# Computing and Systems Technology Division 2018

Core Programming Area at the 2018 AIChE Annual Meeting

Pittsburgh, Pennsylvania, USA
28 October - 2 November 2018

ISBN: 978-1-5108-7623-1

**Printed from e-media with permission by:**

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2018) by AIChE
All rights reserved.

Printed by Curran Associates, Inc. (2019)

For permission requests, please contact AIChE
at the address below.

AIChE
120 Wall Street, FL 23
New York, NY 10005-4020

Phone: (800) 242-4363
Fax: (203) 775-5177

www.aiche.org

**Additional copies of this publication are available from:**

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

# TABLE OF CONTENTS

**(40a) Optimal Cleaning Scheduling and Control of Heat Exchanger Networks Under Fouling: Problem Formulation and Solution Strategy** ..... 1
*Federico Lozano Santamaria, Sandro Macchietto*

**(40b) Control of a Heating, Ventilation and Air Conditioning (HVAC) System Using Decentralized Extremum Seeking** ..... 9
*Judith Ebegbulem, Martin Guay, John M. House, Timothy I. Salsbury*

**(40c) Subsystem Decomposition of Process Networks for Simultaneous Distributed State Estimation and Control** ..... 10
*Xunyuan Yin, Jinfeng Liu*

**(40d) Distributed Model Predictive Control Based on NLP Sensitivity** ..... 11
*Tianyu Yu, Jun Zhao, Zuhua Xu, Xi Chen, Lorenz T. Biegler*

**(40e) Event-Triggered Model-Based Control and Identification of Networked Process Systems** ..... 12
*Amr Zedan, Da Xue, Nael H. El-Farra*

**(40f) Coordination of Distributed MPC Systems with Closed-Loop Prediction Approximation in Dynamic Real-Time Optimization (DRTO)** ..... 13
*Hao Li, Christopher L. E. Swartz*

**(40g) Data-Based Sequential Design of Decentralized PID Controllers** ..... 16
*Anikesh Kumar, Min-Sen Chiu*

**(40h) Distributed Estimation and Nonlinear Model Predictive Control of a Benzene Chlorination Process** ..... 17
*Davood Babaei Pourkargar, Manjiri Moharir, Ali Almansoori, Prodromos Daoutidis*

**(51a) Pynumero: Python Numerical Optimization** ..... 20
*Jose S. Rodriguez, Bethany Nicholson, Carl D. Laird, John D. Siirola*

**(51b) Graph-Based Modeling Abstractions and Computational Tools for Complex Systems** ..... 21
*Jordan Jalving, Victor M. Zavala*

**(51c) Plasmoalgorithms, a Collection of Decomposition Algorithms for Graph-Based Problem Representations** ..... 22
*Braulio Brunaud, M. Paz Ochoa, Alisandra Welch, Ignacio E. Grossmann*

**(51d) Component Based Development of Application Specific Computer-Aided Tools** ..... 23
*Anjan Kumar Tula, Mario Richard Eden, Rafiqul Gani, Xi Chen*

**(51e) SPICE: A Computer-Aided Platform for Simultaneous Process Synthesis and Intensification** ..... 24
*Jianping Li, Salih E. Demirel, M. M. Faruque Hasan*

**(51f) Data Driven Modeling in Alamo: Feature Selection and Non-Parametric Modeling Applications** ..... 25
*Zachary Wilson, Nick Sahinidis*

**(51g) Recent Advances in the EaGO Platform: Global and Robust Optimization in Julia** ..... 26
*Matthew Wilhelm, Matthew D. Stuber*

**(51h) A Sensitivity-Based Nonlinear Model Predictive Control and State-Estimation Framework in Python** ..... 27
*David Thierry, Bethany Nicholson, Lorenz T. Biegler*

**(52a) Multi-Period Design and Planning of Centralized and Distributed Manufacturing Networks** ..... 28
*Cristiana L. Lara, Christian Wende, Ignacio E. Grossmann*

**(52b) A Stochastic Game Theoretic Framework for Optimization of Decentralized Supply Chains Under Uncertainty** ..... 29
*Jiyao Gao, Fengqi You*

**(52c) A Column Generation Approach to Multiscale Capacity Planning for Continuous Power-Intensive Processes** ..... 32
*Angela Flores-Quiroz, Jose M. Pinto, Qi Zhang*

**(52d) Solving Robust Vehicle Routing Via a Branch-Price-and-Cut Approach** ..... 33
*Akang Wang, Chrysanthos E. Gounaris*

**(52e) Autologous Cancer Therapies:How Can We Handle the Complexity of the Supply Chain?** ..... 34
*Maria M. Papathanasiou, Nilay Shah*

**(52f) Surrogate-Based Derivative-Free Optimization of a Multi-Enterprise Supply Chain Simulation** ..... 35
*Atharv Bhosekar, Marianthi Ierapetritou*

**(52g) Strategic Time Window Assignment in Vehicle Routing Operations** ..... 36
*Anirudh Subramanyam, Akang Wang, Chrysanthos E. Gounaris*

**(52h) Time Window Based Berth and Yard Allocation Planning of Container Vessels** ..... 37
*Jialin Xu, Honglin Qu, Qiang Xu*

**(76a) Verifying Performance Specifications for Dynamic Processes Under Uncertainty Using Backward Reachability Analysis** ..... 38
*Kai Shen, Xuejiao Yang, Joseph Scott*

**(76b) An Embedded Model Predictive Controller for a Medical Oxygen Concentrator Device** ..... 39
*Matthew Urich, Rama Rao Vemula, Mayuresh V. Kothare*

**(76c) Online Scheduling Design Principles** ..... 40
*Dhruv Gupta, Christos T. Maravelias*

**(76d) Demand Response-Oriented Modeling and Production Scheduling Optimization for Chlor-Aklali Processes** ..... 41
*Joannah Otashu, Michael Baldea*

**(76e) Forty Years of Computers and Chemical Engineering (1977-2017): Analysis of the Field Via Natural Language Processing Techniques** ..... 42
*Tong Zhang, Nick Sahinidis, Carolyn Rose, Satyajith Amaran, Bo Shuang*

**(106a) Developing Engineering Thinking during an Ill-Structured Activity for Kinetics and Reactor Design: A Technology Solution** ..... 43
*Milo D. Koretsky, James L. Gugel, Thomas Ekstedt*
**(106b) Reading and Repetition Using an Interactive Textbook for Material and Energy Balances** ..... 44
*Matthew Liberatore, Katherine Roach*
**(106c) Check Your Homework with Your Phone** ..... 45
*John Wagner, Amanda P. Malefyt, Garth Thomas Jr.*
**(106d) Educational Augmented Reality Tools: Development, Implementation, and Assessment of Phase I** ..... 46
*Konstantinos E. Kakosimos, Ghada Salama, Marcelo Castier, Marcin Kozusznik*
**(106e) Preparing Chemical Engineering Students for the Digitalization of Tomorrow - Integrating Modelling Across the Curriculum** ..... 47
*Eva Sorensen, Pieter Schmal*
**(106f) Wastewater Minimization and Energy Conservation Software Developed and Used in Teaching Process Systems Engineering at Vanderbilt** ..... 48
*Russell F. Dunn, Scott A. Guelcher, Bryan Beyer*
**(106g) Aspen Plus® Videos for Chemical Engineering Undergraduates** ..... 49
*Michael Shao, Mark B. Shiflett, Alejandra Rocha*
**(106h) Problem Solving Skills When Using Student-Generated Problems That Reverse Engineer YouTube Videos** ..... 50
*Uchenna Asogwa, Amanda P. Malefyt, T Ryan Duckett, Gale Mentzer, Charlene Czerniak, Matthew Liberatore*
**(120b) 2018 Outlook for Energy: A View to 2040** ..... 51
*Theodore J. Wojnar Jr.*
**(120c) Energy Decarbonisation Scenarios** ..... 52
*Kamel Ben Naceur*
**(120a) Fundamental Research Needs to Advance Energy Technologies** ..... 53
*Bruce Garrett*
**(126a) On the Value of Global Optimality in Machine Learning Problems: The Case of Feature Selection for Linear Support Vector Machines** ..... 54
*Adam Beitz, Mark Blenner, Joseph Scott*
**(126b) Towards Developing a Learning Based Evolutionary Assistive Paradigm for Surrogate Selection (LEAPS2)** ..... 55
*Sushant S Garud, Iftekhar A. Karimi, Markus Kraft*
**(126c) Explore the Potential of Machine Learning in Building Reaction Models for Chemical Industry** ..... 58
*Bo Shuang, Anil Mehta, Kenric Marshall, Tong Zhang, Nikolaos V. Sahinidis*
**(126d) Data-Driven Optimization with Implicit Constraints: Application to an Ethane Steam Cracking Process** ..... 59
*Burcu Beykal, Melis Onel, Onur Onel, Efstratios N. Pistikopoulos*
**(126e) Recurrent Neural Networks, Numerical Integrators and Nonlinear System Identification** ..... 60
*Tom S. Bertalan, Rob Farber, Thomas Thiem, Felix Dietrich, Ioannis G. Kevrekidis*
**(126f) Data-Driven Identification of Interpretable Reduced-Order Models Using Sparse Regression** ..... 61
*Abhinav Narasingam, Joseph Sangil Kwon*
**(126g) A Comparison of Mathematical Optimization and Deep Reinforcement Learning for Supply Chain Materials Planning** ..... 62
*Christian D. Hubbs, Satyajith Amaran, John M. Wassick, Nick Sahinidis, Ignacio E. Grossmann*
**(126h) Dimensional Analysis Based Uncertainty Quantification: Modeling of Erosion in Pipeline Transportation** ..... 63
*Wei Dai, Selen Cremaschi*
**(130a) Efficient Computation of Local Sensitivity Information for Nonsmooth Process Models** ..... 64
*Kamil A. Khan*
**(130b) A Novel Geometric Based Algorithm to Solve Multiparametric Programming Problems** ..... 65
*Justin Katz, Baris Burnak, Efstratios N. Pistikopoulos*
**(130c) Bayesian Machine Learning Modeling of a Reformer Furnace Using CFD Data** ..... 66
*Anh Tran, Madeleine Pont, Andres Aguirre, Helen Durand, Marquis Crose, Panagiotis D. Christofides*
**(130d) Image-Based Modeling of Fibroblasts Modifying PDGF-BB Gradient Explains Cells™ Alternated Directional Decision during Chemotaxis in a Microfluidic Maze** ..... 67
*Long Quang Pham, Lydia N. Rodrigues, Vishnu Deep Chandran, David Chege, Timothy Dijamco, Nhat-Anh N. Tong, Roman Voronov*
**(130e) Multiscale Computational Modeling of Renal Intercellular Cross-Talk at the Onset of Diabetic Kidney Disease** ..... 68
*Minu R. Pilvankar, Steve M. Ruggiero, Ashlea D. Bucher, Ashlee N. Ford Versypt*
**(130f) Controllability of the Influenza Virus-Host Protein-Protein Interaction Network: Engineering Insights into Host-Virus Interactions** ..... 69
*Emily E. Ackerman, Jason E. Shoemaker*
**(136a) Novel Approaches for the Integration of Supply Chain Planning and Scheduling** ..... 72
*Braulio Brunaud, Satyajith Amaran, Scott J. Bury, John M. Wassick, Ignacio E. Grossmann*
**(136b) Optimal Demand Response Operation of an Industrial Air Separation Unit Using Data-Driven, Scheduling-Relevant Dynamic Models** ..... 73
*Calvin Tsay, Michael Baldea, Jun Shi, Ankur Kumar, Jesus Flores-Cerrillo*
**(136c) Integration of Planning, Scheduling and Control Using Feasibility Analysis and Surrogate Models** ..... 74
*Lisia S Dias, Marianthi Ierapetritou*
**(136d) Decode: Detection of Communities for Optimization Decomposition** ..... 75
*Andrew Allman, Wentao Tang, Prodromos Daoutidis*

**(136e) Identification of Optimal Dopant Patterns in a Doped Perovskite Oxygen Carrier** ..... 76
*Christopher L. Hanselman, Dominic Alfonso, Jonathan W. Lekse, De Nyago Tafen, Christopher Matranga, David C. Miller, Chrysanthos E. Gounaris*

**(136f) Unipopt: Univariate Projection-Based Optimization without Derivatives** ..... 77
*Ishan Bajaj, M. M. Faruque Hasan*

**(136g) Hierarchical MPC Schemes for Periodic Systems Using Stochastic Programming Techniques** ..... 78
*Ranjeet Kumar, Victor M. Zavala*

