Centre for Process Systems Engineering

Imperial College London

The Twenty Second Professor Roger W.H. Sargent Lecture

The Professor Roger Sargent Lecture is an annual event the Centre for Process Systems Engineering inaugurated as a tribute to Professor Sargent's vision, leadership, significant technical contributions and to his legacy in the field of Process Systems

Professor Venkat Venkatasubramanian
Columbia University

Process Systems Engineering at Crossroads: Challenges and Opportunities in the Era of Watson

In the Chair: **Professor Nilay Shah, Director, Centre for Process Systems Engineering, Imperial College London**

Vote of Thanks: **Dr J Krishnan, Centre for Process Systems Engineering, Imperial College London**

Abstract: "Who is Bram Stoker?" – With this $1 million prize winning final question in the game show *Jeopardy*, IBM's Watson supercomputer using DeepQA technology ushered in a new era in artificial intelligence and informatics. This has far reaching implications for knowledge management in a number of fields including process systems engineering. Process systems engineering has entered an important era. Driven by a convergence of powerful forces such as the great progress in molecular sciences and computer/communications technologies, ever increasing automation of globally integrated operations of our enterprises, tightening regulatory constraints, and competitive business pressures demanding speed to market for products and services, our discipline is in an unprecedented transition. One important common outcome from this convergence is the generation, use, and management of massive amounts of diverse data, information, and knowledge. Such a data deluge is coming from smart sensors in process plants, *ab initio* quantum calculations, molecular dynamics simulations, and so on. We are moving from an era of limited data obtained through time consuming experiments and simulations to one of a tsunami enabled by high throughput experiments and TeraGrid computing environments. But it is not raw data that we are after. What we desire are in-depth knowledge and mechanistic, first-principles based, understanding of the underlying phenomena that can be modeled to aid us in rational decision making. However, knowledge extraction and model development from this data deluge pose unprecedented challenges, as well as offer tremendous opportunities. Past approaches developed in a "data poor" era do not work well in this new world. The new environment requires imaginative thinking and innovative approaches in process systems engineering to address these challenges. This is where Data Science concepts and breakthroughs, as seen in Watson, will play a crucial role. In this lecture, I will discuss the challenges, opportunities and emerging trends using case studies drawn from diverse areas such as molecular products design, pharmaceutical manufacturing and systemic risk management in complex plants.

Biography: Professor Venkat Venkatasubramanian is Samuel Ruben-Peter G. Viele Professor of Engineering in the Department of Chemical Engineering, Professor of Computer Science (Affiliate), and Professor of Industrial Engineering and Operations Research (Affiliate) at Columbia University in the City of New York. He earned his Ph. D. in Chemical Engineering at Cornell, M.S. in Physics at Vanderbilt, and B. Tech. in Chemical Engineering at the University of Madras, India. Venkat worked as a Research Associate in Artificial Intelligence in the School of Computer Science at Carnegie-Mellon University. He taught at Purdue University for many years, before returning to Columbia in 2011. At Columbia, Venkat directs the research efforts in the *Complex Resilient Intelligent Systems Laboratory*. He is also the founding Co-Director of the *Center for the Management of Systemic Risk*, a transdisciplinary center focused on understanding how complex systems fail in order to prevent or mitigate such failures in the future, with faculty from a number of departments at Columbia University. Prof. Venkatasubramanian received the *Norris Shreve Award* for Outstanding Teaching in Chemical Engineering three times at Purdue University. He won the *Computing in Chemical Engineering Award* from AIChE and is a *Fellow of AIChE*. In 2011, the College of Engineering at Purdue University recognized his contributions with the *Research Excellence Award*. He is a past-President of the Computer Aids for Chemical Engineering (CACHE) Corporation. He currently serves as an Editor for *Computers and Chemical Engineering*.

Venkat Venkatasubramanian

Thursday 3 December 2015 • 17:30

Lecture Theatre 1 (Room 250), Department of Chemical Engineering, ACE Extension Building, South Kensington Campus, Imperial College London SW7 2AZ

Tea and coffee will be served before the lecture from 16:30 in the Common Room (Room 228), Department of Chemical Engineering, Level 2, ACE Extension Building

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