

Concise CV of Dr. G. Rigatos

Dr. Gerasimos Rigatos obtained his diploma (1995) and his Ph.D. (2000) both from the Department of Electrical and Computer Engineering, of the National Technical University of Athens (NTUA), Greece. In 2001 he was a post-doctoral researcher at IRISA-INRIA, Rennes, France. He is currently a Research Director (Researcher Grade A') at the Industrial Systems Institute, Greece. He is a Senior Member of IEEE, and a Member and CEng of IET. He has led several research cooperation agreements and projects which have given accredited results in the areas of nonlinear control, nonlinear filtering and control of distributed parameter systems. His results appear in 8 research monographs and in several journal articles. His research comprising 130 journal articles where he is the first author, has received in Scopus more than 3000 citations with an H-index of 26 (in Scholar one counts more than 5500 citations with an H-index of 34). Since 2007, he has been awarded visiting professor positions at several academic institutions (University Paris XI, France, Harper-Adams University College, UK, University of Northumbria, UK, University of Salerno, Italy, Ecole Centrale de Nantes, France). He is an editor of the Journal of Advanced Robotic Systems and of the Journal of Electrified Vehicles.

I. Research topics: Nonlinear control theory, various control topics (control systems synthesis, control systems analysis, adaptive control, optimal control), robotics and control, electric power systems and control, filtering and estimation theory, fault diagnosis, computational intelligence

Main research findings are analyzed in the following **monographs** (also accessible through the e-link <http://u.pc.cd/36x7>):

- [E1] G.G. Rigatos, and K. Busawon, Robotic manipulators and vehicles: control, estimation and filtering, Springer 2018
- [E2] G.G. Rigatos, State-space approaches for modelling and control in financial engineering: systems theory and machine learning approaches, Springer, 2017
- [E3] G.G. Rigatos, Intelligent Renewable Energy Systems: Modelling and Control, Springer, 2016
- [E4] G.G. Rigatos Differential flatness approaches to nonlinear filtering and control: Applications to Electromechanical Systems, Springer, 2015.
- [E5] G.G. Rigatos Advanced Models of Neural Networks: Nonlinear Dynamics and Stochasticity in Biological Neurons, Springer, 2013.
- [E6] G.G. Rigatos, Modelling and Control for Intelligent Industrial Systems: Adaptive Algorithms in Robotics and Industrial Engineering, Springer, 2011.
- [E7] G.G. Rigatos and E. Karapanou, Advances in Applied Nonlinear Optimal Control, Cambridge Scholars Publishing, 2020
- [E8] G.G. Rigatos, M. Abbaszadeh and P. Siano, Control and estimation for dynamical nonlinear and Partial Differential Equations systems: Theory and Applications, IET Publications, 2021

- [E9] G.G..Rigatos, M. Abbaszadeh and M.A. Hamida, Nonlinear control, estimation and fault diagnosis for electric power generation, traction and propulsion systems, in press, 2023

II. Research and teaching positions

- [P1] 2002-today: Researcher (currently Research Director – Grade A) at the Industrial Systems Institute on the topic of “Modelling and Control of Industrial Systems” (Decree. 4386/2016)
- [P2] 2021-2022: Invited Professor at Ecole Centrale de Nantes, Laboratoire des Systèmes du Numérique de Nantes LS2N, UMR 6004
- [P3] 2016-2019: Invited Professor at the Department of Engineering and Environment of the University of Northumbria, UK
- [P4] 2016-2020: Invited Professor at the Department of Management and Innovation Systems of the University of Salerno Italy.
- [P5] 2011-2012: Lecturer on Mechatronics and Artificial Intelligence at the Department of Engineering, Harper Adams University, UK.
- [P6] 2007-2009: Lecturer on Systems and Control (Decree 407/80) at the Department of Electrical and Computer Engineering of the National Technical University of Athens.
- [P7] 2006-2007: Professeur invité (maître de conférences), Université Paris XI – Institut d’ Electronique Fondamentale, Orsay-Paris France, (June-July 2007), topic : Commande Intelligente et Systèmes Adaptatifs.

