Zhengshou Lai

*Curriculum Vitae*

Postdoc researcher, Geomechanics  
School of Intelligent Systems Engineering  
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# Education

* 2015 – 2018, **Ph.D.**, Civil Engineering, Clemson University  
  Dissertation: *Discrete element modeling of the grading- and shape- dependent behavior of granular materials*
* 2012 – 2014, **Ph.D. candidate**, Engineering Mechanics, Sun Yat-sen University
* 2008 – 2012, **B.Sc.**, Civil Transportation Engineering, Sun Yat-sen University

# Research Interests

1. Grading- and shape-dependent discrete element modeling of granular materials
2. Material microscopic morphology and structure characterization with computed tomography
3. Computational hydromechanics of porous materials (with dynamics, random field, uncertainty)
4. Numerical bifurcation analysis of material instability

# Professional Experience

2018-present, Assistant Professor, STEM Education  
University of Tennessee, Knoxville

2012-2018, Graduate Research and Teaching Assistant  
Michigan State University

# Publications

## Journal Articles

1. **Lai, Z.**, Xia, Y., Huang, H., Westover, T., Klinger, J., & Chen, Q. (2019). Investigation and characterization of the particle deformability effects on granular hopper flow based on DEM simulations. In review.
2. **Lai, Z.**, Chen, Q., & Huang, L. (2019). Fourier series-based discrete element method for computational mechanics of irregular-shaped particles. In revision.
3. Xia, Y., **Lai, Z.**, Westover, T., Klinger, J., Huang, H., & Chen, Q. (2019). Discrete element modeling of deformable pinewood chips in cyclic loading test. *Powder Technology*, 345, 1-14.
4. **Lai, Z.** & Chen, Q. Reconstructing granular particles from X-ray computed tomography using the TWS machine learning tool and the level set method. *Acta Geotechnica*, 14(1), 1-18.
5. **Lai, Z.**, Chen, Q., Wang, C., & Zhou, X. (2019). Modeling dynamic responses of heterogeneous seabed with embedded pipeline through multiresolution random field and coupled hydromechanical simulations. *Ocean Engineering*, 173, 556-570.
6. Chen, Q. & **Lai, Z.** (2018). Hydromechanical modeling of CO2 sequestration using a component-based multiphysics code. *Environmental Geotechnics*. 1-17.
7. Liang, Y., Zhang, J., **Lai, Z.**, Huang, Q., & Huang, L. (2017). Temporal and spatial distribution of the grout pressure and its effects on lining segments during synchronous grouting in shield tunnelling. *European Journal of Environmental and Civil Engineering*, 1-18.
8. **Lai, Z.** & Chen, Q. (2017). Characterization and discrete element simulation of grading and shape-dependent behavior of JSC-1A Martian regolith simulant. Granular Matter, 19(4), 69.
9. **Lai, Z.** & Chen, Q. (2017). Particle swarm optimization for numerical bifurcation analysis in computational inelasticity. *International Journal for Numerical and Analytical Methods in Geomechanics*, 41(3), 442–468.
10. Mota, A., Chen, Q., Foulk, J., Ostien, J., & **Lai, Z.** (2016). A Cartesian parametrization for the numerical analysis of material instability. *International Journal for Numerical Methods in Engineering*, 108(2), 156–180.

## Conference Proceedings

1. Chen, Q., **Lai, Z.**, Moysey, S., & Shen, M. (2018). Image-based shape characterization and three-dimensional discrete element modeling of a granular Martian regolith simulant. In *GeoShanghai International Conference 2018*. Shanghai, China.
2. Chen, Q., Wang, C., **Lai, Z.**, & Juang, C. (2018). Integration of heterogeneous data for multiscale regional liquefaction settlement mapping. In *Proceedings of the Geotechnical Earthquake Engineering and Soil Dynamics V 2018*. Austin, Texas, USA.
3. Gleaton, J., Xiao, R., **Lai, Z.**, McDaniel, N., Johnstone, C.A., Burden, B., Chen, Q., & Zheng, Y. (2018). Biocementation of Martian Regolith with In-Situ Resources. In *2018 ASCE Earth and Space Conference*. Cleveland, Ohio, USA.
4. **Lai, Z.** & Chen, Q. (2018). Discrete element modeling of Martian regolith simulants accounting for realistic particle shapes and particle size distributions. In *2018 ASCE Earth and Space Conference*. Cleveland, Ohio, USA.
5. Shukla, S., Agnihotri1, S., **Lai, Z.**, Kousaalya, A., Pilla, S., & Chen, Q. (2018). Creation and characterization of regolith-based functional blocks with simulated in-situ Martian materials. In *2018 ASCE Earth and Space Conference*. Cleveland, Ohio, USA.

# Presentations and Posters

1. **Lai, Z.**, Xia, Y., Huang, H., Westover, T., & Chen, Q. (2018, August). Numerical characterization of biomass flowability in biorefinery. *INL’s Annual intern expo & poster session*, Idaho Falls, ID, USA.
2. **Lai, Z.** & Chen, Q. (2018, May). Fourier series-based discrete element method for computational mechanics of irregular particles. *Engineering Mechanics Institute Conference 2018*, Cambridge, Massachusetts, USA.
3. **Lai, Z.** (2018, February). From X-ray CT images to numerical models: capturing the grading and shape- dependent behavior of granular materials. Graduate Student Research seminar, Clemson University, SC, USA.
4. Chen, Q. & **Lai, Z.** (2017, May). Martian soil simulants – Mechanical properties and feasibility as building blocks. *Clemson University Research Symposium: Moving Clemson Forward Through Research*, Clemson University, SC, USA.
5. **Lai, Z.** & Chen, Q. (2016, May). Numerical bifurcation analysis of an anisotropic fuel cladding damage model. *The Joint 2016 Engineering Mechanics Institute Conference and the Probabilistic Mechanics & Reliability Conference*, Nashville, TN, USA.