Ph.D. Opportunities: Geomechanics and Geotechnics

Northeastern University
Department of Civil and Environmental Engineering

The research group of **Dr. Enrique M. del Castillo** in the *Department of Civil and Environmental Engineering* at *Northeastern University* is seeking highly motivated Ph.D. students to begin in **Fall 2026**. The students will conduct state-of-the-art research in geomechanics and geotechnics using both computational and experimental techniques. Our philosophy as a lab is to focus on furthering fundamental understanding of the physics governing geomaterial behavior, particularly fracture and friction, as well as on harnessing this knowledge for solving engineering and geophysical challenges. In addition to developing numerical methods, we use simulation and experimentation to probe and improve mechanistic theory, and to create computational digital twins of geomaterials and earth structures.

Research Topics / Positions

- **Position 1:** Continuum, discrete, and data-driven surrogate *meshfree* modeling of granular materials across scales, from initial failure to flow-like behavior. Application to designing resilient infrastructure to protect against large-deformation geohazards.
- **Position 2:** Phase-field and continuum damage modeling of different localized failure modes in porous, fluid-saturated geomaterials. Focus on ice calving in glaciers and ice sheets, hydraulic fracking, and compaction band propagation in geological reservoirs.

About the PI

Dr. Enrique M. del Castillo is set to join Northeastern University as a *tenure-track Assistant Professor* in the Department of Civil and Environmental Engineering starting in July, 2026. Enrique is currently a postdoctoral research associate working with Prof. Liuchi Li in the Department of Civil and Environmental Engineering at Princeton University. Enrique obtained his MS and PhD in Civil Engineering (Geomechanics) at Stanford University, where he was advised by Prof. Ronaldo Borja and received the NSF Graduate Research Fellowship, the Stanford Graduate Fellowship, and the Siebel Scholarship. Prior to his time at Stanford, Enrique completed an AB in Geosciences at Princeton University where he was the recipient of the Arthur F. Buddington Award in Geosciences and the PRISM Best Senior Thesis Award in Material Science and Engineering. Enrique's research focuses on both mechanistic and data-driven computational modeling of faults, fractures, and deformation bands, as well as on the post-failure behavior of geomaterials using meshfree methods, with implications for understanding earthquake-related hazards and improving critical infrastructure resilience.

Dr. del Castillo will be the director of the new *Geotechnical and Sustainable Materials Laboratory* at Northeastern University, which will include modern material testing and geotechnical equipment, as well as high-velocity optical imaging equipment for DIC analysis. Students will have the opportunity to take part in the exciting development of this new experimental laboratory space and make use of its facilities for research. The del Castillo Research Group will also have access to its own exclusive computing nodes on Northeastern's Discovery High Performance Computing Cluster (https://rc.northeastern.edu/).

Preferred Qualifications

- Academic background in Civil Engineering, Geosciences, or a closely related discipline
- Demonstrated research experience in one or more of: soil mechanics, computational solid mechanics, the finite element method, meshfree methods, machine learning
- Strong course work in mechanics and mathematics
- Proficiency in C++ (preferred), or Python, and familiarity with parallel computing
- Excellent written and oral communication skills in English
- A Master's degree is preferred but not required

We Offer

- Full financial support including tuition, stipend, and benefits through fellowships, research assistantships, and teaching assistantships.
- Access to high performance computing resources, and experimental testing facilities
- Professional development opportunities, including travel to conferences, interdisciplinary collaboration, learning through course work, and academic and career advising

About Northeastern University and the Department of Civil and Environmental Engineering

Northeastern University is a *private R1 research university* located in Boston, MA. The Department of Civil and Environmental Engineering is internationally recognized for its excellence in research and education, particularly in civil infrastructure security and sustainable resource engineering. Northeastern is also known for its experiential learning and vibrant connections to industry and government, which prepares students for real world engineering challenges and industry experience as part of the co-op program for graduate students https://coe.northeastern.edu/academics-experiential-learning/. As a PhD student at Northeastern you will be located in Boston with its university-rich ecosystem, walkable neighborhoods, international and global feel, public transport, and high quality of life. The city is also home to large-scale recently-completed (e.g. the *Big Dig*) and still ongoing infrastructure projects.

To Apply

Email **Dr. Enrique M. del Castillo** at emdc@princeton.edu with the subject line: *Ph.D. Application: [Your Last Name].* Include:

1. A brief statement of research interests and career goals
2. CV (with GPAs, TOEFL/IELTS if applicable, and GRE)
3. Contact information for three academic references
4. Academic transcripts

Prospective students are then encouraged to apply to the PhD program in Civil and Environmental Engineering at https://enroll.northeastern.edu/apply/, which has the application deadline of **December 1st, 2025**.