**(136h) Concurrent Canonical Variate Analysis for Process Operating Condition Deviations and Dynamic Anomalies Monitoring** ..... 81
*Weike Sun, Benben Jiang, Richard D. Braatz*

**(182a) A Combined Graphical / Algebraic Method for Model Reduction and Analysis of Chemical Reaction Networks: Application to Atomic Layer Deposition Process** ..... 82
*Hossein Salami, Aisha Alobaid, Raymond A. Adomaitis*

**(182b) Optimal Solar Cell Configuration Under Partially Shaded Conditions** ..... 84
*Aisha Alobaid, Raymond A. Adomaitis*

**(182f) Multi-Objective Optimization of Cchp Systems Using Particle Swarm Algorithms** ..... 85
*Xueqiang Wang, Shuo Qiu, Jiangtao Wu*

**(182g) HPC Modeling and Simulation of Mass Transport in Wavy Falling Liquid Films** ..... 86
*Ming-Zhao Liu, Yi Heng, Dong-Chuan Mo, Shu-Shen Lyu*

**(182h) Autotuning with Derivative-Free Optimization** ..... 89
*Benjamin Sauk, Nick Sahinidis*

**(182t) An Ontology-Based Automated Generation of Training Scenarios: Development of Process Safety Rule Engine** ..... 90
*Dongil Shin*

**(182i) Construction of a Semi-Stochastic Intracellular Signaling Model Via Global Sensitivity Analysis and Probability Density Estimation** ..... 91
*Dongheon Lee, Joseph Sangil Kwon, Arul Jayaraman*

**(182j) Mechanical Perturbation Approach for Treating Cardiac Arrhythmias** ..... 92
*Azzam Hazim, Stevan Dubljevic*

**(182k) The Impact of Glottis Opening on Drug Aerosol Delivery in a Subject-Specific Lung-Airway Model: A Numerical Study** ..... 93
*Yu Feng*

**(182l) Investigating LecA Binding Mechanisms with a Cellular Membrane Containing Multiple Types of Receptors Via Kinetic Monte Carlo Simulation** ..... 94
*Dongheon Lee, Hyun Kyu Choi, Joseph Sangil Kwon, Hung-Jen Wu*

**(182m) Rigorous Parameter Estimation for Model Validation in Oncological Systems** ..... 95
*Chenyu Wang, John D. Martin, Horacio Cabral, Matthew D. Stuber*

**(182n) An MCMC-Based Approach to Inferring Cell Counts in Diseased Tissue** ..... 96
*Muying Wang, Jason E. Shoemaker*

**(182o) Optimization in Cancer Therapeutics: Model Integration for Tumor Dynamics and Myelosuppression to Predict Chemotherapy Dosing Profiles** ..... 99
*Ian Dunn, Kirti M. Yenkie*

**(182p) Modeling Heat Transfer Using an Integral Equation Approach Via Green's Function: Application to Cancerous Tumor Undergoing Hyperthermia Treatment** ..... 102
*A. Nastasia Allred, Yung-Way Liu, J. Robby Sanders, Pedro E. Arce*

**(182q) A Modeling Framework to Characterize Kinetics, Efficacy and Toxicity of Hydroxyurea Based Treatment of Individual Sickle Cell Disease Patients** ..... 103
*Akancha Pandey, Robert Hannemann, Peter Kissinger, Seethal Jacob, Terry Vik, Sangtae Kim, Doraiswami Ramkrishna*

**(182r) Customized Robust Optimal Dosage Determination in the Face of Uncertainties for IVF Practices** ..... 104
*Apoorva Nisal, Urmila M. Diwekar*

**(182s) Metabolites from Blood Samples of Pregnant Mothers Predict Autism Risk** ..... 105
*Kathryn Hollowood, Jill James, Uwe Kruger, Juergen Hahn*

**(183a) Review and Comparative Study of Nonlinear PCA Fault Detection Methods** ..... 106
*Weike Sun, Richard D. Braatz*

**(183b) Development of the Texas A&M Superfund Research Program Computational Platform for Data Integration, Visualization, and Analysis** ..... 107
*Rajib Mukherjee, Melis Onel, Burcu Beykal, Anthony H. Knap, Timothy D. Phillips, Ivan Rusyn, Michael A. Mancini, Lan Zhou, Fred A. Wright, Efstratios N. Pistikopoulos*

**(183c) Advanced Data Analytics for Process-Shop Base+Delta Sub-Model Estimation in Planning and Scheduling Decision-Making** ..... 108
*Robert E. Franzoi Jr., Jeffrey D. Kelly, Brenno C. Menezes, Jorge A. W. Gut*

**(183e) A Segmentation Approach for Oscillation Characterization** ..... 109
*Mohd Faheem Ullah, Laya Das, Sweta Parmar, Babji Srinivasan, Raghunathan Rengaswamy, Chinta Sivadurgaprasad*

**(183f) A Dead Time Compensation Approach for State Estimation of Sampled-Data Systems in the Presence of Large Measurement Delays** ..... 110
*Chen Ling, Costas Kravaris*

**(183g) Iterative Fault Isolation for Integrated Chemical Systems Based on Approximate Linear Model Inversion** ..... 111
*Xiaonan Xu, Qiang Xu*

**(183j) Hypothesis-Driven Data-Based Modeling to Study the Effect of Specialization on Hospital Performance** ..... 112
*Jangwon Lee, Q. Peter He*

**(183k) Dynamic Mode Decomposition Based Model Reduction for Control of Moving Boundary Problems via Approximate Dynamic Programming** ..... 113
*Mohammed Saad Faizan Bangi, Harwinder Singh Sidhu, Prashanth Siddhamshetty, Joseph Sangil Kwon*

**(183l) Data-Driven Optimization for Process Intensification Governed By High-Fidelity Models** ..... 114
*Ishan Bajaj, Shachit S. Iyer, Akhil Arora, M. M. Faruque Hasan*

**(183m) Constrained Least Square Parameter Identification Algorithms for Dual-Rate Systems with Inter-Sample Output Estimation** ..... 115
*Jingwei Gan, Satish J. Parulekar, Ali Cinar*

**(183n) Global Optimization of a Class of Black-Box Problems with Bounded Hessian** ..... 116
*Ishan Bajaj, M. M. Faruque Hasan*

**(183o) Ontology Engineering Approach to Support Process of Model Integration** ..... 117
*Franjo Cecelja, Linsey Koo, Edlira Kalemi*

**(183p) Prototype Study for Monitoring Flare Performance** ..... 118
*Albert Odell III, Qiang Xu*

**(183r) An Artificial Neural Network Approach for the Identification of Stochastic Models of Travelling Traders Exchange Process** ..... 119
*Chunbing Huang, Patrick Piccione, Federica Cattani, Federico Galvanin*

**(183s) Process Data Analytics Using Deep-Learning Based Methods** ..... 120
*Majid Moradi Aliabadi, Yinlun Huang, Ming Dong*

**(184a) Development of an Efficient Control for Smr Using Rigorous Modelling Techniques, to Improve Plant Performance, Stability, and Reliability During Feed Disturbances** ..... 121
*Jagan Mohan Rallapalli, Abdulla Saad Al-Dughaither*

**(184d) Leveraging Open Source, Big Data and the Cloud for Chemical Process Control** ..... 122
*Benjamin Rizkin, Ryan L. Hartman*

**(184e) A Synthesis Framework for Structure Constrained Thermally Coupled Distillation Sequences Including Divided Wall Columns** ..... 123
*Haotian Ye, Xiong Zou, Weixuan Zhu, Yang Yang, Hong-Guang Dong*

**(184f) A Novel Robust Kalman Filter Algorithm Using Incremental PID Controller for Model Uncertainties** ..... 124
*Min-Kyung Lee, Byeong Eon Park, Jun-Hyung Ryu, In-Beum Lee*

**(184g) Simultaneous Uncertainty Reduction and Control of Hydraulic Fracturing** ..... 125
*Abhinav Narasingam, Joseph Sangil Kwon*

**(184h) Non-Linear Model Predictive Control of Module Temperature in Photovoltaic System** ..... 126
*Dheeraj Kumar, Arun K. Tangirala*

**(184i) Discrete-Time Nonlinear Observer-Based Globally Linearizing Control of a PEM Fuel Cell** ..... 127
*K. Sankar, Amiya K. Jana*

**(184j) Robust Model Predictive Control for Smart Grid Integrated with Solar Power and Energy Storage System Under Regular and Abnormal Loads** ..... 128
*Yu Yang, Hen-Geul Yeh, Son Doan*

**(184l) Feedback Predictive Control Versus Model Predictive Control for Automatically Controlling Blood Glucose Concentration** ..... 129
*Yong Mei, Derrick Rollins*

**(184m) Dual Control Framework with Multistep Ahead Prediction Model** ..... 130
*Yu Yang, Anthony Perez*

**(184n) Black Box Operation Optimization for Temperature Control of Basic Oxygen Furnace Process** ..... 131
*Yongxia Liu, Jingyu Tang, Yuan Wang*

**(184o) Optimal Control of Bof Steelmaking with Considering Energy Consumption** ..... 132
*Dongying Song, Jingyu Tang*

**(184p) Machine Learning Techniques for Model Identification from Historical Data for Control** ..... 133
*Manikandan S, Raghunathan Rengaswamy*

**(184q) Modeling and Control of Proppant Distribution of Multi-Stage Hydraulic Fracturing in Horizontal Wells** ..... 134
*Prashanth Siddhamshetty, Kan Wu, Joseph Sangil Kwon*

**(184s) A Monte Carlo Simulation Study to Evaluate the Limits of Prediction Accuracy for Blood Glucose Concentration** ..... 135
*Yong Mei, Derrick Rollins*

**(184t) Dynamic Optimization of Natural Gas Network with Rigorous Thermodynamics** ..... 136
*Kai Liu, Lorenz T. Biegler, Bingjian Zhang, Qinglin Chen*

**(184u) Modelling and MPC Design of Mineral Column Flotation Process** ..... 137
*Yahui Tian, Fei Liu, Stevan Dubljevic*

**(184v) Multiple Phase Shifted Chirp Signals for Rapid Impedance Estimation: Applications in Diagnosis of Electrochemical Systems** ..... 138
*Resmi Suresh, Sathish Swaminathan, Raghunathan Rengaswamy*

**(184w) Development of Advanced Model-Based Controllers for Optimal Load-Following Operation of the Supercritical Pulverized Coal Power Plants** ..... 139
*Parikshit Sarda, Elijah Hedrick, Katherine Reynolds, Emily Tomer, Benjamin P. Omell, Stephen E. Zitney, Debangsu Bhattacharyya*

**(184x) Recurrent Neural Network-Based Model Predictive Control for Continuous Pharmaceutical Manufacturing** ..... 140
*Wee Chin Wong, Jiali Li, Xiaonan Wang*

**(184z) Smart Constrained Model Predictive Control** ..... 141
*Su Liu, Jinfeng Liu*

**(184aa) Simultaneous Scheduling of Refinery Manufacturing and Pipeline-Based Multi-Oil Product Distribution** ..... 142
*Li Yu, Qiang Xu*

**(185a) Single & Multi-Objective Optimizations Using Parallelized Process Simulators** ..... 143
*Trevor Rice, Mingder Lu*

**(185b) Development of a Spatio-Temporal Multi-Objective Optimisation Model for Multi-Product Oil Palm Value Chains** ..... 144
*John Frederick D. Tapia, Sheila Samsatli*

**(185c) Optimal Synthesis of Reaction Networks for the Manufacture of Benzaldehyde from Toluene Via the P-Graph Methodology** ..... 145
*Jean Pimentel, Andres Argoti, Ivan Gil, Istvan Heckl, Botond Bertok, Ferenc Friedler, Juan Carlos Garcia-Ojeda*

**(185d) Simulation Approach for Natural Gas Sweetening Using Mixed Amines** ..... 146
*Mohammed S. Ba-Shammakh*

**(185e) Impact of Biomass Densification on the Overall Economics of Renewable Gasoline and Diesel Production** ..... 147
*Sampath Gunukula, William J. Desisto, M. Clayton Wheeler*

**(185f) A Novel Conceptual Design for Simultaneous Production of Biodiesel and Glycerol Carbonate from Soybean Oil** ..... 148
*Cuixia Xu, Qiang Xu*

**(185g) Spry Drying System Modelation for Orange (Citrus sinensis) Juice Drying Using Open Foam** ..... 149
*A. Ramos Sr., Ricardo Cogua Barrera, Luis Alberto Figueroa Sr.*

**(185h) Tackling the Challenges/Limitations Posed By Heat Exchanger Network in Work-Heat Exchange Network Synthesis** ..... 150
*Sajitha K. Nair, Iftekhar A. Karimi*