III. Main Research Achievements

- [A1] New nonlinear optimal control method which is based on H-infinity control theory and on approximate linearization of the system’s dynamics
- [A2] New adaptive neurofuzzy control approach which is based on approximate linearization of the system’s dynamics and on H-infinity control theory
- [A3] New nonlinear adaptive neurofuzzy control method which is based on differential flatness theory and which extends the class of dynamical systems to which adaptive fuzzy control can be applied.
- [A4] New nonlinear flatness-based control method which is implemented in successive loops.
- [A5] New control method for distributed parameter systems, that is systems described by partial differential equations. The method can be applied for boundary control of PDE systems exhibiting wave and diffusion-type dynamics
- [A6] New nonlinear Kalman filtering method which is based on differential flatness theory and which solves the nonlinear estimation problem in a conditionally optimal manner.
- [A7] New method for statistical validation of the Kalman Filter and its distributed variants.
- [A8] New method for fault diagnosis that is based on the analysis of the spectral content of a system’s output using neural networks with Gauss-Hermite polynomial activation functions.

Appendix

IV. Research Grants:

- [G1] E-Pico: Electric Vehicles Propulsion and Control Project, 2021-2022, European Commission, Ecole Centrale de Nantes, France
- [G2] Nonlinear control and filtering, 2016-2019, University of Northumbria, Laboratory of Nonlinear Dynamics, UK
- [G3] Systems theory and machine learning in Financial engineering, 2016-2020, University of Salerno, Smart Cities Lab, Italy
- [G4] Erasmus Programme Cooperation Agreement, 2014-2016, European Commission - University of Salerno, Italy
- [G5] Mechatronics and Artificial Intelligence, 2011-2012, Harper Adams University College, UK
- [G6] Erasmus Programme Cooperation Agreement, 2010-2013, European Commission - University of Salerno, Italy
- [G7] Commande Nonlinéaire et Systèmes Adaptatifs, 2007 Université Paris XI- Institut d' Electronique Fondamentale

V. Selected journal articles (2016-2023)

- [J1] G. Rigatos, M. Abbaszadeh, and J. Pomares, Flatness-based control in successive loops for electropneumatic actuators and robots (2023) IFAC Journal of Systems and Control, 25, art. no. 100222.
- [J2] G. Rigatos, P. Siano, B. Sari, M. Abbaszadeh and H. Hamida, Nonlinear optimal control of a multi-rotor wind power unit with PMSGs and AC/DC converters, Journal of Control and Decision, Taylor and Francis, 2023
- [J3] G. Rigatos, A nonlinear optimal control approach for unmanned surface vessels, Journal of Marine Systems and Ocean Technology, Springer, 2023
- [J4] G. Rigatos, M. Abbaszadeh, B. Sari, P. Siano, G. Cuccurullo and F Zouari, Nonlinear optimal control for a gas compressor driven by an induction motor (2023) Results in Control and Optimization, 11, art. no. 100226
- [J5] G. Rigatos, and M. Abbaszadeh, Nonlinear optimal control for a five-link parallel robotic manipulator (2023) JVC/Journal of Vibration and Control, 29 (3-4), pp. 714-735
- [J6] G. Rigatos, M. Abbaszadeh, B. Sari, and J. Pomares, Nonlinear optimal control for UAVs with tilting rotors (2023) International Journal of Intelligent Unmanned Systems
- [J7] G. Rigatos, A nonlinear optimal control approach for multi-DOF redundant robotic manipulators (2023) Mechanics Based Design of Structures and Machines, Taylor and Francis.
- [J8] G. Rigatos, M. Abbaszadeh, F. Marignetti, and P. Siano, A nonlinear optimal control approach for voltage source inverter-fed three-phase PMSMs (2023) COMPEL - The Intl Journal for Computation and Mathematics in Electrical and Electronic Engineering
- [J9] G. Rigatos, M. Hamida, M. Abbaszadeh, and P. Siano, Flatness-based disturbance observer for condition monitoring of marine power generation units (2023) Proceedings of the Institution of Mechanical Engineers. Part I: Journal of Systems and Control Engineering

