Curriculum Vitae

Hoonyoung Jeong

Associate Professor,

Department of Energy Resources Engineering

Seoul National University

+82-2-880-7235

hoonyoung.jeong@snu.a

Seoul, Republic of Korea

https://petro.snu.ac.kr

Areas of Expertise

- Subsurface Modeling
- Thermo-Hydro-Mechanical-Chemical Simulation
- Flow Assurance
- Inversion
- Optimization
- Machine learning
- Development of Oil and Gas Fields
- Geological CO2 storage
- High-level Nuclear Waste Disposal

Work Experience

Mar 2022 to Present	**Associate Professor** Department of Energy Resources Engineering, Seoul National University Seoul, Republic of Korea
Mar 2018 to Feb 2022	**Assistant Professor** Department of Energy Resources Engineering, Seoul National University Seoul, Republic of Korea
	Postdoctoral Fellow

Jul 2016 to Feb 2018	Bureau of Economic Geology, University of Texas at Austin Austin, TX, USA **Reservoir Engineer**
Nov 2009 to Jan 2011	Korea National Oil Corporation Anyang, Republic of Korea

Academic Background

Jan 2011 to May 2016	Ph.D., Petroleum Engineering, University of Texas at Austin
Sep 2006 to Aug 2008	M.S., Energy Resources Engineering, Seoul National University
Mar 1999 to Aug 2006	B.S., Civil, Urban and Geosystem Engineering, Seoul National University

Publications

- International Journal Articles
  1. Kim, S., Kim, T. W., Hong, Y., Kim, J., & Jeong, H. (2024). Enhancing pressure gradient prediction in multi-phase flow through diverse well geometries of North American shale gas fields using deep learning. *Energy*, *290*, 130291. https://doi.org/10.1016/J.ENERGY.2024.130291
  2. Liang, B., Liu, J., Kang, L.-X., Jiang, K., You, J.-Y., Jeong, H., & Meng, Z. (2024). A novel framework for predicting non-stationary production time series of shale gas based on BiLSTM-RF-MPA deep fusion model. *Petroleum Science*. https://doi.org/10.1016/J.PETSCI.2024.05.012
  3. Oh, H., Yoon, H., Park, S., Kim, Y., Choi, B., Sun, W., & Jeong, H. (2024). Estimation of CO2 Storage Capacities in Saline Aquifers Using Material Balance. *Fuel*, *Submitted*.
  4. Kim, J., Yoon, H., Hwang, S., Jeong, D., Ki, S., Liang, B., Jeong, H., 2024. Real-time monitoring of CO2 transport pipelines using deep learning, Process Safety and Environmental Protection, Volume 181, Pages 480-492. https://doi.org/10.1016/j.psep.2023.11.024.

5. Liang, B., Liu, J., You, J., Jia, J., Pan, Y., Jeong, H., 2023. Hydrocarbon production dynamics forecasting using machine learning: A state-of-the-art review. Fuel 337, 127067. https://doi.org/10.1016/J.FUEL.2022.127067
6. Kim, S., Yun, Y., Choi, J., Bizhani, M., Kim, T., Jeong, H., 2022. Prediction of maximum slug length considering impact of well trajectories in British Columbia shale gas fields using machine learning. J. Nat. Gas Sci. Eng. 106, 104725. https://doi.org/10.1016/J.JNGSE.2022.104725
7. Yun, Y., Kim, T., Hwang, S., Oh, H., Kim, Y., Jeong, H., Kim, S., 2022. Prediction of liquid surge volumes and flow rates for gas wells using machine learning. J. Nat. Gas Sci. Eng. 108, 104802. https://doi.org/10.1016/J.JNGSE.2022.104802
8. Jo, S., Jeong, H., Min, B., Park, C., Kim, Y., Kwon, S., Sun, A., 2021. Efficient deep-learning-based history matching for fluvial channel reservoirs. J. Pet. Sci. Eng. 109247. https://doi.org/10.1016/J.PETROL.2021.109247
9. Jeong, D., Yoshioka, K., Jeong, H., Min, B., 2021. Sequential short-term optimization of gas lift using linear programming: A case study of a mature oil field in Russia. J. Pet. Sci. Eng. 205, 108767. https://doi.org/10.1016/J.PETROL.2021.108767
10. Ren, B., Jeong, H., 2020. Buoyant and countercurrent flow of CO2 with capillary dispersion. J. Pet. Sci. Eng. 195, 107922. https://doi.org/10.1016/j.petrol.2020.107922
11. Jeong, H., Sun, A.Y., Jeon, J., Min, B., Jeong, D., 2020. Efficient Ensemble-Based Stochastic Gradient Methods for Optimization Under Geological Uncertainty. Front. Earth Sci. 8, 108. https://doi.org/10.3389/feart.2020.00108
12. Kim, S., Lee, K., Lim, J., Jeong, H., Min, B., 2020. Development of ensemble smoother–neural network and its application to history matching of channelized reservoirs. J. Pet. Sci. Eng. 191, 107159. https://doi.org/10.1016/j.petrol.2020.107159
13. Kang, B., Jung, H., Jeong, H., Choe, J., 2020. Characterization of three-dimensional channel reservoirs using ensemble Kalman filter assisted by principal component analysis. Pet. Sci. https://doi.org/10.1007/s12182-019-00362-8
14. Jung, H., Jo, H., Kim, S., Kang, B., Jeong, H., Choe, J., 2020. Use of Channel Information Update and Discrete Cosine Transform in Ensemble Smoother for Channel Reservoir Characterization. J. Energy Resour. Technol. 142, 012901. https://doi.org/10.1115/1.4043856

