

Hongyang Cheng | Ph.D.

Multi-Scale Mechanics, Faculty of Engineering Technology
MESA+, University of Twente
P.O. Box 217, 7500 AE Enschede, The Netherlands
☎ +31 687 880 043 • ✉ h.cheng@utwente.nl

Research Interests

- **Predictive computational science** for granular mechanics across scales: Bayesian calibration, model selection and uncertainty propagation between micro-, macro- and multi-scale simulations of granular materials
- **Multi-physics (not yet multi-scale)** modeling of granular materials, including wave propagation in (saturated) granular media and selective laser sintering/melting of powders
- **Multi-scale** modeling of complex granular mixtures, e.g., geosynthetic-reinforced soils, using coupled FEM-DEM
- Microscopically-informed/motivated **constitutive modeling** of complex granular mixtures
- Machine learning-based **image processing** for 3D morphological characterization of granular materials

Education

- **Hiroshima University, Japan** **Ph.D.**
2013–2016
Graduate School for International Development and Cooperation
Thesis: Multiscale characterization of geotextile-reinforced granular soil
- **Hiroshima University, Japan** **M.Eng.**
2011–2013
Graduate School for International Development and Cooperation
Thesis: Seismic response of buildings with soilbag-reinforced foundations
- **Shenyang Jianzhu Univeristy, China** **B.Eng.**
2007–2011
School of Civil Engineering
Thesis: An experimental study of the settlement behaviors of composite foundations with different pile length configurations

Employment

- **Hiroshima University, Japan** 2013.10–2016.9
Graduate School for International Development and Cooperation
Research assistant
- **University of Twente, The Netherlands** 2016.11–present
Multi Scale Mechanics, Faculty of Engineering Technology
Postdoctoral researcher

Selected Award

- Japanese Government (Monbukagakusho: MEXT) Scholarship, 2011, 10
- Best student paper award at the 7th International Conference on Discrete Element Methods, 2016, 08
- Top 5 downloaded article of *Granular Matter* during 2018, 2019, 04

Programing Skills and Softwares

Operating system:	Linux (Ubuntu)
Programming languages:	C++, Python, Fortran, L ^A T _E X, Matlab
Open-source software development:	MercuryDPM (DEM), Oomph-lib (FEM), YADE (DEM), LB3D (LBM)
Machine learning packages:	Scikit learn, Keras/TensorFlow
Post-processing package:	Paraview, Blender

Languages

Chinese: Mother English: Fluent (IELTS: 7.5)
Japanese: Advanced Dutch: Beginner (A1)

Collaborations

Dr. Thomas Weinhart

Assistant Professor, Multi-Scale Mechanics, University of Twente, the Netherlands 2019–present
Virtual Prototyping of Particulate Processes – design and optimization via multiscale modeling and rapid prototyping

Prof. Jens Harting

Professor, Helmholtz Institute Erlangen-Nürnberg for Renewable Energy, Germany 2017–present
LBM-DEM modeling of elastic wave propagation in saturated granular media

Prof. Stefan Luding

Professor, Multi-Scale Mechanics, University of Twente, the Netherlands 2016–present

Dr. Vanessa Magnanimo

Associate Professor, Multi-Scale Mechanics, University of Twente, the Netherlands 2016–present
Direct numerical modeling of elastic wave propagation in dry and saturated granular soils

Dr. Pamela Tempone

Geomechanics Specialist, ENI Exploration & Production, Milano, Lombardy, Italy 2016–2018
Bayesian calibration, machine learning-based image analysis, wave propagation in granular media

Prof. Ning Guo

Professor, Zhejiang University, China 2016–present
Concurrent multiscale modeling of granular soils with geosynthetic inclusions

Dr. Takayuki Shuku

Associate Professor, Okayama University, Japan 2015–present
Bayesian uncertainty quantification for discrete element simulations

Dr. Klaus Thoeni

Research Associate, University of Newcastle, Australia 2014–present
Discrete element modeling of deformable wires, fibers and geotextiles

Prof. Haruyuki Yamamoto

Professor, Hiroshima University, Japan 2013–2016
Multiscale modeling and characterization of geosynthetic-reinforced granular soils

Dr. Yang Wu

Associate Professor, Guangzhou University, China 2013–2015
Particle crushing in granular materials

