Curriculum vitae di *Alessandro Astolfi*

Sottosettori ERC primari (max 3): *PE7_1,*
Eventuali sottosettori ERC secondari (max 3): *PE7_3, PE7_10, PE7_12*

PERSONAL DETAILS

Family name, First name: Astolfi, Alessandro

Birthdate: 11 October 1967

Researcher unique identifier(s) (such as ORCID, Research ID, etc. ...): orcid.org/0000-0002-4331-454X

URL for web site: https://profiles.imperial.ac.uk/a.astolfi

- **Education and key qualifications**

1993 – 1996	Dottorato di Ricerca (PhD) from the University of Rome "La Sapienza" Thesis: Robust Control of Nonlinear Systems
1992 – 1995	Dr. in Technischen Wissenschaften (PhD) with Medal of Honour from ETH-Zurich Thesis: Discontinuous control of nonholonomic systems
1993 – 1995	Nachdiplomstudium (M.Sc.) in Informationstechnik from ETH-Zurich
1986 – 1991	Diploma (M.Eng.) cum laude in Electronic Engineering at University of Rome "La Sapienza"

- **Current position(s)**

2005 –	Professor of Nonlinear Control Theory, EEE Department, Imperial College London, London, UK
2005 –	Full Professor, DICII, University of Roma Tor Vergata, Roma, Italy

- **Previous position(s)**

2022 – 2025	College Consul , for the Faculty of Engineering & Business School, Imperial College London, London, UK
2010 – 2022	Head of the Control & Power Group, Imperial College London, London, UK
2002 – 2005	Reader in Nonlinear Control Theory, Imperial College London, London, UK
2000 – 2002	Senior Lecturer in Control Engineering, Imperial College London, London, UK
1996 – 2000	Lecturer, Imperial College London, London, UK
1998 – 2003	Associate Professor, Poilitecnico of Milano, Milan, Italy
1995 – 1996	Lecturer in Nonlinear Control Theory, ETH Zurich, Zurich, Switzerland

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Research achievements

Prof Alessandro Astolfi is world leader in the analysis and design of nonlinear control systems and their applications to mechanical, electromechanical, power and energy transformation, automotive, biomedical, and social systems. He is internationally renowned for having significantly advanced the state-of-the art in nonlinear, robust, optimal, and adaptive control designs rendering them applicable to physical systems and developing algorithms which require modest computations, thus scale gently with the dimension of the problem. In addition, he has made ground-breaking contributions to the estimation and observation problems for nonlinear systems developing universal methods and algorithms. Finally, he has pioneered model reduction methods for nonlinear systems and has demonstrated how reduced order models can be exploited in analysis, prediction, design, and optimization. A. Astolfi has been awarded 4 major best paper awards: one for his pioneering work on model reduction for nonlinear systems (2012 IEEE G. Axelby Outstanding Paper Award) and three for the application of nonlinear control theory to infectious diseases (2009 inaugural Googol Best New Application Paper Award (Sponsored by Googol Technology (HK Ltd)); to microgrids (2017 Automatica Best Paper Award); and to wave-energy conversion (2023 Transactions on Control Systems Technology Outstanding Paper Award).

The guiding principles of all the above contributions are the notions of geometry, interconnection, invariance, energy flow and dissipation. These have informed the whole research activity of A. Astolfi and have proved to be powerful principles around which advanced control methods can be designed and impact applications.

Prof. Astolfi has published over 200 journal papers, 300 conference papers, and 1 book, which have received more than 21,000 citations (Google Scholar). He has won 2 medals and has given over 20 plenary/keynote presentations at leading international conferences.

He has supervised over 30 Ph.D. students – many of whom have received national and international awards for their PhD thesis – and over 15 Postdoctoral Researchers. His PhD and Postdoctoral researchers have leading academic and industrial roles.

