

DAVOOD BABAIE POURKARGAR

Assistant Professor, Tim Taylor Department of Chemical Engineering

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EMPLOYMENT

- Assistant Professor** 2020 – Present
Tim Taylor Department of Chemical Engineering, Kansas State University, Manhattan, KS
- Senior Engineer** 2019 – 2020
ExxonMobil Research and Engineering, Houston, TX
- Postdoctoral Associate** 2016 – 2019
Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN
Advisor: Prodromos Daoutidis
- Postdoctoral Researcher** 2015 – 2016
Catalysis Center for Energy Innovation (CCEI), Department of Chemical and Biomolecular Engineering, University of Delaware, Newark, DE
Advisor: Dionisios Vlachos

EDUCATION

- Ph.D. in Chemical Engineering** 2011 – 2015
Department of Chemical Engineering, The Pennsylvania State University, University Park, PA, USA
Advisor: Antonios Armaou
- M.S. in Process Simulation and Control** 2008 – 2010
Chemical and Petroleum Engineering Department, Sharif University of Technology, Tehran, Iran
Advisor: Mohammad Shahrokhi
- B.S. in Chemical Engineering** 2004 – 2008
Chemical and Petroleum Engineering Department, Sharif University of Technology, Tehran, Iran
Advisor: Ramin Bozorgmehry Boozarjomehry

SELECTED ACHIEVEMENTS AND AWARDS

- Best Presentation in the Session Award, AIChE Annual Meeting, 2017 (Session 170: Process Control Applications)
- Robert F. Smith School Distinguished Junior Researcher Seminar Program Award, Cornell University, 2017
- Finalist for the AIChE Computing and Systems Technology (CAST) Director's Student Presentation Award, 2015
- O. Hugo Schuck Best Paper Award (Application Category), American Automatic Control Council (AACC), 2014
- Best Session Presentation Awards in American Control Conferences, 2013 (Session MoA14) & 2015 (Session ThA16)
- Finalist for the Alumni Association Dissertation Award, The Pennsylvania State University, 2014-15
- Finalist for the Best Paper Award, Department of Chemical Engineering, The Pennsylvania State University, 2014
- Walter R. and Aura Lee Supina Graduate Fellowship in Chemical Engineering, Pennsylvania State University, 2011
- Premier Award for 2nd place in Graduate program at Chemical and Petroleum Engineering Department amongst 124 Graduate Students, Sharif University of Technology, 2010
- Sharif University of Technology Dean Award (Sharif Stars), 2009
- Iran Presidential Award, 2009
- Silver Medal in Iranian National Chemical Engineering Olympiad, 2008
- Iranian Association of Chemical Engineers (IACHE) Best Undergraduate Student Award, 2008
- Sharif University of Technology Exceptional Talents Fellowship, 2008-2010
- Iranian National Foundation of Elites Fellowship, 2008-2010

- Premier Award for 3rd place in Undergraduate program at Chemical and Petroleum Engineering Department amongst 157 Undergraduate Students, Sharif University of Technology, 2008

SELECTED TRAVEL GRANTS/AWARDS

- National Science Foundation Travel Award, First American Model Predictive Control Summer School, University of Wisconsin-Madison, 2017 (**Amount: \$500**)
- Institute for Mathematics and its Application (IMA) Visiting Travel Award, University of Minnesota, 2016 (**Amount: \$1500**)
- AIChE Computing and Systems Technology (CAST) Division Travel Grant, 2015 (**Amount: \$500**)
- Society of Industrial and Applied Mathematics (SIAM) Graduate Student Travel Grant, 2014 (**Amount: \$650 + Stipend Registration**)
- College of Engineering Student Travel Awards, The Pennsylvania State University, 2013 & 2014 & 2015 (**Total Amount: \$2000**)
- American Automatic Control Council (AACC) Student Travel awards, 2013 & 2014 & 2015 (**Total Amount: \$900 + Stipend Registrations**)