15. Kim, J., Kang, B., Jeong, H., Choe, J., 2019. Field development optimization using a cooperative micro-particle swarm optimization with parameter integration schemes. J. Pet. Sci. Eng. 183, 106416. https://doi.org/10.1016/J.PETROL.2019.106416
16. Zhong, Z., Sun, A.Y., Jeong, H., 2019. Predicting CO2 Plume Migration in Heterogeneous Formations Using Conditional Deep Convolutional Generative Adversarial Network. Water Resour. Res. 2018WR024592. https://doi.org/10.1029/2018WR024592
17. Sun, A.Y., Zhong, Z., Jeong, H., Yang, Q., 2019. Building complex event processing capability for intelligent environmental monitoring. Environ. Model. Softw. 116, 1–6. https://doi.org/10.1016/J.ENVSOFT.2019.02.015
18. Ren, B., Jeong, H., 2018. Influence of injection strategies on local capillary trapping during geological carbon sequestration in saline aquifers. J. CO2 Util. 27, 441–449. https://doi.org/10.1016/J.JCOU.2018.08.021
19. Kim, S., Min, B., Lee, K., Jeong, H., 2018. Integration of an Iterative Update of Sparse Geologic Dictionaries with ES-MDA for History Matching of Channelized Reservoirs. Geofluids 2018, 1–21. https://doi.org/10.1155/2018/1532868
20. Min, B., Sun, A.Y., Wheeler, M.F., Jeong, H., 2018. Utilization of multiobjective optimization for pulse testing dataset from a CO2-EOR/sequestration field. J. Pet. Sci. Eng. 170, 244–266. https://doi.org/10.1016/J.PETROL.2018.06.035
21. Jeong, H., Sun, A.Y., Lee, J., Min, B., 2018. A Learning-based Data-driven Forecast Approach for Predicting Future Reservoir Performance. Adv. Water Resour. https://doi.org/10.1016/J.ADVWATRES.2018.05.015
22. Jeong, H., Sun, A.Y., Zhang, X., 2018. Cost-optimal design of pressure-based monitoring networks for carbon sequestration projects, with consideration of geological uncertainty. Int. J. Greenh. Gas Control 71, 278–292. https://doi.org/10.1016/j.ijggc.2018.02.014. *This paper was featured in NETL's July 2018 Carbon Storage Newsletter.*
23. Sun, A.Y., Jeong, H., González-Nicolás, A., Templeton, T.C., 2018. Metamodeling-based approach for risk assessment and cost estimation: Application to geological carbon sequestration planning. Comput. Geosci. 113, 70–80. https://doi.org/10.1016/j.cageo.2018.01.006
24. Nwachukwu, A., Jeong, H., Pyrcz, M., Lake, L.W., 2018. Fast evaluation of well placements in heterogeneous reservoir models using machine learning. J. Pet. Sci. Eng. 163, 463–475. https://doi.org/10.1016/J.PETROL.2018.01.019

