DEPARTMENT of ISE
UNIVERSITY of HOUSTON

ISE FRIDAY SEMINAR
BROADEN HORIZONS | EXTEND MINDS

Prof. Enrique del Castillo
Distinguished Professor
Department of IME & Stat
The Pennsylvania State University, PA

Date: Friday, Jan. 23, 2026

Time: 1 - 1:50 pm

Location: D2 Lect2

Spectral and Manifold Fitting Methods for Process Monitoring of 3-D and High Dimensional Processes

Abstract: Well-established Statistical Process Control (SPC) methods are difficult to apply to monitor the manufacturing of complex geometrical parts, or processes of high dimensionality. I will present an overview of a research program undertaken over the last 5 years in my laboratory that addresses these two questions with modern differential-geometric techniques. I will discuss first how we can consider intrinsic geometrical properties of a sequence of parts, estimated from 3-dimensional sensor data, to do on-line SPC on complex parts. This approach is based on the spectrum of the Laplace-Beltrami operator defined on the surface or interior of parts, which avoids the costly part to part registration. For monitoring higher dimensional processes, I will review next recent work where we take a manifold fitting, contrary to a manifold learning (i.e., embedding) point of view to develop a conceptually simple monitoring scheme. Relations of this research program with past work by my group and others will be discussed.

Biography: **Enrique del Castillo** is Distinguished Professor in the Department of Industrial & Manufacturing Engineering PSU, where he also holds an appointment as Professor of Statistics and directs the Engineering Statistics and Machine Learning Laboratory. Dr. Castillo's research interests include Statistical and Machine Learning methodology in Engineering and Science with particular emphasis on process optimization and control. An author of over 130 refereed journal papers, he is the author of the textbooks *Process Optimization, a Statistical Approach* (Springer, 2007), Statistical *Process Adjustment for Quality Control* (Wiley, 2002), co-editor (with B.M. Colosimo) of the book *Bayesian Process Monitoring, Control, and Optimization* (CRC, 2006), and co-author (with J.J. Peterson) of the forthcoming book *Process Optimization with Multiple Response Variables, A Predictive Approach in R*, (CRC Press, 2026). An NSF CAREER and twice Fulbright Scholar awardee, he has served as editor-in-chief of the *Journal of Quality Technology (*where he currently serves in its editorial board) and as associate editor of *Technometrics and IISE Transactions*. His research has been funded by the National Science Foundation, General Motors R&D, Intel Corporation, Minitab and NATO. A former professional soccer player, he still plays the game competitively and has acted as advisor of the Penn State International *Futbol* Club.