JOURNAL PUBLICATIONS

- [1] **Pourkargar D.B.**, Armaou A., Lyapunov-based on-line model reduction and control of semilinear dissipative distributed parameter systems with minimum feedback information, *Journal of Process Control*, 2020; under preparation
- [2] **Pourkargar D.B.**, Moharir, M., Almansoori A., Daoutidis P., Distributed estimation and nonlinear model predictive control using community detection, *Industrial and Engineering Chemistry Research*, 2019; 58(30): 13495-13507
- [3] Daoutidis P., Allman A., Khatib S., Moharir, M., Palys M.J., **Pourkargar D.B.**, Tang W., Distributed decision making for intensified process systems, *Current Opinion in Chemical Engineering*, 2019; 25: 75-81
- [4] Moharir, M., **Pourkargar D.B.**, Almansoori A., Daoutidis P., Graph representation for distributed control of diffusion-convection-reaction system networks, *Chemical Engineering Science*, 2019; 204: 128-139
- [5] **Pourkargar D.B.**, Almansoori A., Daoutidis P., Comprehensive study of decomposition effects on output tracking of an integrated process over a wide operating range, *Chemical Engineering Research and Design*, Special Issue on Dynamics and Control, 2018; 134:553-563 (**Invited Paper**)
- [6] Moharir, M., **Pourkargar D.B.**, Almansoori A., Daoutidis P., Distributed model predictive control of an amine gas sweetening plant, *Industrial and Engineering Chemistry Research*, 2018; 57:13103-13115
- [7] Tang W., **Pourkargar D.B.**, Daoutidis P., Relative time-averaged gain array (RTAGA) for distributed control-oriented network decomposition, *AIChE Journal*, 2018; 64(5):1682-1690
- [8] Feng J., Lansford J., Mironenko A., **Pourkargar D.B.**, Vlachos D.G., Katsoulakis M.A., Non-parametric correlative uncertainty quantification and sensitivity analysis: Application to a Langmuir biomolecular adsorption model, *AIP Advances*, 2018; 8:035021
- [9] Tang W., Allman A., **Pourkargar D.B.**, Daoutidis P., Optimal decomposition for distributed optimization in nonlinear model predictive control through community detection, *Computers and Chemical Engineering*, 2018; 111:43-54
- [10] **Pourkargar D.B.**, Almansoori A., Daoutidis P., The impact of decomposition on distributed model predictive control: A process network case study, *Industrial and Engineering Chemistry Research*, 2017; 56(34):9606-9616
- [11] **Pourkargar D.B.**, Shahri S.M.K., Rioux R.M., Armaou A., Spatiotemporal modeling and parametric estimation of isothermal CO₂ adsorption columns, *Industrial and Engineering Chemistry Research*, 2016; 55(22):6443-6453
- [12] **Pourkargar D.B.**, Armaou A., Dynamic shaping of transport-reaction processes with a combined sliding mode controller and Luenberger-type dynamic observer design, *Chemical Engineering Science*, 2015; 138:673-684
- [13] **Pourkargar D.B.**, Armaou A., Design of APOD-based switching dynamic observers and output feedback control for a class of nonlinear distributed parameter systems, *Chemical Engineering Science*, Special Issue on Control and Optimization of Smart Plant Operations, 2015; 136:62-75 (**Invited Paper**)
- [14] **Pourkargar D.B.**, Armaou A., Control of spatially distributed processes with unknown transport-reaction parameters via two-layer system adaptations, *AIChE Journal*, 2015; 61(8):2497-2507
- [15] **Pourkargar D.B.**, Armaou A., APOD-based control of general linear distributed parameter systems in the presence of network communication constraints, *AIChE Journal*, 2015; 61(2):434-447

- [16] **Pourkargar D.B.**, Armaou A., Geometric output tracking of nonlinear distributed parameter systems via adaptive model reduction, *Chemical Engineering Science*, 2014; 116:418-427
- [17] **Pourkargar D.B.**, Armaou A., Modification to adaptive model reduction for regulation of distributed parameter systems with fast transients, *AIChE Journal*, 2013; 59(12):4595-4611 (**Finalist for the Best Paper Award, Department of Chemical Engineering, The Pennsylvania State University, 2014**)
- [18] **Pourkargar D.B.**, Shahrokhi M., Optimal fuzzy synchronization of generalized Lorenz chaotic systems, *The Journal of Mathematics and Computer Science*, 2011; 2(1):27-36 (**Invited Paper**)

