Professor and N.I.O.C. Endowed Fellow
USC Viterbi School of Engineering
925 Bloom Walk, Room HED 313
Los Angeles, CA 90402
(310) 738-0713
(213) 740-2228
jafarpou@usc.edu
sees.usc.edu

Behnam Jafarpour

Curriculum Vitae

RESEARCH INTERESTS:

My research is at the interface of systems science, data science, and computational geosciences, with an emphasis on improving the description, prediction, and control of subsurface flow and transport processes. My research lab at USC, *Subsurface Energy and Environmental Systems (SEES)*, focuses on integrating advanced system-theoretical principles with modeling and prediction of fluid flow and transport processes in geologic formations to develop scientifically rigorous and practical methods for effective characterization, forecasting, and management of subsurface energy and natural resources. The main research areas in my lab include *(i) Effective Representations of Complex High-Dimensional Geosystems; (ii) Inverse Modeling and Uncertainty Quantification for Subsurface Flow Systems; (iii) Optimization and Control for Subsurface Energy Recovery, and (iv) Data Science for Subsurface Flow Systems.* A current research focus in my lab is on combining state-of-the-art machine learning and predictive analytics techniques with physical insights about fluid flow and transport processes in geologic formations to develop efficient fit-for-purpose predictive tools for decision support in development and management of subsurface energy systems. The applications of interest include conventional and unconventional hydrocarbon reservoirs, groundwater aquifers, geothermal energy systems, and geologic CO_2 storage.

EDUCATION:

Ph.D., in Civil and Environmental Engineering, MIT, 09/2003-10/2007
Dissertation: Reservoir Characterization Using Ensemble Data Assimilation
Thesis Advisor: Prof. Dennis McLaughlin / *Academic Mentor*: Prof. Dara Entekhabi

S.M. in Electrical Engineering and Computer Science, MIT 09/2006-05/2008
Thesis: Estimating Channel Features in Geological Media Using Sparsity Constraints
Thesis Advisors: Prof. Vivek Goyal and Prof. William T. Freeman

M.Sc. in Civil and Environmental Engineering, University of Delaware 09/2011-05/2003
Thesis: Mathematical Modeling of 2-4-DNT Reduction with Pure and Cast Iron
Thesis Advisors: Prof. Paul Imhoff and Prof. Pei Chiu

B.Sc. in Civil Engineering, University of Tehran 09/1995-05/1999

PROFESSIONAL APPOINTMENTS:

N.I.O.C. Endowed Faculty Fellow, University of Southern California 07/2021-present
Viterbi School of Engineering

Professor, University of Southern California 05/2020-present
Mork Family Department of Chemical Engineering and Material Science
Ming Hsieh Department of Electrical Engineering-Systems
Sonny Astani Department of Civil and Environmental-Water and Environment

Co-Director, Center for Advanced Reservoir Characterization & Forecasting 05/2016-present
Sponsored by Energi Simulation (formerly known as Foundation CMG)

Associate Professor, University of Southern California 04/2014-05/2020
Mork Family Department of Chemical Engineering and Material Science
Ming Hsieh Department of Electrical Engineering-Systems
Sonny Astani Department of Civil and Environmental-Water and Environment (since 2018)

Assistant Professor, University of Southern California 09/2011-03/2014
Mork Family Department of Chemical Engineering and Material Science
Ming Hsieh Department of Electrical Engineering-Systems (Since 2012)

Adjunct Assistant Professor, Texas A&M University 08/2011-08/2013
Harold Vance Department of Petroleum Engineering

W.F. & Marilyn Albers Family Assistant Professor, Texas A&M University 10/2007-08/2011
Harold Vance Department of Petroleum Engineering

AWARDS AND HONORS:

- Reservoir Description and Dynamics Award, SPE Western North America Region 2021
- Formation Evaluation Award, SPE Western North America Region 2017
- Industrial Research Chair, Computer Modeling Group (CMG) Foundation 2016
- Management and Information Award, SPE Western North America Region 2015
- Outstanding Engineering Educator Award, Orange County Engineering Council 2015
- Best Reviewer Award, Mathematical Geosciences Journal 2014
- Distinguished Faculty Achievement Award, SPE Western North America Region 2013
- Junior Faculty Research Initiation Award, SPE 2012
- W.F. & Marilyn Albers Family Faculty Fellow, Texas A&M Univ. 2008
- Outstanding Environmental Engineering Graduate Student, Univ. of Delaware 2003
- George Laird Fellowship finalist, College of Engineering, Univ. of Delaware 2002
- Monbusho Japanese Government Fellowship 2001

ADVISING AND MENTORSHIP:

Current PhD Students and Postdocs:

- Mahammad Valiyev (PhD Student, USC, PTE) 2021-present
- Wei Ling (PhD Student, USC, CHE) 2019-present
- Yingxiang Liu (PhD Student, USC, ECE) 2019-present
- Ulugbek Djuraev (PhD Student, USC, PTE) 2019-present
- Jodel Cornelio (PhD Student, USC, PTE) 2019-present
- Zhen Qin (PhD Student, USC, CHE) 2019-present
- Fangning Zheng (PhD Student, USC, PTE, Co-Advised) 2018-present
- Junjie Yu (PhD Student, USC, CHE) 2018-present
- Syamil Mohd-Razak (PhD Student, USC, PTE) 2018-present
- Anyue Jiang (PhD Student, USC, CHE) 2017-present