- [J10] G. Rigatos, M. Abbaszadeh, P. Siano, G. Cuccurullo, J. Pomares and B. Sari, Nonlinear optimal control for the rotary double inverted pendulum (2023) *Advanced Control for Applications: Engineering and Industrial Systems*
- [J11] G. Rigatos, Nonlinear Optimal Control for the Underactuated Double-Pendulum Overhead Crane (2023) *Journal of Vibration Engineering and Technologies*
- [J12] G. Rigatos, M.A. Hamida, M. Abbaszadeh and P. Siano, Nonlinear Optimal Control for Hybrid Electric Vehicles with Doubly Excited Synchronous Machine and AC/DC Converter, (2022) *SAE International Journal of Electrified Vehicles*, 12 (3)
- [J13] G. Rigatos, M. Abbaszadeh and J. Pomares, Nonlinear optimal control for the 4-DOF underactuated robotic tower crane (2022) *Autonomous Intelligent Systems*, 2 (1), art. no. 21,
- [J14] G. Rigatos, M.A. Hamida, M. Abbaszadeh, and P. Siano, A nonlinear optimal control approach for shipboard AC/DC microgrids (2022) *Electric Power Systems Research*, 209, art. no. 108024, .
- [J15] G. Rigatos, M. Abbaszadeh and P. Siano, A nonlinear optimal control approach for permanent magnet AC motors with non-sinusoidal back EMF (2022) *Electrical Engineering*, 104 (4), pp. 2293-2318.
- [J16] G. Rigatos, M. Abbaszadeh and G. Cuccurullo, A nonlinear optimal control method against the spreading of epidemics (2022) *International Journal of Biomathematics*, 15 (5), art. no. 2250026, .
- [J17] G. Rigatos, N. Zervos, P. Siano, M. Abbaszadeh, J. Pomares, and P. Wira, A nonlinear optimal control approach for underactuated power-line inspection robots, (2022) *Robotica*, 40 (6), pp. 1979-2009.
- [J18] G. Rigatos, M. Abbaszadeh and J. Pomares, Flatness-based disturbance observer for exoskeleton robots under time-delayed contact forces (2022) *Advanced Control for Applications: Engineering and Industrial Systems*, 4 (2), art. no. e100
- [J19] G. Rigatos, K. Busawon and M. Abbaszadeh, A nonlinear optimal control approach for the truck and N-trailer robotic system (2022) *IFAC Journal of Systems and Control*, 20, art. no. 100191,
- [J20] G Rigatos, A nonlinear optimal control approach for underactuated offshore cranes (2022) *Ships and Offshore Structures*
- [J21] G. Rigatos, Nonlinear Optimal Control for the Translational Oscillator with Rotational Actuator (2022) *Cybernetics and Systems*, 53 (6), pp. 541-562.
- [J22] G. Rigatos, N. Zervos, P. Siano, M. Abbaszadeh, J. Pomares and P. Wira, A nonlinear optimal control approach for underactuated power-line inspection robots, *Robotica*, Cambridge University Press, 2021
- [J23] G. Rigatos and M. Abbaszadeh, Nonlinear optimal control for a five-link parallel robotic manipulator, *Journal of Vibrations and Control*, Elsevier, 2021
- [J24] G. Rigatos, M. Abbaszadeh, K. Busawon, Z. Gao and J. Pomares, A Nonlinear Optimal Control Approach for Multi-DOF Brachiation Robots, *Journal of Humanoid Robotics*, World Scientific, 2021
- [J25] G. Rigatos, M. Abbaszadeh and P. Siano, A nonlinear optimal control approach for permanent magnet AC motors with non-sinusoidal back EMF, *Journal of Electrical Engineering*, Springer, 2021
- [J26] G. Rigatos, N. Zervos, P. Siano, M. Abbaszadeh and M. Hamida, Nonlinear optimal control for the synchronization of distributed marine-turbine power

