Hyoung Suk Suh, Ph.D.

Assistant Professor
Department of Civil and Environmental Engineering
Case Western Reserve University

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Google Scholar | ResearchGate | ORCID | Scopus | LinkedIn

Education

2018 – 2022 | **Columbia University**, New York, NY, USA
Ph.D., Civil Engineering and Engineering Mechanics

2015 – 2017 | **Yonsei University**, Seoul, Korea
M.S., Civil and Environmental Engineering

2010 – 2015 | **Yonsei University**, Seoul, Korea
B.S. with High Honors, Civil and Environmental Engineering

Experience

2023 – | **Case Western Reserve University**, Cleveland, OH, USA
Assistant Professor (tenure-track)

2022 – 2023 | **Columbia University**, New York, NY, USA
Postdoctoral Research Scientist

2018 – 2022 | **Columbia University**, New York, NY, USA
Presidential Fellow | Research Assistant

Honors and Awards (Selected)

- UCITE Glennan Fellowship — Case Western Reserve University, 2024 – 2025
- The Dongju Lee '03 Memorial Award — Columbia University, 2022
- MMLDT-CSET Conference NSF Fellowship — National Science Foundation, 2021
- Presidential Fellowship — Columbia University, 2018 – 2022
- Brain Korea 21 Fellowship — Korea Research Foundation, 2015 – 2017
- High Honors Graduation Award — Yonsei University, 2015
- National Science and Technology Full Scholarship — Korea Student Aid Foundation, 2010 – 2015

Publications

Journal Articles

[20] **Suh, H.S.** (2024) Diffuse interface modeling of non-isothermal Stokes-Darcy flow with immersed transmissibility conditions, *International Journal for Numerical Methods in Engineering*, published online. https://doi.org/https://doi.org/10.1002/nme.7589.

[19] **Suh, H.S.**, Na, S., and Choo, J. (2024) Pore-morphology-based estimation of the freezing characteristic curve of water-saturated porous media, *Water Resources Research*, published online. https://doi.org/10.1029/2024WR037035.

[18] **Suh, H.S.**, Song, J.Y., Kim, Y., Yu, X., and Choo, J. (2024) Data-driven discovery of interpretable water retention models for deformable porous media, *Acta Geotechnica*, 19, 3821-3835. https://doi.org/10.1007/s11440-024-02322-y.

[17] **Suh, H.S.** (2024) Evolution of anisotropic capillarity in unsaturated granular media within the pendular regime, *International Journal of Geo-Engineering*, 15(1), 10. https://doi.org/10.1186/s40703-024-00211-7.

[16] Bahmani, B., **Suh, H.S.**, and Sun, W. (2024) Discovering interpretable elastoplasticity models via the neural polynomial method enabled symbolic regressions, *Computer Methods in Applied Mechanics and Engineering*, 422, 116827. https://doi.org/10.1016/j.cma.2024.116827.

[15] **Suh, H.S.**, Kweon, C., Lester, B., Kramer, S., and Sun, W. (2023) A publicly available PyTorch-ABAQUS UMAT deep-learning framework for level-set plasticity, *Mechanics of Materials*, 184, 104682. https://doi.org/10.1016/j.mechmat.2023.104682.

[14] **Suh, H.S.** and Sun, W. (2022) Multi-phase-field microporomechanics model for simulating ice-lens growth in frozen soil, *International Journal for Numerical and Analytical Methods in Geomechanics*, 46(12), 2307-2336. https://doi.org/10.1002/nag.3408. (selected as the featured cover).

[13] **Suh, H.S.** and Sun, W. (2021) Asynchronous phase field fracture model for porous media with thermally non-equilibrated constituents, *Computer Methods in Applied Mechanics and Engineering*, 387, 114182. https://doi.org/10.1016/j.cma.2021.114182.

[12] Heider, Y., **Suh, H.S.**, and Sun, W. (2021) An offline multi-scale unsaturated poromechanics model enabled by self-designed/self-improved neural network, *International Journal for Numerical and Analytical Methods in Geomechanics*, 45(9), 1212-1237. https://doi.org/10.1002/nag.3196.

[11] **Suh, H.S.** and Sun, W. (2021) An immersed phase field fracture model for microporomechanics with Darcy-Stokes flow, *Physics of Fluids*, 33, 016603. http://doi.org/10.1063/5.0035602. (selected as the Editor's pick).

