

Utkarsh Mital

(626) 390-8375 | umital@lbl.gov

EDUCATION

- | | |
|---|-------------|
| Ph.D. in Applied Mechanics
California Institute of Technology | 2016 |
| M.S. in Applied Mechanics
California Institute of Technology | 2011 |
| B.Tech. in Civil Engineering
Veermata Jijabai Technological Institute | 2010 |

RESEARCH EXPERIENCE

- | | |
|---|--|
| Geological Project Scientist
Lawrence Berkeley National Laboratory
Supervisor: Dr. Carl Steefel | April 2021 – present
Berkeley, CA |
| <ul style="list-style-type: none">Developing machine learning approaches to integrate data and high-performance watershed-scale models | |
| Postdoctoral Scholar in Energy Geosciences
Lawrence Berkeley National Laboratory
Supervisor: Dr. Carl Steefel | April 2019 – April 2021
Berkeley, CA |
| <ul style="list-style-type: none">Developed a new algorithm to sequentially impute missing values in meteorological datasetsDeveloped a new ML/AI tool to model spatial distribution of mountain snowpackDeveloped a new ML/AI tool to downscale meteorological datasets | |
| Postdoctoral Scholar in Mechanical and Civil Engineering
California Institute of Technology
Advisors: Prof. Domniki Asimaki (07/2016 - 06/2017), Prof. José Andrade (07/2017 – 04/2019) | July 2016 – April 2019
Pasadena, CA |
| <ul style="list-style-type: none">Developed a new ML/AI tool to model macroscopic properties as a function of grain-scale attributes in granular materialsDeveloped a probabilistic model of shear velocity to quantify stiffness of terrain (collaboration with US Geological Survey)Developed a regional map of seismic liquefaction hazard using remotely-sensed hydrological and geological data (collaboration with NASA-JPL)Modeled mechanics of liquefaction in a tailings dam (sponsored by BHP) | |
| Graduate Research Assistant in Applied Mechanics
California Institute of Technology
Advisor: Prof. José Andrade | June 2011 - June 2016
Pasadena, CA |
| <ul style="list-style-type: none">Simulated the mechanics of static soil liquefaction in a triaxial test. Key findings include discovery of a “warning sign” for onset of liquefaction, which can improve modeling failure of artificial slopes | |

- Proposed flow liquefaction as a mechanism for lower end of soil liquefaction charts. This could arm an engineer with predictive power regarding the effects of soil liquefaction in the field
- Modeled the mechanics of shear velocity of soils, to demonstrate correlations between laboratory data and field data. This could enable translating laboratory results to field conditions

HONORS AND AWARDS

- **Second Place**, Computational Mechanics Poster Competition, Engineering Mechanics Institute Conference, Northwestern University, Evanston, IL, 2013
- **Finalist**, Modeling Inelasticity and Multiscale Behavior Student Paper Competition, Engineering Mechanics Institute Conference, Stanford University, Stanford, CA, 2015
- **People's Choice Winner** and **Second Place**, Caltech's Three-Minute-Thesis competition (<https://player.vimeo.com/video/163436530>), 2016
- Paper nominated by ASCE Soil Properties and Modeling Committee for **ASCE Normal Medal** and **Middlebrooks Award**, 2019
- Selected by California Council on Science and Technology to present my research to California policy makers at the **California Science Translators Showcase**, 2019

PUBLICATIONS

Book Chapter

- B1. Andrade, J.E. and **Mital, U.** (2019). Multi-scale and multi-physics modeling of soils. In: Lu, N., Mitchell, J., editors. *Geotechnical Fundamentals for Addressing New World Challenges*. Springer Series in Geomechanics and Geoengineering. https://doi.org/10.1007/978-3-030-06249-1_5

