

Multi-Scale Control and Modeling of Power-Electronic Systems and Networks

Prof. Dr. Sudip K. Mazumder

University of Illinois at Chicago

Professor and Director of the Laboratory for Energy and Switching-Electronic Systems

President of NextWatt LLC

851 S. Morgan St., Chicago, IL: 60607, USA

Abstract:

Power-electronic control and modeling have gone through fundamental shift in its approach with time slowly but surely replacing reduced-order-manifold-based approaches proposed decades back. With the revolution in embedded processors and advancements in multi-objective optimization, stability theory, hybrid systems, and communication/information theory, radically new multi-scale spatio-temporal approaches are being developed and implemented that are showing unprecedented promise for plurality of power-electronic applications and changing the mindset regarding the control and modeling of such hybrid dynamical switching-power systems. At the actuation level, the advent of rapid switching wide-bandgap devices is enabling the accelerated penetration of such next-generation controls across plurality of voltage and power levels encompassing radically improved, new, and complex power-electronic systems. This keynote will begin with an outline on the role of control in traditional power-electronic systems and networks and how they shape the behavior of such hybrid dynamical systems. Subsequently, an overview of the traditional power-electronic control, analysis, and modeling approaches will be provided along with brief discussions on their strengths and limitations. That leads to the future of controls in power electronics and what should and could be done beyond traditional power-electronic control that addresses existing, evolving, and future applications needs encompassing wide temporal and spatial scales? This talk will provide some insights on how and what radically new ideas may need to be synthesized that reach far beyond historical and conventional power-electronic control needs with wide power-conversion applications.

Biography:



Dr. Mazumder received his Ph.D. degree from Virginia Tech in 2001. Since 2001, he serves as a Professor at the University of Illinois at Chicago (UIC) and the Director of the Laboratory for Energy and Switching-Electronic Systems. He also serves as the President of NextWatt LLC since 2008. He has around 30 years of professional experience encompassing academia and leading industries. He was named a Fellow of the American Association for the Advancement of Science (AAAS) in 2020 and a Fellow of the Institute of

Electrical and Electronics Engineers (IEEE) in 2016 for distinguished contributions related to the field of multi-scale control and analysis of power-electronic systems. He served as a Distinguished Lecturer for the IEEE Power Electronics Society (PELS) between 2016-2019. He is the current Editor-in-Chief at Large for IEEE Transactions on Power Electronics. He is the recipient of UIC's highest awards: Distinguished Researcher of the Year (2020), Inventor of the Year (2014), University Scholar (2013). He is also the recipient of several IEEE awards, U.S. ONR Young Investigator Award (2005) and U.S. NSF CAREER Award (2003).