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Model-based and Data-driven Low-cost Fuzzy Controllers with Servo System Applications

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KEYNOTE SPEECH

***Abstract*—This keynote talk covers the following topics: an overview of the Process Control Group at the Politehnica University of Timisoara, Romania; data-driven versus model-free control; our contributions; the structure and tuning of two-degree-of-freedom (2-DOF) fuzzy controllers; servo system control applications; and evolving fuzzy systems in relation to control. The presentation will include transportation applications within the context of an ERA-NET Cofund Urban Accessibility and Connectivity (ENUAC) JPI Urban Europe project.**

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Keywords—2-DOF fuzzy controllers, data-driven control, fuzzy control, model-based control, servo systems

SHORT BIO

Radu-Emil Precup (M IEEE '03 - SM IEEE '07 - F IEEE '25) was born in Lugoj, Romania, in 1963. He received the Dipl.Ing. (Hons.) degree in automation and computers from the "Traian Vuia" Polytechnic Institute of Timisoara, Timisoara, Romania, in 1987, the Diploma in mathematics from the West University of Timisoara, Timisoara, in 1993, and the Ph.D. degree in automatic systems from the "Politehnica" University of Timisoara, Timisoara, in 1996.

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He is the author or coauthor of more than 300 papers published in various scientific journals, refereed conference proceedings, and contributions to books. His research interests include mainly development and analysis of new control structures and algorithms (conventional control, fuzzy control, data-based control, sliding mode control, neuro-fuzzy control, etc.), theory and applications of soft computing, computer-aided design of control systems, modeling, optimization (including nature-inspired algorithms), and applications to mechatronic systems (including automotive systems and mobile robots), embedded systems, control of power plants, servo systems, electrical driving systems.

Prof. Precup is an IEEE Fellow, in the 2025 class of fellows, "for contributions to fuzzy and data-driven control of servo systems", a corresponding member of The Romanian Academy, a member of the US National Academy of Artificial Intelligence - NAAI, a Fellow of the Asia-Pacific Artificial Intelligence Association, a Doctor Honoris Causa of the Óbuda University, Budapest, Hungary, a Doctor Honoris Causa of the Széchenyi István University, Győr, Hungary, a member of the Task Force on Autonomous Learning Systems within the Neural Networks Technical Committee (TC) of the Institute of Electrical and Electronics Engineers (IEEE) Computational Intelligence Society, the TCs on Computational Cybernetics, and Cyber-Medical Systems of the IEEE Systems, Man, and Cybernetics

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He was the recipient of the Elsevier Scopus Award for Excellence in Global Contribution (2017), the "Henri Coandă" prize in the Engineering Sciences category, awarded at the Romanian Research Gala 2024, the "Tudor Tănăsescu" Prize from the Romanian Academy for data-driven controller tuning techniques (2020), the "Grigore Moisil" Prize from the Romanian Academy, two times, in 2005 and 2016, for his contribution on fuzzy control and the optimization of fuzzy systems, the Spiru Haret Award from the National Grand Lodge of Romania in partnership with the Romanian Academy in 2016 for education, environment and IT, the Excellency Diploma of the International Conference on Automation, Quality & Testing, Robotics AQTR 2004 (THETA 14, Cluj-Napoca, Romania), two Best Paper Awards in the Intelligent Control Area of the 2008 Conference on Human System Interaction HSI 2008, Krakow (Poland), the Best Paper Award of 16th Online World Conference on Soft Computing in Industrial Applications WSC16 (Loughborough University, UK) in 2011, the Certificate of Appreciation for the Best Paper in the Session TT07 1 Control Theory of 39th Annual Conference of the IEEE Industrial Electronics Society IECON 2013 (Vienna, Austria), a Best Paper Nomination at 12th International Conference on Informatics in Control, Automation and Robotics ICINCO 2015 (Colmar, France), a Best Paper Award at 7th International Conference on Information Technology and Quantitative Management ITQM 2019 (Granada, Spain), a Best Paper Award at 8th International Conference on Information Technology and Quantitative Management ITQM 2020 & 2021 (Chengu, China), was named a 2022 academic data leader by Chief Data Officer (CDO) Magazine, and was listed as one of the top 10 researchers in Artificial Intelligence and Automation (according to IIoT World as of July 2017). He is in the top half of the 1% Best Electronics and Electrical Engineering Scientists list and 1st in the National Ranking (Romania) according to Research.com, and in the 3% best Engineering & Technology / Electrical & Electronic Engineering rankings according to AD Scientific Index. Included in the list since 2020, he is currently ranked in the top 0.5% (2192nd out of 458615 researchers in Artificial Intelligence & Image Processing worldwide in 2025) according to the "Top 2% Scientists" Stanford University's list, and has 17 highly cited papers.

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