Journal Articles

- J1. **Mital, U.** and Andrade, J.E. (2021). Bridging length scales in granular materials using convolutional neural networks, *Computational Particle Mechanics* (available online). <https://doi.org/10.1007/s40571-021-00405-1>
- J2. **Mital, U.**, Ahdi, S., Herrick, J., Iwahashi, J., Savvaiddis, A., and Yong, A. (2021). A probabilistic framework to model distributions of V_{s30} , *Bulletin of the Seismological Society of America* (available online). <https://doi.org/10.1785/0120200281>
- J3. **Mital, U.**, Dwivedi, D., Brown, J.B., Faybishenko, B., Painter, S.L., and Steefel, C.I. (2020). Sequential imputation of missing spatio-temporal precipitation data using random forests. *Frontiers in Water*, 2(20):1-15. <https://doi.org/10.3389/frwa.2020.00020>
- J4. **Mital, U.**, Kawamoto, R. and Andrade, J.E. (2019). Effect of fabric on shear wave velocity in granular soils. *Acta Geotechnica*, 15:1189-1203. <https://doi.org/10.1007/s11440-019-00766-1>
- J5. **Mital, U.**, Mohammadnejad, T. and Andrade, J.E. (2017) Flow liquefaction instability as a mechanism for lower end of liquefaction charts. *Journal of Geotechnical and Geoenvironmental Engineering*, 143(9):04017065. [https://doi.org/10.1061/\(ASCE\)GT.1943-5606.0001752](https://doi.org/10.1061/(ASCE)GT.1943-5606.0001752)
- J6. **Mital, U.** and Andrade, J.E. (2016). Mechanics of origin of flow liquefaction instability under proportional strain triaxial compression. *Acta Geotechnica*, 11(5):1015-1025. <https://doi.org/10.1007/S11440-015-0430-8>

Journal Articles (in review)

- J7. **Mital, U.**, Dwivedi, D., Özgen-Xian, I., Brown, J.B., and Steefel, C.I. Modeling spatial variability of snow water equivalent by coupling precipitation and temperature with lidar maps, in review.
- J8. Reid, D., Dickinson, S., **Mital, U.**, Fanni, R., and Fourie, A. On some current uncertainties related to static liquefaction triggering assessments, in review
- J9. Dwivedi, D., **Mital, U.**, Faybishenko, B., Dafflon, B., Varadharajan, C., Agarwal, D., Williams, K.H., Steefel, C.I., and Hubbard, S.S. Imputation of missing high-resolution groundwater time series data using machine learning and information theory, in review.

Conference Proceedings (peer-reviewed)

- C1. **Mital, U.**, Rajasekaran, E., Asimaki, D. and Das, N.N. (2018). Investigating the applicability of integrated hydrological modeling for mapping regional liquefaction hazard. In *Proceedings of the 5th Conference of Geotechnical Earthquake Engineering and Soil Dynamics*, Austin, TX. <https://doi.org/10.1061/9780784481462.066>
- C2. **Mital, U.**, Andrade, J.E. and Mohammadnejad, T. (2015). Investigating the mechanical underpinnings of origin of liquefaction in field. In *Proceedings of the 6th International Conference on Earthquake Geotechnical Engineering*, Christchurch, New Zealand. https://secure.tcc.co.nz/ei/images/ICEGE15%20Papers/Mital%20231.00_.pdf

Conference Proceedings (not peer-reviewed)

- C3. Andrade, J.E., **Mital, U.** and Mohammadnejad, T. (2013). Micromechanical origin of static and dynamic liquefaction in granular soils. In *Proceedings of the Fifth Biot Conference on Poromechanics*, pp. 527-532, ASCE. <https://doi.org/10.1061/9780784412992.062>
- C4. Andrade, J.E., Vlahinic, I., Lim, K.-W. and **Mital, U.** (2012). Two-scale characterization and modeling of porous continua from discrete mechanics. In *46th US Rock Mechanics/Geomechanics Symposium*. American Rock Mechanics Association. <https://onepetro.org/conference-paper/ARMA-2012-322>

