

The logo for Purdue University Chemical Engineering features a stylized, abstract shape in white and yellow on a dark blue background, resembling a flame or a dynamic form. The word "PURDUE" is written in white, bold, sans-serif capital letters to the left of this shape, and "CHEMICAL ENGINEERING" is written in white, sans-serif capital letters to the right.

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SCHOOL OF CHEMICAL ENGINEERING
GRADUATE SEMINAR SERIES

Dr. Stratos Pistikopoulos FREng

Associate Director and
TEES Distinguished Research Professor
Artie McFerrin Department of Chemical Engineering
Texas A&M Energy Institute
Texas A&M University

“Multi-Parametric Model-Based Optimization and Control”

Thursday, October 15, 2015

3:00 - 4:15 p.m.

FRNY G140

Reception at 2:30 p.m. in Henson Atrium

Abstract: Model based multi-parametric programming provides a complete map of solutions of an optimization problem as a function of, unknown but bounded, parameters in the model, in a computationally efficient manner, without exhaustively enumerating the entire parameter space. In a Model-based Predictive Control (MPC) framework, multi-parametric programming can be used to obtain the governing control laws – the optimal control variables as an explicit function of the state variables. The main advantage of this approach is that it reduces repetitive on-line control and optimization to simple function evaluations, which can be implemented on simple computational hardware, such as a microchip, thereby opening avenues for many applications in chemical, energy, automotive, and biomedical equipment, devices and systems.

In this presentation, we will first provide a historical progress report of the key developments in multi-parametric programming and control. We will then describe PAROC, a prototype software system which allows for the representation, modelling and solution of integrated design, scheduling and control problems. Its main features include: (i) a high-fidelity

dynamic model representation, also involving global sensitivity analysis, parameter estimation and mixed integer dynamic optimization capabilities; (ii) a suite/toolbox of model approximation methods; (iii) a host of multi-parametric programming solvers for mixed continuous/integer problems; (iv) a state-space modelling representation capability for scheduling and control problems; and (v) an advanced control toolkit for multi-parametric/explicit MPC and moving horizon reactive scheduling problems. Algorithms that enable the integration capabilities of the systems for design, scheduling and control are presented along with applications in sustainable energy systems, smart manufacturing and personalized healthcare engineering.

Bio: Professor Pistikopoulos is the Associate Director of the Texas A&M Energy Institute, as well as a TEES Distinguished Research Professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University. Until recently and for the last 24 years (1991-2015) he was a Professor of Chemical Engineering at Imperial College London, and the Director of its Centre for Process Systems Engineering between 2002 and 2009.

He holds a Ph.D. degree from Carnegie Mellon University and he worked with Shell Chemicals in Amsterdam before joining Imperial in 1991. He has authored or co-authored over 350 major research publications in the areas of modelling, control and optimization of process, energy and systems engineering applications, 10 books and 2 patents. A Fellow of the Institution of Chemical Engineers, Editor of Computers & Chemical Engineering, Co-Editor of the Book Series in Computer Aided Chemical Engineering (Elsevier) and Process Systems Engineering (Wiley-VCH), on the Editorial Boards of Industrial & Engineering Chemistry Research (2011-2013), the Journal of Global Optimization and the Journal of Computational Management Science, Professor Pistikopoulos has been a co-founder of Process Systems Enterprise (PSE) Ltd and a founder/director of Parametric Optimization Solutions (ParOS) Ltd.

In 2007, Prof. Pistikopoulos was a co-recipient of the prestigious MacRobert Award from the Royal Academy of Engineering; in 2008, he received an Advanced Investigator Award from the European Research Council; in 2009, he delivered the Bayer Lecture in Process Systems Engineering at Carnegie Mellon University, USA, and in 2014, the 21st Professor Roger Sargent Lecture at Imperial College London. In 2012, he received the Computing in Chemical Engineering Award of the Computing and Systems Technology (CAST) Division of the American Institute of Chemical Engineers (AIChE). He received the title of Doctor Honoris Causa from the University Politehnica of Bucharest in 2014, and from the University of Pannonia in 2015. In 2013, he was elected Fellow of the Royal Academy of Engineering in the UK.

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