Current MSc Students:

- Fatimah Alruwai (MSc Student, USC, PTE) 2020-present
- Musab Al Abdrabalameer (MSc Student, USC, PTE) 2020-present

Past Postdocs and Graduated PhDs:

- Atefeh Jahandideh (Postdoc) 2019-2021
- Entao Liu (Postdoc, joined Machine Learning Engineer at Texas Instruments) 2012-2013
- Lianlin Li (Postdoc, joined Peking University as Assistant Professor) 2009-2011
- Atefeh Jahandideh (PhD-USC) 2012-2018
  Second Place, 2018 SWP-WRM Student Paper Contest
- Siavash Hakim-Elahi (PhD-USC, now Data Scientist at CRC) 2012-2018
- Azarang Golmohammadi (PhD-USC, Data Scientist at Beyond Limits) 2012-2018
- Reza M. Khaninezhad (PhD-USC, now Senior Data Scientist at Apache) 2011-2018
- Wei Ma (PhD, USC) 2011-2018
  First Place, 2018 SWP-WRM Student Paper Contest
- Morteza Khodabakhshi (PhD, TAMU, now with Oxy in Houston) 2009-2014
- Mohammadali Tarrahi (PhD-TAMU, now Data Scientist at Marathon Oil) 2009-2014
- Eric Bhark (PhD, co-advised w/ A. Datta-Gupta, now with Chevron) 2007-2011
  Best PhD Thesis Award, Petroleum Engineering, Texas A&M University, 04/2012

MSc Students Supervised:

- Fatimah Alruwai (MSc Student, USC, PTE) 2020-present
- Musab Al Abdrabalameer (MSc Student, USC, PTE) 2020-present
- Yujie Dou (MSc Student, USC, PTE) 2019-2020
- Jungang Chen (MSc, USC, PTE) 2018-2019
- Fan Zou (MSc, USC, PTE) 2017-2019
- Fangning Zheng (MSc, USC, PTE) 2017-2018
- Zhishuai Zhang (MSc, continued to PhD at UC Berkeley) 2011-2012
- Thorn Lerlertpakdee (MSc, co-advised w/ Dr. E. Gildin) 2010-2012
- Reza M. Khaninezhad (MSc-TAMU, PhD-USC) 2009-2012
  SPE-STAR fellowship ($40,000 for four years), 04/2011
- Hossein Shamshiri (MSc-TAMU) 2008-2010

TEACHING:

Courses Developed:

- CHE/PTE599 Data Science for Engineering Systems (USC)
- PTE500 Computational Aspects of Reservoir Modeling (USC)
- PTE574 Optimization for Subsurface Energy Resources Development (USC)
- PTE573 Inverse Modeling for Dynamic Data Integration (USC)
- PTE572 Geostatistics , Completely Redesigned (USC)
- PETE689-01 Reservoir Characterization and Forecasting (TAMU)
- PETE689-03 CO_2 Capture and Uses (TAMU)

Courses Taught at USC:

- PTE574 Optimization for Subsurface Energy Resources Development (F15,F16,F17,F18)
- PTE500 Computational Aspects of Reservoir Modeling (F14)
- PTE572 Geostatistics (F12, S14,S15,S16,S17,S18, F19)
- PTE505 Inverse Modeling for Dynamic Data Integration (S12, S13, F19)
- PTE411/463 Introduction to Transport Processes in Porous Media (F12)
- PTE412/464 Petroleum Reservoir Engineering (S20)

Courses Taught at Texas A&M University:

- PETE689-01 Reservoir Characterization and Forecasting (F08,F09,F10)
- PETE689-03 CO_2 Capture and Uses (F08,F09, Co-taught)
- PETE322 Geostatistics (S08,S09,S10,S11)

Guest Lectures Taught at USC:

- PTE582 Groundwater Flow Lecture (F18)
- PTE586 Probability and Statistics Lecture (F16, F18)
- PTE587 Closed-Loop Control Lecture (F13, F15)

PROFESSIONAL SERVICE AND ACTIVITIES:

Professional Memberships:

- Society for Industrial and Applied Mathematics (SIAM)
- American Geophysical Union (AGU)
- Institute of Electrical and Electronics Engineers (IEEE)
- Society of Exploration Geophysics (SEG)
- Society of Petroleum Engineers (SPE)
- European Association of Geoscientists and Engineers (EAGE)
- International Association for Mathematical Geosciences (IAMG)

Journal Editor:

- Editorial Board, Mathematical Geosciences Journal (2019-present)
- Associate Editor, Computational Geosciences Journal (2018-present)
- Associate Editor, SPE Journal (2009-2014)

Journal Reviewer:

- Water Resources Research Journal
- Advances in Water Resources Journal
- Computational Geosciences Journal
- Mathematical Geosciences Journal
- Computers and Geosciences Journal
- Society of Petroleum Engineers (SPE) Journal
- Journal of Petroleum Science and Engineering
- Society of Petroleum Engineers Reservoir Evaluation and Engineering Journal
- IEEE Transactions on Geosciences and Remote Sensing Journal
- Geophysics Journal

Proposal Reviewer:

