

Contact

“100-Talents Program” Professor, Department of Civil Engineering
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Education

PhD 2009.09~2014.08 Department of Civil and Environmental Engineering
The Hong Kong University of Science and Technology, Hong Kong

BEng 2005.09~2009.07 Department of Hydraulic Engineering
Tsinghua University, Beijing, China

Employment

2018.06~present **“100-Talents Program” Professor**, Department of Civil Engineering
Zhejiang University, Hangzhou, China

2016.09~2018.05 **Assistant Professor**, Department of Civil and Environmental Engineering
Carleton University, Ottawa, Canada

2015.01~2016.09 **Post-doctoral Fellow**, Department of Civil and Environmental Engineering
The Hong Kong University of Science and Technology, Hong Kong

2014.09~2015.01 **Lecturer**, Department of Civil and Environmental Engineering
The Hong Kong University of Science and Technology, Hong Kong

Selected Awards

2018	Outstanding Paper Award	Computers and Geotechnics, Elsevier
2017	Thousand Young Talents Plan	Central Government of China
2013	SENG PhD Fellowship	School of Engineering, HKUST
2012	JASSO Scholarship	Japan Student Services Organization, Japan
2010	AGS Scholarship	Association of Geotechnical & Geoenvironmental Specialists, HK

Projects and Grants

2019.01~2021.12 (Principal Investigator) National Natural Science Foundation of China (Grant No. 51809229): Micromechanics study of sand dynamics considering particle shape effect and multiscale modeling of seismic response, CNY 270,000.

2017.04~2023.03 (Principal Investigator) Natural Sciences and Engineering Research Council of Canada (Grant No. RGPIN-2017-06322): Multiscale modelling of hydro-mechanical processes in geomaterials with evolving weak/strong discontinuities, CAD 130,000.

2017.01~2020.12 (Co-Investigator) National Natural Science Foundation of China (Grant No. 51679207):

Multiscale modelling of granular sand considering particle morphology and pore water pressure, CNY 630,000.

2016.01~2018.12

(Co-Investigator) National Natural Science Foundation of China (Grant No. 51509041): Experimental study and constitutive modelling of monotonic and cyclic behaviour of unsaturated loess at different temperatures, CNY 234,000.

Teaching Courses

ECOR 1101 <i>Mechanics I</i>	Undergraduate	Carleton
CIVE 3208 <i>Geotechnical Mechanics</i>	Undergraduate	Carleton
CIVE 4918 <i>Design Project</i>	Undergraduate	Carleton
CIVE 5800 <i>Computational Geomechanics</i>	Graduate	Carleton
CIVL 4750 <i>Numerical Solutions to Geotechnical Problems</i>	Undergraduate	HKUST

Journal Papers

1. Wu, H., Zhao, J. & Guo, N. (2018). Multiscale insights into borehole instabilities in high-porosity sandstones. *Journal of Geophysical Research: Solid Earth* 123(5): 3450–3473.
DOI: [10.1029/2017JB015366](https://doi.org/10.1029/2017JB015366)
2. Wu, H., Guo, N. & Zhao, J. (2018). Multiscale modeling and analysis of compaction bands in high-porosity sandstones. *Acta Geotechnica* 13(3): 575–599.
DOI: [10.1007/s11440-017-0560-2](https://doi.org/10.1007/s11440-017-0560-2)
3. Guo, N. & Zhao, J. (2016). Parallel hierarchical multiscale modelling of hydro-mechanical problems for saturated granular soils. *Computer Methods in Applied Mechanics and Engineering* 305: 37–61.
DOI: [10.1016/j.cma.2016.03.004](https://doi.org/10.1016/j.cma.2016.03.004)
4. Guo, N. & Zhao, J. (2016). 3D multiscale modeling of strain localization in granular media. *Computers and Geotechnics* 80, 360–372.
DOI: [10.1016/j.compgeo.2016.01.020](https://doi.org/10.1016/j.compgeo.2016.01.020)
5. Guo, N., Zhao, J. & Sun, W. C. (2016). Multiscale analysis of shear failure of thick-walled hollow cylinder in dry sand. *Géotechnique Letters* 6(1): 77–82.
DOI: [10.1680/jgele.15.00149](https://doi.org/10.1680/jgele.15.00149)
6. Guo, N. & Zhao, J. (2016). Multiscale insights into classical geomechanics problems. *International Journal for Numerical and Analytical Methods in Geomechanics* 40(3): 367–390.
DOI: [10.1002/nag.2406](https://doi.org/10.1002/nag.2406)
7. Zhao, J. & Guo, N. (2015). The interplay between anisotropy and strain localisation in granular soils: a multiscale insight. *Géotechnique* 65(8): 642–656.
DOI: [10.1680/geot.14.P.184](https://doi.org/10.1680/geot.14.P.184)
8. Guo, N. & Zhao, J. (2014). A coupled FEM/DEM approach for hierarchical multiscale modelling of granular media. *International Journal for Numerical Methods in Engineering* 99(11): 789–818. (**Featured by Most Cited Papers published in IJNME 2014-2015**)
DOI: [10.1002/nme.4702](https://doi.org/10.1002/nme.4702)
9. Guo, N. & Zhao, J. (2014). Local fluctuations and spatial correlations in granular flows under constant-volume quasistatic shear. *Physical Review E* 89: 042208. (**Featured by PRE Kaleidoscope**)
DOI: [10.1103/PhysRevE.89.042208](https://doi.org/10.1103/PhysRevE.89.042208)
10. Zhao, J. & Guo, N. (2014). Rotational resistance and shear-induced anisotropy in granular media. *Acta Mechanica Sinica* 27(1): 1–14.