**(185i) Uncertainty Analysis Including Safety, Environmental and Economic Performance of Chemical Processes** ..... 151
*Andrea Paulina Ortiz-Espinoza, Karen De Jesus Guillen-Cuevas, Arturo Jimenez-Gutierrez, Vasiliki Kazantzi, Fadwa T. Eljack, Mahmoud M. El-Halwagi, Nikolaos Kazantzis*

**(185k) Design of Carbon-Hydrogen-Oxygen Symbiosis Networks with $CO_2$ Monetization and Footprint Constraints** ..... 152
*Marc Panu, Kevin Topolski, Sarah Abrash, Mahmoud M. El-Halwagi*

**(185l) Integrating Mass and Heat in the Synthesis of Carbon-Hydrogen-Oxygen Symbiosis Networks** ..... 153
*Kevin Topolski, Marc Panu, Luis Fernando Lira-Barragan, J. M. Ponce-Ortega, Mahmoud El-Halwagi*

**(185n) Optimal Design of PHAs Plants with Alternative Substrates** ..... 154
*Fernando Ramos, Claudio Delpino, Marcelo Villar, Maria Soledad Diaz*

**(185o) Optimizing Energy System Design Using a Parallel Tabu Search Algorithm** ..... 155
*Art Vollbrecht, K. V. Camarda*

**(185q) Computer-Aided Tools for Process and Product Design** ..... 156
*Anjan Kumar Tula, Mario Richard Eden, Rafiqul Gani*

**(185s) Optimal Design of Gas Supply Chains Including Shale with Economic and Environmental Criteria** ..... 157
*Josselin Colin-Robledo, Sergio Ivan Martinez-Guido, Luis Fernando Lira-Barragan, J. M. Ponce-Ortega, Medardo Serna-Gonzalez*

**(185t) Multi-Scale Simultaneous Parameter Estimation in Rate-Based Processes** ..... 158
*Paul Akula, John C. Eslick, Debangsu Bhattacharyya, David C. Miller*

**(185u) Development of a One-Dimensional Bubbling Fluidized Bed Model for a Coal-Fed Chemical Looping Combustion Fuel Reactor** ..... 159
*Chinedu O. Okoli, Andrew Lee, Anthony P. Burgard, David C. Miller*

**(185v) A New Optimization-Based Computer-Aided Molecular and Mixture Design (OptCAMD) Framework** ..... 160
*Lei Zhang, Qilei Liu, Linlin Liu, Jian Du, Rafiqul Gani*

**(185w) The Optimization of Integrated Energy System Under Uncertainty Based on Genetic Algorithm** ..... 161
*Shuo Qiu, Xueqiang Wang, Jiangtao Wu*

**(185x) Application of Sequential Design of Experiments (SDoE) to a MEA-Based $CO_2$ Capture Pilot Plant** ..... 162
*Joshua C. Morgan, Benjamin P. Omell, Michael S. Matuszewski, Christine Anderson-Cook, Charles H. Tong, Debangsu Bhattacharyya, David C. Miller, Muhammad Ismail Shah, Thomas De Cazenove*

**(185y) Process Synthesis and Simultaneous Minimization of Inherent Risk** ..... 163
*Andreja Nemet, Zdravko Kravanja*

**(185z) Quantitative Risk Assessment of Soft Sensor Predictions Using Fast PDF Estimation** ..... 164
*Francesco Rossi, Sudarshan Ganesh, Qinglin Su, Linas Mockus, Gintaras Reklaitis*

**(185aa) Development of Artificial Lift Infrastructure Plan Under Endogenous and Exogenous Uncertainties** ..... 165
*Zuo Zeng, Selen Cremaschi*

**(185ab) Bayesian Design of Experiments for Fault Detection and Isolation** ..... 167
*Evan K. Stefanidis, Kyle A. Palmer, George M. Bollas*

**(185ad) Design of Optimal Multistage Heat Exchange Networks** ..... 168
*Nadir Ziyatdinov, Artem Bezrukov, Ilya Emelyanov, Denis Kubanov*

**(185ae) Experimental and Numerical Investigation to Develop the Ultrasound Assisted Oxidative Desulfurization (UAOD) Process in aÂ New Continuous-Flow System** ..... 169
*Masoud Rahimi, Shahrokh Shahhosseini, Salman Movahedirad, Mohammad Amin Sobati*

**(185af) Model-Based Analysis and Optimization of a Semi-Lean MBC Process for Natural Gas Sweetening** ..... 170
*Ven Chian Quek, Javier Rodriguez, Nilay Shah, Benoit Chachuat*

**(185ag) Process Intensification of Hydrogen Production Systems** ..... 171
*Secgin Karagoz, Theodore Tsotsis, Vasilios Manousiouthakis*

**(185ah) Heat Integration and Controllability Analysis of Heat Exchanger Networks** ..... 172
*Nabil Abdel Jabbar, Ibrahim Masoud, Rachid Chebbi, Muhammad Qasim*

**(6if) An Open Source Process Simulation Environment on Python for Automated Preliminary Techno-Economic Analysis** ..... 173
*Yoel Cortes, Deepak Kummar, Vijay Singh, Jeremy Guest*

**(186a) Optimization-Based Retrofit of a Cryogenic Air Separation Unit for Flexible Operation** ..... 174
*Artur M. Schweidtmann, Pascal Schafer, Adrian Caspari, Hagen Seele, Pascal Padberg, Christoph Offermanns, Adel Mhamdi, Alexander Mitsos*

**(186b) Planuling: A Hybrid Planning and Scheduling Optimization to Schedule Slow and Plan Fast Processes** ..... 175
*Jeffrey D. Kelly, Robert E. Franzoi Jr., Brenno C. Menezes, Jorge A. W. Gut*

**(186c) GoNDEF: A New Exact Method to Generate All Non-Dominated Points of Multi-Objective Mixed-Integer Linear Programs** ..... 178
*Metin Turkay, Seyyed Amir Babak Rasmi*

**(186d) Data-Driven Robust Optimization with Principal Component Analysis and Kernel Smoothing** ..... 179
*Chao Ning, Fengqi You*

**(186e) Validation of CFD Prediction Accuracy of VOC Generation Rate for Cost-Effective Design of VOC Recovery Equipment** ..... 180
*Xidong Hu, Manabu Kumagami, Shaoxiang Qian, Nobuhiro Yamada, Masahiro Kawasaki, Takashi IItsuka, Syuichi Oguro*

**(186f) Process Design Quality for the Success of Industrial R&D at SABIC** ..... 188
*Zheng Liu, Brain Peng, Blamurali Nair*

**(186g) A Multi-Objective MILP Model for Spatio-Temporal Design and Operation of Multi-Product Oil Palm Value Chains** ..... 189
*John Frederick D. Tapia, Sheila Samsatli*

**(186h) Numerical Analysis of Effect of Diaphragm Structure Based on Thermo-Electro-Magneto-Hydrodynamics Coupling Model in Magnesium Electrolysis cell** ..... 190
*Cheng-Lin Liu, You-Fa Jiang, Jin Xue, Jian-Guo Yu*

**(186i) Integrated Design and Control of Intensified Membrane-Based Hydrogen Production Via Methane Steam Reforming** ..... 191
*Alexios S. Kyriakides, Spyros S. Voutetakis, Simira Papadopoulou, Panos Seferlis*

**(186j) Scale up Design Optimization of Pressure Swing Adsorption Processes for Gas Separation** ..... 194
*Daeho Ko*

**(186k) Scale up Design Optimization of a Membrane Module for Gas Separation** ..... 195
*Daeho Ko*

**(186l) Solving Real-World Natural Gas Gathering Systems** ..... 196
*Russell Burnett, Charles C. Solvason, Michael Sellers*

**(186m) On the Temporal Evolution of the Material Stress Profile in a Supercritical Pulverized Coal Boiler Under Load-Following Operation** ..... 197
*Katherine Reynolds, Elijah Hedrick, Parikshit Sarda, Emily Tomer, Benjamin P. Omell, Stephen E. Zitney, Debangsu Bhattacharyya*

**(186n) Optimization of Single-Well $CO_2$ Injection for Enhancement of Tight Oil Production** ..... 198
*Guofan Luo, Christine Ehlig-Economides, Michael Nikolaou*

**(186o) A Novel Methodology to Optimize the Operation of Combined Cooling Heat and Power Systems** ..... 199
*Sayyed Faridoddin Afzali, Vladimir Mahalec*

**(186p) Simultaneous Crude Procurement Planning and Movement Scheduling for Petroleum Refineries** ..... 200
*Honglin Qu, Qiang Xu*

**(186q) Dynamic Production Planning and Scheduling for an Chemical Plant** ..... 201
*Min Chen, Qiang Xu, Zhenlei Wang*

**(186r) Sustainable Strategic Planning for a National Natural Gas Energy System Accounting for Unconventional Sources** ..... 202
*Esbeydi Villicana-Garcia, J. M. Ponce-Ortega*

**(186s) A Multi-Objective MILP Model for Planning, Design and Operation of Biomass Supply Chains - Capturing the Trade-Offs within the Food-Energy-Water-Environment Nexus** ..... 203
*Sheila Samsatli*

**(186t) Data-Driven Multi-Period Planning Model and Global Optimization for Entire Petroleum and Petrochemical Operations** ..... 204
*Wei Khang Ooi, Jie Li, Xin Xiao, Yong Qiao, Baoguo Zhao, Guangming Du, Xin Su, Hongwei Liu*

**(218a) CESMII Overview** ..... 207
*Haresh Malkani*

**(218b) CESMII Roadmap Projects - Advancing CESMII's Mission** ..... 208
*Miguel Corcio*

**(218c) Panel Session: Democratization of Smart Manufacturing (SM)** ..... 209
*Jim Davis*

**(253a) Enhancing Relaxations for Nonconvex Mixed-Integer Quadratically-Constrained Quadratic Programs** ..... 210
*Carlos Nohra, Aida Khajavirad, Nick Sahinidis*

**(253b) Advances in Decomposition Strategies for Non-Convex Nonlinear Programs** ..... 213
*Jose S. Rodriguez, Bethany Nicholson, Carl D. Laird, Victor M. Zavala*

**(253c) Online Generation Via Offline Selection of Strong Linear Cuts from a Semidefinite Programming Relaxation** ..... 214
*Radu Baltean-Lugojan, Pierre Bonami, Andrea Tramontani, Ruth Misener*

**(253d) New Underestimator and Branching Scheme for the Global Optimization of General Nonconvex Problems** ..... 215
*Ishan Bajaj, M. M. Faruque Hasan*

**(253e) On Piecewise Under- and over-Estimators of Fractional Terms** ..... 216
*Radhakrishna Tumbalam Gooty, Rakesh Agrawal, Mohit Tawarmalani*

**(253f) Quadratic Underestimators of Differentiable Mccormick Relaxations for Deterministic Global Optimization** ..... 217
*Matthew Wilhelm, Matthew D. Stuber*

**(253g) A Novel Branching Scheme for Problems with Reverse Convex Quadratic Constraints and Its Application to Packing Problems** ..... 218
*Akang Wang, Christopher L. Hanselman, Chrysanthos E. Gounaris*

**(253h) Subtangent-Based Approaches for Optimization of Parametric Process Systems** ..... 219
*Kamil A. Khan*

**(257a) Perspectives on the Control of Advanced Manufacturing Systems** ..... 220
*Joel Paulson, Eranda Harinath, Lucas Foguth, Richard D. Braatz*

**(257b) Investigating the Impacts of Time-Varying Operation on Equipment Fidelity** ..... 221
*Matthew Wegener, Helen Durand*

**(257c) Generalized Chaos Expansions with Arbitrary Multivariate Probability Measures: Applications in Closed-Loop Performance Verification for Stochastic Dynamic Systems** ..... 222
*Joel Paulson, Ali Mesbah*

**(257d) Constrained Control Lyapunov Function Construction Via Approximation of Static Hamilton-Jacobi-Bellman Equations** ..... 223
*Tyler Homer, Prashant Mhaskar*

**(257e) On Multiparametric/Explicit NMPC for Quadratically Constrained Problems** ..... 224
*Nikolaos A. Diangelakis, Iosif S. Pappas, Efstratios N. Pistikopoulos*

**(257f) Explicit Model Predictive Control Using Nonlinear Intrinsic Variables** ..... 225
*Robert J. Lovelett, Felix Dietrich, David Sroczynski, Ioannis G. Kevrekidis*

**(257h) Securing Process Control Systems Using Dynamic Watermarking** ..... 226
*Joseph Sangil Kwon, Bharadwaj Satchidanandan, Woo-Hyun Ko, Jaewon Kim, Abhinav Narasingam, P. R. Kumar*