25. Jeong, H., Srinivasan, S., 2017. Fast selection of geologic models honoring CO2 plume monitoring data using Hausdorff distance and scaled connectivity analysis. Int. J. Greenh. Gas Control 59, 40–57. https://doi.org/10.1016/j.ijggc.2017.02.005
26. Jeong, H., Srinivasan, S., 2016. Fast assessment of CO2 plume characteristics using a connectivity based proxy. Int. J. Greenh. Gas Control 49, 387–412. https://doi.org/10.1016/j.ijggc.2016.03.001
27. Lee, K., Jeong, H., Jung, S., Choe, J., 2013. Characterization of channelized reservoir using ensemble Kalman Filter with clustered covariance. Energy, Explor. Exploit. 31, 17–30. https://doi.org/10.1260/0144-5987.31.1.17
28. Lee, K., Jeong, H., Jung, S., Choe, J., 2013. Improvement of ensemble smoother with clustered covariance for channelized reservoirs. Energy, Explor. Exploit. 31, 713–726. https://doi.org/10.1260/0144-5987.31.5.713
29. Jeong, H., Srinivasan, S., Bryant, S., 2013. Uncertainty Quantification of CO2 Plume Migration Using Static Connectivity of Geologic Features. Energy Procedia 37, 3771–3779. https://doi.org/10.1016/j.egypro.2013.06.273
30. Jeong, H., Ki, S., Choe, J., 2010. Reservoir Characterization from Insufficient Static Data Using Gradual Deformation Method with Ensemble Kalman Filter. Energy Sources, Part A Recover. Util. Environ. Eff. 32, 942–951. https://doi.org/10.1080/15567030802606350
31. Shin, Y., Jeong, H., Choe, J., 2010. Reservoir Characterization Using an EnKF and a Non-parametric Approach for Highly Non-Gaussian Permeability Fields. Energy Sources, Part A Recover. Util. Environ. Eff. 32, 1569–1578. https://doi.org/10.1080/15567030902804780

- Domestic Journal Articles
  1. Oh, B., Kim, Y., Lee, W., Jang, Y., Min, B., Jeong, H., 2021. Optimization of Well Operations in a Carbonate Reservoir Using Stochastic Simplex Approximate Gradient. J. Korean Soc. Miner. Energy Resour. Eng. 58, 119–129. https://doi.org/10.32390/KSMER.2021.58.2.119
  2. Kim, N., Jung, H., Kim, G., Jeong, H., Shin, H., Kwon, Y., Choe, J., 2018. The Stability Assessment of an Aquifer in Pohang Yeongil Bay due to CO2 Injection. J. Eng. Geol. 28, 183–192.
- Non-Peer Reviewer Journal Articles
  1. Nwachukwu, A., Jeong, H., Sun, A., Pyrcz, M., Lake, L. W., 2018. Machine Learning-Based Optimization of Well Locations and WAG Parameters under Geologic Uncertainty. In SPE Improved Oil Recovery Conference. Society of Petroleum Engineers. https://doi.org/10.2118/190239-MS

2. Yip, Y.H., Jeong, H., Fu, S., van Nierop, E.A., 2013. Comparison of CO2 and CH4 Recovery from a Storage Site. Energy Procedia 37, 4843–4852. https://doi.org/10.1016/j.egypro.2013.06.394
3. Jeong, H., Srinivasan, S., Bryant, S., 2013. Uncertainty Quantification of CO2 Plume Migration Using Static Connectivity of Geologic Features. Energy Procedia 37, 3771–3779. https://doi.org/10.1016/J.EGYPRO.2013.06.273

