Associate Editor and Senior Editor of the *IEEE Transactions on Intelligent Vehicles*. Since 2018 she has been Associated Editor of *Automatica*, and, since January 2022, Senior Editor of *IEEE Open Journal of Intelligent Transportation Systems*. She was a member of the *IEEE Transactions on Intelligent Vehicles* Steering Committee representing the IEEE Control Systems Society (CSS Liaison Representative) from 2021 to 2023.

She was Series Editor of the book series “*Advances in Industrial Control*” published by Springer Nature (2018-2021). She was Guest Editors of five Special Issues in international scientific journals.

Participations in International Program Committees: She was and currently is member of the International Program Committee of several international conferences and events. She is one of the two General Chairs of the IEEE Workshop on Variable Structure Systems to be held in Exeter, UK, in July 2025. She was *Program Chair* of the IEEE Workshop on Variable Structure Systems held in Abu Dhabi in October 2024, and *Chair of the International Program Committee* of the IFAC Modeling, Estimation, and Control Conference 2024 (MECC 2024) held in Chicago on October 27-30, 2024.

Moreover, she was *Program Vice-Chair* of the European Control Conference (ECC 2014) held in Strasbourg, France, *Program Vice-Chair* of the 22nd IEEE Mediterranean Conference on Control & Automation (Med14) held in Palermo, Italy, *Program Co-Chair* of the IEEE IES International Conference on Mechatronics (ICM) 2019 held in Ilmenau, German, and *Program Co-Chair* of the 8th IEEE International Conference on Connected Vehicles and Expo (ICCVE) held in Graz, Austria. She was *Editor* of the IFAC Symposium on Control in Transportation Systems (CTS) 2018 held in Savona, Italy, as well as *Publication Chair* for IEEE Conference on Decision and Control 2019 (CDC 2019) held in Nice, France. She has been Associate Editor at Large of the IEEE Conference on Decision and Control since 2021.

She will serve as one of the two *Program Chairs* for the *24th IFAC World Congress* to be held in Amsterdam, The Netherlands, in 2029 (the IFAC World Congress is the most prestigious conference in the control community, held once every three years and attracting leading researchers and practitioners from around the globe).

Scientific Society Involvements: She has been a member of the European Control Association (EUCA) Council since 2015. Since the European Control Conference in 2019 (ECC 2019), she has been serving as the *EUCA Conference Editorial Board Chair*, leading a team of 166 Associate Editors and 14 Associate Editors at Large, contributing to the program preparation of seven ECC editions.

She was “appointed member” of the Board of Governors of the IEEE Control Systems Society in 2012. She was *Chair of the Women in Control Committee* of the IEEE Control Systems Society (July 2013-December 2016) and, at present, she is a member of the Advisory Board of that committee. She was “elected member” of the Board of Governors of the IEEE Control Systems Society for the triennium 2016-2018. She was member of the IEEE Control System Society Outreach Task Force (2017-2019) and was appointed *Chair of the Outreach Task Force* in 2020. At present (since January 2023), she is *Director of Operations of the IEEE Control System Society* and member of the ExCom of that society. Moreover, she is *ex officio member of the IEEE Control System Society Board of Governors and Long-Term Planning Committee*. She is a *member of the CSS IEEE Fellow Nomination Committee* (since 2024) and of the *International Federation of Automatic Control (IFAC) Fellow Search Committee* (for the triennium 2024-2026). She is a *member of the IFAC Manfred Thoma Medal Selection Committee* (2023 - 2026).

She is also *appointed member of the IEEE ITS Society Long-Term Planning Committee* (since January 2025).

She is the *Vice-Chair for industry* of the IFAC Technical Committee (TC) 2.3 on Nonlinear Control for the triennium 2024-2026 and *member of the IFAC Industry Board*. She is a *member of the IFAC Conference Board* (starting from July 2023). She is a member of the IFAC TC on Nonlinear Control Systems, IFAC TC on Transportation Systems, IFAC TC on Intelligent Autonomous Vehicles, IEEE TC on Automotive Control, IEEE TC on Smart Cities, and IEEE TC on Variable Structure Systems.

Awards and Fellowships: Among several awards, she was a co-recipient of the *2020 IEEE Transactions on Control Systems Technology Outstanding Paper Award*.

She was elected as a *Fellow of the European Academy of Sciences (EurASc)*, *Fellow of the Institute of Electrical and Electronics Engineers (IEEE)*, *Fellow of the International Federation of Automatic Control (IFAC)* and *Fellow of the Asia-Pacific Artificial Intelligence Association (AAIA)*.

She is a *Senior Fellow of the Brussels Institute for Advanced Studies*.

Leadership in Competitive Research Projects: Prof. Ferrara is/was *Principal Investigator* and member of research units in numerous international research projects. In particular, just mentioning some of her projects, she was *Principal Investigator* in the European Project PROTECTOR (Preventive safety for un-protected road users) ended in 2003, in the European Project ITEAM (Interdisciplinary Training Network in Multi-Actuated Ground Vehicles, Marie Skłodowska-Curie Action), 2016-2019, and in the International Europe-Mexico FONCICYT project (Automation of Energy Production Processes via Sliding Modes). She was also involved in the EU Project HYCON2 (FP7-ICT-2009-5) contributing to the development of the road traffic control showcase in Grenoble, France. At the moment, she is *Coordinator* of the EU HORIZON-MSCA-2023-PF-01 project RACE (Robust Control Strategy for Dynamic Lane Change of Intelligent Articulated Heavy Vehicle in Complex Traffic Environment), and of the EU HORIZON-MSCA-2023-PF-01 project FEASIBLE (Federated Learning-based Distributed Control for Heterogeneous Platoons of Connected Autonomous Electric Vehicles). She is PI of the project E-COSMOS on “Electric Charging Optimization for Sustainable Mobility Systems” started on April 1st, 2025 and lasting 36 months.

