Su Jiang

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RESEARCH INTERESTS

Scientific machine learning, data assimilation, uncertainty quantification, subsurface flow simulation, environment and energy (geological carbon storage, seawater intrusion, subsurface energy development, battery modeling)

EDUCATION

Stanford University, Stanford, CA, United States
– Ph.D. in Energy Resources Engineering 2018 - 2022
Advisor: Louis J. Durlofsky
Committee: Roland Horne, Daniel Tartakovsky, Simona Onori, Greg Beroza
Thesis: Use of Deep Learning and Error Correction for Data-Space Inversion and Model-Based History Matching

– M.S. in Energy Resources Engineering 2016 - 2018
Thesis: Data-Space Inversion with Variable Well Controls in the Prediction Period

Tsinghua University, Beijing, China
– Bachelor in Environmental Engineering (with honors) 2012 - 2016
– Bachelor in Economics (Dual degree)

PROFESSIONAL EXPERIENCE

Lawrence Berkeley National Laboratory, Postdoc Fellow 2024 - Present
Project: Surrogate Model and Uncertainty Quantification for Seawater Intrusion and Watershed Management, funded by U.S. DOD Strategic Environmental Research and Development Program (SERDP)

Stanford University, Postdoc Fellow 2022 - 2023
Project: Data-Space Inversion and Model-Based History Matching for CO_2 Storage and Energy Systems

Lawrence Livermore National Laboratory, Research Intern Summer 2021
Project: Deep-Learning-Based Surrogate Flow Modeling for 3D CO_2 Storage Problem with Multi-Fidelity Data, funded by U.S. DOE Science-informed Machine Learning for Accelerating Real-Time Decisions (SMART) in Carbon Storage Applications Initiative

ExxonMobil Corporation, Research Intern Summer 2020
Project: Reservoir Performance Prediction with Distributed Gauss-Newton Method and Global Sensitivity Analysis for Optimization

Chevron Technical Center, Research Intern Summer 2019
Project: Data Assimilation for Naturally Fractured Reservoirs

JOURNAL PUBLICATIONS

10. **S. Jiang***, and L. J. Durlofsky. History Matching for Geological Carbon Storage using Data-Space Inversion with Spatio-Temporal Data Parameterization. *International Journal of Greenhouse Gas Control* (2024). doi:10.1016/j.ijggc.2024.104124

9. Y. Han*, F. P. Hamon, **S. Jiang**, and L. J. Durlofsky. Surrogate Model for CO_2 Storage and Its Use in MCMC-based History Matching. *Advances in Water*

Resources (2024). doi:10.1016/j.advwatres.2024.104678

8. H. Wu, Z. Jin*, **S. Jiang**, H. Tang, J. P. Morris, J. Zhang, and B. Zhang. Selecting Appropriate Model Complexity: An Example of Tracer Inversion for Thermal Prediction in Enhanced Geothermal Systems. *Water Resources Research* (2024). doi:10.1029/2023WR036146

7. **S. Jiang***, and L. J. Durlofsky. Use of Multifidelity Training Data and Transfer Learning for Efficient Construction of Subsurface Flow Surrogate Models. *Journal of Computational Physics* (2023). doi:10.1016/j.jcp.2022.111800

6. H. Tang*, P. Fu, H. Jo, **S. Jiang***, C. S. Sherman, F. Hamon, N. A. Azzolia, and J. P. Morris. (co-corresponding author) Deep Learning-Accelerated 3D Carbon Storage Reservoir Pressure Forecasting Based on Data Assimilation Using Surface Displacement from InSAR. *International Journal of Greenhouse Gas Control* (2022). doi:10.1016/j.ijggc.2022.103765

5. **S. Jiang***, and L. J. Durlofsky. Treatment of Model Error in Subsurface Flow History Matching using a Data-Space Method. *Journal of Hydrology* (2021). doi:10.1016/j.jhydrol.2021.127063

4. **S. Jiang***, M. Hui, and L. J. Durlofsky. Application of RAE-based Data-space Inversion for a Naturally Fractured Reservoir. *Frontiers in Applied Mathematics and Statistics* (2021). doi:10.3389/fams.2021.686754

3. **S. Jiang***, and L. J. Durlofsky. Data-Space Inversion Using a Recurrent Autoencoder for Time-Series Parameterization. *Computational Geosciences* (2021). doi: 10.1007/s10596-020-10014-1