Journal Papers (* corresponding author)

1. Cheng, H.*, Guo, N., Thoeni, K. & Yamamoto, H. (2019). A coupled FEM/DEM approach for integrated hierarchical-concurrent multiscale modeling of soil-geosynthetic interaction. *Computers and Geotechnics*. (in preparation)
2. Cheng, H.*, Shuku, T., Thoeni, K., Tempone, P., Luding, S. & Magnanimo, V. (2018). An iterative Bayesian filtering framework for fast and automated calibration of DEM models. *Computer Methods in Applied Mechanics and Engineering*. 350: 268-294.
3. Cheng, H.*, Luding, S., Rivas, N., Harting, J. & Magnanimo, V. (2019). Hydro-micromechanical modeling of wave propagation in saturated granular crystals. *International Journal for Numerical and Analytical Methods in Geomechanics*. 43(5): 1115–1139.
4. Cheng, H.*, Luding, S., Saitoh, K. & Magnanimo, V. (2019). Elastic wave propagation in dry granular media: effects of probing characteristics and stress history. *International Journal of Solids and Structures*. (in print)
5. Cheng, H.*, Shuku, T., Thoeni, K. & Yamamoto, H. (2018). Probabilistic calibration of discrete element simulations using the sequential quasi-Monte Carlo filter. *Granular Matter* 20(1): 11.
6. Cheng, H.*, Yamamoto, H., Thoeni, K. & Wu, Y. (2017). An analytical solution for geotextile-wrapped soil based on insights from DEM analysis. *Geotextiles and Geomembranes*. 45(4):361–376.
7. Cheng, H.*, Yamamoto, H. & Thoeni, K. (2016). Numerical study on stress states and fabric anisotropies in soilbags using the DEM. *Computers and Geotechnics* 76: 170–183.

Refereed Conference Proceedings

1. **Cheng, H.**, Shuku, T., Thoeni, K., Tempone, P., Luding, S. & Magnanimo, V. (2018). Grain learning: Bayesian calibration of DEM models and validation against elastic wave propagation. In *China Europe Conference on Geotechnical Engineering*: 132-135. Vienna, Austria.
2. **Cheng, H.**, Shuku, T., Thoeni, K., Tempone, P., Luding, S. & Magnanimo, V. (2018). An iterative sequential Monte Carlo filter for Bayesian calibration of DEM models. In *9th European Conference on Numerical Methods in Geotechnical Engineering*: 381–389. Porto, Portugal.
3. **Cheng, H.**, Luding, S., Rivas, N., Harting, J. & Magnanimo, V. (2018). Coupled subpore-scale hydro-mechanical modeling of wave propagation in saturated granular media. In *micro to MACRO mathematical modelling in soil mechanics*. Reggio Calabria, Italy.
4. **Cheng, H.**, Shuku, T., Thoeni, K. & Yamamoto, H. (2017). Calibration of micromechanical parameters for DEM simulations by using the particle filter. In *EPJ Web of Conferences*: 140 12011. Montpellier, France.
5. **Cheng, H.**, Pellegrino, A. & Magnanimo, V. (2017). Bayesian calibration of microCT-based DEM simulations for predicting the effective elastic response of granular materials. In *PARTICLE-BASED METHODS V Fundamentals and Applications*. Hanover, Germany.
6. **Cheng, H.**, Yamamoto, H., Guo, N. & Huang, H. (2016). A simple multiscale model for granular soils with geosynthetic inclusion. In *Proceedings of 7th International Conference on Discrete Element Methods (DEM7)*: 445–453. Dalian, China.
7. **Cheng, H.*** & Yamamoto, H. (2016). Evaluating the performance of geotextile wrapped/layered soil: a comparative study using the DEM. *Geo-China 2016: Geosynthetic Civil Infrastructure, Disaster Monitoring, and Environmental Geotechnics*: 122–130.
8. **Cheng, H.*** & Yamamoto, H. (2016). Modeling microscopic behavior of geotextile-wrapped soil by discrete element method. *Japanese Geotechnical Society Special Publication 2(65)*: 2215–2220.
9. **Cheng, H.** & Yamamoto, H. (2015). Discrete modeling of geotextile-wrapped soil under simple shear. In *PARTICLE-BASED METHODS IV Fundamentals and Applications*: 485–496. Barcelona, Spain.
10. **Cheng, H.***, Yamamoto, H., Jin, S. & Okano, S. (2013). Soil reinforcement using soilbags — A preliminary study on its static and dynamic properties. *Geotechnics for Sustainable Development*: 569–578.
11. Yamamoto, H. & **Cheng, H.** (2012). Development study on device to reduce seismic response by using soil-bags assemblies. In *Research, Development and Practice in Structural Engineering and Construction*: 597–602. Perth, Australia.