Research Grants

1. 2021.11 – Present. Technology development for ensuring safety of CO2 geological storage. KETEP.
2. 2021.5 – Present. Development and Commercialization of an Intelligent Evaluation System for Big data of Natural Gas Fields in the North America. KETEP.
3. 2021.4 – Present. Evaluation of short- and long-term coupled properties of rock under disposal conditions at depth. KAERI.
4. 2020.3 – Present. Development of machine-learning-based flow assurance evaluation techniques for EGR+ in Shale Reservoirs. KIGAM.
5. 2020.4 – 2020.9. Prediction of Sucker Rod Pump Failure and Optimization of Pump Operation. SK E&P Operations America, LLC.
6. 2020.10 – 2020.12. Optimization of Horizontal Well Length in the Mahar Field, POSCO International Corporation
7. 2019.2 – 2019.12, Assessment of E&P Competency of KOGAS, KOGAS.
8. 2019.7 – 2019.10, Optimization of Well Operation in a Carbonate Reservoir Using Stochastic Gradients. KIGAM.
9. 2018.9 – 2019.1, Survey of Gradient-based Reservoir Operation Optimization Techniques Considering Reservoir Uncertainty. KIGAM.
10. 2018 – 2020, Development of a General-purpose Optimizer for Safe and Efficient Use of Subsurface Reservoirs. NRF.
11. 2018 – 2019, Development of a python package for optimization of reservoir management. Seoul National University.

Conferences

- International Conferences
    1. Kim, Y., Lee, Y., Jeong, D., Jeong, H., Prediction of Sonic Log Using Machine Learning and Petrophysical Interpretation, 2022 Fall Joint Conference and the 8th International Symposium on Mine Reclamation, Nov 2-4, 2022

2. Lee, Y., Kim, Y., Kim, D., Jeon, H., Jeong, H., Choe, J., Analysis on Trapping Mechanism for Various Well Operation Conditions of Carbon Storage in an Aquifer, 2022 Fall Joint Conference and the 8th International Symposium on Mine Reclamation, Nov 2-4, 2022
3. Kim, Y., Jeong, H., Lee, C., Lee, M., Inversion of Barcelona Basic Model Parameters of Kunigel-V1, 2022 Autumn Conference of Korean Radioactive Waste Society, Oct 26-28, 2022
4. Yoon, H., Kim, Y., Jeong, H., Sun, A., Ren, B., Deep-learning-based surrogate model for brine extraction well placement for geological carbon storage, International Society for Porous Media, Online, 31 May 2021 - 4 June 2021.
5. Lee, T., Jeong, D., Jang, S., Kim J., Mo C., Jeong, H., Choe, J., Infill Well Placement Optimization Using Integrated Asset Modeling Technique, SPE/IATMI Asia Pacific Oil & Gas Conference and Exhibition, Bali, Indonesia, October 29-31, 2019.
6. Kim, Y., Jeong, H., Oh., B., Choe, J., Sun, A. Y., Development of a Python Package for Predicting Reservoir Performance Using Machine Learning, The 20th Annual Conference of the International Association for Mathematical Geosciences. State College, Pennsylvania, USA, Aug 10-16, 2019.
7. Kim, J., Kang, B., Jeong, H., Choe, J., Field development optimization using cooperative micro-particle swarm optimization, The 20th Annual Conference of the International Association for Mathematical Geosciences. State College, Pennsylvania, USA, Aug 10-16, 2019.
8. Sun, A. Y., Zhong, Z., Jeong, H., Adversarial Learning for Subsurface Flow and Transport Modeling, no. 2019AGUFM.H31K1854S, 2019 AGU Fall Meeting, San Francisco, Calif., December, 2019.
9. Sun, A. Y., Jeong, H., Hovorka, S. D., Templeton, T., Arctur, D., Zhu, T., and Xu, W., Development of an intelligent monitoring system for geological carbon sequestration (GCS) systems, no. 2016AGUFM.H44E..06S, 2016 AGU Fall Meeting, San Francisco, Calif., December, 2016.
10. Jeong, H., Sun, A. Y., Cost-optimal design of pressure-based monitoring networks for carbon sequestration projects, with consideration of geological uncertainty: presented at Mastering the Subsurface through Technology Innovation and Collaboration: Carbon Storage and Oil and Natural Gas Technologies Review Meeting, Pittsburgh, Penn., August 1-3, 2017.
11. Jeong, H., Sun, A. Y., Detection of CO2 Leakage and Unknown CO2 Migration Path Using Machine Learning and Ensemble Kalman Filter, Mastering the Subsurface through Technology Innovation and Collaboration: Carbon

Storage and Oil and Natural Gas Technologies Review Meeting, Pittsburgh, Penn., August 16-18, 2016.