She is/was *Principal Investigator* in national projects as well. At present, she is *National Coordinator* and *Principal Investigator* in the national project PRIN 2022 “Sustainable Mobility Control Strategies for Urban and Extra-Urban Traffic via Electric Connected and Automated Vehicles and Buses”, as well as *Principal Investigator* in the national project PRIN PNRR 2022 “HeRo-MAC Heterogeneity on the Road - Modeling, Analysis, Control”, both funded by the EU Next Generation Program. She is also *Co-Principal Investigator* in the strategic project of the Italian Ministry of University and Research “Fit for Medical Robotics - Fit4MedRob” on innovations in robotic rehabilitation (team grant: € 5M). She is a member of the “National Centre for HPC, Big Data and Quantum Computing” (2022-2025), contributing to the research on: “Multiscale Modelling and Engineering Applications”.

Industrial Collaborations: She was/is scientific leader of several research projects in collaboration with companies, including Ferrari F1, Centro Ricerche FIAT, Volvo and Skoda.

Other achievements: She is one of the eleven experts appointed by the Italian Ministry of Research to write the National Research Plan for the period 2021-2027 for the research area “Sustainable Mobility”.

Since June 2019 she has been listed in the Italian Database <https://100esperte.it> including women regarded as national leading experts in STEM and other sciences.

She is listed in the top 2% of highly cited researchers’ rankings produced by Stanford University scientists in cooperation with publisher Elsevier BV and the SciTech Strategies Inc, based on Scopus data. One of her papers has received the “Top Viewed Paper Certificate” from Wiley as one of the top viewed papers in the International Journal of Robust and Nonlinear Control in 2023.

Main Research Topics:

- Nonlinear control theory with special emphasis on “sliding mode control”, “sliding mode observers” and “optimization-based sliding mode algorithms”.
- Control of vehicles dynamics (cars and motorcycles), as well as control strategies for connected and automated vehicles and autonomous driving.
- Optimization and control for electric mobility (cars, heavy-duty vehicles and buses).
- Modelling, state observation and control of road traffic systems, with a special attention to sustainability objectives (climate neutrality, reduction of fuel consumption, energy efficiency).

- Intelligent robotics (mobile robotics, robotics and artificial intelligence, human-robot interaction) and rehabilitation robotics.
- Control, state estimation and fault diagnosis in power networks and energy systems.

Major Scientific Achievements:

- Antonella Ferrara contributed to the development of the concept of second-order sliding modes through the introduction of the **Second Order Sliding Mode Suboptimal Algorithm** (Automatica, 1997; IEEE Transactions on Automatic Control, 1998), which remains one of the few widely recognized and established second order sliding mode control algorithms. Building on this foundation, she advanced the field further by proposing innovative control strategies, including MPC-sliding mode-based nested controllers, event-triggered sliding mode schemes, and adaptive and switched controllers, all rooted in the generation of sliding modes. These technical achievements laid the groundwork for her second major contribution to control theory: the generalization of the second-order sliding mode concept to that of higher-order sliding modes. She was among the few pioneers in this area, helping to shape the current state of the art in nonlinear sliding mode control.
- She demonstrated the **possibility of applying sliding mode control to robotics**, proposing efficient algorithms with chattering alleviation which were assessed in practical implementations. She also successfully investigated the possibility of enhancing classical robot control by means of deep reinforcement learning techniques and other machine learning based methods.
- Her **automotive applications of sliding mode control** to traction/brake control, stability systems, and torque-vectoring control of fully electric vehicles are also appreciated and used in practice in European projects and R&D groups in companies. Four Master Theses on automotive control she supervised were awarded with the ATA Award (ATA is the *Associazione Tecnica dell'Automobile*, an Italian association part of the Fédération Internationale des Sociétés d'Ingénieurs des Techniques de l'Automobile and of the European Automobile Engineers Co-operation). Prof. Ferrara edited and co-authored the book: "Sliding Mode Control of Vehicle Dynamics", IET Digital Library, 2017. She pursued research collaborations with well-known automotive companies such as Ferrari F1 and FIAT, through her multiple years long collaboration with *Centro Ricerche FIAT* (CRF), credited with promoting the adoption of sliding mode control and other nonlinear control methodologies within the automotive industry.
- She also demonstrated the **possibility of applying sliding mode control to micro-grids and power networks**, proposing efficient algorithms with distributed observation and control capabilities. Experimental validations, carried out in collaboration with RSE S.p.A. (Ricerca sul Sistema Energetico), a company indirectly controlled by the Italian Ministry of Economy and Finance, confirmed the effectiveness of the developed control strategies, demonstrating their practical applicability and innovative contribution to real-world energy system operations.
- She contributed to research in **vehicular traffic modelling and control** from a control engineering perspective, publishing several influential papers and delivering plenary and invited tutorial lectures at leading international conferences. She contributed to the EU project HYCON 2, which resulted in the implementation of a real-world traffic management showcase in Grenoble, France. She published the monograph "Freeway Traffic Modeling and Control" (Springer) co-authored by S. Saccone and S. Siri. The book review by Prof. Cassandras, Boston University, was published in the IEEE Control Systems Magazine in 2019 (*C.G. Cassandras, "Freeway Traffic Modelling and Control" in IEEE Control Systems Magazine, vol. 39, no. 1, pp. 68-71, Feb. 2019*). She collaborated with the Italian companies, managing national motorways, *Autostrade S.p.A.* and *Società Autostrade Valdostane*.