PEER-REVIEWED PROCEEDINGS PUBLICATIONS

- [1] **Pourkargar D.B.**, Armaou A., Control of dissipative distributed parameter systems via on-demand model order reduction, In Proceedings of the 21st World Congress of the International Federation of Automatic Control (IFAC), Berlin, Germany, 2020, Accepted (**Invited Paper**)
- [2] **Pourkargar D.B.**, Armaou A., Control of semilinear dissipative distributed parameter systems with minimum feedback information, In Proceedings of the American Control Conference (ACC), Denver, CO, 2020, Accepted
- [3] Moharir M., **Pourkargar D.B.**, Almansoori A., Daoutidis P., Decomposition and distributed control of integrated lumped and distributed parameter process networks, In *Proceedings of the IEEE Conference on Decision and Control (CDC)*, 2908-2913, Miami Beach, FL, 2018 (**Invited Paper**)
- [4] **Pourkargar D.B.**, Almansoori A., Daoutidis, P., Distributed model predictive control of process networks: Impact of control architecture, In *Proceedings of the 20th World Congress of the International Federation of Automatic Control (IFAC)*, 12452-12457, Toulouse, France, 2017
- [5] **Pourkargar D.B.**, Armaou A., Spatiotemporal response shaping of transport-reaction processes via adaptive reduced order models, In *Proceedings of the American Control Conference (ACC)*, 4157-4162, Boston, MA, 2016
- [6] **Pourkargar D.B.**, Armaou A., Adaptive control of chemical distributed parameter systems, In *Proceedings of the IFAC International Symposium on Advanced Control of Chemical Processes (ADCHEM)*, 682-687, Whistler, Canada, 2015
- [7] **Pourkargar D.B.**, Armaou A., Low-dimensional adaptive output feedback controller design for transport-reaction processes, In *Proceedings of the European Control Conference (ECC)*, 879-884, Linz, Austria, 2015
- [8] **Pourkargar D.B.**, Armaou A., Wave motion suppression in the presence of unknown parameters using recursively updated empirical basis functions, In *Proceedings of the American Control Conference (ACC)*, 2619-2624, Chicago, IL, 2015 (**Best Session Presentation Award in American Control Conference, 2015, Session ThA16**)
- [9] **Pourkargar D.B.**, Armaou A., Output tracking of spatiotemporal thermal dynamics in transport-reaction processes via adaptive model reduction, In *Proceedings of the American Control Conference (ACC)*, 3364-3370, Portland, OR, 2014
- [10] **Pourkargar D.B.**, Armaou A., Feedback control of linear distributed parameter systems via adaptive model reduction in the presence of device network communication constraints, In *Proceedings of the American Control Conference (ACC)*, 1667-1673, Portland, OR, 2014 (**Invited Paper**)
- [11] **Pourkargar D.B.**, Armaou A., A refined adaptive model reduction approach for control of fast evolving distributed parameter systems, In *Proceedings of the 21st International Symposium on Mathematical Theory of Networks and Systems (MTNS)*, 140-147, Groningen, Netherlands, 2014 (**Invited Paper**)
- [12] **Pourkargar D.B.**, Armaou A., Control of dissipative partial differential equation systems using APOD based dynamic observer designs, In *Proceedings of the American Control Conference (ACC)*, 502-508, Washington DC, 2013 (**invited paper, O. Hugo Schuck Best Paper Award in the Application Category, American Automatic Control Council (AACC), 2014, Best Session Presentation Award in American Control Conference, 2013, Session MoA14**)

CONFERENCE PRESENTATIONS

- [1] **Pourkargar D.B.**, Moharir M., Almansoori A., Daoutidis P., Distributed estimation and nonlinear control of a benzene chlorination process, Paper 40h, AIChE Annual Meeting, Pittsburgh, PA, 2018
- [2] **Pourkargar D.B.**, Optimization-based control of complex process networks in smart manufacturing: The appearance of cyber-physical systems, cloud computing, and big data analytics, Poster 6id, AIChE Annual Meeting, Pittsburgh, PA, 2018
- [3] Moharir M., **Pourkargar D.B.**, Almansoori A., Daoutidis P., Graph representation and decomposition of diffusion-convection-reaction processes for distributed control, Paper 560a, AIChE Annual Meeting, Pittsburgh, PA, 2018