12. Jeong, H., Srinivasan, S., Improved Proxies for Assessing Plume Migration during Geologic Sequestration: The Second University of Texas Conference on Carbon Capture and Storage, Austin, TX, January 28-30, 2014.
13. Srinivasan, S., Jeong, H., Uncertainty Quantification of CO2 Plume Migration Using Scaled Connectivity Analysis: Carbon Storage R&D Project Review Meeting, Pittsburgh, Penn., August 20-22, 2013.
14. Jeong, H., Srinivasan, S., Fast Proxies for Assessing Uncertainty in CO2 Plume Migration during Sequestration: UT PGE GCS IAP Research Review, Austin, TX, January 30-February 1, 2013.
15. Jeong, H., Srinivasan, S., Uncertainty Quantification of CO2 Plume Migration Using Static Connectivity: University of Texas conference on Carbon Capture and Storage, Austin, TX, January 25-27, 2012.
16. Jeong, H., Srinivasan, S., Modeling the Uncertainty in CO2 Plume Migration During Sequestration Using Static Connectivity: presented at Conference on Geostatistics for Environmental Applications, Valencia, Spain, September 19-21, 2012.
17. Jeong, H., Park, W., and Choe, J., 2010, Efficient calculation of sensitivity coefficients using ensemble method, 2010 Annual Conference of the International Association for Mathematical Geosciences, Hungary.
18. Jeong, H., Srinivasan, S., CO2 plume monitoring using injection data and a model selection approach: presented at 22nd Annual Industrial Affiliates Meeting at the Center for Subsurface Modeling, October 30-31, 2012.
19. Jeong, H., Srinivasan, S., Fast Assessment of CO2 Plume Extent Using a Connectivity Based Proxy, Geological CO2 Storage Research Review, Austin, TX, February 18, 2016.
20. Jeong, H., Srinivasan, S., Fast Quantification of Uncertainty in CO2 injectivity Using Connectivity Based Analyses, Geological CO2 Storage Research Review, Austin, TX, January 20, 2015.
21. Jeong, H., Srinivasan, S., Quantification of Uncertainty in CO2 Plume Migration Using Model Selection Algorithms, The 23rd Annual Industrial Affiliates Meeting at the Center for Subsurface Modeling, Austin, TX, November 18-19, 2014.
22. Jeong, H., Srinivasan, S., Fast Quantification of Uncertainty in Well Responses Using Connectivity Analysis: presented at CPGE 2014 Research Showcase, Austin, TX, November 6-7, 2014.

- Domestic Conferences

1. Yoon, H., Kim, Y., Oh, H., Jeong, H., Fast Robust Optimization of a Brine Extraction Well Location for Carbon Storage Using Fast Marching Method and Convolutional Neural Network, Conference of Korean Society of Petroleum Engineers, June 24, 2022.
2. Kim, J., Lee, Y., Jeong, H. Development of a pipeline leak detection model in a transient state by integrating dynamic modeling and machine learning. Conference of Korean Society of Petroleum Engineers, Seoul, South Korea, June 24, 2022.
3. Kim, Y., Jeong, H., Learning-based Pattern-data-driven Forecast Approach for Predicting Reservoir Performance, 2022 118th Spring Conference of Korean Society of Mineral and Energy Resources Engineers, May 19 - 21, 2022
4. Kim, Y., Jeong, H., Oh, B., Yun, Y., Son, C., Lee, D., Jun, J., Park, Y., Diagnosis of Rod Pump Anomalies Using Deep-learning-based Classification of Dynamometer Cards, 2021 Fall Joint Conference of KSMER, KSRM, KSEG, KSPE, Oct 28-29, 2021.
5. Yoon, H., Kim, Y., Oh, H., Jeong, H., Optimization of Brine Extraction Well Locations for Safe Geological Carbon Storage Using Fast Marching Method and Deep Learning, Conference of the Korean Society of Mineral and Energy Resources Engineers, May 20-21, 2021.
6. Jeong, H., Oh., B., Lee, W., Jang, Y., Kim, Y., Optimization of Operating Conditions in the Haliba Field Using a Stochastic Gradient Method, 2019 Fall Conference of the Korean Society of Mineral and Energy Resources Engineers, Jeju, South Korea, Nov 6 – 8, 2019.
7. Kim, J., Ahn, Y., Kim, D., Lee, Y., Jeong, H., Choe, J., Development a robust proxy using streamline simulation and convolutional neural network, 2019 Fall Conference of the Korean Society of Mineral and Energy Resources Engineers, Jeju, South Korea, Nov 6 – 8, 2019.
8. Kim, Y., Jeong, H., Oh, B., Choe, J., Development of Python Package for Predicting Performance using Machine Learning, Spring Conference of the Korean Society of Mineral and Energy Resources Engineers, Daejeon, South Korea, May 5 – 9, 2019.
9. Oh., B., Jeong, H., Lee, W., Jang, Y., Choe, J., Kim, Y., Lee, J., Optimization of Operating Conditions of a Carbonate Reservoir Using a Stochastic Gradient Method, Spring Conference of the Korean Society of Mineral and Energy Resources Engineers, Daejeon, South Korea, May 5 – 9, 2019.