**(272a) Nonlinear Manifold Learning of Nucleosome Dynamics from Molecular Simulation** ..... 227
*Ashley Guo, Joshua Lequieu, Juan De Pablo*

**(272b) Machine Learning Predicts Functional Classes of Family 7 Glycoside Hydrolases with High Accuracy** ..... 228
*Japheth Gado, Anna Borisova, Jerry Stahlberg, Christina M. Payne*

**(272c) Implementation and Automation of a Hierarchical Graph Based Approach for Extracting Coarse-Grain Mapping Operators** ..... 229
*Maghesree Chakraborty, Andrew White*

**(272d) Machine Learning Algorithms for High-Throughtput Chemical Sensing Using Liquid-Crystals** ..... 230
*Yankai Cao, Huaizhe Yu, Nicholas L. Abbott, Victor M. Zavala*

**(272e) Materials Informatics for Process Optimization: Case Studies Using P3HT and PP Composites** ..... 231
*Michael McBride, Nils Persson, Elsa Reichmanis, Martha A. Grover*

**(272f) Learning Many-Body Molecular Interactions from Machine Learning** ..... 232
*Francesco Paesani, Thuong Nguyen, Andreas W. Gotz*

**(272g) Combining Machine Learning and Evolutionary Computing for Accelerating Materials Design** ..... 233
*Tarak Patra, David S. Simmons, Subramanian Sankaranarayanan, Badri Narayanan*

**(272h) Predicting Colloidal Crystals from Shapes Via Inverse Design and Machine Learning** ..... 234
*Yina Geng, Greg Van Anders, Sharon C. Glotzer*

**(272i) Autonomous Crystal Structure Characterization with Neighborhood Graph Analysis** ..... 235
*Wesley F. Reinhart, Athanassios Z. Panagiotopoulos*

**(272j) The Physical Analytics Pipeline - a Bayesian Optimization of the Hybrid Organic-Inorganic Perovskite Compositional Space** ..... 236
*Henry C. Herbol, Matthias Poloczek, Paulette Clancy*

**(273a) A Computational Tool for Applying Optimization Under Uncertainty on Advanced Process Simulators** ..... 237
*Frits Byron Soepyan, John C. Eslick, Miguel A. Zamarripa, Andrew Lee, Benjamin P. Omell, Charles H. Tong, Brenda Ng, Jeremy C. Ou, Pedro Sotorrio, Joshua Boverhof, Michael S. Matuszewski, David C. Miller*

**(273b) A Novel Objective Reduction Method: Application to the Comparison of Risk Metrics** ..... 238
*Daniel Vazquez, Ruben Ruiz-Femenia, Jose A. Caballero*

**(273c) Stochastic Programming Framework for Electric Power Infrastructure Planning** ..... 241
*Cristiana L. Lara, Benjamin P. Omell, David C. Miller, Ignacio E. Grossmann*

**(273d) Strategic Planning of Supply Chains Considering Extreme Events: Novel Heuristic and Application to the Petrochemical Industry** ..... 242
*Michael Ehrenstein, Gonzalo Guillen-Gosalbez*

**(273e) Resilient Design and Operations of Chemical Process Systems Using Robust Optimization** ..... 243
*Jian Gong, Fengqi You*

**(273f) A Mixed-Integer Conic Programming Formulation for Computing the Flexibility Index Under Multivariate Gaussian Random Variables** ..... 244
*Victor M. Zavala, Joshua Pulsipher*

**(273g) Modeling for Reliability Optimization of System Design and Maintenance Based on Markov Chain Theory** ..... 245
*Yixin Ye, Ignacio E. Grossmann, Jose M. Pinto, Sivaraman Ramaswamy*

**(273h) Novel Method for the Integration of Flexibility and Stability in Design of Chemical Processes Under Parametric Uncertainties** ..... 246
*Ying Chen, Zhihong Yuan, Bingzhen Chen*

**(304a) Energy-Water Nexus Study for a Mushroom Farming Initiative in Nigeria** ..... 247
*Quinta Nwanosike Warren*

**(304b) Sustainable Optimal Strategic Planning for Shale Water Management** ..... 248
*Jose A. Caballero, Alba Carrero-Parreno, Viviani C. Onishi, Juan A. Reyes-Labarta, Raquel Salcedo-Diaz, Ruben Ruiz-Femenia, Ignacio E. Grossmann*

**(304c) A Multi-Objective Energy-Water Nexus Planning Model: A Case Study of the Power Systems in Texas Edwards Aquifer** ..... 251
*Cory Allen, Yaling Nie, Styliani Avraamidou, Efstratios N. Pistikopoulos, Xin Xiao*

**(304d) Optimal Use of Thermal Membrane Distillation (TMD) for Treatment of Flowback Water** ..... 252
*Kaiyu Cao, Priscille I. Etoughe, Rajib Mukherjee, Debalina Sengupta, Joseph Sangil Kwon, Mahmoud M. El-Halwagi*

**(304e) The Energy-Water Nexus of Thermoelectric Power Generation and Its Impacts in the Muskingum River Watershed in Ohio** ..... 253
*Kyuha Lee, Sami Khanal, Bhavik R. Bakshi*

**(304f) Systematic Analysis and Optimization of Water-Energy Nexus** ..... 254
*Spyridon D. Tsolas, M. Nazmul Karim, M. M. Faruque Hasan*

**(304g) Thermo-Economic Optimization Based Comparison of Membrane Distillation Vs Mechanical Vapor Recompression for Shale Gas Produced Water Treatment** ..... 255
*Elmira Mohammadi Shamlou, Atoosa Mashayekhi, Radisav Vidic, Vikas Khanna*

**(304h) Application of Adsorbate Solid Solution Theory to Design Novel Adsorbents for Arsenic Removal Using Computer-Aided Molecular Design** ..... 256
*Rajat Doshi, Arti A. Rajput, Rajib Mukherjee, Suresh Gupta, Urmila M. Diwekar*

**(311a) The Impact of Shale Gas and Oil on the Chemical Industry** ..... 257
*Jeffrey J. Siirola*

**(311b) Sustainable Energy and Chemicals: Past, Present, and Future** ..... 258
*Joseph B. Powell*

**(311c) Disruptions: What the Future May Hold** ..... 259
*Scott F. Mitchell*

**(311d) Geopolitical Factors Influencing the Evolution of the Chemical Industry** ..... 260
*David West*

**(311e) Agility & Resilience: How to Maintain Career Competitiveness in the Changing Chemical Industry** ..... 261
*Antonis Papadourakis*

**(140f) Leveraging Deep Learning for Pharmaceutical Discovery Lead Profiling** ..... 262
*Jacob Albrecht, Marcello Ricottone, Wilson Shou, Stephen Johnson*

**(140b) Learning to Design and Validate Small-Molecule Synthetic Routes from Historical Reaction Data** ..... 263
*Connor W. Coley, Pieter Plehiers, Wengong Jin, Hanyu Gao, Regina Barzilay, Tommi S. Jaakkola, William H. Green, Klavs F. Jensen*

**(140c) Using Machine Learning to Recommend Reaction Conditions and Quantifying Similarity of Catalysts, Solvents, and Reagents** ..... 264
*Hanyu Gao, Thomas Struble, Connor W. Coley, William H. Green, Klavs F. Jensen*

**(140d) Applying Data Science Techniques to Solubility Data for Synthetic Compounds: An Expedited End-to-End Workflow from Data Collection to Crystallization Process Design** ..... 265
*Michael Lovette, Seth Huggins*

**(140e) Optimizing Drying Profile of Polymeric Drug Products Using Machine Learning and First Principle Modeling** ..... 266
*Rishi Mehan, Svb Janardhan Garikipati, Ravichandra Palaparthi, Arnesh Palanisamy*

**(140a) A Reaction Database for Small Molecule Pharmaceutical Processes Integrated with Process Information: Future Developments** ..... 267
*Emmanouil Papadakis, Anjan Kumar Tula, Rafiqul Gani*

**(315a) Multiscale CFD Model Parallelization with Application to PECVD of Thin Films** ..... 268
*Marquis Crose, Anh Tran, Yangyao Ding, Panagiotis D. Christofides*

**(315b) An Analysis of the Nonlinear Behavior of the Autothermal Reactor** ..... 269
*Guilherme Ozorio Cassol Sr., Stevan Dubljevic*

**(315c) Accurate and Efficient Discrete Finite Volume Approximations for Population Balances Incorporating Coagulation and Fragmentation** ..... 270
*Mehakpreet Singh, Gurmeet Kaur, Themis Matsoukas, Gavin Walker*

**(315d) Comparison of Global, Stochastic Optimization Algorithms Using Toy Problems and Multi-Parameter Models to Kinetic Fermentation and Rheological Data** ..... 271
*Matthew Armstrong, Corey James, April Miller*

**(315e) Multilevel Monte Carlo Applied for Efficient Estimation of Observables in Multiscale Stochastic Systems** ..... 272
*Grigoriy Kimaev, Luis A. Ricardez-Sandoval*

**(315f) Tightening Mccormick Relaxations Via Reformulation of Intermediate Functions into Schema** ..... 273
*Matthew Wilhelm, Robert Ernst, Matthew D. Stuber*

**(315g) Optfill: A Novel Optimization-Based Tool to Automate the Gapfilling of Genome-Scale Metabolic Models** ..... 274
*Wheaton Schroeder, Rajib Saha*

**(315h) A Novel Homotopy Continuation Technique to Locate All Real Solutions of a Nonlinear System of Algebraic Equations** ..... 275
*Saeed Khaleghi Rahimian, J. D. Seader*

**(343a) The Industrial Implementation of Validated Dynamic Simulation and Optimisation Tools Towards Superior Beer Fermentation** ..... 276
*Alistair D. Rodman, Megan Weaser, Lee Griffiths, Dimitrios I. Gerogiorgis*

**(343b) From Academia to Industry: Optimization Models for Shale Gas Development** ..... 277
*Markus G. Drouven, Ignacio E. Grossmann*

**(343c) Reconciling Ranking Criteria with Fuzzy Sets for Effective Use in Project Portfolio Selection** ..... 278
*Scott J. Bury, Satyajith Amaran, Sreekanth Rajagopalan, Anshul Agarwal*

**(343d) Multi-Scale Modeling and Design Optimization of an Industrial Hydrogen Production Plant with High-Resolution PSA and Steam-Methane Reformer Models** ..... 279
*Calvin Tsay, Ankur Kumar, Thomas F. Edgar, Michael Baldea*

**(343e) Optimization of Circuitry Arrangements for Heat Exchangers** ..... 280
*Nikolaos Ploskas, Christopher Laughman, Arvind Raghunathan, Nick Sahinidis*

**(343f) An Integrated Data-Driven Modeling & Global Optimization Approach for Production Planning Under Uncertainty** ..... 281
*C. Doga Demirhan, Fani Boukouvala, William W. Tso, Kyungwon Kim, Hyeju Song, Efstratios N. Pistikopoulos*

**(343g) Robust Multi-Period Vehicle Routing: Construction of Uncertainty Sets and Evaluation Via Rolling-Horizon Simulations** ..... 282
*Anirudh Subramanyam, J. M. Lainez-Aguirre, Jose M. Pinto, Chrysanthos E. Gounaris*

**(343h) Data-Driven Modelling and Optimization of Compressor Operations** ..... 283
*Harsha Nagesh Rao, Harsha Vardhan Reddy Guddeti, Vikas Singh Bisen, Iftekhar A. Karimi, Farooq Shamsuzzaman*

**(359a) Optimization-Based Predictive Control of Networked Process Systems with Discrete and Delayed Sensor-Controller Communication** ..... 284
*Da Xue, Nael H. El-Farra*

**(359b) Stochastic-Tube MPC for Offset-Free Tracking in the Presence of Plant-Model Mismatch** ..... 285
*Joel Paulson, Tito Santos, Ali Mesbah*

**(359c) An Efficient Distributed Algorithm for Multistage Scenario Model Predictive Control Using Primal Decomposition** ..... 286
*Dinesh Krishnamoorthy, Eka Suwartadi, Sigurd Skogestad, Johannes Jaschke*

**(359d) Approximate Dynamic Programming Based Control of Hydraulic Fracturing Process to Achieve Uniform Proppant Concentration Level** ..... 287
*Harwinder Singh Sidhu, Prashanth Siddhamshetty, Abhinav Narasingam, Joseph Sangil Kwon*

