

Prof. Laxmivarahan's Lecture Series on Data Assimilation during 6-10 February 2023



Title of the Course:

"Role of Observability Gramain in state and Parameter Estimation in Dynamical Systems"

Abstract: The classical 4-D VAR method despite its great success is largely silent of the number and distribution of observations needed for effective estimation of the state and parameters in dynamical systems. Thanks to the advances in technology, as we move steadily from data sparse to data rich regimes, the cost of assimilating large data set on large scale models become prohibitively large. To alleviate this computational burden, the question of selecting a proper subset of "influential observations" becomes very important. By combining the properties of the forward sensitivities of the model solution to the control consisting of the initial and boundary conditions and parameters, and the Jacobian of the forward operator, the structure of the observability Gramian is identified. An algorithm for identifying a minimal set of observations to render this observability Gramian positive definite provides a solution to the selection of an effective subset of observation to be used in data assimilation.

Brief Resume: After completing his PhD from the Indian Institute of Science in 1973, S. Lakshmivarahan held faculty and post-doctoral positions at the IIT-Madras, Brown and Yale Universities through 1978. In the Fall of 1978, he joined the School of Computer Science, University of Oklahoma (OU) where he held the position of George Lynn Cross Research Professor since 1995. While at OU, he has won numerous awards for both teaching and research. His research interests are in Applied Mathematics and Computation and includes Data Mining and Analytics, Data Assimilation, Parallel Computation and Learning Algorithms. He was elected as a Fellow of the IEEE in 1993 and a Fellow of ACM in 1995. He has held short term visiting positions in Japan, China, Taiwan, India, Germany, England, Mexico, Brazil, Canada, and USA. Since July 2019, he holds the position of George Lynn Cross Research Professor Emeritus at the School of Computer Science, OU.

Lecture 1

Confluence of Data Science and AI/ML

Lecture 2

Challenges in Bigdata Analysis/
"Mathematics of Data Sciences"



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