

Su Jiang

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RESEARCH INTERESTS

Data Assimilation and Uncertainty Quantification, Scientific Machine Learning, Optimization and Decision Making Under Uncertainty, Subsurface Flow, CO₂ Geological Storage, Energy Storage, Energy Transition

EDUCATION

Stanford University, Stanford, CA, United States
– Ph.D. in Energy Resources Engineering March 2018 - June 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 September 2016 - June 2018
Thesis: Data-Space Inversion with Variable Well Controls in the Prediction Period

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

PROFESSIONAL EXPERIENCE

Stanford University, Postdoctoral Scholar July 2022 - Present
Project: Data-Space Inversion and Model-Based History Matching for CO₂ Storage and Energy Systems

Lawrence Livermore National Laboratory, Research Intern Summer 2021
Project: Deep-Learning-Based Surrogate Flow Modeling for 3D CO₂ Storage Problem with Multi-Fidelity Data

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

12. **S. Jiang***, and L. J. Durlofsky. History Matching for Geological Carbon Storage using Data-Space Inversion with Spatio-Temporal Data Parameterization, submitted to *International Journal of Greenhouse Gas Control*. arXiv preprint:[arXiv:2310.03228](https://arxiv.org/abs/2310.03228)
11. **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](https://doi.org/10.1016/j.jcp.2022.111800)

10. Y. Han*, F. P. Hamon, **S. Jiang**, and L. J. Durlofsky. Surrogate Model for CO₂ Storage and Its Use in MCMC-based History Matching, submitted to *Advances in Water Resources*. arXiv preprint:[arXiv:2308.06341](https://arxiv.org/abs/2308.06341)
9. **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](https://doi.org/10.1016/j.jhydrol.2021.127063)
8. **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](https://doi.org/10.3389/fams.2021.686754)
7. **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](https://doi.org/10.1007/s10596-020-10014-1)
6. **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](https://doi.org/10.1007/s10596-019-09853-4)
5. 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](https://doi.org/10.1016/j.ijggc.2022.103765)
4. 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](https://doi.org/10.1016/j.apenergy.2017.04.029)
3. 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, submitted to *Water Resources Research*. doi:[10.1002/essoar.10512864.1](https://doi.org/10.1002/essoar.10512864.1)
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*.
1. **S. Jiang***, W. Ma, S. Onori, and L. J. Durlofsky. Surrogate Model and Uncertainty Quantification for Lithium-ion Battery Pack Performance, in preparation.

* indicates correponding author

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

- “Surrogate Modeling and Data Assimilation for Subsurface Energy Storage and CO₂ 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 for Subsurface Flow System.” Invited seminar talk, School of Mathematics, **Shandong University**, Online, September 2022
- “Data-Space Inversion Using a Recurrent Autoencoder for Time-Series Parameterization.” Computational Geoscience Seminar, **Lawrence Livermore National Laboratory**, Online, 2021

SELECTED TALKS

- “Data-space Inversion for Forecasting Flow and Geomechanical Quantities in CO₂ Storage.” AGU Fall Meeting, San Francisco, CA, USA, December 2023
- “Surrogate Model for CO₂ 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
- “New Developments in Data-Space Inversion: Parameterization and Error Modeling.” Stanford Smart Fields Consortium Annual Affiliates Meeting, Stanford, CA, USA, 2019
- “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 Fellowship 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

Guido Di Federico (PhD student, Stanford)	2022 Fall - Present
Xiaowen He (Master student, Stanford)	2022 Fall - Present
Yifu Han (PhD candidate, Stanford)	2021 Fall - 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, 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)

Vice President, Student Association of Science and Technology in School of Environment of Tsinghua University 2015

Secretary, Student Green Association of Tsinghua University 2013