- U.S. Department of Energy, Technology Commercialization Fund (2019)
- U.S. Department of Energy, Energy Frontier Research Centers (2018)
- U.S. Department of Energy, Technology Commercialization Fund (2018)
- U.S. Department of Energy, Fossil Fuel Program, National Energy Technology Lab (2018)
- Society of Petroleum Engineers Junior Research Faculty Award Proposals (2016)
- American Chemical Society, Petroleum Research Fund, New Investigator Proposals (2016)
- U.S. Department of Energy, Basic Energy Science, Geoscience Program Proposals (2016)
- The Research Council of Norway, Applied Mathematics Proposal (2016)
- Society of Petroleum Engineers Junior Research Faculty Award Proposals (2015)

Conference Organization:

- Member, Scientific Committee of International Association for Mathematical Geosciences Annual Conference (2019)
- Panelist, Energi Simulation Summit Panel The Role of Artificial Intelligence and Machine Learning in the Energy Industry (2018)
- Member, Industrial Research Chair Evaluation Team, Computer Modeling Group Foundation, Calgary, Canada (2017)
- Co-Organizer, Symposium on Machine Learning Applications in Subsurface Reservoir Modeling, Society of Industrial and Applied Mathematics (SIAM) Conference on Mathematical and Computational Issues in the Geosciences (2017)
- Co-Organizer, Foundation CMG School on Optimization and Geomechanics, Banff, Canada (2017)
- Lecturer, Foundation CMG School on Optimization, Banff, Canada (2017)
- Lecturer, Workshop on Data Assimilation, Uncertainty Reduction, and Optimization for Subsurface Flow, UCLA, USA (2017)
- Lecturer, Workshop on PDE-constrained Optimization, University of Minnesota, USA (2016)
- Co-Organizer, Symposium on Uncertainty Quantification in Subsurface Reservoirs, Society of Industrial and Applied Mathematics (SIAM) Conference on Mathematical and Computational Issues in the Geosciences (2015)
- Member, Technical Committee of SPE Western North America and Rocky Mountain Meeting (2014)
- Member, Technical Committee for Reservoir Description and Dynamics, SPE Annual Technical Conference and Exhibition (2014)
- Organizer and Session Co-Chair, Innovative Methods in Hydrogeology, American Geophysical Union, Fall Meetings (2013)
- Lecturer, Summer School of Data Assimilation and Inverse Problems, Reading University, UK (2013)
- Member, Technical Committee for Reservoir Description and Dynamics, SPE Annual Technical Conference and Exhibition (2013)
- Organizer and Session Co-Chair, Novel Inverse Methods for High-Dimensional and Nonlinear Problems, American Geophysical Union, Fall Meetings (2012)
- Member, Technical Committee for Reservoir Description and Dynamics, SPE Annual Technical Conference and Exhibition (2012)
- Lecturer, Summer School of Data Assimilation, Sibiu, Romania (2012)

- Member, Technical Committee for Reservoir Description and Dynamics, SPE Annual Technical Conference and Exhibition (2011)
- Organizer and Session Co-Chair a, Computational Sciences and Water Applications in Hydrology and Groundwater Management, Fall Meetings (2011)
- Member, Technical Committee for Reservoir Description and Dynamics, SPE Annual Technical Conference and Exhibition (2011)
- Organizer and Session Co-Chair, Advanced Inverse Strategies for Improved Characterization and Assessment of Groundwater, Mineral, and Petroleum Resources, American Geophysical Union, Fall Meetings (2009)

University Service:

- Chair, MFD Committee for New Teaching Evaluation Implementation (2019-20)
- Member, MFD Committee for Evaluating PhD Students Progress (2018-present)
- Member, Viterbi Engineering Faculty Council (EFC) (2018-present)
- Chair, MFD Committee for Tenure Midterm Review (2019)
- Chair, MFD Committee for Developing a Unified PhD-Level Mathematics Course (2018)
- Member, MFD Committee for Tenure Midterm Review (2018)
- Member, MFD Committee for Re-evaluating Part-Time Lecturers Courses (2018)
- Member, MFD UCAR Review Committee (Petroleum Engineering) (2017)
- Member, MFD Petroleum Engineering Curriculum Committee (2017)
- Chair, MFD Full-Time Lecturers Annual Merit Review Committee (2016-present)
- Chair, MFD Part-Time Lecturers Annual Merit Review Committee (2016-present)
- Member, Viterbi Information Technology Advisory Council (2015-present)
- Member, MFD Faculty Search Committee, Tenure-Track Material Science Position (2015)
- Member, MFD Faculty Search Committee for Tenure-Track Position in PTE (2014)
- Member, MFD Faculty Search Committee for PTE Full-Time Lecturer in PTE (2014)
- Member, University Research Committee (2013-2014)
- Member, Committee for PhD Students Screening Exams in PTE (2012-present)
- Member, MFD Departmental Awards Committee (2012-2014)
- Chair, MFD Graduate Seminars Committee (2012-2015)
- Panelist, MFD Practical Graduate Seminars Seminar (2012-2013)
- Member, Faculty Search Committee, PETE (TAMU) (2009-2010)
- Member, Graduate Admission Committee, PETE (TAMU) (2009-2011)
- Member, Faculty Excellence Award Committee, PETE (TAMU) (2009-2011)

Other General University Services:

- Member, Thesis Committees in Petroleum and Chemical Engineering (USC)
- Member, Thesis Committees in Electrical Engineering (USC)
- Member, Thesis Committees in Civil and Environmental Engineering (USC)
- Member, Thesis Committees in Earth Sciences (USC)
- Presenter, OXY Summer Camp Events (USC)
- Participant, Explore USC Program for Undergraduate Scholarship Interview (USC)
- Participant, Departmental Events (Alumni Dinners, Retreats, Open Houses) (USC)
- Participant, University Hooding Ceremony and Commencement Marshal (USC)
- Member, Thesis Committees in Petroleum Engineering (TAMU)

INVITED TALKS:

IT55 "Latent Space Data Assimilation (LSDA): A deep learning-based assimilation of monitoring and production data into subsurface reservoir models", SEG High Performance Computing & Software for Exploration and Reservoir Development Workshop, Bahrain, October 3-4, 2021.

IT54 "Low-rank representations for subsurface flow inverse problems: from Fourier and Wavelets to Deep Learning ", GeoScience & GeoEnergy Webinar Series, September 17, 2020.

IT53 "Convolutional neural networks for dynamic data integration into subsurface flow systems", Machine Learning in Solid Earth Geoscience, Santa Fe, NM, March 16-20, 2020 (postponed).

IT52 "Deep convolutional neural networks for subsurface flow inverse modeling", Distinguished Speaker Series, Petroleum Engineering Graduate Webinar (Fall 2020), Texas A&M, College Station, TX, October 20, 2020.

IT51 "Subsurface flow inverse modeling with deep convolutional neural networks", Computational Methods in Water Resources (CMWR 2020), Plenary Talk, Stanford University, Stanford, CA, June 22-25, 2020.

IT50 "Machine learning proxy models for prediction and optimization of waterflood performance", SPE Workshop: Smart Integration in Production System Modeling, The Woodlands Resort The Woodlands, Texas, Feb 18-19, 2020.

IT49 "Pattern-based estimation of discrete parameters with complex spatial distributions from nonlinear data: application to calibration of geologic facies against flow data", SIAM Conference on Mathematical & Computational Issues in Geosciences, Houston, Texas, March 11-14, 2019.

IT48 "Strategies for ensemble-based conditioning of multiple-point statistical facies simulation on nonlinear subsurface flow data", SIAM Conference on Mathematical & Computational Issues in Geosciences, Houston, Texas, March 11-14, 2019.

IT47 "Stochastic oilfield optimization for hedging against uncertainty in future development plans", ExxonMobil Research and Engineering Company, Annandale, NJ, Jan 30, 2019.

IT46 "Workflows for geologic scenario identification from production data", ExxonMobil Research and Engineering Company, Annandale, NJ, Jan 30, 2019.

IT45 "Predictive analytics and machine learning in dynamic reservoir characterization and forecasting", Energi Simulation Panel on The Role of Artificial Intelligence and Machine Learning in the Energy Industry, Calgary , Canada, Oct 2-4, 2018.

IT44 "Calibration of reservoir models against production data under uncertain geologic scenarios", Energi Simulation Annual Summit, Calgary, Canada, Oct 2-4, 2018.

IT43 "Conditioning facies simulation from training-images on flow data ", 2018 William C. Gussow Geoscience Conference, Canadian Society of Petroleum Geologists, Lake Louise, Alberta, October 8-11, 2018.

IT42 "Learning complex geologic patterns for subsurface flow model calibration", Machine learning approaches for uncertainty quantification in porous media flow problems, 2018 SIAM Conference on Uncertainty Quantification, Orange County, California, April 16-19, 2018.

IT41 "Stochastic oilfield optimization under future development uncertainty", FCMG Annual Summit, Calgary, Canada, Oct 2-3, 2017.

IT40 "Dynamic characterization of reservoir facies models with complex geologic connectivity patterns", Universidade Federal de Pernambuco (UFPE), Recife, Brazil, August 28, 2017.

IT39 "Robust history matching with sparse geologic dictionaries", Petrobras, Rio De Janeiro, Brazil, August 25, 2017.

IT38 "Generalized oilfield development optimization", Universidade Estadual de Campinas (Unicamp), Campinas, Brazil, August 24, 2017.

IT37 "Pattern-based calibration of complex subsurface flow models ", Institute for Pure and Applied Mathematics (IPAM), Workshop on Data Assimilation, Uncertainty Reduction, and Optimization for Subsurface Flow, UCLA, Los Angeles, CA, May 25, 2017.

IT36 "Novel sparse inverse modeling formulations for dynamic reservoir characterization", ExxonMobil Research and Engineering Company, Annandale, NJ, August 02, 2016.

IT35 "Subsurface flow model calibration under uncertain geologic scenarios", SIAM Annual Meeting, Boston, MA, July 11-15, 2016.

IT34 "Conditioning discrete facies simulation to production data in complex geologic environments", FCMG Annual Summit, Calgary, Canada, Sep 14-16, 2016.

IT33 "Exploiting sparsity in solving PDE-constrained inverse problems: application in subsurface flow model calibration", Frontiers in PDE-constrained Optimization, University of Minnesota, Minneapolis, MN, June 6-10, 2016.

IT32 "Prior model identification during subsurface flow data integration with adaptive sparse representations", SIAM Conference on Imaging Science, Albuquerque, New Mexico, May 23-26, 2016.