- generation units, *Electric Power Components and Systems*, Taylor and Francis, 2021
- [J27] G. Rigatos and M. Abbaszadeh, *Nonlinear optimal control for flexible joint robots*, *Optimal Control Applications and Methods*, J. Wiley, 2021
- [J28] G. Rigatos, M. Abbaszadeh and M.A. Hamida, *Nonlinear optimal control for the underactuated slosh-container system dynamics*, *Ships and Offshore structures*, 2021
- [J29] G. Rigatos, *Nonlinear optimal control for vertically take-off and landing aircrafts*, *Journal of Guidance, Dynamics and Control*, World Scientific, 2021
- [J30] G. Rigatos, *Nonlinear optimal control for the UAV and suspended payload system*, *Journal of Cybernetics and Physics*, 2021\
- [J31] G. Rigatos, N. Zervos, P. Siano, P. Wira and M. Abbaszadeh, *Flatness-based control for steam-turbine power generation units using a disturbance observer*, *IET Electric Power Applications*, 2021
- [J32] G. Rigatos, *Nonlinear optimal control for the translational oscillator with rotational actuator*, *Journal of Cybernetics and Systems*, Taylor and Francis, 2020
- [J33] G. Rigatos, M. Abbaszadeh, G. Cuccurullo, and P. Siano, *A nonlinear optimal control approach for the pulping process of paper mills (2021)* *IET Collaborative Intelligent Manufacturing*, 3 (2), pp. 161-174.
- [J34] G. Rigatos, M. Abbaszadeh, *Nonlinear optimal control and synchronization for chaotic electronic circuits (2021)* *Journal of Computational Electronics*, 20 (2), pp. 1050-1063.
- [J35] G. Rigatos, P. Siano, M. Abbaszadeh, and T. Ghosh, *Nonlinear optimal control of coupled time-delayed models of economic growth (2021)* *Decisions in Economics and Finance*,
- [J36] G. Rigatos, *A Nonlinear Optimal Control Approach for Tracked Mobile Robots(2021)* *Journal of Systems Science and Complexity*,
- [J37] G. Rigatos, P. Siano, and M. Abbaszadeh, *Nonlinear optimal control for synchronization of distributed hydropower generators (2021)* *Transactions of the Institute of Measurement and Control*, 43 (2), pp. 295-312.
- [J38] G. Rigatos, P. Siano, M. Abbaszadeh and A. Monteriu, *A nonlinear optimal control approach for the autonomous octocopter*, *Advanced Control for Applications*, J. Wiley, vol. 2, pp. 1-20, 2020
- [J39] G. Rigatos, P. Siano, V. Loia, and T. Ghosh, *Stabilization of a stock-loan valuation PDE process using differential flatness theory (2020)* *Asian Journal of Control*, 22 (6), pp. 2229-2241.
- [J40] G. Rigatos, M. Abbaszadeh, J. Pomares, and P. Wira, *A Nonlinear Optimal Control Approach for a Lower-Limb Robotic Exoskeleton (2020)* *International Journal of Humanoid Robotics*, 17 (5), art. no. 2050018, .
- [J41] G. Rigatos, K. Busawon, M. Abbaszadeh, and P. Wira, *Non-linear optimal control for four-wheel omnidirectional mobile robots (2020)* *Cyber-Physical Systems*, 6 (4), pp. 181-206.
- [J42] G. Rigatos, N. Zervos, M. Abbaszadeh, P. Siano, D. Serpanos, and V. Siadimas, *Neural networks and statistical decision making for fault diagnosis of PM linear synchronous machines (2020)* *International Journal of Systems Science*, 51 vol. 12, pp. 2150-2166.
- [J43] G. Rigatos, *Differential flatness theory-based control and filtering for a mobile manipulator (2020)* *Cybernetics and Physics*, 9 (1), pp. 57-68. \