**(359e) Advanced-Step Multistage Nonlinear Model Predictive Control** ..... 288
*Zhou (Joyce) Yu, Lorenz T. Biegler*

**(359f) Decomposition of Optimization Problems Using Community Detection and Its Application in Nonlinear Model Predictive Control** ..... 289
*Wentao Tang, Andrew Allman, Davood Babaei Pourkargar, Prodromos Daoutidis*

**(359g) Safeness Index-Based Economic Model Predictive Control of Stochastic Nonlinear Systems** ..... 290
*Zhe Wu, Helen Durand, Panagiotis D. Christofides*

**(359h) Dual Offset Blocking Strategy for Computationally-Efficient Model Predictive Control** ..... 291
*Sang Hwan Son, Jong Min Lee*

**(382a) On Integration of Feedback Control and Safety Systems: Studying a High-Pressure Flash Drum Separator** ..... 292
*Zhihao Zhang, Zhe Wu, Helen Durand, Panagiotis D. Christofides*

**(382b) Two Feedback Control Schemes for the Size and Shape of Needle-like Crystals Growing in Suspension** ..... 293
*Stefan Boetschi, Ashwin Kumar Rajagopalan, Manfred Morari, Marco Mazzotti*

**(382c) Robust Fault Tolerant Control of Hydraulic Pipeline Systems** ..... 294
*Xiaodong Xu, Stevan Dubljevic*

**(382d) Learning-Based Nonlinear Model Predictive Control with Chance Constraints for Stochastic Systems** ..... 295
*Angelo D. Bonzanini, Tito Santos, Ali Mesbah*

**(382e) Control Under Uncertainty in Automated Drug Delivery** ..... 296
*Mudassir Rashid, Iman Hajizadeh, Ali Cinar*

**(382f) Predictive Control with Model Performance Monitoring and Re-Identification** ..... 297
*Masoud Kheradmandi, Prashant Mhaskar*

**(382g) Advanced Biomimetic Control Approach Integrated with Multi-Agent Optimization for Nonlinear Chemical Processes** ..... 298
*Gaurav Mirlekar, Berhane Gebreslassie, Urmila M. Diwekar, Fernando V. Lima*

**(382h) Nonlinear Optimal Control Structure Design** ..... 299
*Temitayo Bankole, Debangsu Bhattacharyya*

**(384a) 25 by 25: Chemical Engineering in the Next 25 Years** ..... 300
*Clare McCabe, Phillip R. Westmoreland*

**(384b) The Future of Chemical Engineering Itself** ..... 301
*Phillip R. Westmoreland*

**(384e) Accelerating Innovation through Academic-Industrial Partnerships** ..... 302
*William Liechty, Shawn D. Feist*

**(384c) Maximizing Uptime, Efficiency, and Safety of Industrial Operations through Early Risk Detection** ..... 303
*Ankur Pariyani*

**(384d) Gaussian Processes for Hybridizing Analytical & Data-Driven Decision-Making** ..... 304
*Simon Olofsson, Johannes Wiebe, Marc Peter Deisenroth, Ruth Misener*

**(392a) Designing Difficult-to-Cyberattack Process Control Systems** ..... 307
*Helen Durand*

**(392b) Cyber Security of Model Predictive Control Systems for Chemical Processes** ..... 308
*Zhe Wu, Junfeng Zhang, Yannong Li, Helen Durand, Panagiotis D. Christofides*

**(392c) Keynote Talk: Technology Development for Cybersecure Fossil Power Generation** ..... 309
*Briggs White*

**(392e) Keynote Talk: Cybersecurity Realities in Industrial Control System Environments** ..... 310
*Kenny Mesker*

**(393a) A Metaheuristic Approach to Best Subset Selection for the Development of Regression-Based Surrogate Models** ..... 311
*Owais Sarwar, Nick Sahinidis*

**(393b) Data-Driven Stochastic Robust Optimization for Process Operation Under Uncertainty** ..... 312
*Chao Ning, Fengqi You*

**(393c) Uncertainty Quantification and Stochastic Programming Strategies for Energy Market Participation** ..... 313
*Xian Gao, Steven Atkinson, Alexander W. Dowling*

**(393d) Predicting Future Production for Unconventional Resources: A Data-Driven Approach** ..... 314
*Sunit Mathur, Matteo Marongiu-Porcu, Michael Nikolaou*

**(393e) Distributed Approximate Dynamic Programming (dADP) for Data-Driven Optimal Control of Nonlinear Systems** ..... 315
*Wentao Tang, Prodromos Daoutidis*

**(393f) Data-Driven Evolution Equation Reconstruction for Parameter-Dependent Nonlinear Dynamical Systems** ..... 316
*David Sroczynski, Or Yair, Felix Dietrich, Ronen Talmon, Ioannis G. Kevrekidis*

**(393g) Integrated Data-Driven Monitoring & Explicit Fault-Aware Control of Chemical Processes: An Adaptive Approach for Smart Operation** ..... 317
*Melis Onel, Baris Burnak, Efstratios N. Pistikopoulos*

**(393h) Why Plant Operations Are Unstable after All the Design and How Data Science Can Help** ..... 318
*S. Joe Qin, Yining Dong*

**(408j) Gas Capture by Ionic liquids** ..... 319
*Xiaochun Zhang, Suojiang Zhang*

**(408d) Thermoeconomic Optimization of Reverse Brayton Cycle Based Cryocooler for HTS Power Transmission Cable** ..... 320
*Aman Dhillon, Parthasarathi Ghosh*

**(408c) Technology Readiness Levels As a Framework for Techno-Economic Assessment** ..... 321
*Georg A. Buchner, Arno W. Zimmermann, Annika Marxen, Kai J. Stepputat, Arian E. Hohgrave, Reinhard Schomacker*

**(408f) Techno-Economic Modeling and Optimization of Catalytic Reactive Distillation for Bio-Oil Upgradation** ..... 322
*M. Arif Khan, Yusuf G. Adewuyi*

**(408g) Superstructure Optimization of Membrane-Based Carbon Capture Systems** ..... 323
*Miguel A. Zamarripa, Samir Budhathoki, Olukayode Ajayi, Janice A. Steckel, Christopher E. Wilmer, Michael S. Matuszewski, David C. Miller*

**(408k) Making Hydrogen from Water with a Protein Organized Electrode: Ultra-High Utilization of Noble Metal in Proton Exchange Membrane Electrolysis for Capital Cost Reduction** ..... 324
*Nuttanit Pramounmat, Julie N. Renner*

**(408i) Design Optimization and Economic Evaluation of LNG/NGL Integrated Processes Under Lean Feed Composition** ..... 325
*Chunhe Jin, Youngsub Lim*

**(421a) A General Framework for the Evaluation of Direct Nonoxidative Methane Conversion Strategies** ..... 326
*Kefeng Huang, James B. Miller, George W. Huber, James A. Dumesic, Christos T. Maravelias*

**(421b) Upstream Process Optimization to Reduce the Cost of Air Pollution Control** ..... 327
*Fred Hencken*

**(421c) Nonsmooth Simulation of Dry and Vaporless Tray Distillation Columns** ..... 328
*Suzane M. Cavalcanti, Paul I. Barton*

**(421d) Analysis of Chemical Process System Analysis with Entropy Generation** ..... 329
*John P. O'Connell*

**(421e) Effective Generalized Disjunctive Programming (GDP) Models for Modular Plant Design** ..... 330
*Qi Chen, Ignacio E. Grossmann*

**(421f) ProCAFD: A Computer-Aided Tool for Sustainable Process Synthesis, Design, Analysis and Improvement** ..... 332
*Anjan Kumar Tula, Mario Richard Eden, Venkat Venkatasubramanian, Rafiqul Gani*

**(421g) Systematic Process Design and Innovation Using Building Blocks** ..... 333
*Salih E. Demirel, Jianping Li, M. M. Faruque Hasan*

**(421h) Surrogate-Based Optimization for Biocatalytic Manufacturing of Diabetes Drug** ..... 334
*Chi-Hung Ho, Jieran Yi, Wei Sun, Xiaonan Wang*

**(440a) Comparison of First Principles and Parametric Models for the Design and Operation of a Spray Dryer for Whey Protein Production** ..... 335
*Anibal Barrios Quant, John Telotte, J. A. P. Mendoza*

**(440b) Molecular Thermodynamic Model for Aqueous $Na^+$-$K^+$-$Mg^{2+}$-$Ca^{2+}$-$Cl^-$/$SO_4^{2-}$ Quinary Electrolyte Systems** ..... 345
*Sheik Tanveer, Chau-Chyun Chen*

**(440c) Numerical Investigation of Heat Transfer in Fixed-Bed Reactors Filled with Complex Particle Shapes Using CFD** ..... 346
*Nico Jurtz, David Lucht, Matthias Kraume*

**(440f) Optimal Front-End Crude Scheduling for Refinery with Consideration of Proactive Unit Maintenance** ..... 347
*Honglin Qu, Qiang Xu*

**(440g) Thermodynamic Modeling of $CO_2$ Absorption in Aqueous Amino Acid Salt Solutions with Symmetric Electrolyte NRTL Model** ..... 348
*Rajasi Shukre, Chau-Chyun Chen*

**(440h) Plantwide Process Design with Automatic Column Optimization, Sequencing and Stacking Using a Rigorous Process Simulator** ..... 349
*Yuan-Wei Ni, Jeffrey D. Ward*

**(441a) A Sigmoidal Approximation for Chance-Constrained Nonlinear Programs** ..... 351
*Yankai Cao, Victor M. Zavala*

**(441b) A Global Optimization Algorithm for Nonconvex Chance-Constrained Programs with Continuous Random Variables** ..... 352
*Yuanxun Shao, Joseph Scott*

**(441c) On Solving Nonconvex Two-Stage Stochastic Programs with Generalized Benders Decomposition** ..... 353
*Can Li, Ignacio E. Grossmann*

**(441d) New Developments in Flexibility Analysis in the Framework of Design Space Definition** ..... 354
*M. Paz Ochoa, Carla Luciani, Stephen D. Stamatis, Salvador Garcia-Munoz, Ignacio E. Grossmann*

**(441e) Adaptive Robust Optimization Under Uncertainty with Regret** ..... 355
*Chao Ning, Fengqi You*

**(441f) Hybrid Decision Rules in Multistage Adaptive Optimization** ..... 356
*Said Rahal, Zukui Li*

**(441g) An Algorithmic Cutting Plane Method for Solving Robust Optimization Problems with Endogenous Uncertainty** ..... 357
*Nikolaos Lappas, Anirudh Subramanyam, Chrysanthos E. Gounaris*

**(441h) Robust Explicit Optimization and Control within the Paroc Framework** ..... 358
*Nikolaos A. Diangelakis, Richard Oberdieck, Iosif S. Pappas, Efstratios N. Pistikopoulos*

**(456a) Estimating Uncertain Atmospheric Aerosol Dynamics with an Input Observer** ..... 359
*Dana L. McGuffin, B. Erik Ydstie, Peter J. Adams*

**(456b) Adaptive Model Predictive Control with Recursive Subspace Identification** ..... 360
*Iman Hajizadeh, Mudassir Rashid, Ali Cinar*

**(456c) Robust Model Predictive Control with Decomposed Disturbance Subsets for Less Conservative Control** ..... 361
*Tae Hoon Oh, Jong Min Lee*

**(456d) A Nonlinear Programming Framework for Estimating Spatial Coupling and Seasonal Transmission Parameters in Disease Transmission** ..... 362
*Todd Zhen, Carl D. Laird*

**(456e) Active Fault Diagnosis for Stochastic Linear Systems: Design Criteria and Implementation Issues** ..... 363
*Tor Aksel N. Heirung, Ali Mesbah*

**(456f) Stochastic Multiscale Model-Based Predictive Control Via Polynomial Chaos Theory: Manufacturing of Thin Films for Pharmaceutical Applications** ..... 364
*Jonggeol Na, Jong Woo Kim, Kyeongsu Kim, Eranda Harinath, Mo Jiang, Jong Min Lee, Bernhardt L. Trout, Richard D. Braatz*

**(456g) An Improved Set-Based State Estimation Method for Fault Detection and Diagnosis in Highly Nonlinear and Uncertain Chemical Processes** ..... 365
*Xuejiao Yang, Joseph Scott*

**(456h) Robust Model Based Control Via Closed-Loop Reference Trajectory Optimization** ..... 366
*Hao Li, Christopher L. E. Swartz*

**(468a) Identifying Nucleation and Growth Kernels of Crystallization** ..... 367
*Anish V. Dighe, James Fell, Meenesh R. Singh*

**(468b) A Novel Mode of Supersaturation Feedback Control: Semi-Batch Cooling Crystallization By Feeding Flow Rate Profiles** ..... 368
*Teng Zhang, Brigitta Nagy, Botond Szilagyi, Junbo Gong, Zoltan K. Nagy*

