

Title: Dynamic Latent Variable Modeling and Feature Analysis of Systems with Reduced Dynamic Dimensions

Abstract: Dynamics in multi-dimensional data from engineering systems is inevitable. In addition, multi-collinearity is ubiquitous in modern engineering systems in the era of data-rich environment. In this talk, we present a dynamic latent variable (DLV) modeling framework with a canonical correlation objective to model such data with simultaneously dimension reduction and latent dynamic modeling. The dynamic latent variables are enforced to be orthogonal and separated from non-dynamic latent factors. The DLV framework allows for multivariate dynamic latent models as well as successive univariate latent models, with the latter having an advantage in dynamic feature engineering for process troubleshooting. A DLV framework for MIMO system identification is also presented, which is convenient to handle parallel controlled variables and comoving manipulated variables. A couple of examples will be used to illustrate the superiority of the DLV framework.



Biography: Dr. S. Joe Qin is currently Chair Professor, Dean of the School of Data Science, and Director of Hong Kong Institute for Data Science at City University of Hong Kong. In his prior career he was the Fluor Professor at the Viterbi School of Engineering of the University of Southern California, Endowed Professor at the University of Texas at Austin, and Principal Engineer at Emerson Process Management. He was Cheung Kong Visiting Professor with Tsinghua University from 2006 to 2009.

Dr. Qin is a Fellow of the U.S. National Academy of Inventors, the International Federation of Automatic Control (IFAC), AIChE, and IEEE. He is a recipient of the U.S. National Science Foundation CAREER Award, the 2011 Northrop Grumman Best Teaching award at USC Viterbi School of Engineering, the DuPont Young Professor Award, Halliburton/Brown & Root Young Faculty Excellence Award, NSF-China Outstanding Young Investigator Award, and IFAC Best Paper Prize for a model predictive control paper published in *Control Engineering Practice*. He has served as Senior Editor of *Journal of Process Control*, Editor of *Control Engineering Practice*, Member of the Editorial Board for *Journal of Chemometrics*, and Associate Editor for several journals. He has published over 400 international journal papers, book chapters, conference papers and/or presentations. He received over 34,000 Google Scholar citations with an h-index of 79. Dr. Qin's research interests include data analytics, machine learning, process monitoring, fault diagnosis, model predictive control, system identification, smart manufacturing, and predictive maintenance.