- [4] Tang W., Allman A., **Pourkargar D.B.**, Daoutidis P., Decomposition of optimization problems using community detection and its application in nonlinear model predictive control, Paper 359f, AIChE Annual Meeting, Pittsburgh, PA, 2018
- [5] **Pourkargar D.B.**, Almansoori A., Daoutidis P., Distributed model predictive control of complex plants: A systematic study of decomposition effects, Paper 497a, AIChE Annual Meeting, Minneapolis, MN, 2017
- [6] **Pourkargar D.B.**, Moharir M., Tang W., Almansoori A., Daoutidis P., Nonlinear distributed model predictive control of gas sweetening processes, Paper 170a, AIChE Annual Meeting, Minneapolis, MN, 2017 (**Best Paper in the Session Award, Session 170: Process Control Applications**)
- [7] Tang W., **Pourkargar D.B.**, Daoutidis P., Relative time averaged gain array for distributed architecture design, Paper 497g AIChE Annual Meeting, Minneapolis, MN, 2017
- [8] **Pourkargar D.B.**, Optimization-based control of complex process networks: Application to medicine and energy systems, Poster 7iq, AIChE Annual Meeting, Minneapolis, MN, 2017
- [9] **Pourkargar D.B.**, Armaou A., Output Feedback Control of Transport-Reaction Processes with Unknown Parameters Using Adaptive Model Reduction with Minimum Feedback Information, Paper 582b, AIChE Annual Meeting, San Francisco, CA, 2016
- [10] **Pourkargar D.B.**, Armaou A., Adaptive output feedback control of transport-reaction processes via two layer system adaptations, Paper 569g, AIChE Annual Meeting, Salt Lake City, UT, 2015 (**Finalist for the AIChE Computing and Systems Technology (CAST) Director's Student Presentation Award**)
- [11] **Pourkargar D.B.**, Armaou A., Estimation of spatially distributed processes via adaptive model reduction using mobile sensors network, Paper 583a, AIChE Annual Meeting, Salt Lake City, UT, 2015
- [12] **Pourkargar D.B.**, Shahri S.M.K., Rioux, R.M., Armaou A., Spatiotemporal modeling and identification of CO₂ adsorption columns, Paper 662d, AIChE Annual Meeting, Salt Lake City, UT, 2015
- [13] **Pourkargar D.B.**, Robust adaptive model predictive control of chemical and biological systems, Poster 6it, AIChE Annual Meeting, Salt Lake City, UT, 2015
- [14] **Pourkargar D.B.**, Armaou A., Adaptive control of dissipative distributed parameter systems via recursively updated reduced order models, Paper 555f, AIChE Annual Meeting, Atlanta, GA, 2014
- [15] **Pourkargar D.B.**, Armaou A., Shaping the spatiotemporal dynamics of transport-reaction processes via adaptive proper orthogonal decomposition, Paper 610h, AIChE Annual Meeting, Atlanta, GA, 2014
- [16] **Pourkargar D.B.**, Armaou A., Estimation of distributed parameter systems using recursively updated empirical basis functions, Poster 568y, AIChE Annual Meeting, Atlanta, GA, 2014
- [17] **Pourkargar D.B.**, Armaou A., Robust dynamic shaping of distributed parameter systems via recursively updated empirical basis functions, Session CP7, SIAM Annual Meeting, Chicago, IL, 2014
- [18] **Pourkargar D.B.**, Armaou A., Output Feedback Control of Nonlinear Distributed Parameter Systems via Adaptive Model Order Reduction, Department of Chemical Engineering Research Symposium, The Pennsylvania State University, University Park, PA, 2014
- [19] **Pourkargar D.B.**, Armaou A., Control of fast evolving distributed parameter systems via information aware model reduction recursions, 11th Annual College of Engineering Research Symposium (CERS), The Pennsylvania State University, University Park, PA, 2014
- [20] **Pourkargar D.B.**, Armaou A., APOD-based control of spatially distributed processes with limited sensor/controller communication bandwidth, 11th Annual College of Engineering Research Symposium (CERS), The Pennsylvania State University, University Park, PA, 2014
- [21] **Pourkargar D.B.**, Armaou A., Output feedback control of transport-reaction processes based on adaptive model reduction in the presence of sensor communication constraints, Paper 613a, AIChE Annual Meeting, San Francisco, CA, 2013
- [22] **Pourkargar D.B.**, Armaou A., Improving model reduction approaches for output feedback control of fast evolving spatially distributed processes, Paper 589c, AIChE Annual Meeting, San Francisco, CA, 2013
- [23] **Pourkargar D.B.**, Armaou A., Design of recursively updated reduced order dynamic observers for distributed parameter systems, Session CP4, SIAM Conference on Control and its Application, San Diego, CA, 2013
- [24] **Pourkargar D.B.**, Armaou A., Output feedback control of distributed parameter systems based on adaptive model reduction, 10th Annual College of Engineering Research Symposium (CERS), University Park, PA, 2013
- [25] **Pourkargar D.B.**, Armaou A., Output feedback control of transport reaction processes using adaptive proper orthogonal decomposition, Paper 747d, AIChE Annual Meeting, Pittsburgh, PA, 2012
- [26] **Pourkargar D.B.**, Orkomi A.A., Boozarjomehry B.R., Thermodynamic and transport properties estimation of a complicated mixture of hydrocarbons by fuzzy clustering methods, 19th International Congress of Chemical and

