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Engineering & Scientific Consulting

Ronak Mehrabi, Ph.D.

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Professional Profile

Dr. Mehrabi specializes in geotechnical and geo-environmental engineering, rock mechanics, and computational geomechanics. She has experience developing numerical models to assess structural integrity, stability, and failure modes of civil engineering systems. She has been a key technical member of teams working on the analysis and design of several technically challenging tunnels and underground space developments.

Dr. Mehrabi expertise includes the development and application of advanced geotechnical engineering solutions, with a particular focus on computational geomechanics. During her doctoral studies at the State University of New York at Buffalo, she focused on advancing eco-friendly bio-mediated techniques to stabilize the ground, and on geomechanics of coupled processes (biochemical-hydraulic-mechanical-thermal) in porous media. In her research, Dr. Mehrabi leveraged predictive mathematical and numerical models alongside laboratory-scale experiments to gain insights into the mechanism controlling ground improvement processes. She actively participated in various other projects, including the assessment of heated concrete performance and numerical modeling of soil-faulting-tunnel interaction during earthquakes. Dr. Mehrabi also served as a Graduate Instructor or Teaching Assistant for university courses in “Soil Mechanics and Foundation Engineering” and “Soil Mechanics Laboratory” For undergraduate classes.

Prior to joining Exponent, Dr. Mehrabi worked in tunneling analysis and design where she further strengthened her practical knowledge in rock mechanics and geology. Working within multidisciplinary teams on national tunnels and underground space development projects, she honed her abilities in assessing infrastructure failure modes and designing necessary support systems.

Academic Credentials & Professional Honors

Ph.D., Civil Engineering, University at Buffalo, 2021

M.Sc., Geotechnical Engineering, Iran University of Science and Technology, 2015

B.Sc., Civil Engineering, Iran University of Science and Technology, 2012

Academic Appointments

Graduate Research Assistant, Ph.D.; 2016 – 2021; State University of New York at Buffalo, Buffalo, NY.

Graduate Teaching Assistant, Ph.D.; 2018 – 2020; State University of New York at Buffalo, Buffalo, NY.

Prior Experience

Engineering Analyst – Geotechnical, Tunneling & Geology; Jun. 2021 – Dec. 2023; Arup, New York City, NY.

Professional Affiliations

American Society of Civil Engineers (ASCE)

Patents

Environmental Earth Sciences Journal (2024)

ASCE Geo-Congress (2023, 2022)

ARMA (American Rock Mechanics Association) (2022)

Journal of Petroleum Science and Engineering (2022)

Publications

Mehrabi R, Atefi-Monfared K (2023). “Impact of Silt, Kaolinite, and Montmorillonite Particles on Bio-cementation in Sandy Soils”. Canadian Geotechnical Journal, Under review.

Mehrabi R, Atefi-Monfared K (2022). “A Coupled Bio-Chemo-Hydro-Mechanical Model for Bio-cementation in Porous Media”. Canadian Geotechnical Journal 59 (7), 1266-1280.

Mehrabi R, Atefi-Monfared K, Kumar D, Deshpande, A A, Ranade R (2022). “Thermo-mechanical assessment of heated bridge deck under internal cyclic thermal loading from various heating elements: pipe, cable, rebar”. Cold Regions Science and Technology 194, 103466.

Mehrabi R, Baziar MH, Nabizadeh A, Hung WY (2021). “Discrete-Element Modeling of Underground Tunnel Response to Reverse Fault Rupture in Sand”. Proceedings of the Institution of Civil Engineers-Geotechnical Engineering, 1-13.

Baziar MH, Nabizadeh A, Mehrabi R, Lee CJ, Hung WY (2016). “Evaluation of Underground Tunnel Response to Reverse Fault Rupture Using Numerical Approach”. Soil Dynamics and Earthquake Engineering 83, 1-17.

Khan Z, Mehrabi R, Atefi-Monfared K, Cascante G (2022). “Dynamic and Static Characterization of Bio-Cemented Soils ”. 56th US Rock Mechanics/Geomechanics Symposium.

Mehrabi R, Atefi-Monfared K (2019). “Geomechanical Characterization of MICP-Treated Soils”. In proceedings of XVI Panamerican conference on Soil Mechanics and Geotechnical Engineering.

Mehrabi R, Atefi-Monfared K (2018). “Clogging in Reservoirs: Current Gaps, Mitigation Challenges, and Future Priorities”. 52nd US Rock Mechanics/Geomechanics Symposium.

Presentations

Mehrabi R, Atefi-Monfared K (2019). “Geomechanical Characterization of Bio-Cemented Sands Using Continuum-Based Simulation”. Engineering Mechanics Institute Conference.

Project Experience

- For the VTA's BART Silicon Valley Phase II Extension project and the NYC Department of Environmental Protection Kentico-Eastview Connection project, performed analytical and numerical modeling for several technically challenging tunnels and underground space development projects, performed assessment and analysis of geotechnical and geological hazards, prepared design drawings, design calculations, and technical reports).

- Designed foundations, performed soil stability and settlement analysis for deep excavations, analyzed laboratory testing results for geotechnical design parameters, and conducted seismic ground response analysis.
- Performed numerical simulation of soil-tunnel interaction.
- Developed multiphase multispecies coupled predictive models for bio-mediated soil improvement, validated coupled FEM modeling tools, and conducted coupled Hydro-Mechanical and Thermo-Mechanical simulations.
- Designed laboratory-scale experimental setups and experienced working in geotechnical and bio-environmental laboratories