Indian Institute of Science
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BSSE Seminar

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A Small Rearguard Action in the Age of Big Data and Machine Learning: Mechanistic Models in Computational Physiology

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ABOUT THE SPEAKER

Dr. George Verghese received his BTech from the Indian Institute of Technology, Madras in 1974, his MS from the State University of New York, Stony Brook in 1975, and his PhD from Stanford University in 1979, all in Electrical Engineering. Since 1979, he has been with MIT, where he is the Henry Ellis Warren (1894) Professor, and Professor of Electrical and Biomedical Engineering, in the Department of Electrical Engineering and Computer Science. He was named a MacVicar Faculty Fellow at MIT for the period 2011-2012, for outstanding contributions to undergraduate education.Verghese is also a principal investigator with MIT's Research Laboratory of Electronics (RLE). His research interests and publications are in the areas of dynamic systems, modeling, estimation, signal processing, and control. Over the past decade, his research focus has shifted from applications in power systems and power electronics entirely to applications in biomedicine. He directs the Computational Physiology and Clinical Inference Group in RLE. He is an IEEE Fellow, and has co-authored two texts: *Principles of Power Electronics* (with J.G. Kassakian and M.F. Schlecht, 1991), and *Signals, Systems and Inference* (with A.V. Oppenheim, 2015).

ABSTRACT

The talk will draw some contrasts between phenomenological or empirical models (e.g., regression, neural networks) and mechanistic models (e.g., circuit analogs). Mechanistic models focus on meaningful component parts/subprocesses of the phenomenon of interest, and on their interconnections/interactions, which then generate the range of possible system behaviors. Examples will be given of mechanistic models for aspects of cardiovascular, cerebrovascular and respiratory physiology, and application of these models to extracting interpretable information from relevant data obtained in clinical or ambulatory settings.