Process Engineering (CHISA19) and the 7th European Congress of Chemical Engineering (ECCE-7), Prague, Czech Republic, 2010

- [27] Orkomi A.A., **Pourkargar D.B.**, Boozarjomehry R.B., Approximate fuzzy feedback linearization of amine gas sweetening plant via genetic algorithm, 19th International Congress of Chemical and Process Engineering (CHISA19) and the 7th European Congress of Chemical Engineering (ECCE-7), Prague, Czech Republic, 2010
- [28] **Pourkargar D.B.**, Orkomi A.A., Boozarjomehry R.B., Fuzzy clustering of complex hydrocarbon mixtures, 4st International Conference of Fuzzy Information & Engineering, Amol, 2010
- [29] **Pourkargar D.B.**, Shahrokhi M., Optimal fuzzy synchronization, 4st International Conference of Fuzzy Information & Engineering, Amol, 2010
- [30] Orkomi A.A., **Pourkargar D.B.**, Boozarjomehry R.B., Effects of transfer function selection on optimal approximate feedback linearization of CO₂ Absorption by amine solution, 1st International Regional Chemical & Petroleum Engineering Conference & 13th National Iranian Chemical Engineering Congress, Kermanshah, 2010
- [31] **Pourkargar D.B.**, Shahrokhi M., Synchronization of two chaotic chemical reactors, 1st International Regional Chemical & Petroleum Engineering Conference & 13th National Iranian Chemical Engineering Congress, Kermanshah, 2010
- [32] **Pourkargar D.B.**, Orkomi A.A., Boozarjomehry R.B., Fuzzy feedforward control of amine gas sweetening plant, International Conference of Control, Instrumentation and Automation (ICCIA), Tehran, 2010
- [33] **Pourkargar D.B.**, Orkomi A.A., Boozarjomehry R.B., Control of amine gas sweetening plant by approximate fuzzy feedback linearization via genetic algorithm, International Conference of Control, Instrumentation and Automation (ICCIA), Tehran, 2010
- [34] **Pourkargar D.B.**, Orkomi A.A., Comparison between PID and a novel model based controller in interactive chemical plants control, International Conference of Control, Instrumentation and Automation (ICCIA), Tehran, 2010