DOI: [10.1016/S0894-9166\(14\)60012-4](https://doi.org/10.1016/S0894-9166(14)60012-4)

11. Zhao, J. & Guo, N. (2013). Unique critical state characteristics in granular media considering fabric anisotropy. *Géotechnique* 63(8): 695–704.
DOI: [10.1680/geot.12.P.040](https://doi.org/10.1680/geot.12.P.040)
12. Guo, N. & Zhao, J. (2013). The signature of shear-induced anisotropy in granular media. *Computers and Geotechnics* 47: 1–15. (*Outstanding Paper Award-winning paper*)
DOI: [10.1016/j.compgeo.2012.07.002](https://doi.org/10.1016/j.compgeo.2012.07.002)

Book Chapters

1. Wu, H., Guo, N. & Zhao, J. (2017). Borehole instabilities in granular rocks revisited: A multiscale perspective. In E. Papamichos et al. (Eds.) *Bifurcation and Degradation of Geomaterials with Engineering Applications*. Springer, Cham. pp. 433–439.
DOI: [10.1007/978-3-319-56397-8_54](https://doi.org/10.1007/978-3-319-56397-8_54)
2. Cheng, H., Yamamoto, H., Guo, N. & Huang, H. (2017). A simple multiscale model for granular soils with geosynthetic inclusion. *Proceedings of the 7th International Conference on Discrete Element Methods. Volume 188 of the series Springer Proceedings in Physics*. Springer, Germany. pp. 445–453.
DOI: [10.1007/978-981-10-1926-5_47](https://doi.org/10.1007/978-981-10-1926-5_47)
3. Guo, N. & Zhao, J. (2015). A multiscale investigation of strain localization in cohesionless sand. In K.T. Chau and J.D. Zhao (Eds.) *Bifurcation and Degradation of Geomaterials in the New Millennium. Springer Series in Geomechanics and Geoengineering*. Springer, Germany. pp. 121–126.
DOI: [10.1007/978-3-319-13506-9_18](https://doi.org/10.1007/978-3-319-13506-9_18)
4. Zhao, J. & Guo, N. (2015). Bridging the micro and macro for granular media: A computational multi-scale paradigm. In K. Soga et al. (Eds.) *Geomechanics from Micro to Macro*. CRC Press, Taylor & Francis, London. Vol. 1, pp. 747–752.
DOI: [10.1201/b17395-134](https://doi.org/10.1201/b17395-134)
5. Zhao, J., Guo, N. & Li, X.S. (2013). Unique quantification of critical state in granular media considering fabric anisotropy. In Q. Yang, J.M. Zhang, H. Zheng & Y.P. Yao (Eds.) *Constitutive Modeling of Geomaterials: Advances and New Application. Springer Series in Geomechanics and Geoengineering*. Springer Berlin Heidelberg. pp. 247–252.
DOI: [10.1007/978-3-642-32814-5_31](https://doi.org/10.1007/978-3-642-32814-5_31)
6. Zhao, J. & Guo, N. (2011). Signature of anisotropy in liquefiable sand under undrained shear. In S. Bonelli, C. Dascalu and F. Nicot (Eds.) *Advances in Bifurcation and Degradation in Geomaterials. Springer Series in Geomechanics and Geoengineering*. Springer, Germany. Vol. 11, pp. 45–51.
DOI: [10.1007/978-94-007-1421-2_6](https://doi.org/10.1007/978-94-007-1421-2_6)
7. Guo, N. & Zhao, J. (2011). Bimodal character of induced anisotropy in granular materials under undrained shear. In M.J. Jiang and M. Bolton (Eds.) *Geomechanics and Geotechnics from Micro to Macro*. CRC Press, Taylor & Francis, London. Vol. 1, pp. 513–517.
DOI: [10.1201/b10528-83](https://doi.org/10.1201/b10528-83)