**(468c) Parameter Range Optimization and Modeling for a Reactive Crystallization Process** ..... 369
*Michael Dummeldinger, Daniel Treitler, Jose E. Tabora, Amanda Rogers*

**(468d) Enhanced Mass Transfer Process Control Via Hollow Fiber Membrane Assisted Antisolvent Crystallization** ..... 370
*Xiaobin Jiang, Linghan Tuo, Xuehua Ruan, Wu Xiao, Gaohong He*

**(468e) Experimental Implementation of a Model-Free Feedback Controller for the Size and Shape of Needle-like Crystals Growing in Suspension** ..... 373
*Ashwin Kumar Rajagopalan, Stefan Boetschi, Manfred Morari, Marco Mazzotti*

**(468f) Morphology Based Adsorption Kinetics of a Selectively Modulated Metal-Organic Framework** ..... 374
*Luke Huelsenbeck, Karl Westendorff, Gaurav Giri*

**(468g) Effects of Scale-up on the Mechanism and Kinetics of Crystal Nucleation** ..... 375
*R. R. E. Steendam, Leila Keshavarz, Melian A. R. Blijlevens, Brian De Souza, Denise Croker, Patrick Frawley*

**(470a) Accelerating High-Throughput Experimentation with Templated Statistical Analysis** ..... 376
*Jacob Albrecht, Victor W. Rosso, Eric M. Saurer, Jose E. Tabora, Brendan C. Mack, Frederick Roberts, Grace Chiou, Jacob Janey*

**(470b) Process Fingerprinting Tools in the Development of an Alkylation Reaction** ..... 377
*Kevin Stone, Brian M. Wyvratt, Emmanuel Adachi, Marguerite Mohan, Jonathan P. McMullen*

**(470c) Reactor Design for Continuous Synthesis of Pharmaceutical Intermediates: Correlation of Computational Fluid Dynamics and Design of Experiment Approaches** ..... 378
*Thomas D. Roper, Michael J. Bortner, Cameron Armstrong, Cailean Pritchard, Daniel Cook, Mariam Ibrahim, Bimbisar Desai, Yizheng Chen, Brian Marquardt, Patrick Whitham, Thouakesseh Zoueu*

**(470d) Optimal Design of Experiments for Building Fundamental Models of Pharmaceutical Production Processes** ..... 379
*Ali Shahmohammadi, Kimberley B. McAuley*

**(470e) Model-Based Design of Experiments for Pharmaceutical Reaction Development** ..... 380
*Kevin Stone, Jonathan P. McMullen, Dan Willard*

**(470f) Defining the Optimal Operating Window for Pharmaceutical Reactions Using the Dynamic Response Surface Methodology for All Measured Species** ..... 381
*Yachao Dong, Christos Georgakis, Jason Mustakis, Joel M. Hawkins, Jonathan P. McMullen, Shane T. Grosser*

**(470g) Sensitivity Analysis and Identification of Feasible Region of a Wet Granulation Continuous Pharmaceutical Manufacturing Process** ..... 382
*Nirupaplava Metta, Marianthi Ierapetritou, Rohit Ramachandran*

**(474a) Dynamic Modeling of Phase Changes in Liquid-Liquid Mixtures** ..... 383
*Tobias Ploch, Moll Glass, Andreas M. Bremen, Ralf Hannemann-Tamas, Alexander Mitsos*

**(474b) From Graphical to Optimization-Based Distillation Column Design: A Mccabe-Thiele-Inspired Math Program** ..... 384
*Lingxun Kong, Christos T. Maravelias*

**(474c) An MINLP Formulation for the Optimization of Heat-Pump Assisted Distillation Configurations** ..... 385
*Radhakrishna Tumbalam Gooty, Tony Joseph Mathew, Mohit Tawarmalani, Rakesh Agrawal*

**(474d) New Isotherm Model for S-Shaped Isotherm Data to be Used in Process Modeling and Its Model Reduction with Machine Learning Techniques** ..... 386
*Seongbin Ga, Sangwon Lee, Jihan Kim, Jay H. Lee*

**(474f) Heat Pump Assisted Configurations for Amine Based Natural Gas Sweetening Units** ..... 387
*Anoop Jagannath, Ali Almansoori*

**(474g) Conceptual Design and Exergy Analysis of the Cryogenic Energy Storage System Integrated with LNG Cold Utilization** ..... 388
*Inkyu Lee, Il Moon*

**(474h) Global Deterministic Surrogate-Based Process Design** ..... 389
*Artur M. Schweidtmann, Wolfgang R. Huster, Alexander Mitsos*

**(530a) Scheduling with Preemption** ..... 390
*Pedro M. Castro, IIro Harjunkoski, Ignacio E. Grossmann*

**(530b) Robust Planning and Scheduling for Processes with Equipment Degradation** ..... 391
*Johannes Wiebe, Ruth Misener*

**(530c) A Simultaneous Process Scheduling and Personnel Allocation Framework for Industrial-Scale Multipurpose Facilities** ..... 392
*Fernando Santos, Ricardo Fukasawa, Luis A. Ricardez-Sandoval*

**(530d) A Novel Mathematical Model for Short-Term and Medium-Term Scheduling of Multipurpose Batch Plants** ..... 393
*Nikolaos Rakovitis, Jie Li, Nan Zhang*

**(530e) An Algorithm Combining the Strengths of Discrete- and Continuous-Time Scheduling Models** ..... 396
*Hojae Lee, Christos T. Maravelias*

**(530f) Batch Scheduling with Quality-Based Changeovers** ..... 397
*Braulio Brunaud, Satyajith Amaran, Scott J. Bury, John M. Wassick, Ignacio E. Grossmann*

**(530g) A Computational Comparison of New Models for the Multi-Mode Resource Constrained Project Scheduling Problem with Optional Activities** ..... 398
*Nikolaos Lappas, Hua Wang, Chrysanthos E. Gounaris*

**(530h) Scheduling and Analytics - Towards Better Planning** ..... 399
*Iiro Harjunkoski*

**(534a) Designing Stochastic Model Predictive Control Based Neural Interface to Restore Communication between Brain Regions** ..... 400
*Joseph Schmalz, Gautam Kumar*

**(534b) Predictive Strategies for Control of Indoor Air Quality** ..... 401
*Hari S. Ganesh, Hagen E. Fritz, Thomas F. Edgar, Atila Novoselac, Michael Baldea*

**(534c) An Optimization-Based Feedback Control Strategy for Spatially-Uniform Dose Delivery Using Atmospheric Pressure Plasma Jets** ..... 402
*Dogan Gidon, David B. Graves, Ali Mesbah*

**(534d) Dynamic Real-Time Optimization of a Gas-Phase Polymerization Reactor** ..... 403
*Yajun Wang, George S. Ostace, Rita A. Majewski, Lorenz T. Biegler*

**(534e) Model Predictive Control of a Nonisothermal and Nonisobaric Membrane Reactor for Water-Gas Shift Reaction Applications** ..... 404
*Jacob Douglas, Paul Akula, Gaurav Mirlekar, Fernando V. Lima*

**(534f) Operator-Triggered Advisory System for Electric Arc Furnace Process Optimization** ..... 405
*Smriti Shyamal, Christopher L. E. Swartz*

**(534g) Geosteering Using Image Logs and an Intelligent Bottomhole Assembly** ..... 408
*Jude Rodrigues, Michael Nikolaou*

**(534h) Intelligent Pressure Control Method for Managed Pressure Drilling** ..... 409
*Jeevan Dahal, Oluwatosin Oyelakin, Banchao Shu, Isaac Snyder, Priyanka Shahi*

**(537a) Addressing Uncertainty in Large-Scale Bioconversion Product and Process Networks with Two-Stage Adaptive Robust Optimization** ..... 410
*Daniel Garcia, Jian Gong, Fengqi You*

**(537b) A Flexible Design Framework for Process Systems with Demand Response Objectives** ..... 413
*Yu Liu, Nael H. El-Farra, Ahmet Palazoglu*

**(537d) Accounting for Uncertainty Via Scheduling Informed Optimal Design: A Renewable Ammonia Case Study** ..... 414
*Andrew Allman, Matthew J. Palys, Prodromos Daoutidis*

**(537e) Design and Optimization of Multifunctional Processes for Utilizing Unconventional and Distributed Feedstocks** ..... 415
*Akhil Arora, Ishan Bajaj, Shachit S. Iyer, M. M. Faruque Hasan*

**(537g) Simultaneous Process Synthesis and Heat Integration Using Building Block Superstructure** ..... 416
*Salih E. Demirel, Jianping Li, M. M. Faruque Hasan*

**(537h) Green Operation of an Air Separation Unit Using an Efficient MILP Optimal Scheduling Framework** ..... 417
*Morgan Kelley, Ross Baldick, Michael Baldea*

**(560a) Graph Representation and Decomposition of Diffusion-Convection-Reaction Processes for Distributed Control** ..... 418
*Manjiri Moharir, Davood Babaei Pourkargar, Ali Almansoori, Prodromos Daoutidis*

**(560b) Machine Learning-Based Model Predictive Control of Distributed Chemical Processes** ..... 419
*Anh Tran, Yangyao Ding, Panagiotis D. Christofides*

**(560c) Optimization-Based Sensor/Actuator Scheduling and Control of Sampled-Data Distributed Processes** ..... 420
*Da Xue, Nael H. El-Farra*

**(560d) Adaptive Model Reduction for Dissipative PDE Systems with Strong Convective Phenomena** ..... 421
*Manda Yang, Antonios Armaou*

**(560e) Equation-Free Multiparametric Model Predictive Control for Dissipative PDEs** ..... 422
*Panagiotis Petsagkourakis, Constantinos Theodoropoulos*

**(560f) Product Uniformity in PECVD Systems: Applying Run-to-Run Control to a Multiscale Three-Dimensional CFD Model** ..... 423
*Marquis Crose, Anh Tran, Yangyao Ding, Panagiotis D. Christofides, Weiqi Zhang*

**(560g) Process Monitoring and Leakage Diagnosis for Distributed Pipeline System Based on Discrete Observer and Moving Horizon Estimation** ..... 424
*Junyao Xie, Stevan Dubljevic*

**(560h) Dynamic Modeling and Control of a Natural Gas Combined Cycle (NGCC) Power Plant with a Damage Model** ..... 425
*Yifan Wang, Debangsu Bhattacharyya, Richard Turton*

**(583a) A Reactive Distillation Optimization Model for Low- and High-Temperature Fischer-Tropsch Syntheses for Multiphase Product Recovery** ..... 426
*Yanyan Hu, Naien He, Yizu Zhang, Cornelius Mduduzi Masuku, Lorenz T. Biegler*

**(583b) Design and Intensification of Sorption-Enhanced Reaction Processes for Methanol Production** ..... 427
*Akhil Arora, Shachit S. Iyer, Ishan Bajaj, M. M. Faruque Hasan*

**(583c) Comparison of Adsorptive Separation Performance of a Hollow Fiber Bed and a Packed Bed: A Modeling Study Using Zeolite 13X and a Mixture of Propylene and Propane** ..... 428
*Trisha Sen, Yoshiaki Kawajiri, Matthew J. Realff*

**(583d) Towards a Systematic Process Intensification Framework for Advanced Distillation Systems** ..... 429
*Yuhe Tian, M. Sam Mannan, Efstratios N. Pistikopoulos*

**(583e) An MILP-Based Operability Approach for Process Design, Intensification and Modularity of Nonlinear and High-Dimensional Energy Systems** ..... 430
*Vitor Gazzaneo, Fernando V. Lima*

**(583f) Compact, Nonsmooth Operators for Single-Component Mass and Water Integration** ..... 431
*Caroline Nielsen, Paul I. Barton*

**(583g) Optimal Mass Exchanger Network Synthesis Using a 2-Step Hybrid Algorithm Including Packed Column Design** ..... 432
*Michael Short, Lorenz T. Biegler, Adeniyi J. Isafiade*

**(583h) Mathematical Optimization of Sustainable Water Desalination Processes Using Directional Solvent Extraction** ..... 433
*Alejandro Garciadiego, Tengfei Luo, Alexander W. Dowling*

**(584a) System Decomposition for Distributed Multivariate Statistical Process Monitoring** ..... 434
*Shaaz Khatib, Prodromos Daoutidis, Ali Almansoori*

**(584b) Transfer Entropy-Based Dynamic Causal Maps Generation for Fault Diagnosis in Systems with Cycles** ..... 435
*Resmi Suresh, Abhishek Sivaram, Venkat Venkatasubramanian*