IT31 "Dynamic characterization of reservoir connectivity in complex and uncertain geologic environments", European Association of Geoscientists and Engineers (EAGE), Annual Meeting, FCMG Presentation, Vienna, Austria, May 30 - June 02, 2016.

IT30 "A generalized formulation for oilfield development optimization", Trends in Reservoir Modeling, Control and Optimization, 2nd IFAC Workshop on Automatic Control in Offshore Oil and Gas Production, Florianapolis, Brazil, May 27- 29, 2015.

IT29 "Nonlinear flow data assimilation into training-image-based facies models", SIAM Conference on Mathematical and Computational Issues in the Goesciences, Stanford University, Palo Alto, CA, June 29 - July 2, 2015.

IT28 "Model calibration under uncertain geologic scenarios with sparse representation techniques", SIAM Conference on Mathematical and Computational Issues in the Goesciences, Stanford University, Palo Alto, CA, June 29 - July 2, 2015.

IT27 "Sparse solutions to large-scale nonlinear subsurface flow inverse problems", MS238 Session on Sparse and Compressible Representations: Theory, Algorithms and Applications - Part III of III, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 14-18, 2015.

IT26 "Model selection and calibration with sparse representations", American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19, 2014.

IT25 "Identification of reservoir connectivity from production data with robust sparse (low-rank) descriptions", SEG/SPE/AAPG/SPWLA/EAGE Summer Research Workshop, Multi-disciplinary Static and Dynamic Reservoir Modeling: Best Practices, Opportunities and Challenges, San Diego, CA, August 2014.

IT24 "Effective reservoir descriptions for dynamic model updating ", SPE San Joaquin Valley Section Subsurface Study Group, Bakersfield, CA, March 2014.

IT23 "Inverse modeling and uncertainty quantification for nonlinear subsurface flow problems under complex geologic connectivity models", mini-symposium on Uncertainty Quantification and Reduction in Environmental Fluids, 2014 SIAM Conference on Uncertainty Quantification, Savannah, GA, March 2014.

IT22 "Reservoir modeling inverse problem", Summer School and Creative Workshop in Data Assimilation & Inverse Problems: from Weather Forecasting to Neuroscience, Reading University, Reading, UK, July 2013.

IT21 "Sparse solution of nonlinear subsurface flow inverse problems ", 2013 SIAM Annual Meeting, Sparse and Low-rank Modeling in the Geophysical Sciences, San Diego-CA, July 2013.

IT20 "Estimation of discrete geologic facies distributions from production data using probability maps", 2013 SIAM Conference on the Mathematical and Computational Issues in the Geosciences, Data Assimilation and Large-scale Geological Structures, University of Padova, Italy.

IT19 "Sparse representations for reservoir description and history matching", Mewbourne School of Petroleum and Geological Engineering University of Oklahoma, Norman-OK, April 2013.

IT18 "Adaptive sparse reconstruction for prior selection and robust geophysical inversion", 2013 SIAM Conference on Computational Science and Engineering, Boston-MA, February 2013.

IT17 "Subsurface imaging for effective development of energy and environmental resources", Department of Civil and Environmental Engineering, Cornell University, Ithaca-NY, July 2012.

IT16 "Exploiting sparsity in solving subsurface characterization inverse problems", Energy Resources Engineering Department, Stanford University, Palo Alto-CA, May 2012.

IT15 "Sparse priors for regularization of ill-posed subsurface model calibration inverse problems", Interpore Conference , Purdue University, West Lafayette-IN, May 2012.

IT14 "Reservoir characterization and development under geologic uncertainty: an integrated systems approach", Society of Petroleum Engineers, Los Angles Basin Section, Long Beach-CA, May 2012.

IT13 "A geologically-guided systems approach for improved reservoir development", China University of Petroleum-Beijing , October 2011.

IT12 "Compressed representations for subsurface imaging", Communications, Networks and Systems [CommNetS] Seminar , Ming Hsieh Department of Electrical Engineering, University of Southern California, September 2011.

IT11 "Compressed history matching with geologic dictionaries: reconciling uncertainty, dimensionality, and geologic consistency", Chevron Energy Technology Company, Houston-Texas, April 2011.

IT10 "Feature-based reservoir descriptions for improved dynamic data integration", Mork Family Department of Chemical Engineering and Material Science, University of Southern California, April 2011.

IT9 "Model error identification using sparsity-based inversion techniques for subsurface characterization", IAMCS Workshop in Large-Scale Inverse Problems and Uncertainty Quantification, Texas A&M University, College Station, TX, February 2011.

IT8 "Exploiting sparsity in reservoir engineering optimization problems", J.L. Corky Frank Graduate Seminar, Texas A&M University, College Station, TX, October 2010.

IT7 "Ensemble-based model calibration under structural model uncertainty", American Geophysical Union, 2010 Western Pacific Geophysics Meeting, Session: H04. Uncertainty in Groundwater Model Calibration and Applications, Taipei, Taiwan, June 2010.

IT6 "Lecture 1: Data assimilation in reservoir engineering; Lecture 2: reservoir parameterization; Lecture 3: sparse reconstruction: towards feature estimation", Summer School on Data Assimilation, Sibiu, Romania, July 2009.