Conference Papers

1. Guo, N. & Zhao, J. (2018). Multiscale modeling of wave propagation in granular soils and seismic ground response analysis. *Engineering Mechanics Institute Conference (EMI 2018)*, 29 May–1 Jun 2018, Cambridge, MA, USA.
2. Zhao, J., Wu, H. & Guo, N. (2017). Pattern transitions between compaction band and shear band in

- high-porosity sandstone: a computational multiscale study. *Engineering Mechanics Institute Conference (EMI 2017)*, 4–7 Jun 2017, San Diego, CA, USA.
3. Zhao, J. & Guo, N. (2016). Multiscale hydro-mechanical modeling of saturated granular media. *The 7th International Conference on Discrete Element Methods*. 1–4 Aug 2016, Dalian, China.
 4. Zhao, J., Wu, H. & Guo, N. (2016). The evolving nature of compaction bands in highly porous sandstone: a multiscale view. *WCCM XII & APCOM VI*. 24–29 Jul 2016, Seoul, Korea.
 5. Zhao, J. & Guo, N. (2016). Alternative pathway to granular plasticity via computational multiscale modeling. *Plasticity 2016*. 3–9 Jan 2016, Hawaii, USA.
 6. Wu, H., Zhao, J. & Guo, N. (2015). Multiscale modeling of compaction band in highly porous sandstone. *The First International Conference on Geo-Energy and Geo-Environment*. 4–5 Dec 2015, Hong Kong.
 7. Wu, H., Zhao, J. & Guo, N. (2015). Multiscale modelling of compaction bands in highly porous sandstone. *The Twenty-Eight KKHTCNN Symposium on Civil Engineering*. 16–18 Nov 2015, Bangkok, Thailand.
 8. Zhao, J., Guo, N. & Sun, W. (2015). A multiscale study of inherent anisotropy and strain localization in granular soils. *Japanese Geotechnical Society Special Publication*, Vol. 2, No. 16, pp. 615–620.
DOI: [10.3208/jgssp.TC105-02](https://doi.org/10.3208/jgssp.TC105-02)
 9. Guo, N. & Zhao, J. (2015). Hierarchical multiscale modeling of fluid-saturated soils. *Japanese Geotechnical Society Special Publication*, Vol. 2, No. 17, pp. 649–653.
DOI: [10.3208/jgssp.TC105-08](https://doi.org/10.3208/jgssp.TC105-08)
 10. Zhao, J. & Guo, N. (2015). Multiscale modelling of initial anisotropy, fabric evolution and strain localization in granular media. *The 4th International Conference on Particle-based Methods*. 28–30 Sep 2015, Barcelona, Spain.
 11. Guo, N. & Zhao, J. (2015). 3D hierarchical multiscale modeling (HMM) of strain localization in granular media. *Engineering Mechanics Institute Conference (EMI 2015)*. 16–19 Jun 2015, Stanford, USA.
 12. Guo, N. & Zhao, J. (2015). Multiscale modeling of failure in saturated sand. *Proceedings of the 19th Annual Conference of HKSTAM and the 11th Jiangsu–Hong Kong Forum on Mechanics and Its Application*. 28 Mar 2015, Hong Kong.
 13. Wu, H., Guo, N. & Zhao, J. (2015). Multiscale modeling of compaction band in porous sandstone. *Proceedings of the 19th Annual Conference of HKSTAM and the 11th Jiangsu–Hong Kong Forum on Mechanics and Its Application*. 28 Mar 2015, Hong Kong.
 14. Zhao, J. & Guo, N. (2015). Capturing the interplay among inherent anisotropy, non-coaxiality and strain localization in granular media. *EMI 2015 International: Engineering Mechanical Institute (ASCE) 2015 International Conference*. 7–9 Jan 2015, Hong Kong.
 15. Guo, N. & Zhao, J. (2014). Multiscale modeling of strain localization in granular media. *Conference of Computational Mechanics of Granular Materials (CMGM-2014)*. 22–24 Aug 2014, Lanzhou, Gansu, China.
 16. Zhao, J. & Guo, N. (2014). A multiscale insight into strain localization in sand. *2015 Engineering Mechanics Institute Conference (EMI 2014)*. 5–8 Aug 2014, Hamilton, Ontario, Canada.
 17. Zhao, J. & Guo, N. (2014). A hierarchical multiscale approach for granular media. *11th World Congress on Computational Mechanics (WCCM XI) in conjunction with 5th European Conference on Computational Mechanics (ECCM V) and 6th European Conference on Computational Fluid Dynamics (ECFD VI)*. 20–25 July 2014, Barcelona, Spain.
 18. Guo, N. & Zhao, J. (2013). A hierarchical model for cross-scale simulation of granular media. *AIP Conference Proceedings*. Vol. 1542, pp. 1222–1225.
DOI: [10.1063/1.4812158](https://doi.org/10.1063/1.4812158)
 19. Zhao, J. & Guo, N. (2013). A new definition on critical state of granular media accounting for fabric anisotropy. *AIP Conference Proceedings*. Vol. 1542, pp. 229–232.

