Gege Wen

Department of Energy Science & Engineering
Stanford Doerr School of Sustainability

Email: gegewen@stanford.edu
Homepage: https://gegewen.github.io

RESEARCH AREA

- Data-driven and physics-based machine learning modeling
- Computational methods for environmental and earth sciences
- CO_2 geological storage and sustainable subsurface energy storage
- Creator of web app CCSNet.ai

EDUCATION

Doctor of Philosophy in Energy Science & Engineering 2018 – Present
Doerr School of Sustainability | Stanford University, United States
Advisor: Sally M. Benson
Committee members: Hamdi Tchelepi, Louis Durlofsky, Anima Anandkumar, Eric Darve

Master of Science in Environmental Fluid Mechanics and Hydrology 2016 – 2018
Civil and Environmental Engineering | Stanford University, United States
Advisor: Peter K. Kitanidis

Bachelor of Applied Science and Engineering 2011 –2016
Lassonde Mineral Engineering | University of Toronto, Canada
Graduate with Honour, Engineering Business Minor

PUBLICATION

Wen, G., Li, Z., Long Q., Azizzadenesheli, K., Anandkumar, A., Benson, S. *Nested Fourier Neural Operator for High-resolution 4D CO_2 Storage.* Energy & Environmental Science 16.4: 1732-1741 https://doi.org/10.1039/D2EE04204E (Wen et al., 2023)
Media coverage: Nvidia, CarbonCredits.com

Wen, G., Li, Z., Azizzadenesheli, K., Anandkumar, A., Benson, S. *U-FNO—An enhanced Fourier neural operator-based deep-learning model for multiphase flow*. Advances in Water Resources https://doi.org/10.1016/j.advwatres.2022.104180 (Wen et al., 2022a)
Media coverage: Nvidia

Wen, G., Hay, C., Benson, S. *CCSNet: a deep learning modeling suite for CO_2 storage.* Advances in Water Resources https://doi.org/10.1016/j.advwatres.2021.104009 (Wen et al., 2021b)

Wen, G., Tang, M., Benson, S. *Towards a predictor for CO_2 plume migration using deep neural networks.* International Journal of Greenhouse Gas Control https://doi.org/10.1016/j.ijggc.2020.103223 (Wen et al., 2021a)

Wen, G., & Benson, S. *CO_2 plume migration and dissolution in layered reservoirs*. International Journal of Greenhouse Gas Control https://doi.org/10.1016/j.ijggc.2019.05.012 (Wen et al., 2019)

Callas, C., Saltzer, S. D., Davis, J., Hashemi, S. S., Kovscek, A. R., Okoroafor, E. R., **Wen, G**., Zoback, M. D., Benson, S. M. *Criteria and workflow for selecting depleted hydrocarbon reservoirs for carbon storage.* Applied Energy https://doi.org/10.1016/j.apenergy.2022.119668 (Callas et al., 2022)

Chu, A., Benson, S. M. **Wen, G**., *Deep Learning-based Flow Prediction for CO_2 Storage in Shale-Sandstone Formations*. Energies Special Issue "Machine Learning Applications in Subsurface Flow Characterization" https://doi.org/10.3390/en16010246 (Chu et al., 2022)

Wang, Y., Zechner, M., **Wen, G.**, Corso, A., Mern, J., Moss, R., Kochenderfer, M., Caers, J., *Why Intelligent Agents may be needed to ensure long-term safety for Carbon Storage Operations?* In preparation (Wang et al., 2023)

Ju, X., Hamon, F., **Wen, G.**, Castelletto, N., Kanfar, R., Araya-Polo, M., Tchelepi, H., *Learning CO_2 plume migration in faulted reservoirs using graph neural networks.* In preparation (Ju et al., 2023)

TEACHING AND WORKING EXPERIENCE

Lecture Instructor | Stanford University, United States Fall 2020, Spring 2022, Spring 2023
- Designed course material and instructed topics on machine learning and CO_2 plume prediction.

ExxonMobil Emerging Energy Fellow | Stanford University, United States 2017 – Present
- Machine learning-based modeling for ExxonMobil soft sediments project at the Gulf Coast

Teaching Assistant | Stanford University, United States Fall 2019
- ENERGY 153/253: Carbon Capture and Sequestration

Engineering Co-op Student | Husky Energy Inc., Canada 2014 –2015
- Water−flooding project management in the north Alberta heavy oil and gas production

Engineering Intern | China Minmetals Non-Ferrous Metals Co. Ltd, China Summer 2013
- Environmental impact study review for the Glencore Xstrata Las Bambas Copper Mine bidding project

INVITED TALKS

ExxonMobile ML Seminar, *High-resolution Multi-physics 4D CO_2 storage simulation with Multi-level Fourier Neural Operator*. Sept 2022

IMAGE conference ML workshop, *U-FNO - an enhanced Fourier neural operator based-deep learning model for CO_2 storage*. Sept 2022

GEOSX Annual Technical Review, *CCSNet - A Deep Learning Modeling Suite for CO_2 storage*. June 2022

AI for Climate Change Bootcamp, *U-FNO - an enhanced Fourier neural operator based-deep learning model for CO_2 storage*. May 2022