[10] **Suh, H.S.**, Sun, W., and O'Connor, D. (2020) A phase field model for cohesive fracture in micropolar continua, *Computer Methods in Applied Mechanics and Engineering*, 369, 113181. https://doi.org/10.1016/j.cma.2020.113181.

[9] **Suh, H.S.** and Sun, W. (2019) An open source FEniCS implementation of a phase field fracture model for micropolar continua, *International Journal of Multiscale Computational Engineering*, 17(6), 639-663. https://doi.org/10.1615/IntJMultCompEng.2020033422.

[8] Kim, Y., **Suh, H.S.**, and Yun, T.S. (2019) Reliability and applicability of the Krumbein-Sloss chart for estimating geomechanical properties in sands, *Engineering Geology*, 248, 117-123. https://doi.org/10.1016/j.enggeo.2018.11.001.

[7] **Suh, H.S.** and Yun, T.S. (2018) Modification of capillary pressure by considering pore throat geometry with the effects of particle shape and packing features on water retention curves for uniformly graded sands,

Computers and Geotechnics, 95, 129-136. https://doi.org/10.1016/j.compgeo.2017.10.007.

[6] **Suh, H.S.**, Kang, D.H., Jang, J., Kim, K.Y., and Yun, T.S. (2017) Capillary pressure at irregularly shaped pore throats: Implications for water retention characteristics, *Advances in Water Resources*, 110, 51-58. https://doi.org/10.1016/j.advwatres.2017.09.025.

[5] Lee, C., **Suh, H.S.**, Yoon, B., and Yun, T.S. (2017) Particle shape effect on thermal conductivity and shear wave velocity in sands, *Acta Geotechnica*, 12, 615-625. https://doi.org/10.1007/s11440-017-0524-6.

[4] **Suh, H.S.**, Kim, K.Y., Lee, J., and Yun, T.S. (2017) Quantification of bulk form and angularity of particle with correlation of shear strength and packing density in sands, *Engineering Geology*, 220, 256-265. https://doi.org/10.1016/j.enggeo.2017.02.015.

[3] **Suh, H.S.**, Jo, Y., Yun, T.S., and Kim, K.Y. (2016) Shear resistance of sandy soils depending on particle shape, *Journal of the Korean Geotechnical Society*, 32(6), 41-48. https://doi.org/10.7843/kgs.2016.32.6.41.

[2] Kim, K.Y., **Suh, H.S.**, Yun, T.S., Moon, S.-W., and Seo, Y.-S. (2016) Effect of particle shape on the shear strength of fault gouge, *Geosciences Journal*, 20(3), 351-359. https://doi.org/10.1007/s12303-015-0051-0.

[1] **Suh, H.S.**, Yun, T.S., and Kim, K.Y. (2016) Prediction of soil-water characteristic curve and relative permeability of Jumunjin sand using pore network model, *Journal of the Korean Geotechnical Society*, 32(1), 55-62. https://doi.org/10.7843/kgs.2016.32.1.55.

Manuscript Under Review or In Preparation

- Kim, T. G., Yun, T.S., and **Suh, H.S.**, Can ChatGPT implement finite element models for geotechnical engineering applications?, in preparation.
- Kim, Y. and **Suh, H.S.**, GNPNM: A graph neural pore network model for predicting capillary-dominant flow patterns in porous media, in preparation.

Peer Reviewed Conference Proceedings and Book Chapters

[6] **Suh, H.S.** and Sun, W. (2023) A multi-phase-field model for simulating ice lens growth and thawing in frozen porous media, *Geo-Congress 2023*, Los Angeles, CA, USA.

[5] **Suh, H.S.** and Sun, W. (2022) Multi-phase-field approach for modeling ice lens growth and thaw in frozen soil, *2nd International Conference on Energy Geotechnics*, La Jolla, CA, USA.

[4] **Suh, H.S.** and Sun, W. (2022) An immersed phase field fracture model in fluid-infiltrating porous media with evolving Beavers-Joseph-Saffman condition, *2nd International Conference on Energy Geotechnics*, La Jolla, CA, USA.

[3] **Suh, H.S.**, Kang, D.H., Jang, J., Kim, K.Y., and Yun, T.S. (2018) Capillary pressure at irregularly shaped pore throat, *7th International Conference on Unsaturated Soils*, Kowloon, HKSAR.