Non-refereed papers & presentations

1. **Cheng, H.**, Shuku, T., Thoeni, K., Weinhart, T., & Luding, S. (2019). GrainLearning: an efficient Bayesian uncertainty quantification framework for discrete element simulations of granular materials. In *8th International Conference on Discrete Element Methods (DEM8)*.
2. **Cheng, H.**, Luding, S., Harting, J., & Magnanimo, V. (2019). Direct simulation of wave propagation in fully saturated granular packings using. In *8th International Conference on Discrete Element Methods (DEM8)*.
3. Alvarez, J.E. **Cheng, H.**, Thornton, A.R., & Weinhart, T. (2019). Virtual Prototyping of Particulate Processes - Multiscale simulations of the Selective Laser Sintering process. In *8th International Conference on Discrete Element Methods (DEM8)*.
4. **Cheng, H.**, Shuku, T., Thoeni, K., Tempone, P., Luding, S. & Magnanimo, V. (2018). A Bayesian calibration toolbox for YADE. In *2nd Yet Another Discrete Element Workshop – Discrete-based modeling of multi-scale coupled problems*: 59–60. Aix-en-Provence, France.
5. **Cheng, H.**, Luding, S. & Magnanimo, V. (2017). Fast and automated uncertainty quantification for DEM simulations of dense granular media. In *Twentieth Engineering Mechanics Symposium*: 28–29. Arnhem, the Netherlands.
6. **Cheng, H.**, Guo, N. & Yamamoto, H. (2017). Multiscale modeling of large deformation in geosynthetic-reinforced granular soils. In *ALERT Geomaterials Workshop 2017*. Aussois, France.
7. **Cheng, H.**, Shuku, T. & Yamamoto, H. (2016). Parameter identification for DEM models of cohesionless granular soil using the particle filter. In *Proceedings of 51th Japanese Geotechnical Engineering Society Annual Meeting*. Okayama, Japan.
8. **Cheng, H.** & Yamamoto, H. (2016). A multiscale approach for modeling soil-geosynthetic interaction. In *Proceedings of Annual Research Meeting Chugoku Chapter, Architectural Institute of Japan*, 39: 365–368.

9. **Cheng, H.** & Yamamoto, H. (2014). Hysteretic behaviors of soil-bag layer under irregular cyclic shear. In *Proceedings of Annual Research Meeting Chugoku Chapter, Architectural Institute of Japan*, 37: 61–64.
10. **Cheng, H.** & Yamamoto, H. (2013). Dynamic analysis of base isolation with soilbags. In *Proceedings of Annual Research Meeting Chugoku Chapter, Architectural Institute of Japan*, 36: 183–186.

Invited Talks

1. **Cheng, H.** (2018). Discrete element method for modeling wave propagation in dry and saturated granular media. *Department of Earth Sciences, University of Pisa*. Pisa, Italy. (Invited seminar)
2. **Cheng, H.** (2018). Uncertainty quantification and propagation for multi-scale models of geomaterials: an iterative Bayesian approach. *Recent Developments of Discrete Particle Simulation for Geotechnical Engineering*. Tokyo, Japan. (Seminar invited by the Japanese Geotechnical Society)

Peer Review

Invited peer reviews for Web of Science indexed journals, including *International Journal for Numerical and Analytical Methods in Geomechanics*, *Geosynthetic International*, *International Journal of Solids and Structures*, *Journal of Fluid Mechanics*, *Granular Matter*, etc., can be found on publons.

Conference/Journal Organizer

- Session chair:** Mini-symposium “Open-source development” at the 8th International Conference on Discrete Element Methods
- Journal organizer:** Special issue of *Computers and Geotechnics* journal