IT5 "History matching of oil reservoirs with the ensemble Kalman filter", Schlumberger Doll-Research Center, Cambridge, MA, February 2009.

IT4 "Towards a feature-based estimation approach in subsurface characterization", J.L. Corky Frank Graduate Seminar, Texas A&M University, College Station, TX, November 2008.

IT3 "Accounting for spatial structure in reservoir parameter estimation", SPE Closed-loop Reservoir Management, Bruges, Belgium, June 2008.

IT2 "Towards a feature-based approach to ensemble data assimilation", International EnKF Workshop for Updating of Reservoir Simulation Models, Voss, Norway, June 2008.

IT1 "Realistic ensemble generation and efficient multi-scale estimation for reservoir control problems", International EnKF Workshop for Updating of Reservoir Simulation Models, Bergen, Norway, 18-20 June 2007.

PUBLICATIONS:

Note: *Student/Advisee names are underlined*

Book Chapters:

2. Golmohammadi A., Mohammad-Khaninezhad M., **Jafarpour B.** (2016, invited chapter): "Exploiting sparsity in solving PDE-constrained inverse problems: application to subsurface flow model calibration", *The IMA Volumes in Mathematics and its Applications: PDE-Constrained Optimization*, Springer.
1. **Jafarpour B.** (2013, invited chapter): "Sparsity-promoting solution of subsurface flow model calibration inverse problems", *Advances in Hydrogeology*, Springer.

Journal Papers:

Papers published/in-press:

JP71 Cornelio J., Mohd Razak S., Cho Y., Vaidya R., Liu H.H., **Jafarpour B.** (2022): "Integrating deep learning and physics-based models for improved production prediction in unconventional reservoirs", *SPE Journal, in press.*

JP70 Jiang A., Qin Z., Fauler D., Cladouhos T.T. **Jafarpour B.** (2022): "Recurrent neural networks for short-term and long-term prediction of energy production from geothermal reservoirs", Geothermics, *accepted with minor revisions.*

JP69 Liu Y., Ling W., Young R., Zia J., Cladouhos T.T.,**Jafarpour B.** (2022): "Latent-space dynamics for prediction and fault detection in geothermal power plant operations", *Energies, 15, 2555, doi: https://doi.org/10.3390/en15072555.*

JP68 Yu J., Jahandideh A., **Jafarpour B.** (2022): "A neural network model with connectivity-based topology for production prediction in complex subsurface flow systems", *SPE Journal, in press.*

JP67 Mohd Razak S., Cornelio J., Cho Y., Vaidya R., Liu H.H., **Jafarpour B.** (2022): "Transfer learning with recurrent neural networks for long-term production forecasting in unconventional reservoirs", *SPE Journal, in press.*

JP66 Jiang, A., **Jafarpour B.** (2021): "Deep convolutional autoencoders for robust flow model calibration under uncertainty in geologic continuity", *Water Resources Research, in press.*

JP65 Yu J., Jahandideh A., **Jafarpour B.** (2021): "Efficient robust production optimization with reduced random sampling", *SPE Journal, in press.*

JP64 Razak S.M., Jahandideh A., Djuraev U.B., **Jafarpour B.** (2021): "Deep learning for latent space data assimilation (LSDA) in subsurface flow systems", *SPE Journal, in press.*

JP63 Mohd Razak, S., **Jafarpour B.** (2021): "Conditioning generative adversarial networks on nonlinear flow response labels for model calibration", *Computational Geosciences, in press.*

JP62 Yu J., Jahandideh A., **Jafarpour B.** (2021): "Active learning for well control optimization with surrogate models", *SPE Journal, in press.*

JP61 Mohd Razak, S., **Jafarpour B.** (2021): "Latent-space inversion (LSI): A deep learning framework for inverse mapping of subsurface flow data", *Computational Geosciences, in press.*

JP60 Zheng F., Jahandideh A., Jha B., **Jafarpour B.** (2021): "Geologic CO_2 storage optimization under geomechanical risk using coupled-physics models", *International Journal of Greenhouse Gas Control*, Volume 110, 103385, doi: https://doi.org/10.1016/j.ijggc.2021.103385.

JP59 Yu J., Jahandideh A., Hakim-Elahi S., **Jafarpour B.** (2021): "Sparse neural networks for inference of reservoir inter-well connectivity and production prediction", *SPE Journal*, doi: https://doi.org/10.2118/205498-PA.

JP58 Jiang, A., **Jafarpour B.** (2021): "Inverting subsurface flow data for geologic scenarios selection with convolutional neural networks", *Advances in Water Resources*, *Advances in Water Resources*, Volume 149, 103840, doi: https://doi.org/10.1016/j.advwatres.2020.103840.

JP57 Jahandideh A., Hakim-Elahi S., **Jafarpour B.** (2021) : "Inference of rock flow and mechanical properties from injection-induced microseismic events during geologic CO_2 storage", *International Journal of Greenhouse Gas Control*, Volume 105, 103206, doi: https://doi.org/10.1016/j.ijggc.2020.103206.

JP56 Mohd Razak, S., **Jafarpour B.** (2020): "Convolutional neural networks (CNN) for feature-based model calibration under uncertain geologic scenarios", *Computational Geosciences*, 24, 1625–1649 (2020), doi.org/10.1007/s10596-020-09971-4.

