
**IEEE SMC Italian Chapter Virtual Lecture Series on
“Smart, PErvasive and Mobile Systems Engineering”****Lecture Title “Optimal control strategies to mitigate the COVID-19
outbreak in a multi-region scenario”***University of Calabria**On-line**February 26, 2021**12.00-13.00 CET*

by

Prof. Mariagrazia Dotoli
Politecnico di Bari, Italy**Abstract:**

In this talk, after revising the main models used in the related literature for analyzing the dynamics of infectious diseases, we present a novel time-varying epidemiological model for COVID-19. The model belongs to the class of SIRCQTHE models (i.e., considering Susceptible, Infected, Removed, Contagious, Quarantined, Threatened, Healed, and Extinct categories of individuals) and allows to get reliable predictions on the pandemic’s dynamics on a regional basis. We present an innovative stochastic non-linear control approach that supports the decision or policy makers in determining robust optimal strategies to tackle the COVID-19 secondary waves. More precisely, based on the presented SIRCQTHE model, a stochastic model predictive control problem is defined that allows policy makers to select the control actions that minimize the pandemic’s socio-economic costs, i.e., various types of people’s mobility restrictions (for example, closure of shops and restaurants, closure of regional/municipality borders). In addition, considering the unavoidable uncertainty characterizing the model’s parameters that strongly affect the decision-making process, we impose that the capacity of the network of regional healthcare systems is not violated, in accordance with a chance constraint approach. The effectiveness of the presented modeling and control technique in supporting the definition of diversified regional strategies for tackling the COVID-19 spread is effectively tested on the network of Italian regions using real data from the Italian Civil Protection Department.

Bio:

Mariagrazia Dotoli is a Full Professor in Systems and Control Engineering at Politecnico di Bari, Italy. She is the Coordinator of the PhD Program in Industry 4.0 of Politecnico di Bari and University of Bari. She is also deputy Director for Research of the Department of Electrical and Information Engineering at Politecnico di Bari. She has been Vice Rector for Research of Politecnico di Bari and a member elect of the Academic Senate of the same University. After receiving her Master’s degree in Electronic Engineering with honors and the Ph.D. in Electrical Engineering, both from Politecnico di Bari, she was a visiting scholar at the Paris 6 University (France) and at the Technical University of Denmark. She co-founded a start-up company and worked as scientific expert and consultant for a number of public and private organizations. Prof. Dotoli authored over 200 scientific papers and delivered speeches to several scientific conferences and workshops. She has 25 years of experience in multidisciplinary research in modeling, identification, management, control, automation, optimization, and diagnosis of discrete event industrial systems, manufacturing systems, supply chains, logistics and transportation systems, traffic networks, energy systems, smart cities, epidemic systems, digital industry. Prof. Dotoli served in many roles in the

IEEE (Institute of Electrical and Electronics Engineers), the world’s largest technical professional organization for the advancement of technology. She is currently a Senior Editor of the IEEE Transactions on Automation Science and Engineering and an Associate Editor of the IEEE Transactions on Control Systems Technology, and the IEEE Transactions on Systems, Man, and Cybernetics: Systems. She is a member elect of the Board of Governors of the IEEE Systems Man and Cybernetics Society (SMCS). She was the Editor in Chief of the eNewsletter of SMCS for years 2016-2020. She was involved in the scientific organization of numerous international conferences and symposia. She is currently General Chair of the MED2021 29th Mediterranean Conference on Control and Automation.