Purdue University ML Seminar, *U-FNO - An enhanced Fourier neural operator-based deep-learning model for multiphase flow*. April 2022

Beyond Limits Data Science Seminar, *U-FNO - an enhanced Fourier neural operator based-deep learning model for CO_2 storage* Sept 2021

ExxonMobile ML Seminar. *U-FNO - an enhanced Fourier neural operator based-deep learning model for multiphase flow*. Aug 2021

Microsoft Azure Special Webinar. *CCSNet - A Deep Learning Modeling Suite for CO_2 storage*. July 2021

Lawrence Berkeley National Laboratory Modeling Forum. *CCSNet - A Deep Learning Modeling Suite for CO_2 storage*. May 2021

ExxonMobile CCS Seminar. *CCSNet - A Deep Learning Modeling Suite for CO_2 storage*. May 2021

SELECTED TALKS

Stanford Center for Carbon Storage Annual Affiliates Meeting. *CO_2 geological storage modeling with machine learning* Jan 2023

MIT A+B Conference. *CCSNet - A Deep Learning Modeling Suite for CO_2 storage*. (Best paper award) July 2022

InterPore Annual Meeting. Machine Learning and Big Data in Porous Media Session. *U-FNO - an enhanced Fourier neural operator-based deep-learning model for multiphase flow.* June 2022

Stanford Energy Solutions Week. *CCSNet - A Deep Learning Modeling Suite for CO_2 storage*. May 2022

AGU Fall Meeting. Application of Multimodal Physics-Informed Machine Learning/Deep Learning in Subsurface Flow and Transport Modeling, *CCSNet II: an advanced machine learning modeling suite for CO_2 storage in anisotropic and heterogeneous media.* Dec 2021

Stanford Center for Carbon Storage Annual Affiliates Meeting. *U-FNO - An enhanced Fourier neural operator-based deep-learning model for multiphase flow.* Oct 2021

Stanford Center for Carbon Storage Special Webinar: *CCSNet.ai Web App Launch.* Oct 2021

MMLDT-2021 Conference. Advances in Machine Learning Algorithms in Geosciences and Reservoir Engineering Applications. *CCSNet - A Deep Learning Modeling Suite for CO_2 storage*. Sept 2021

InterPore Annual Meeting. Machine Learning and Big Data in Porous Media. *CCSNet - A Deep Learning Modeling Suite for CO_2 storage*. May 2021

Stanford Center for Carbon Storage Annual Affiliates Meeting. *Reservoir scale CO_2 plume migration prediction with deep neural network.* Nov 2020

Stanford Center for Carbon Storage Annual Affiliates Meeting. *Multiphase Flow Prediction with Deep Neural Network.* Nov 2019

MENTORING EXPERIENCE

Qirui Long | *Research assistant at Benson Lab* Jun 2023 – Present
Tycho Augustus Svoboda | *Research assistant at Benson Lab* Nov 2022 – Present
Catharine Callas | *Ph.D. Candidate at Benson Lab* Oct 2020 - Present
Andrew K. Chu | *Stanford Doerr School of Sustainability K-12 outreach* Mar 2021 – Jan 2023
Thibaut Badoual | *Research assistant at Benson Lab* Mar 2021 – Sep 2021

ACADEMIC SERVICE

Conference Convenor

- AGU Fall Meeting (2022). Session: *Machine Learning Applications in Earth, Energy, and Environmental Studies*
- AAAI Fall Symposium (2022). Session: *AI and Climate Change*
- Goldschdmit Conference (2022). Session: *Artificial Intelligence approach to multiscale geochemical processes: from molecular- to field-scale*
- AGU Fall Meeting (2021). Session: *Application of Multimodal Physics-Informed Machine Learning/Deep Learning in Subsurface Flow and Transport Modeling*

Journal Reviewer:

- Water Resources Research
- Computer & Geoscience
- Journal of Computational Physics
- Journal of International Greenhouse Gases Control
- International Journal of Environmental Science and Technology

Conference and Grants Reviewer:

- Climate Change AI Innovation Grants 2023
- ICLR 2023 workshop: *Tackling Climate Change with Machine Learning*
- NeurIPS 2022 workshop: *Tackling Climate Change with Machine Learning*
- AAAI Fall Symposium 2022 Session: *The Role of AI in Responding to Climate Challenges*
- Climate Change AI Innovation Grants 2021
- ICML 2021 workshop: *Tackling Climate Change with Machine Learning*
- NeurIPS 2021 workshop: *Tackling Climate Change with Machine Learning*
- ICLR 2021 workshop: *Deep Learning for Simulation*
- NeurIPS 2020 workshop: *Tackling Climate Change with Machine Learning*
- NeurIPS 2019 workshop: *Tackling Climate Change with Machine Learning*

HONOR AND SCHOLARSHIP

Best Paper Award | MIT A+B conference, United States 2022
ExxonMobil Emerging Energy Fellow | Stanford University, United States 2019
Best Project Award | CS231N CNN for Visual Recognition, Stanford University, United States 2019
Best Poster Award | CS230 Deep Learning, Stanford University, United States 2018
Grads to Watch | University of Toronto, Canada 2016
Dean's List Scholar | University of Toronto, Canada 2013 – 2015
Lassonde Scholarship | University of Toronto, Canada 2013 – 2014