**(584c) Efficient Process Monitoring and Causality Analysis of Processes Via the Integrated Use of the Graphical Lasso and Markov Random Fields Modeling** ..... 436
*Changsoo Kim, Hodong Lee, Wonbo Lee*

**(584d) Transfer Learning Method for Chemical Plant Fault Diagnosis** ..... 437
*Junyao Xie, Stevan Dubljevic*

**(584e) Multi-Class Classification of Process Faults Using Nonlinear Support Vector Machine Based Feature Selection Algorithm** ..... 438
*Melis Onel, Efstratios N. Pistikopoulos*

**(584f) In Situ FT-IR Quantitative Analysis of Amine Concentration and $CO_2$ Loading Amount in Mixture Solvent Using Deep Neural Network** ..... 439
*Yo Sung Yoon, Jay H. Lee*

**(584g) Deep Learning for Pyrolysis Reactor Monitoring: From Thermal Imaging Towards Smart Monitoring System** ..... 440
*Wenbo Zhu, Jose A. Romagnoli*

**(584h) Model-Based Stochastic Fault Detection and Diagnosis of Lithium-Ion Batteries** ..... 441
*Jeongeun Son, Yuncheng Du*

**(584i) Implementation of Model-Predictive Safety Systems to Detect Predictively Operation Hazards in Non-Minimum-Phase Processes** ..... 442
*Masoud Soroush, Jeffrey E. Arbogast, Warren D. Seider, Ahmad Arabi Shamsabadi*

**(598a) Towards Global Optimization on Low-Dimensional Surrogates Via Manifold Learning** ..... 443
*Felix Dietrich, Logan R. Matthews, Dmitry Pozharskiy, Ioannis G. Kevrekidis*

**(598b) On the Derivation of Piecewise Linear Continuous Approximating Functions** ..... 444
*Lingxun Kong, Christos T. Maravelias*

**(598c) Surrogate-Based Optimization Framework in Process Systems Engineering** ..... 445
*Atharv Bhosekar, Lisia S Dias, Zilong Wang, Marianthi Ierapetritou*
**(598d) Spatial Branch-and-Bound Optimization Using Surrogate Approximations** ..... 446
*Jianyuan Zhai, Fani Boukouvala*
**(598e) Reduced Space Formulation for Global Optimization with Artificial Neural Networks Embedded** ..... 447
*Artur M. Schweidtmann, Alexander Mitsos*
**(598f) Optimization of Data-Dependent Mixed-Integer Nonlinear Problems** ..... 448
*Sun Hye Kim, Fani Boukouvala*
**(598g) On Discretization Based Global Optimization for Mixed-Integer Bilinear Programs** ..... 449
*Xin Cheng, Xiang Li*
**(598h) Quadratic Cut Decomposition Method for Convex Mixed-Integer Nonlinear Programs** ..... 450
*David E. Bernal, Lijie Su, Lixin Tang, Ignacio E. Grossmann*
**(601a) Machine Learning for Automated Meal Detection in Glucose Control Systems for People with Diabetes** ..... 451
*Sediqeh Samadi, Mudassir Rashid, Iman Hajizadeh, Jianyuan Feng, Mert Sevil, Caterina Lazaro, Nicole Hobbs, Rachel Brandt, Ali Cinar*
**(601b) Source Analysis of Process Variability in Multi-Step Bio-Process Manufacturing** ..... 452
*Yuan Jin, S. Joe Qin, Victor M. Saucedo, Zheng Li, Angela Meier, Siddhartha Kunda, Briana Lehr, Salim Charaniya*
**(601c) Multi-Rate Hard and Soft Sensors Fusion for Monitoring Chemical Processes** ..... 453
*Zhenyu Wang, Leo H. Chiang*
**(601d) A New Big Data Benchmark Problem: Fluid Catalytic Cracker Under Model Predictive Control** ..... 454
*Omar S. Santander, Michael Baldea*
**(601e) Computation-Driven Mechanistic Understanding of the Cellular Cost and Regulation of Melanin Production** ..... 455
*Rajib Saha, Wheaton Schroeder, Jyothi Kumar, Steve Harris*
**(601f) Using Data Variety for Modeling and Control of Batch Processes** ..... 456
*Abhinav Garg, Prashant Mhaskar*
**(601g) Optimal Input and Sensor Selection for System Health Assessment** ..... 459
*Kyle A. Palmer, George M. Bollas*
**(601h) Performance Characterization and Fault-Tolerant Control of Multi-Rate Sampled-Data Process Systems with Unknown Measurement Delays** ..... 460
*James Allen, Nael H. El-Farra*
**(629a) Real Time Constrained Model Predictive Control for the Continuous Manufacturing of Pharmaceuticals** ..... 461
*Kelly Nocon, Omar Sheikh, Niraj Mehta, Vasilios Manousiouthakis*
**(629b) Model Predictive Control of a Rotational Molding Process** ..... 462
*Abhinav Garg, Felipe P. C. Gomes, Prashant Mhaskar, Michael R. Thompson*
**(629c) A Multiparametric Programming Based Approach to Integrate Design, Scheduling, and Control of a Batch Process** ..... 463
*Baris Burnak, Efstratios N. Pistikopoulos*
**(629d) Multi-Objective Dynamic Optimisation of a Fed-Batch Nosiheptide Reactor** ..... 464
*Alistair D. Rodman, Dimitrios I. Gerogiorgis*
**(629e) Big Data and the Chemical Industry: From Sensor to Value** ..... 465
*Flor Castillo, William Hollar*
**(629f) Big Data and Iot: A Demonstration Testbed of Multi-Stage Centrifugal Pumping System** ..... 466
*Devarshi Shah, Jin Wang, Q. Peter He*
**(629g) Pressure Swing Adsorption Cycle Synthesis Utilizing Artificial Neural Networks As Surrogate Models** ..... 467
*Karson Leperi, Daison Yancy-Caballero, Randall Q. Snurr, Fengqi You*
**(629h) Continuous Control of a Polymerization System with Deep Reinforcement Learning** ..... 468
*Yan Ma, Wenbo Zhu, Michael G. Benton, Jose A. Romagnoli*
**(658a) On Integration of Feedback Control and Safety Systems for Networked Chemical Processes** ..... 469
*Zhihao Zhang, Zhe Wu, Carlos Garcia, Helen Durand, Panagiotis D. Christofides*
**(658b) Manifold Learning for Measurements across Several Sensors: Alternating Diffusion, Data Fusion and Constructing Nonlinear Observers for Complex Chemical Reaction Networks** ..... 470
*David Sroczynski, Felix Dietrich, Mahdi Kooshkbaghi, Seungjoon Lee, Ioannis G. Kevrekidis*
**(658c) Emergence of Structural Features in Complex Networks Via Adaptation** ..... 471
*Abhishek Sivaram, Sihyun Lee, Jackson Chen, Meir Retter, Resmi Suresh, Yu Luo, Venkat Venkatasubramanian*
**(658d) Modeling the Stochastic Dynamics of Gene Regulatory Networks Using Probabilistic Boolean Networks** ..... 472
*Cameron Gallivan, Elizabeth Read*
**(658e) Koptic: A Novel Approach for in silico Prediction of Enzyme Kinetics and Regulation** ..... 473
*Wheaton Schroeder, Rajib Saha*
**(658f) Lung Immunodynamics during pH1N1 Influenza Virus Infection** ..... 474
*Emily E. Ackerman, Ericka Mochan, Jason E. Shoemaker*
**(658g) Understanding the Basal Ganglia Dynamic Transition from the Healthy to the Parkinsonian State** ..... 475
*Joseph Schmalz, Gautam Kumar*
**(658h) Dynamic Transcriptomic Profiling of Scheffersomyces Stipitis Reveals Key Information of Its Gene Regulatory Network at Genome-Scale** ..... 476
*Matthew Hilliard, Thomas Jeffries, Q. Peter He, Jin Wang*
**(679a) The Impact of Microgrids on the Grid: Integration of Distributed Renewables Via Network-Constrained Affine Robust Unit Commitment** ..... 477
*Matthew J. Palys, Prodromos Daoutidis*

**(679b) Modeling and Optimization of Supercritical Pulverized Coal Power Plants Under Part Load Operation** ..... 478
*Jaffer Ghouse, John C. Eslick, Anthony P. Burgard, Andrew Lee, Miguel A. Zamarripa, Jinliang Ma, John P. Eason, Bethany Nicholson, Carl D. Laird, Lorenz T. Biegler, Debangsu Bhattacharyya, David C. Miller*

**(679c) Cost-Effectiveness of Grid Energy Storage Technologies in Current and Future U.S. Power Systems** ..... 479
*Omar J. Guerra, Joshua Eichman, Bri-Mathias S. Hodge, Jennifer Kurtz*

**(679d) New Operating Strategy for a Combined Cycle Gas Turbine Power Plant** ..... 480
*Zuming Liu, Iftekhar A. Karimi*

**(679e) Flexible Carbon Capture Exploiting Dynamic Changes in Electricity Price** ..... 481
*Manali Zantye, M. M. Faruque Hasan*

**(679f) Stability-Preserving Economic Optimization of Microgrids** ..... 482
*Sungho Shin, Victor M. Zavala*

**(679g) Optimal Design of Aging Systems: A-Frame Coolers Design Under Fouling** ..... 483
*Jose A Luceno, Mariano Martin*

**(679h) A Data-Driven Optimization Framework for Selection and Operation of Energy Storage Systems** ..... 484
*Lanyu Li, Tianxun Zhou, Xiaonan Wang*

**(681a) Safe Economic Model Predictive Control of Nonlinear Systems** ..... 485
*Zhe Wu, Helen Durand, Panagiotis D. Christofides*

**(681b) Improving Flexibility and Energy Efficiency of a Post-Combustion $CO_2$ Capture Process Using Economic Model Predictive Control** ..... 486
*Benjamin Decardi-Nelson, Su Liu, Jinfeng Liu*

**(681c) Towards on-Line Development of Physically-Based Models for Model-Based Control Design** ..... 487
*Laura Giuliani, Helen Durand*

**(681d) Data Driven Economic Model Predictive Control for Unstable Systems** ..... 488
*Masoud Kheradmandi, Prashant Mhaskar*

**(681e) Incorporation of Sustainability and Economic Considerations in Process Control of Hydraulic Fracturing in Unconventional Reservoirs** ..... 489
*Priscille Etoughe, Prashanth Siddhamshetty, Kaiyu Cao, Rajib Mukherjee, Joseph Sangil Kwon*

**(681f) Multi-Objective Optimization of the Energy System in an Iron and Steel Plant Considering the Economic Cost and Life Cycle Environmental Impact** ..... 490
*Yujiao Zeng, Jie Li, Xin Xiao, Fei Song, Yaling Nie, Min Zhu*

**(681g) Model Predictive Control with Active Learning Under Model Uncertainty** ..... 491
*Tor Aksel N. Heirung, Ali Mesbah*

**(681h) A Modified SQP Method for MPC of a Supercritical Pulverized Coal-Fired Power Plant during Cycling** ..... 492
*Xin He, Fernando V. Lima*

**(696a) A Model-Based Algorithm for Subtyping Patients with Clotting Abnormalities Using Thromboelastogram Response** ..... 493
*Michelle Pressly, Matthew Neal, Gilles Clermont, Robert S. Parker*

**(696b) Hemolysis Prediction from CFD Simulations of Turbulent Blood Flow in a Functioning and Malfunctioning Bi-Leaflet Artificial Heart Valve** ..... 494
*Madison James, Edgar A. O'Rear, Dimitrios V. Papavassiliou*

**(696c) Dynamic Modeling of Cardiovascular System for Optimal Control of Ventricular Assist Devices** ..... 495
*Jeongeun Son, Yuncheng Du*

**(696d) First Passage of Molecular Motors on Networks of Cytoskeletal Filaments** ..... 496
*Paul J. Mlynarczyk, Steven M. Abel*

**(696f) Numerical Accuracy Comparison of Boundary Conditions Commonly Used for Approximating Shear Stress Distributions in Tissue Engineering Scaffolds Cultured Under Perfusion** ..... 497
*Olufemi Kadri, Cortes Williams III, Vassilios I. Sikavitsas, Roman Voronov*

**(696g) An in-Silico study of Feedforward Predictive Control in Blood Glucose Concentration for People with Type 1 Diabetes** ..... 512
*Yong Mei, Derrick Rollins*

**(696h) A Model-Based Investigation of Cytokine Storm for T-Cell Therapy** ..... 513
*Boorks Hopkins, Matthew Tucker, Yiming Pan, Zuyi (Jacky) Huang*