[1] A. Moreschini, M. Bin, A. Astolfi and T. Parisini, "A Generalized Passivity Theory over Abstract Time Domains," in IEEE Transactions on Automatic Control, 2025.
[2] K. Chen and A. Astolfi, "Active Nodes of Network Systems with Sum-Type Dissipation Inequalities," in IEEE Transactions on Automatic Control, vol. 69, no. 6, pp. 3896-3911, June 2024
[3] A. Moreschini, J.D. Simard and A. Astolfi, Data-driven model reduction for port-Hamiltonian and network systems in the Loewner framework, Automatica, Volume 169, 2024
[4] M. Sassano, T. Mylvaganam and A. Astolfi, "Model-Based Policy Iterations for Nonlinear Systems via Controlled Hamiltonian Dynamics," in IEEE Transactions on Automatic Control, vol. 68, no. 5, pp. 2683-2698, May 2023.
[5] L. Tziovani, L. Hadjidemetriou, P. Kolios, A. Astolfi, E. Kyriakides and S. Timotheou, "Energy Management and Control of Photovoltaic and Storage Systems in Active Distribution Grids," in IEEE Transactions on Power Systems, vol. 37, no. 3, pp. 1956-1968, May 2022
[6] J. D. Simard and A. Astolfi, "Nonlinear Model Reduction in the Loewner Framework," in IEEE Transactions on Automatic Control, vol. 66, no. 12, pp. 5711-5726, Dec. 2021
[7] N. Faedo, G. Scarciotti, A. Astolfi and J. V. Ringwood, "Nonlinear Energy-Maximizing Optimal Control of Wave Energy Systems: A Moment-Based Approach," in IEEE Transactions on Control Systems Technology, vol. 29, no. 6, pp. 2533-2547, Nov. 2021 (**2023 Best Paper Award**)
[8] M. Sassano and A. Astolfi, "Combining Pontryagin's Principle and Dynamic Programming for Linear and Nonlinear Systems", in IEEE Transactions on Automatic Control, vol. 65, no. 12, pp. 5312 - 5327, December 2020
[9] J. Jiang, A. Astolfi and T. Parisini, Robust traffic wave damping via shared control, Transportation Research Part C: Emerging Technologies, Volume 128, 2021, 103110.
[10] K. Chen and A. Astolfi, "Adaptive Control for Systems with Time-Varying Parameters," in IEEE Transactions on Automatic Control, vol. 66, no. 5, pp. 1986-2001, May 2021
[11] A. Padoan and A. Astolfi, "Moments of Random Variables: A Systems-Theoretic Interpretation," in IEEE Transactions on Automatic Control, vol. 64, no. 11, pp. 4407-4422, Nov. 2019
[12] P. Ascencio, A. Astolfi and T. Parisini, "Backstepping PDE Design: A Convex Optimization Approach," in IEEE Transactions on Automatic Control, vol. 63, no. 7, pp. 1943-1958, July 2018
[13] G. Scarciotti and A. Astolfi, Data-driven model reduction by moment matching for linear and nonlinear systems, Automatica, pp. 340-351, Volume 79, 2017
[14] G. Scarciotti and A. Astolfi, "Moment-Based Discontinuous Phasor Transform and its Application to the Steady-State Analysis of Inverters and Wireless Power Transfer Systems," in IEEE Transactions on Power Electronics, vol. 31, no. 12, pp. 8448-8460, Dec. 2016
[15] G. Scarciotti, L. Praly and A. Astolfi, "Invariance-Like Theorems and "lim inf" Convergence Properties," in IEEE Transactions on Automatic Control, vol. 61, no. 3, pp. 648-661, March 2016
[16] J. Schiffer, R. Ortega, A. Astolfi, J. Raisch and T. Sezi, Conditions for stability of droop-controlled inverter-based microgrids, Automatica, Volume 50, Issue 10, pp. 2457-2469, 2014 (**Best Paper Award**).

US10843024B2: Exercise equipment, Inventors: Alessandro Astolfi, Alex Caccia, Paul Mitcheson, Current Assignee MUOVERTI Ltd

Peer recognition

2026 – 2028 Chair of the IFAC Technical Board
2025 Member of the IEEE Fellow Nominations and Appointments Committee
2025 Member of the IEEE Thesaurus Editorial Board

2024 Member of the IEEE PSPB Strategic Planning Committee
2023 IEEE Transactions on Control Systems Technology Outstanding Paper Award for the paper "Nonlinear Energy-Maximizing Optimal Control of Wave Energy Systems: A Moment-Based Approach", N. Faedo, G. Scarciotti, A. Astolfi, J. Ringwood, 29 (6), 2533-2547, 2021
2021 – ERC Panel Members for Consolidator Grants
2020 – 2026 Vice-Chair of the IFAC Technical Board
2019 – 2022 Member of the IEEE Fellow Committee
2018 – 2025 Editor in Chief of the IEEE Trans. on Automatic Control
A. Astolfi is the first non-US-based EiC of the journal, which was founded in 1956
2017 International Federation of Automatic Control Outstanding Service Award
2017 Automatica Best Paper Award for the paper "Conditions for stability of droop-controlled inverter-based microgrids", J Schiffer, R Ortega, A Astolfi, J Raisch, T Sezi, Automatica 50 (10), 2457-2469
2016 Institute of Measurement and Control Sir Harold Hartley Medal for "Outstanding contributions to the technology of measurement and control"
2015 – 2021 Chair of the IEEE CSS Ruberti Young Researcher Prize Committee
2013 – 2025 Founding Editor in Chief of Foundation and Trends in Systems and Control
2013 – 2017 Editor in Chief of the European Journal of Control
2012 George S. Axelby Outstanding Paper Award for the paper "Model Reduction by Moment Matching for Linear and Nonlinear Systems", A. Astolfi, IEEE Transactions on Automatic Control, Vol. 55, No. 10, pp.2321-2336, October 2010
2012 IEEE CSS Distinguished Member Award
2011 – 2013 Elected Member of the IEEE Control Systems Society Board of Governors
2009 Googol Best New Application Paper Award (Sponsored by Googol Technology (HK) Ltd) for the paper "Activation of Immune Response in Disease Dynamics via Controlled Drug Scheduling", H. Chang and A. Astolfi, 6 (2), pp. 248-255, 2009
2007 Antonio Ruberti Young Researcher Prize, IEEE Control Systems Society
2006 – 2011 Member of the Administrative Council of the European Control Association
2003 Philip Leverhulme Prize, Leverhulme Trust

ADDITIONAL INFORMATION

A. Astolfi industrial experience, as consultant or project manager, has been directed towards the development of innovative technological solutions for a large set of industries, via his engineering consultancy companies: AMCC Holdings Limited and AMP Engineering Consulting Ltd.