JP55 Golmohammadi, A., Mohammad-khaninezhad M.R.,**Jafarpour B.** (2020): "Reducing uncertainty in conceptual prior models of complex geologic systems via integration of flow response data", *Computational Geosciences*, doi:10.1007/s10596-019-09908-6.

JP54 Jahandideh, A., **Jafarpour B.** (2020): "Closed-loop stochastic oilfield optimization under uncertainty in geologic description and future development plans", *Computational Geosciences*, doi:10.1007/s10596-019-09902-y.

JP53 Jesmani M.,**Jafarpour B.**, Bellout M.C., Foss B. (2019): "A reduced random sampling strategy for fast robust well placement optimization", *Journal of Petroleum Science and Engineering*, Vol. 184 (106414)

JP52 Mohammad-khaninezhad M.R., Golmohammadi, A., **Jafarpour B.** (2019): "A pattern-matching method for flowmodel calibration under training image constraint", *Computational Geosciences*, 23, Pages 813–828.

JP51 Ma, W., **Jafarpour B.** (2019): "Assessing multiple-point statistical facies simulation behavior for effective conditioning on probabilistic data", *Mathematical Geosciences*, 51, Pages 975–998.

JP50 Ma W., **Jafarpour B.** (2019): "Integration of soft data intomultiple-point statistical simulation: re-assessing the probability conditioning method for facies model calibration", *Computational Geosciences*, 23, Pages 683–703.

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CP1 **Jafarpour B.**, McLaughlin D.B.: "Efficient permeability parameterization with the discrete cosine transform", Paper SPE-106453, Society of Petroleum Engineers Reservoir Simulation Symposium, Woodlands, TX, Feb 26-28, 2007.

Conference Abstracts and Presentations:

CA41 Mohd-Razak S., **Jafarpour B.**: "Latent-space inversion (LSI) for subsurface flow model calibration with physics-informed autoencoding ", American Geophysical Union Fall Meeting, Dec 1-17, 2020.

CA40 Jahandideh A., Mohd-Razak S., Djuraev U., **Jafarpour B.**: "Efficient data assimilation with latent-space representations for subsurface flow systems", American Geophysical Union Fall Meeting, Dec 1-17, 2020.

CA39 Liu Y., Ling W., Young R., Cladouhos T.T., Zia J., **Jafarpour B.**: "A dynamic deep learning model for performance prediction and fault detection in geothermal power plants", American Geophysical Union Fall Meeting, Dec 1-17, 2020.

CA38 Jiang A., Qin Z., Cladouhos T.T., Zia J., **Jafarpour B.**: "Recurrent neural networks for predicting the dynamic response of geothermal reservoirs from monitoring data ", American Geophysical Union Fall Meeting, Dec 1-17, 2020.

CA37 Yu J., Jahandideh A., Mohd-Razak S., **Jafarpour B.**: "Convolutional neural network for subsurface flow prediction", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9-13, 2019.

CA36 Mohd-Razak S., **Jafarpour B.**: "Generative adversarial networks for calibration and uncertainty quantification of complex subsurface flow models", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9-13, 2019.

CA35 Jiang A., **Jafarpour B.**: "Variational auto-encoders for low-rank parameterization and calibration of subsurface flow models", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9-13, 2019.

CA34 Golmohammadi A., Khaninezhad R., **Jafarpour B.**: "Pattern-based inverse modeling for characterization of subsurface flow models with complex geologic heterogeneity", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 11-15, 2017.

CA33 Ma W., **Jafarpour B.** (abstract): "Assimilating flow data into complex multiple-point statistical facies models using pilot points method", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 11-15, 2017.

CA32 Jahandideh A., **Jafarpour B.**: "Identification of plausible geologic scenarios from integration of dynamic production data", FCMG Annual Summit, Calgary, Canada, Oct 2-3, 2017.

CA31 Hakim-Elahi S., **Jafarpour B.**: "Dynamic characterization of hydraulic fracturing with ensemble Kalman filter", FCMG Annual Summit, Calgary, Canada, Sep 14-16, 2016.

CA30 Ma W., **Jafarpour B.**: "Discrete imaging for estimation of geologic facies from production data", FCMG Annual Summit, Calgary, Canada, Sep 14-16, 2016.

CA29 M. Khaninezhad M.R., **Jafarpour B.**: "Sparse geologic dictionaries for flexible and low-rank subsurface flow model calibration: field applications ", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19, 2014.

CA28 Golmohammadi A., **Jafarpour B.**: "Group sparsity regularization for calibration of subsurface flow models under geologic uncertainty", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19, 2014.

CA27 Hakim-Elahi S., **Jafarpour B.**: "Characterization of hydraulically induced fractures from monitoring and production data with the ensemble Kalman filter", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19, 2014.

CA26 Ma W., **Jafarpour B.**, Qin, J. (abstract): "Predicting CO_2 plume evolution during geologic storage with ensemble Kalman filter", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9-13, 2013.

CA25 M. Khaninezhad M.R., **Jafarpour B.** (abstract): "Sparse representations for robust subsurface flow model reduction and calibration ", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9-13, 2013.

CA24 M. Khaninezhad M.R., **Jafarpour B.** (abstract): "Subsurface flow model calibration under uncertain geologic scenarios with adaptive sparse reconstruction techniques ", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9-13, 2013.

