Modeling, Prediction, Mitigation and Vaccine Policy for COVID-19 Using Big Data and Fractional Calculus

YangQuan Chen

Mechatronics, Embedded Systems and Automation Laboratory,
Department of Mechanical Engineering University of California, Merced, CA,95343, USA
E-mail: ychen53@ucmerced.edu
Project website: https://mechatronics.ucmerced.edu/covid19

This presentation will introduce our group research efforts in COVID-19 epidemic modeling, prediction, mitigation and vaccine policy with the help of Google mobility data as well as Facebook Symptom Dataset. In modeling we focused on fractional order generalized SEIR model and its variants. As one of the active models in the https://viz.covid19forecasthub.org/, we shall report our weekly predictions since June 2020. Then we report our participation in the MMODS (multi-model outbreak decision support https://midasnetwork.us/mmods/) team project with scenarios and mitigation options study. Finally, we share some recent research on vaccine fairness priority scheduling. Future research efforts are discussed on long term COVID-19 monitoring and seasonal coupling effect with regular influenza.

Bio-sketch of YangQuan Chen

YangQuan Chen earned his Ph.D. from Nanyang Technological University, Singapore, in 1998. He had been a faculty of Electrical Engineering at Utah State University (USU) from 2000-12. He joined the School of Engineering, University of California, Merced (UCM) in summer 2012 teaching "Mechatronics", "Engineering Service Learning" and "Unmanned Aerial Systems" for undergraduates; "Fractional Order Mechanics", "Linear Multivariable Control", "Nonlinear Controls" and "Advanced Controls: Optimality and Robustness" for graduates. His research interests include mechatronics for sustainability, cognitive process control (smart control engineering enabled by digital twins), small multi-UAV based cooperative multi-spectral "personal remote sensing", applied fractional calculus in controls, modeling and complex signal processing; distributed measurement and control of distributed parameter systems with mobile actuator and sensor networks. He received Research of the Year awards from USU (2012) and UCM (2020). He was listed in Highly Cited Researchers by Clarivate Analytics in 2018 and 2019. His lab website is http://mechatronics.ucmerced.edu/ and his publication list is at https://scholar.google.com/citations?user=RDEIRbcAAAAJ&hl=en (Email: ychen53@ucmerced.edu)