- [J44] G Rigatos, P. Siano, and M. Abbaszadeh, Nonlinear optimal control for ship propulsion systems comprising an induction motor and a drivetrain (2020) Proceedings of the Institution of Mechanical Engineers Part M: Journal of Engineering for the Maritime Environment, 234 (2), pp. 409-425.
- [J45] G. Rigatos, M. Abbaszadeh, and M.A. Hamida, Nonlinear optimal control for the inertia wheel inverted pendulum (2020) Cyber-Physical Systems, 6 (2), pp. 55-75.
- [J46] G. Rigatos, P. Siano, and M. Sayed-Mouchaweh, Adaptive neurofuzzy H-infinity control of DC–DC voltage converters (2020) Neural Computing and Applications, 32 (7), pp. 2507-2520.
- [J47] G. Rigatos, P. Siano, F. Zouari, and S. Ademi, Nonlinear optimal control of autonomous submarines' diving (2020) Marine Systems and Ocean Technology, 15 (1), pp. 57-69.
- [J48] G. Rigatos, N. Zervos, K. Busawon, P. Siano, and M. Abbaszadeh, Differential flatness theory-based approach to the control of gas-turbine electric power generation units (2020) IET Control Theory and Applications, 14 (2), pp. 187-197.
- [J49] G. Rigatos, Statistical Validation of Multi-Agent Financial Models Using the H-Infinity Kalman Filter (2020) Computational Economics, .
- [J50] G. Rigatos, P. Siano, P. Wira, K. Busawon, and R. Binns, A nonlinear H-infinity control approach for autonomous truck and trailer systems (2020) Unmanned Systems, 8 (1), pp. 49-69.
- [J51] G. Rigatos, K. Busawon, and M. Abbaszadeh, Nonlinear optimal control of the acute inflammatory response (2020) Biomedical Signal Processing and Control, 55, art. no. 101631.
- [J52] G. Rigatos, K. Busawon, J. Pomares, and M. Abbaszadeh, Nonlinear Optimal Control for the Wheeled Inverted Pendulum System (2020) Robotica, 38 (1), pp. 29-47.
- [J53] G. Rigatos, P. Wira, M. Abbaszadeh, K. Busawon, and L. Dala, Nonlinear optimal control for autonomous hypersonic vehicles (2019) Aerospace Systems, 2 (2), pp. 197-213.
- [J54] G. Rigatos, N. Zervos, P. Siano, M. Abbaszadeh, P. Wira, and B Onose. Nonlinear optimal control for DC industrial microgrids (2019) Cyber-Physical Systems, 5 (4), pp. 231-253.
- [J55] G. Rigatos, N. Zervos, D. Serpanos, V. Siadimas, P. Siano, and M. Abbaszadeh, Fault diagnosis of gas-turbine power units with the derivative-free nonlinear Kalman Filter (2019) Electric Power Systems Research, 174, art. no. 105810, .
- [J56] G. Rigatos, K. Busawon, J. Pomares, and M. Abbaszadeh, Nonlinear optimal control for a spherical rolling robot (2019) International Journal of Intelligent Robotics and Applications, 3 (2), pp. 221-237.
- [J57] G. Rigatos, P. Siano, T. Ghosh, and B.A. Xin, A Nonlinear Optimal Control Approach for Industrial Production under an Oligopoly Model (2019) IEEE Systems Journal, 13 (2), art. no. 8470943, pp. 1991-2000.
- [J58] G. Rigatos, P. Siano, and T. Ghosh, Nonlinear Optimal Control Approach to Stabilization of Business Cycles of Finance Agents (2019) Computational Economics, 53 (3), pp. 1111-1131.
- [J59] G. Rigatos, P. Siano, M. Abbaszadeh, and P. Wira, Nonlinear optimal control for wind power generators comprising a multi-mass drivetrain and a DFIG (2019) Journal of the Franklin Institute, 356 (5), pp. 2582-2605.