INVITED PRESENTATIONS

- [1] Optimization-based control of complex process networks, Department of Chemical Engineering, University of California, Davis, CA, 2019
- [2] Optimization-based control of complex process networks, ExxonMobil Research and Engineering, Spring, TX, 2018
- [3] Optimization-based control of complex process networks, Department of Chemical Engineering, Kansas State University, Manhattan, KS, 2018
- [4] Optimization-based control of complex process networks, Pfizer Global Research and Development, Groton, CT, 2018
- [5] Optimization-based control of complex process networks, Department of Biomedical and Chemical Engineering and Sciences, Florida Institute of Technology, Melbourne, FL, 2018
- [6] Optimization-based control of complex process networks, Department of Chemical and Environmental Engineering, University of Cincinnati, Cincinnati, OH, 2018
- [7] Optimization-based control of complex process networks, Department of Chemical, Biological and Bio Engineering, North Carolina A&T State University, Greensboro, NC, 2018
- [8] Optimization-based control of complex process networks: Handling complexity through model reduction and system decomposition, William G. Lowrie Department of Chemical and Biomolecular Engineering, The Ohio State University, Columbus, OH, 2018
- [9] Optimization-based control of complex process networks, Distinguished Junior Researcher Seminar, Robert Frederick Smith School of Chemical and Biomolecular Engineering, Cornell University, Ithaca, NY, 2017
- [10] Output feedback control of transport-reaction processes via two-layer system adaptations, Applied and Computational Mathematics Research Program (Ioannis Kevrekidis Research Group), Princeton University, Princeton, NJ, 2015

REVIEW EXPERIENCE

Journals: AIChE Journal, Industrial and Engineering Chemistry Research, Chemical Engineering Research and Design, Transactions of the Institute of Measurement and Control, IET Control Theory and Applications, Asian Journal of Control, Automatica, Journal of Process Control, IEEE Transaction on Automatic Control, IEEE Transaction on Control of Network Systems, IEEE Control Systems Letters

Conferences: American Control Conferences 2013 & 2015 & 2016 & 2017 & 2018 & 2019 & 2020, European Control Conference 2016, ASME Dynamic Systems and Control Conference 2014, IEEE Conference on Decision and Control 2017 & 2018 & 2019, IFAC World Congress 2017 & 2020, IFAC Symposium on Robust Control Design 2018, IFAC Workshop on Linear Parameter Varying Systems 2018

INDUSTRIAL EXPERIENCE

- Senior Engineer, Exxon Mobil Research and Engineering, Houston, TX (2019-2020)
- Senior Engineer in Automation and Control, High Tech Development Company, Tehran, Iran (2010-2011)
- Process Engineer & Programmer in Optimization of Gas Pipeline Networks, SEPDCO, Tehran, Iran (2008-2009)
- Engineering Intern in Computer Aided Process Design, Namvaran Engineering & Management Company, Tehran, Iran (2007-2008)

INDUSTRIAL CERTIFICATES

- Managing Corrosion in Oil & Gas Industry, TOTAL S.A. and TOTAL Professeurs Associes (TPA), 2010
- Reduction of CO₂ Emissions by Capture and Storage, TOTAL S.A. and TOTAL Professeurs Associes (TPA), 2010
- Drilling Engineering, TOTAL S.A. and TOTAL Professeurs Associes (TPA), 2009
- Exploration through Geophysical Data, TOTAL S.A. and TOTAL Professeurs Associes (TPA), 2009

PROFESSIONAL ACTIVITIES

- Session Chair, 12th Annual College of Engineering Research Symposium (CERS), The Pennsylvania State University, University Park, 2015
- Poster Session Judge, Graduate Exhibition, The Pennsylvania State University, University Park, 2015

PROFESSIONAL MEMBERSHIPS

- Senior Member of American Institute of Chemical Engineering (AIChE), 2013-Present
 - AIChE Computing and System Technology (CAST) Division, AIChE Catalysis and Reaction Engineering (CRE) Division, Institute for Sustainability, Process Development Division, Education Division
- Member of Institute of Electrical and Electronic Engineers (IEEE), 2012-Present
 - IEEE Control Systems Society (CSS), IEEE Young Professionals, IEEE Cloud Computing Community, IEEE Internet of Things Community, IEEE Smart Grid Community, IEEE Consultants Network, IEEE SIGHT, IEEE Sensors Council, IEEE Systems Council
- Member of Society for Industrial and Applied Mathematics (SIAM), 2012-Present
 - SIAM Activity Groups on Control and Systems Theory (SIAG/CST), Analysis of Partial Differential Equations (SIAG/APDE), Uncertainty Quantification (SIAG/UQ), Data Mining and Analytics (SIAG/DMA), Optimization