DOI: [10.1063/1.4811909](https://doi.org/10.1063/1.4811909)

20. Zhao, J. & Guo, N. (2012). A micromechanical study on the shear strength in granular materials: the role of particle shape. *The 23rd International Congress of Theoretical and Applied Mechanics (ICTAM2012)*. 19–24 Aug 2012, Beijing, China.
21. Guo, N., Thay, S., Pipatpongsa, T., Takahashi, A. & Zhao, J. (2012). A physical model of pressure profile beneath a planar sand valley. *Proceedings of the 4th Multidisciplinary International Student Workshop*. 9 Aug 2012, Tokyo, Japan.
22. Zhao, J. & Guo, N. (2011). Characteristics of shear-induced anisotropy in granular media. *11th U.S. National Congress on Computational Mechanics (USNCCM-11)*, 25–28 Jul 2011, Minneapolis, Minnesota, USA.
23. Zhao, J. & Guo, N. (2011). The role of anisotropy in characterizing the states of liquefaction, phase transformation and critical state in granular media. *The 15th Annual Conference of Hong Kong Society of Theoretical and Applied Mechanics*, 11–12 Mar 2011, Hong Kong and Macau.
24. Zhao, J. & Guo, N. (2011). Evolution of shear-induced anisotropy in granular materials. *The 7th National Youth Conference on Geotechnical Engineering*, 15–18 April 2011, Beijing, China.
25. Zhao, J. & Guo, N. (2010). Strength anisotropy in granular materials. *4th Japan–China Geotechnical Symposium*, 12–14 April 2010, Okinawa, Japan.

Manual

1. V. Šmilauer et al. (2015). Using and programming. In *Yade Documentation*, 2nd ed. The Yade Project.

Invited Review

Funding Agencies

Czech Science Foundation ([Czech Republic](#))

Chilean National Science and Technology Commission ([Republic of Chile](#))

Journals

Canadian Geotechnical Journal ([NRC](#))

Computers and Geotechnics ([ELSEVIER](#))

Engineering Computations ([EMERALD](#))

Granular Matter ([SPRINGER](#))

Indian Geotechnical Journal ([SPRINGER](#))

International Journal for Numerical Methods in Engineering ([WILEY](#))

Journal of Applied Mathematics ([HINDAWI](#))

Journal of Engineering Mechanics ([ASCE](#))

Journal of Rock Mechanics and Geotechnical Engineering ([ELSEVIER](#))

Journal of the Mechanics and Physics of Solids ([ELSEVIER](#))

Soils and Foundations ([ELSEVIER](#))

Tunnelling and Underground Space Technology ([ELSEVIER](#))

Conferences

10th International Workshop on Bifurcation and Degradation in Geomaterials ([IWBDG](#))

GeoShanghai International Conference 2018

Thesis Examination Committee

PhD Thesis Exam Mohammad Al-Umar, Civil, University of Ottawa, Dec 2017
MASc Thesis Exam Thavakumaran Shanmugarajah, Civil, Carleton University, Aug 2017
 Gabrielle Marcotte, Civil, Carleton University, Jan 2018
PhD Qualifying Exam Mohammad Al-Umar, Civil, University of Ottawa, Apr 2017
 Muhammad Asif Salam, Civil, Carleton University, Feb 2017

Supervision

PhD Thesis Premnath Selvarajah, Carleton University, Sep 2017~present
MEng Project Ryan Brault, Civil, Carleton University, Sep 2017

Conference Organization

Session Chair 70th Canadian Geotechnical Conference (GeoOttawa 2017)

Professional Membership

Member Canadian Geotechnical Society, 2017~present
Member International Society of Soil Mechanics and Geotechnical Engineering, 2015~present
Member Hong Kong Geotechnical Society, 2015~present