- [J60] G. Rigatos, P. Wira, and A. Melkikh, Nonlinear optimal control for the synchronization of biological neurons under time-delays (2019) *Cognitive Neurodynamics*, 13 (1), pp. 89-103.
- [J61] G. Rigatos, Flatness-based control approach to networked control under sensor delays (2019) *IET Collaborative Intelligent Manufacturing*, 1 (2), pp. 39-47.
- [J62] G. Rigatos, N. Zervos, P. Siano, M. Abbaszadeh, and P. Wira, Non-linear optimal control for the hot-steel rolling mill system (2019) *IET Collaborative Intelligent Manufacturing*, 1 (3), pp. 97-107.
- [J63] G. Rigatos, P. Siano, and S. Ademi, Nonlinear H-infinity control for switched reluctance machines (2019) *Nonlinear Engineering*, 9 (1), pp. 14-27.
- [J64] G. Rigatos and P. Siano, Differential flatness and boundary control for bandwidth allocation in Internet routes (2018) *Cyber-Physical Systems*, 4 (4), pp. 216-231.
- [J65] G. Rigatos, P. Siano, A. Melkikh, and N.A. Zervos, nonlinear H-infinity control approach to stabilization of distributed synchronous generators (2018) *IEEE Systems Journal*, 12 (3), art. no. 7898811, pp. 2625-2663.
- [J66] G. Rigatos, G., Siano, P., Abbaszadeh, M., Ademi, S., Melkikh, A. Nonlinear H-infinity control for underactuated systems: the Furuta pendulum example (2018) *International Journal of Dynamics and Control*, 6 (2), pp. 835-847.
- [J67] G. Rigatos, and P. Siano, Forecasting of Power Corporations' Default Probability with Nonlinear Kalman Filtering (2018) *IEEE Systems Journal*, 12 (2), pp. 1099-1107.
- [J68] G. Rigatos, P. Siano, V. Loia, T. Ghosh, T., Krawiec, A. Nonlinear optimal control for a business cycles macroeconomic model of linked economies (2018) *Cyber-Physical Systems*, 4 (2), pp. 116-136.
- [J69] G. Rigatos, P. Siano, S. Ademi, and P. Wira, Flatness-Based Control of DC-DC Converters Implemented in Successive Loops (2018) *Electric Power Components and Systems*, 46 (6), pp. 673-687. \
- [J70] G. Rigatos, P. Siano, and M. Abbaszadeh, Nonlinear H-infinity control for 4-DOF underactuated overhead cranes (2018) *Transactions of the Institute of Measurement and Control*, 40 (7), pp. 2364-2377.
- [J71] G. Rigatos, and P. Siano, Stabilization of Mortgage Price Dynamics Using a Boundary PDE Feedback Control Approach (2018) *Journal of Quantitative Economics*, 16 (1), pp. 37-56.
- [J72] G. Rigatos, D. Serpanos, and N. Zervos, Detection of Attacks Against Power Grid Sensors Using Kalman Filter and Statistical Decision Making (2017) *IEEE Sensors Journal*, 17 (23), art. no. 7997714, pp. 7641-7648.
- [J73] G. Rigatos, and Zervos, Detection of Mispricing in the Black–Scholes PDE Using the Derivative-Free Nonlinear Kalman Filter (2017) *Computational Economics*, 50 (1), .
- [J74] G. Rigatos, P. Siano, and G. Raffo, A nonlinear H-infinity control method for multi-DOF robotic manipulators (2017) *Nonlinear Dynamics*, 88 (1), pp. 329-348.
- [J75] G. Rigatos, Control and disturbances compensation in underactuated robotic systems using the derivative-free nonlinear Kalman filter (2017) *Robotica*, 35 (3), pp. 687-711.
- [J76] G. Rigatos, N. Zervos, and A. Melkikh, Flatness-based control approach to drug infusion for cardiac function regulation (2017) *IET Systems Biology*, 11 (1), pp. 8-18.

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- [J78] G. Rigatos, P. Siano, Z. Tir, and M.A. Hamida, Flatness-based adaptive neurofuzzy control of induction generators using output feedback (2016) *Neurocomputing*, 216, pp. 684-699.
- [J79] G. Rigatos, and P. Siano, Power transformers' condition monitoring using neural modeling and the local statistical approach to fault diagnosis (2016) *International Journal of Electrical Power and Energy Systems*, 80, pp. 150-159.
- [J80] G. Rigatos, Non-linear feedback control of the p53 protein-mdm2 inhibitor system using the derivative-free non-linear Kalman filter (2016) *IET Systems Biology*, 10 (3), pp. 94-106.
- [J81] G. Rigatos, G. Zhu, H. Yousef, and A. Boulkroune, A. Flatness-based adaptive fuzzy control of electrostatically actuated MEMS using output feedback (2016) *Fuzzy Sets and Systems*, 290, pp. 138-157.
- [J82] G. Rigatos, P. Siano, and C.A. Cecati, New Non-linear H-infinity Feedback Control Approach for Three-phase Voltage Source Converters (2016) *Electric Power Components and Systems*, 44 (3), pp. 302-312.
- [J83] G. Rigatos, A chaotic communication system of improved performance based on the Derivative-free nonlinear Kalman filter (2016) *International Journal of Systems Science*, 47 (9), pp. 2152-2168.