Tullow Oil and Perenco: A. Astolfi has developed, via AMCC Holdings Ltd, a novel flow assurance technology for Tullow Oil and Perenco. This technology provides an economic and efficient alternative to classical heat-trace solutions, and it is deployable in scenarios in which heat-traces cannot be used, for example to directly heat a reservoir. The technology is Lloyds Register certified; has been demonstrated on the Weatherford testing facility in Aberdeen; and it is currently installed in the Niungo 19 well, jointly operated by Perenco and Tullow Oil in Gabon. It has been instrumental to restart production of the Niungo 19 well, which has been non-operational for a few years.

RMS Pumptools and ARAMCO: A. Astolfi has developed, via AMCC Holdings Ltd, a novel technology to power downhole sensors without the addition of infrastructure to the well system. This technology exploits inductive coupling on the MLE power cable at surface and inductive coupling on the neutral wire (the so-called i-wire) connected to the shorting ring of the downhole pump, to power a set of downhole sensors. This is achieved by using a high-frequency SiC based inverter which generates the power signal which is transmitted along the MLE cable – which acts as a transmission line. The selection of the frequency is optimized to maximize efficiency while minimizing interference with the operation of the downhole pump and the communication system. The technology – called Speedgauge – will be delivered to Aramco in 2025 via RMS Pumptools (which commercializes this technology built by AMCC Holdings).

UltraMTS: A. Astolfi has contributed, via AMCC Holdings Ltd, to the development and production of a unit that controls the passenger doors on a fleet of autonomous electric vehicles used for airport personal rapid transit (PRT) systems. In particular, Ultra-MTS contracted AMCC to engage in a program of work to provide door controllers for the new Chengdu Tianfu International Airport PRT system and to support the upgrade of

the Heathrow Terminal 5 PRT vehicles. Both systems are fully operational and have demonstrated a service availability of 99.86% and an average passenger wait time of 5.4 seconds.

Danieli Automation: A. Astolfi has led, via AMP Engineering Consulting Ltd, a collaborative project dealing with the power electronics control solution for the ground-breaking Q-One technology by Danieli Automation. In particular, he has developed an accurate simulation model of the power electronics subsystems containing high fidelity models of the individual components and all the passive elements using PLECS and has interfaced the model, via Matlab/Simulink, with the control architecture. He has demonstrated that classical PID-like architectures do not allow controlling the ripple currents and the over-voltages, whereas an interleaved hysteresis-based controller, in which all-phases are controlled separately and independently, achieves accurate current and voltage regulation, with minimum overshoots, and manages to compensate for the uncertainty in the arc dynamics. The hysteresis control requires the use of a high frequency PWM component and fast current measurements and relies on a hybrid architecture in which set points are compared with actual measurements and the PWM modulation is asynchronously adjusted to guarantee accurate performance.

Danieli Automation: A. Astolfi has led, via AMP Engineering Consulting Ltd, the development of digital twins for the steel and aluminium milling processes. These have resulted in the Q-Live technology, https://www.dca.it/en/products/technological-packages/flat-products/q-live_32_31.htm, which is currently used to reduce commissioning time; to train new operators in a safe environment; and to monitor the evolution of all process variables involved in the production process.

Ocean Harvesting Technologies AB is developing the point absorbing wave energy converter InfinityWEC, which is designed to provide instant force control capability with high efficiency, with a combination of a hydrostatic pre-tensioning system and bi-directional ball screw actuators. A. Astolfi has developed one of the very few nonlinear WEC optimal constrained control algorithms – the so-called moment-based MPC – which can handle a wide variety of nonlinearities, e.g. those modelling nonlinear Froude-Krylov and viscous drag. The resulting performance due to the high accuracy of the controller is noteworthy, with 45% increase of the average power compared to a linear MPC in the presented sea state, and virtually no constraint violations. The associated computational efficiency is sufficiently high to allow running the algorithm in real time.

A. Astolfi has also contributed, in addition to many other projects, to the design, build, and optimization of compact high-efficient SiC-based power inverters (with AMCC Holdings Ltd); the design of a control system providing virtual inertia for exercise equipment (with Muoverti Ltd); the design of vibrational energy harvesting systems (with Kinergizer BV); and the control of autonomous scooters (with AutoRD Ltd, see https://www.youtube.com/watch?v=t0JdlMksoWs).