2. **S. Jiang***, W. Sun, and L. J. Durlofsky. A Data-Space Inversion Procedure for Well Control Optimization and Closed-Loop Reservoir Management. *Computational Geosciences* (2020). doi: 10.1007/s10596-019-09853-4

1. Y. Chen, **S. Jiang**, D. Zhang* and C. Liu. (co-first author) An Adsorbed Gas Estimation Model for Shale Gas Reservoirs via Statistical Learning. *Applied Energy* (2017). doi: 10.1016/j.apenergy.2017.04.029
indicates corresponding author

MANUSCRIPTS UNDER REVIEW AND IN PREPARATION

6. **S. Jiang***, C. Liu, and D. Dwivedi. GeoFUSE: A High-Efficiency Surrogate Model for Seawater Intrusion Prediction and Uncertainty Reduction, submitted to *Water Resources Research*, under review, 2024.

5. **S. Jiang***, C. Liu, D. Dwivedi, and D. Tartakovsky. Enhancing Predictive Capabilities for Seawater Intrusion over U.S. through Transfer Learning, 2024 (in prep.)

4. **S. Jiang***, W. Ma, S. Onori, and L. J. Durlofsky. Surrogate Model and Uncertainty Quantification for Lithium-ion Battery Pack Performance, 2024 (in prep.)

3. X. He*, **S. Jiang**, and L. J. Durlofsky. Data-Space Inversion for Prediction of Fault Slip Tendency in CO_2 Storage, 2024 (in prep.)

2. J. Zhao, **S. Jiang**, and D. Zhang*. Mechanical Classification of Organic-Rich Shale Based on High-Speed Nanoindentation and Machine Learning, to be submitted to *Journal of Geophysical Research: Solid Earth*, 2024.

1. D. Dwivedi*, G. Hammond, **S. Jiang**, et al. Reactive Transport Benchmarks for Problems Involving Gaseous Species, 2024 (in prep.)

BOOK CHAPTERS

1. **S. Jiang**, and L. J. Durlofsky. Deep-Neural-Network Surrogate Flow Models for History Matching and Uncertainty Quantification, in *Machine Learning Applications in Subsurface Energy Resource Management: State of the Art and Future Prognosis*, Chp. 14, S. Mishra, ed., CRC Press (2022).

CONFERENCE PUBLICATIONS

2. **S. Jiang**, H. Tang, P. Fu, and H. Jo. A Transfer Learning-Based Surrogate Model for Geological Carbon Storage with Multi-Fidelity Training Data. *NeurIPS 2021 Workshop, Tackling Climate Change with Machine Learning* (2021).

1. **S. Jiang**, W. Sun, and L. J. Durlofsky. A Data-Space Approach for Well Control Optimization under Uncertainty. *ECMOR XVI-16th European Conference on the Mathematics of Geological Reservoirs* (2018), Barcelona, Spain.

INVITED TALKS

- "Data Assimilation for Geological CO_2 Storage Using Deep Learning." Invited webinar, **SPE Gulf Coast Section**, Online, October 2024

- "Data Assimilation for Geological CO_2 Storage Using Deep Learning." Invited seminar talk, Department of Petroleum Engineering, **Texas A&M University**, College Station, TX, USA, June 2024

- "Deep-learning-based Surrogate Model and Uncertainty Quantification for Battery Pack Performance", **Stanford and Toyota Research Institute Meeting**, Stanford, CA, April 2024

- "Deep Learning for Hydrogeology.", invited by Anima Anandkumar, **California Institute of Technology**, online, March 2024

- "Data Assimilation for Geological CO_2 Storage Using Deep Learning." Invited seminar talk, Department of Earth, Environmental and Planetary Sciences, **Rice University**, Houston, TX, USA, February 2024

- "Surrogate Modeling and Data Assimilation for Subsurface Energy Storage and CO_2 Storage." Invited seminar talk, Department of Civil and Environmental Engineering, **Hong Kong University of Science and Technology**, Hong Kong, China, August 2023

- "Deep-Learning-Based History Matching for Subsurface Flow." Invited talk, **ExxonMobil Corporation**, Houston, TX, USA, September 2023

- "Deep-Learning-Based Surrogate Model for Geological Carbon Storage." Invited seminar talk, Computational Geoscience Seminar, **Lawrence Livermore National Laboratory**, Online, May 2023

- "Surrogate Model and Data Assimilation in Subsurface Flow System." Invited seminar talk, Department of Geology and Geological Engineering, **Colorado School of Mines**, Golden, CO, USA, May 2023