INVITED TALKS

1. Bridging length scales in granular systems using machine learning. **NERSC Data Seminar Series**, Lawrence Berkeley National Laboratory, March 29, 2019
2. Towards remote sensing data and hydrological modeling for mapping regional liquefaction hazard, **Earth and Environmental Sciences Seminar**, Lawrence Berkeley National Laboratory, March 29, 2019
3. Improving regional liquefaction hazard maps using hydrological remote sensing data: A proof of concept study at Imperial County. Invited presentation at **Seismological Society of America Annual Meeting**, Denver, CO, April 18-20, 2017
4. Mechanics of origin of liquefaction instability. Invited presentation at **5th Annual Caltech Solid Mechanics Symposium**, Pasadena, CA, January 24, 2014

PROFESSIONAL AFFILIATIONS (Past and present)

- American Geophysical Union
- American Society of Civil Engineers
- Engineering Mechanics Institute
- Seismological Society of America
- Australasian Institute of Mining and Metallurgy

SCHOLARLY SERVICE

- Reviewed >15 papers for a variety of international journals: Journal of Geotechnical and Geoenvironmental Engineering, Soil Dynamics and Earthquake Engineering, International Journal for Numerical Methods in Engineering, International Journal of Solids and Structures, Computers and Geotechnics, Computer Methods in Applied Mechanics and Engineering, Transport in Porous Media
- Primary Convener, Application of Artificial Intelligence/Machine Learning to Enhance Process Understanding of Pristine and Agriculture-Intensive Watersheds, AGU Fall Meeting, 2019
- Convener, Advancing Process-Based and Data-Driven Modeling for River Corridor and Watershed Systems, AGU Fall Meeting, 2020

EXTRA-CURRICULAR UNIVERSITY SERVICE

- Career Chair of Caltech Postdoctoral Association, 2017-2019
- Orientation leader for International Student Orientation at Caltech, 2013-2016
- Acted/volunteered in various Caltech Theater Productions, 2013-2017
- Webmaster of Extracurricular Players at Caltech, 2014-16
- President of Organization of Associated Students of Indian Subcontinent at Caltech, 2011-12

TEACHING EXPERIENCE

Teaching Assistant

California Institute of Technology

- Mechanics and Rheology of Porous Media
- Mechanics
- Statics and Dynamics

Pasadena, CA

Winter 2016
Spring 2015
Winter 2012

MEDIA COVERAGE

- <http://www.caltech.edu/news/three-minute-thesis-competition-50557>
- <http://www.mce.caltech.edu/news/844>
- <https://ccst.us/ccsts-science-translators-showcase-to-connect-california-early-career-scientists-with-members-staff/>
- <https://www.pasadenaweekly.com/2018/03/29/when-fiction-passes-as-truth-caltech-helps-the-public-see-the-difference-at-science-for-march-saturday/>

SKILLS

- **Languages:** C/C++, Python, Matlab, Mathematica
- **Engineering/Software packages:** QGIS, Keras, Pytorch, OpenMP
- **Publishing Tools:** LaTeX, EazyDraw, Jupyter notebooks

REFERENCES

1. Carl Steefel
Senior Scientist
Head, Geochemistry Department
Energy Geosciences Division
Lawrence Berkeley National Laboratory
CISTeefel@lbl.gov
(510) 486-7311
2. Dipankar Dwivedi
Earth Research Scientist
Energy Geosciences Division
Lawrence Berkeley National Laboratory
ddwivedi@lbl.gov
(510) 486-4005
3. José Andrade
George W. Housner Professor of Civil and Mechanical Engineering
California Institute of Technology
jandrade@caltech.edu
(626) 395-4141
4. Domniki Asimaki
Professor of Mechanical and Civil Engineering
California Institute of Technology
domniki@caltech.edu
(626) 395-4271
5. Alan Yong
Research Geophysicist
U.S. Geological Survey
yong@usgs.gov
(626) 583-7816