10. Fast Forecast of Future Reservoir Performance Using Machine Learning: presented at the 110th Spring Conference of the Korean Society of Mineral and Energy Resources Engineers, Seoul, South Korea, May 17 – 18, 2018.
11. Optimization of brine extraction design for Geological CO2 Storage: presented at the 110th Spring Conference of the Korean Society of Mineral and Energy Resources Engineers, Seoul, South Korea, May 17 – 18, 2018.

Committee Involvement

- Expert in CCUS (Carbon Capture, Utilization, Storage) Technology Evaluation, Ministry of Science and ICT in South Korea, July 2018 to June 2023.

Patents

- Method and System for Predicting Failures of Sucker Rod Pumps Using Scaled Load Ratios
    - Patent number 17/403,806, USA, August 2021

Awards and Honors

- Jeong, H., Outstanding Teaching Award, SNU, Petroleum and Gas Engineering and Experiment, 2023.
- Jeong, H., 3rd Place Prize, SPE, Building a fracture network model from Utah FORGE microseismic data from hydraulic stimulation, 2023.
- Jeong, H., Outstanding Paper Award, KSPE, Efficient Deep-Learning-Based History Matching for Fluvial Channel Reservoirs, 2022.
- Jeong, H., Outstanding Paper Award, KSMER, Optimization of Well Operations in a Carbonate Reservoir Using Stochastic Simplex Approximate Gradient, 2021.
- Yoon, H., Jeong, H., The Excellent prize, KIGAM, Utilization of Geological Data and Artificial Intelligence Contest**,** Jul 2021.
- Kim, Y., Lee, Y., Jeong, H., Choe, J., The 3rd place prize, KIGAM, Utilization of Geological Data and Artificial Intelligence Contest**,** Jul 2021.
- Kim, Y., Jeong, H., Jang, H., Yu, J., The Korea Geophysical and Physical Exploration Association Award, Mine-Tech Festa, Oct 2020.
- Jeong. H., Google, Support for Development of a Course titled “Data Science for Geoscience”, $7,500, 2019.
- Jeong. H., Google, Google Cloud Platform Support for Fast Prediction and Operation Optimization of Fluid Flow in Subsurface Rock Formations Using Deep

Learning and Reinforcement Learning, $25,000, 2019.

Advising

- Current Graduate Students
  - Yeongju Kim, PhD course, Mar 2019 – Present
  - Hyunjee Yoon, PhD course, Sep 2021 – Present
  - Sanggeon Park, PhD course, Mar 2023 - Present
  - Byungmin Jeong, MS course, Mar 2024 - Present
  - Byungin Choi, PhD course, Sep 2021 – Present
  - Hyungmin Kwon, PhD course, Sep 2024 - Present
- Current Postdoctoral Fellows
  -
- Alumi
  - Byunggun Oh, MS, Sep 2019 – Aug 2021, Reservoir Engineer, Posco International Corporation
  - Youngwoo Yun, MS, Mar 2020 – Feb 2022, Reservoir Engineer, SK Earthon
  - Hyunmin Oh, MS, Sep 2021 – Aug 2023, Reservoir Engineer, SLB
  - Juhyun Kim, Post Doc, Mar 2022 – Dec 2023, Production Engineer, SLB
  - Hyunjoong Lim, MS, Jan 2023 - Dec 2024, Drilling Engineer, Posco International Corporation