[2] **Suh, H.S.**, Kang, D.H., and Yun, T.S. (2017) Capillary pressure correction in irregularly shaped pore channel, *19th International Conference on Soil Mechanics and Geotechnical Engineering*, Seoul, Korea.

[1] Kang, D.H., **Suh, H.S.**, Kim, K.Y., and Yun, T.S. (2016) Calibration of capillary pressure of pore network by lattice Boltzmann simulation, *1st International Conference on Energy Geotechnics*, Kiel, Germany.

Teaching and Supervision

Teaching Experience

- *Instructor*, Soil Mechanics (ECIV330) — CWRU, 2024 –
- *Instructor*, Elasticity and Data-driven Mechanics (ECIV435) — CWRU, 2024 –
- *Faculty Advisor*, Civil Engineering Senior Project (ECIV398) — CWRU, 2023 –
- *Guest Lecturer*, Data Analysis for Civ. and Env. Engr. (ECIV455) — CWRU, 2023
- *Teaching Assistant*, Soil Mechanics (CIEN3141) — Columbia University, 2020 – 2022
- *Teaching Assistant*, Soil Mechanics (CEE3403) — Yonsei University, 2017
- *Teaching Assistant*, Introduction to Engineering Design (ENG1107) — Yonsei University, 2016

Postdoctoral Scholar and Student Advising

Postdoctoral Fellows

- Yejin Kim, *Generative artificial intelligence for the inverse design of engineered geomaterials* — 2024 –

Ph.D. Students

- Mohammad Rezanezhad, *Multi-physics in fractured/fracturing porous media* — 2024 –
- Zixi Zhang, *AI-guided design of digital and physical surrogate of geological materials* — 2024 –

Undergraduate Students

- Mcangel Dougan (Capstone Design Project Advisee) — 2023
- Amory Ling (Academic Advisee) — 2024 –

Grants and Contracts

Principal Investigator

- *Integrating mechanics and AI: data-driven material modeling through an interactive computing platform*, CWRU UCITE Glennan Fellowship (Amount: $6,500) — 2024 – 2025

Service and Activities

Professional Society Membership

- *Member*, American Geophysical Union (AGU)
- *Member*, American Society of Civil Engineers (ASCE)
- *Member*, International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE)
- *Member*, Korean Geotechnical Society (KGS)
- *Member*, Korean-American Scientists and Engineers Association (KSEA)

Journal Reviewer

Applied Thermal Engineering | *Computers and Concrete* | *Computers and Geotechnics* | *European Journal of Mechanics / A Solids* | *Granular Matter* | *International Communications in Heat and Mass Transfer* | *International Journal for Numerical and Analytical Methods in Geomechanics* | *International Journal of Geo-Engineering* | *International Journal of Heat and Mass Transfer* | *International Journal of Mechanical Sciences* | *International Journal of Solids and Structures* | *Journal of Contaminant Hydrology* | *Journal of Engineering Mechanics* | *KSCE Journal of Civil Engineering* | *Proceedings of the Royal Society A* | *Soils and Foundations* | *Steel and Composite Structures*

Invited Talks

- CWRU, Computational Science Colloquium APR. 2024
- Yonsei University, Dept. of Civil and Environmental Engineering JUL. 2023
- KAIST, Dept. of Civil and Environmental Engineering JUN. 2023
- University at Buffalo, Dept. of Civil, Structural and Environmental Engineering FEB. 2023
- University of Hawai'i at Mānoa, Dept. of Civil and Environmental Engineering FEB. 2022
- University of Pittsburgh, Dept. of Civil and Environmental Engineering FEB. 2022

Dissertation Defense and Examination Committee

Ph.D. Defense

- Mohammod Minhajur Rahman, Dept. of Civil and Environmental Engineering, CWRU AUG. 2024
- Yongfan Guo, Dept. of Civil Engineering, McMaster University SEP. 2024

Ph.D. Candidacy Examination

- Shafi Ullah, Dept. of Civil and Environmental Engineering, CWRU APR. 2024

Honor Society Membership

- *Former President and Co-founder*, True Insight — Yonsei University
- *Former Member*, Young Engineers Honor Society (YEHS) — National Academy of Engineering Korea

Outreach Activity

- *Ambassador*, eCYBERMISSION — Army Educational Outreach Program