- "Data-Space Inversion and Model-based History Matching for Subsurface Energy System." Invited talk, **Los Alamos National Laboratory**, Online, May 2023

- "Data-Space Inversion Using a Recurrent Autoencoder for Time-Series Parameterization." Computational Geoscience Seminar, **Lawrence Livermore National Laboratory**, Online, 2021

SELECTED TALKS

- "Surrogate Model for Data Assimilation in Seawater Intrusion Problems." Biennial Bay-Delta Science Conference, Sacramento, CA, USA, September 2024

- "Data-space Inversion for CO_2 Storage with Flow and Geomechanics." Engineering Mechanics Institute Conference (EMI), Chicago, IL, USA, May 2024

- "Machine Learning for Mechanical Classification of Organic-rice Shale based on High-speed Nanoindentation." European Geosciences Union (EGU) General Assembly, Vienna, Austria, April 2024

- "Data-space Inversion for History Matching Carbon Storage Operations." Stanford SUETRI-B / Smart Fields Annual Meeting, Stanford, CA, April 2024

- "Data-space Inversion for Forecasting Flow and Geomechanical Quantities in CO_2 Storage." AGU Fall Meeting, San Francisco, CA, USA, December 2023

- "Surrogate Model for CO_2 Storage with Coupled Flow and Geomechanics and Its Use in MCMC-based Data Assimilation." Engineering Mechanics Institute Conference (EMI), Atlanta, GA, USA, June 2023

- "Data-Space Inversion with Deep-Learning-Based Parameterization for Geological Carbon Storage." Data for Sustainability Conference, Stanford, CA, USA, April 2023

- "Use of Multifidelity Training Data and Transfer Learning for Efficient Surrogate Model Construction." Engineering Mechanics Institute Conference (EMI), Baltimore, MD, USA, May 2022

- "Use of Multifidelity Data and Transfer Learning for Efficient Construction of Subsurface Flow Surrogate Models." Stanford Earth Sciences Algorithm & Architectures Initiative Affiliate Meeting, Stanford, CA, USA, May 2022

- "A Transfer Learning-Based Surrogate Model for Geological Carbon Storage with Multi-Fidelity Training Data." NeurIPS 2021 Workshop, Tackling Climate Change with Machine Learning, Online, 2021

- "Data-Space Inversion with Imperfect Subsurface Models." Stanford Smart Fields Consortium Annual Affiliates Meeting, Online, 2020

- "A Data-Space Approach for Well Control Optimization under Uncertainty." ECMOR XVI-16th European Conference on the Mathematics of Oil Recovery, Barcelona, Spain, 2018

HONORS AND AWARDS

- Chevron CoRE Student Fellow 2016 - 2022
- Outstanding Graduate Student of Tsinghua University 2016
- Outstanding Leadership at Tsinghua University 2015
- Tsinghua Academic Scholarship 2013 - 2016
- Tsinghua Freshman Fellowship 2012

TEACHING EXPERIENCE

Advanced Subsurface Flow Simulation (Stanford ENERGY 224)
Teaching Assistant, Stanford University 2018 Fall

- Provided problem sessions, mentored project, organized discussion, graded homework and exams

Teaching Experience in Energy Resources Engineering (ENERGY 359)
Department of Energy Resources Engineering, Stanford University 2019 Spring

MENTORING EXPERIENCE

Research Mentor

Bex Abylkhani (PhD candidate, Stanford)	January 2024 - Present
Guido Di Federico (PhD candidate, Stanford)	September 2022 - Present
Xiaowen He (Master student, Stanford)	September 2022 - Present
Yifu Han (PhD candidate, Stanford)	September 2021 - Present

Graduate Student Mentor
Department of Energy Resources Engineering, Stanford University 2017 - 2019

- Mentored two incoming graduate students through the transition to graduate school

SERVICE

Journal reviewer to Water Resources Research, Journal of Hydrology, Journal of Computational Physics, International Journal of Greenhouse Gas Control, Computational Geosciences, Computers & Geosciences, SPE Journal, Geoenergy Science and Engineering, Applied Mathematics Letters, Computers and Chemical Engineering

Member of Stanford Women in Fluid Dynamics, Women in Data Science, American Geophysical Union (AGU), European Association of Geoscientists and Engineers (EAGE), Society of Petroleum Engineers (SPE)