**(696e) Data-Driven Discovery of Novel Therapeutic Targets through Metabolic Modeling of Staphylococcus Aureus** ..... 514
*Mohammad Mazharul Islam, Vinai Chittezham Thomas, Rajib Saha*

**(700a) A Process Resilience Analysis Framework (PRAF) Application for Recoverability Assessment Model of Offshore Oil and Gas Platforms** ..... 515
*Prerna Jain, Efstratios N. Pistikopoulos, M. Sam Mannan*

**(700b) A Mixed-Integer Programming Framework for Combined Placement of Fire and Gas Detectors in Chemical Processing Facilities** ..... 516
*Todd Zhen, Katherine A. Klise, Bethany Nicholson, Carl D. Laird*

**(700c) Optimal Design, Control and Scheduling of Multi-Product Systems Under Uncertainty: A Stochastic Back-Off Approach** ..... 517
*Robert Koller, Luis A. Ricardez-Sandoval, Lorenz T. Biegler*

**(700d) Risk-Averse Health-Aware Control of Subsea Plants** ..... 518
*Adriaen Verheyleweghen, Johannes Jaschke*

**(700e) Analytical and Triangular Representation of Flexibility Space** ..... 519
*Fei Zhao, Xi Chen*

**(700f) Design of Flare Systems Under Uncertainty: A Chance-Constrained Nonlinear Programming Approach** ..... 520
*Javier Tovar-Facio, J. M. Ponce, Yankai Cao, Victor M. Zavala*

**(700g) Multistage Stochastic Programming Using Hybrid Scenario and Decision Rule Formulation** ..... 521
*Farough Motamed Nasab, Zukui Li*

**(700h) Optimization of Wastewater Treatment Plant Design Using an Early-Stage Techno-Economic Analysis Under Uncertainty** ..... 522
*Resul Al, Chitta Ranjan Behera, Alexandr Zubov, Krist V. Gernaey, G. Sin*

**(715a) Adaptive Scheduling of Steelmaking and Continuous Cast Process Under Uncertainty** ..... 523
*Sanjula Kammammettu, Zukui Li*

**(715b) A Rolling Horizon Scheduling Algorithm Considering Electricity Load Tracking and Future Load Preduction** ..... 524
*Giancarlo Dalle Ave, IIro Harjunkoski, Sebastian Engell*

**(715c) Comparison of Risk-Averse Stochastic Programming and Adaptive Robust Optimization: A Virtual Power Plant Scheduling Application** ..... 525
*Ricardo M. Lima, Antonio Conejo, L. Giraldi, Olivier Le Maitre, Ibrahim Hoteit, Omar Knio*

**(715d) Novel Formulation for Optimal Schedule with Demand Side Management in Multi-Product Air Separation Processes** ..... 526
*Shengnan Zhao, M. Paz Ochoa, Ignacio E. Grossmann, Lixin Tang, Irene Lotero, Ajit Gopalakrishnan*

**(715e) Multi-Operational Development Planning for Multi-System Shale Gas Production** ..... 527
*Abigail Ondeck, Markus G. Drouven, Nathan Blandino, Ignacio E. Grossmann*

**(715f) Continuous-Time Scheduling Formulation for Pipeline Systems with Branches** ..... 528
*Pedro M. Castro, Hossein Mostafaei*

**(715g) Preprocessing Algorithms and Tightening Constraints for Blend Scheduling Models** ..... 529
*Yifu Chen, Christos T. Maravelias*

**(715h) Long-Term Maintenance and Production Planning for the Integrated Chemical Enterprise** ..... 530
*Satyajith Amaran, Sreekanth Rajagopalan, Mark Joswiak, Scott J. Bury*

**(728a) Ensemble Models for Univariate Time Series Forecasting** ..... 531
*Brad Johnson, Nick Sahinidis*

**(728b) Ontology Engineering Approach to Support Process of Model and Data Integration** ..... 532
*Linsey Koo, Edlira Kalemi, Franjo Cecelja*

**(728e) Comparison of Surrogate Modeling Techniques for Surrogate-Based Optimization** ..... 533
*Bianca Williams, Selen Cremaschi*

**(728f) Semantic Networking Facility for the Biorefining Community** ..... 534
*Edlira Kalemi, Linsey Koo, Franjo Cecelja*

**(728g) The Use of Asset-Oriented Data Models for Data Integration Enables Advanced Analytics in the Process Industry** ..... 535
*Mark C. Molaro*

**(728h) Parameter Prediction for Stochastic Job Shop Scheduling Using Probabilistic Machine Learning** ..... 536
*Teemu Ikonen, IIro Harjunkoski*

**(182c) Two Stage Stochastic Programming Modeling Approach for Energy Storage System Operation Under Uncertainty** ..... 537
*Jiah Yu, Jun-Hyung Ryu, In-Beum Lee*

**(733b) Theoretical and Experimental Investigation of the Microbial Degradation of Solitary Oil Microdroplets** ..... 538
*George E. Kapellos, Nicolas Kalogerakis, Patrick S. Doyle*

**(733c) Modeling Faradaic Capacitive Deionization with Redox Active Porous Electrodes** ..... 539
*Fan He, P. M. Biesheuvel, Martin Z. Bazant, T. Alan Hatton*

**(733e) Finding the Ideal Feedstock for Biodiesel Production Via Generalized Kinetic Model for Transesterification and Saponification** ..... 540
*Pulkit Chhabra, Markus Kraft, Iftekhar A. Karimi, Anikesh Kumar*

**(733f) Accelerating the Generation of Coal Power Plant Property Models** ..... 541
*Benjamin Sauk, Nick Sahinidis*

**(733g) Dynamic Optimisation of Water-Injection Wells Operation for Enhanced Oil Production from a Mature Oil and Gas Field** ..... 542
*Emmanuel Epelle, Dimitrios I. Gerogiorgis*

**(733h) Voluntary Oil Well Ignition As a Blowout Response: Analysis of Factors Influencing Viability** ..... 543
*A. Rashid Hasan, Joseph Sangil Kwon, Prashanth Siddhamshetty, M. Sam Mannan, Boyue Xu, Monir Ahammad*

**(734a) Multi-Objective and Dynamic Real-Time Optimization of Postcombustion Carbon Capture Processes for Cycling Applications** ..... 544
*Rebecca Kim, Fernando V. Lima*

**(734b) Dynamic Modeling and Control of a Post-Combustion Solid-Sorbent Capture System with the Ccsi Models and Tools** ..... 545
*Benjamin P. Omell, Priyadarshi Mahapatra, Debangsu Bhattacharyya, David C. Miller*

**(734c) Application of a Data-Driven Modeling Approach to a Large-Scale Power Plant** ..... 546
*Seyed Mostafa Safdarnejad, Jacob F. Tuttle, Kody Powell*

**(734d) Model-Based Analysis of a Thermofluidic Engine for Low-Grade Heat Recovery: Accounting for Irreversible Thermal Losses** ..... 547
*Yukun Wang, Christos N. Markides, Benoit Chachuat*

**(734e) Model Predictive Control Designs to Achieve Uniform Growth of Simultaneously Propagating Multiple Fractures in Hydraulic Fracturing** ..... 548
*Prashanth Siddhamshetty, Kan Wu, Joseph Sangil Kwon*

**(734f) Real-Time Control and Balancing of a Reformer Furnace** ..... 549
*Anh Tran, Marquis Crose, Madeleine Pont, Panagiotis D. Christofides*

**(734g) Finite Element Modeling and Optimization of Heat Exchangers** ..... 550
*Saif R. Kazi, Lorenz T. Biegler*
**(734h) Application of Paroc in the Optimization and Control of PEM Water Electrolysis Process** ..... 551
*Stratos Pistikopoulos, Gerald S. Ogumerem*
**(734i) Predictive Control of Solar Collector Energy System with Gaussian Process Priors of Uncertain Solar Irradiance** ..... 552
*Xiaodong Xu, Yuan Yuan, Stevan Dubljevic*
**(747a) Fragrance Product Design/Screening Methods Using an Integrated Machine Learning and Camd Model** ..... 553
*Lei Zhang, Haitao Mao, Linlin Liu, Jian Du, Rafiqul Gani*
**(747b) Optimal Production of Power from Mid-Temperature Geothermal Sources: Scale and Safety Issues** ..... 554
*Javier Pena-Lamas, Juan Martinez-Gomez, Mariano Martin, J. M. Ponce-Ortega*
**(747c) Computer-Aided Reaction Solvent Design Integrated with New Reaction Mechanism Model** ..... 555
*Qilei Liu, Lei Zhang, Linlin Liu, Jian Du, Qingwei Meng*
**(747d) Reactor Network Development for Rigid Polyols Production** ..... 556
*Yunhan Wen, Lorenz T. Biegler, Jeff Ferrio*
**(747e) Mixed Integer Linear Programming Optimization Framework Applied to a Platinum Group Metals Flotation Circuit** ..... 557
*Eric Tswaledi Mabotha, Cornelius Mduduzi Masuku*
**(747f) Simultaneous Working Medium Selection, Process and Control System Design for Organic Rankine Cycles** ..... 558
*Theodoros Zarogiannis, Alexios S. Kyriakides, Athanasios I. Papadopoulos, Panos Seferlis*
**(747g) Process Optimization-Centric Design and Screening of Nanoporous Adsorbents for Gas Separations** ..... 559
*Shachit S. Iyer, Ishan Bajaj, M. M. Faruque Hasan*
**(747h) Universal Graph Structures for Property Estimation** ..... 560
*Charles C. Solvason, Russell Burnett*
**(748a) Estimating Parameters and Model Uncertainty in Fundamental Dynamic Models Using Historical Data** ..... 561
*Kimberley B. McAuley, Hadiseh Karimi*
**(748b) Accommodating Missing, Non-Uniformly Sampled and Delayed Measurements for Modeling and Control of Variable Duration Batch Processes in a Subspace Identification Framework** ..... 562
*Abhinav Garg, Prashant Mhaskar*
**(748c) Investigation of $CO_2$ Sorption Mechanisms in Isothermal Columns Via Transient Material and Energy Flow PDE Models** ..... 563
*Manda Yang, Linxi Wang, Seyed Mehdi Kamali Shahri, Robert M. Rioux, Antonios Armaou*
**(748d) Output Feedback Regulation Via Carleman Based Receding Horizon Estimation and Control** ..... 564
*Yizhou Fang, Antonios Armaou*
**(748e) Adaptive Control of System with Unknown Inputs with Application to Chemical Reaction Control** ..... 565
*B. Erik Ydstie, Zixi Zhao*
**(748f) Optimization of Heterogeneous Batch Reactor Under Parameter Uncertainty** ..... 566
*Yajun Wang, Mukund Patel, John M. Wassick, Lorenz T. Biegler*
**(748g) Estimating the Drainage Area of "Frac-HIT" or Refractured Horizontal Well** ..... 567
*Nitish Goyal, Matteo Marongiu-Porcu, Michael Nikolaou*
**(748h) Thin Falling Film Layer Monitoring and State Estimation Via Discrete Kuramoto-Sivashinsky Observer and Kalman Filter** ..... 568
*Junyao Xie, Stevan Dubljevic*
**(749a) A Generalized State-Space Model for Online Scheduling** ..... 569
*Dhruv Gupta, Christos T. Maravelias*
**(749b) Integration of Automation Logic and Scheduling for Real-Time Batch Chemical Plant Optimization** ..... 570
*Venkatachalam Avadiappan, Blake C. Rawlings, Christos T. Maravelias, Stephane Lafortune, John M. Wassick, William Edsall, Adam Kelloway, Bao Lin, Naresh N. Nandola, Mathias Hakenberg*
**(749c) Dynamic Real-Time Optimization of a Coal-Fired Power Plant Using an Artificial Neural Network Model** ..... 571
*Jacob F. Tuttle, Mostafa Safdarnejad, Kody Powell*
**(749d) Efficient Real Time Optimization Using Approximate Dynamic Programming** ..... 572
*Jasper Kelly, Isaac Oboka, Yu Yang*
**(749e) An Overview and Evaluation of Approaches for Online Process Optimization** ..... 573
*Dinesh Krishnamoorthy, Bjarne Foss, Sigurd Skogestad*
**(749g) Accelerated Parallel Alternating Method of Multipliers (ADMM) for Distributed Optimization** ..... 574
*Wentao Tang, Prodromos Daoutidis*
**(749h) Dynamic Modeling for Improved Operation and Control of a Supercritical $CO_2$ Brayton Power Cycle** ..... 575
*Stephen E. Zitney, Eric A. Liese, Priyadarshi Mahapatra, Jacob Albright*
**Author Index**