CA23 Khodabakhshi M., **Jafarpour B.** (abstract): "Adaptive conditioning of multiple-point geostatistical facies simulation to flow data with facies probability maps", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 9-13, 2013.

CA22 Ma W., **Jafarpour B.**, Qin, J.: "Estimating aquifer heterogeneity from CO_2 sequestration monitoring measurements with the ensemble Kalman filter", American Geophysical Union Fall Meeting, San Francisco, CA, Sec 3-7, 2012.

CA21 M. Khaninezhad M.R., **Jafarpour B.**: "Sparse solution of high-dimensional model calibration inverse problems under uncertainty in prior structural connectivity ", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 3-7, 2012.

CA20 M. Khaninezhad M.R., **Jafarpour B.**: "Adaptive sparse recovery of aquifer heterogeneity under variogram uncertainty ", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 3-7, 2012.

CA19 Tarrahi M., **Jafarpour B.**: "Assimilation of discrete micro-seismic events into reservoir models with ensemble Kalman filter", 7th International EnKF Workshop, Bergen, Norway, Jun 18-20, 2012.

CA18 Khodabakhshi M., **Jafarpour B.**: "Conditional facies simulation from multiple training images with EnKF-Based mixture model probability conditioning method", 7th International EnKF Workshop, Bergen, Norway, Jun 18-20, 2012.

CA17 **Jafarpour B.**, Mohammad-khaninezhad M.R.: "Sparse geologic dictionaries for identification of subsurface heterogeneity: A new inverse modeling perspective", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 5-9, 2011.

CA16 Khodabakhshi M., **Jafarpour B.**, King M.: "Fast ensemble Kalman filter for model calibration with streamline-assisted pseudo forecasts", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 5-9, 2011.

CA15 Khodabakhshi M., **Jafarpour B.**: "Flow-data calibrated facies simulation from uncertain training images", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 5-9, 2011.

CA14 Tarrahi M., **Jafarpour B.**: "Inference of geothermal reservoir properties from micro-seismic events with ensemble Kalman filter", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 5-9, 2011.

CA13 Zhang Z., **Jafarpour B.**: "Joint inversion of flow and temperature observations for characterization of subsurface heterogeneity", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 5-9, 2011.

CA12 **Jafarpour B.**, Mohammad-khaninezhad M.R.: "Subsurface flow model identification under uncertain geologic continuity: A sparse model representation and detection approach", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 13-17, 2010.

CA11 **Jafarpour B.**: "Ensemble-based model calibration under structural model uncertainty", American Geophysical Union, 2010 Western Pacific Geophysics Meeting, Taipei, Taiwan, Jun 22-25, 2010.

CA10 **Jafarpour B.**, Khodabakhshi M., Tarrahi M.: "History matching with the ensemble Kalman filter: accounting for structural uncertainty and facies connectivity", 5th International Workshop on Ensemble Kalman Filter for Model Updating, Bergen, Norway, May 18-20, 2010.

CA9 **Jafarpour B.**, Khodabakhshi M.: "Integration of dynamic flow measurements into pattern-based facies simulation", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 14-18, 2009.

CA8 Falcone G., **Jafarpour B.**, Barrufet, M.: "An integrated IGCC-CSS design course for graduate students in petroleum engineering", Virtual Conference on Climate and CO_2 storage, doi: 10.1038/npre.2008.2627.1, December 2008.

CA7 **Jafarpour B.**: "Sparse reconstruction for subsurface characterization: feature estimation using l_1-norm regularization", American Geophysical Union Fall Meeting, San Francisco, CA, Dec 15-19, 2008.

CA6 **Jafarpour B.**, McLaughlin D.B.: "Efficient parameter and state estimation through an ensemble Kalman filter and discrete cosine parameterization with application in oil reservoir characterization", Fall Meeting of American Geophysical Union, San Francisco, CA, Dec 10-14, 2007.

CA5 **Jafarpour B.**, McLaughlin D.B.: "Assimilation of production data for oil reservoir characterization: A parameter estimation problem", Fall Meeting of American Geophysical Union, San Francisco, CA, Dec 11-15, 2006.

CA4 **Jafarpour B.**, McLaughlin D.B.: "Estimation of permeability field via ensemble Kalman filter", Fall Meeting of American Geophysical Union, San Francisco, CA, Dec 5-9, 2005.

CA3 Imhoff P.T., Han B., **Jafarpour B.**, Gallagher V.N., Chiu P.C., Fluman D.A., Vasuki

N.C.: "Field test of partitioning gas tracers for measuring water in landfills, Third Intercontinental Landfill Research Symposium, Toya lake, Japan, Nov 29-Dec 2, 2004.

CA2 Imhoff P.T., Han B., **Jafarpour B.**, Gallagher V.N., Chiu P.C., Fluman D.A., Vasuki N.C., Yazdani R., Augenstein D., Cohen K.: "Evaluation of partitioning gas tracer tests for measuring water in landfills", Fall Meeting of American Geophysical Union, Washington DC, Dec 5-12, 2003.

CA1 Imhoff P.T., Pirestani K., **Jafarpour B.**, Spivey K. M.: "Tracer interaction effects during partitioning tracer tests for NAPL detection", Spring Meeting of American Geophysical Union, Washington DC, May 28-31, 2002.