Saurabh Singh

Contact Information

Department of Civil Engineering
Indian Institute of Science
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Research Interests

Experimental soil mechanics, constitutive modelling, micro-mechanical studies on granular materials, image analysis, and numerical methods in geomechanics.

Education

Indian Institute of Science, Bangalore, India

Ph.D., (Geotechnical Engineering), July 2020

- Dissertation: "Weakly cemented granular materials: study at multiple length scales"

Indian Institute of Science, Bangalore, India

M.E., (Civil Engineering - Geotechnical Engineering), June 2014

- Dissertation: "Evolution of deformation fields in 1-g model footings"

Harcourt Butler Technological Institute, Kanpur, India

B.E., (Civil Engineering), May 2012

- Dissertation: "Analysis and design of high rise buildings"

Honors and Awards

- International Society for Soil Mechanics and Geotechnical Engineering (**ISSMGE**) Foundation Award, 2016
- **NS Lakshmana Rao Gold Medal** in Department of Civil Engineering, IISc, 2014

Academic Experience

Indian Institute of Science, Bangalore, India
Postdoc Researcher

- Analysis of natural soil built structures **August 2020 - February 2021**

Georgia Institute of Technology, Atlanta, U.S.A
Visiting Scholar Dr. Christopher J. Saldana's lab

- Micro-mechanical studies on cemented granular materials using X-ray computed tomography and image processing for quantification of fabric **June 2017 - September 2017**

Indian Institute of Science, India
Teaching Assistant

- Graduate level course - Basic Geomechanics **Fall 2015, 2016, 2018**
- Finite element analysis (centre for continuing education - CCE) **Jan 2017**

- Geomechanics (CCE) **May 2018**

Instructor

- Getting started with Matlab for new graduate students **August 2016**

Experimental Skills

- Soil characterization test – sieve analysis, hydrometer test, consistency limits
- Elemental laboratory test – direct shear, triaxial compression, hollow cylinder torsional shear
- Physical model test – model footing, cutting of granular media
- X-ray computed tomography – volume scanning

Programming and computational background

- Numerical integration of constitutive models
- Image based deformation analysis
- Three dimensional image visualization and processing
- Languages – MATLAB, FORTRAN, PYTHON, C, C++, LaTeX
- Softwares – ABAQUS, PLAXIS, AutoCAD

Journal Publications

Singh S., Kandasami R.K., and Murthy T.G., (2017) "Prediction of mechanical response of geomaterials using an advanced elasto-plastic constitutive model", *Procedia Engineering*, Elsevier, Vol. 173, pp. 793–799.

Singh S., Miers J.C., Saldana C.J., and Murthy T.G., (2020) "Quantification of fabric in cemented granular materials", *Computers and Geotechnics*, Vol. 125, p. 103644

Zachariah N., **Singh S.**, Murthy T.G., and Borges R.M., (2020) "Bi-layered architecture facilitates high strength and ventilation in nest mounds of fungus-farming termites", *Sci Rep*, Nature, Vol. 10, article number 13157.

Kandasami R. K., **Singh S.**, and Murthy T. G., (2020) "Experimental Investigations of the Stress Path Dependence of Weakly Cemented Sand", *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, Vol. 147, Issue 4 (April 2021).

Singh S., Kandasami R.K., Murthy T.G., and Coop M.R., "On the stress transformation and stress-dilatancy of weakly cemented sands", (In review).

Beleyur T., Uma D., **Singh S.**, Somanathan H., and Murthy T.G., "The architecture, dynamics, and silk investment in social spider, Stegodyphus sarasinorum", (In review).

Singh S. and Murthy T.G., "Evolution of structure of cohesive granular ensemble in compression",

(In review).

Pandey K., Masood T.B., **Singh S.**, Hotz I., Natarajan V., Murthy T.G., "An understanding of fabric of cemented sands based on Morse theory", (In review).

Conference Proceedings

Yadav S., **Singh S.**, Kandasami R. K., Murthy T. G., and Saldana C., (2014) "Experimental studies on the cutting of granular materials", *Geomechanics from Micro to Macro*, Taylor & Francis Group, London, Vol. 2, pp. 1209–1212, ISBN 978-1-138-02707-7.

Singh S., Kandasami R.K., and Murthy T.G., (2017) "Mechanics and modeling of cohesive frictional granular materials. In: Ferrari A., Laloui L. (eds) *Advances in Laboratory Testing and Modelling of Soils and Shales (ATMSS). ATMSS 2017.* Springer Series in Geomechanics and Geoengineering. Springer, Cham.

Singh S., Miers J.C., Saldana C.J., and Murthy T. G., (2018) "Experiments show a second length scale in weakly cohered granular materials", *In micro to MACRO Mathematical Modelling in Soil Mechanics*, (pp. 319-326). Birkhäuser, Cham.

International conferences

Singh S., Kandasami R.K., Mahendran R.K., and Murthy T.G., (2017) "System size effects on the mechanical response of cohesive-frictional granular ensembles", *EPJ Web of Conferences*, EDP Sciences, Vol. 140, pp. 08007.

Singh S., Miers J.C., Saldana C.J., and Murthy T. G., (2018) "Structure of cohesive frictional granular materials", *10th European Solid Mechanics Conference*, Bologna, Italy.

Singh S., Miers J.C., Saldana C.J., and Murthy T. G., (2018) "Measurement of fabric in cohesive frictional granular materials using computed tomography", *IS Atlanta*, Atlanta, United States.

Singh S., Hegde A., and Murthy T. G., (2018) "On the depositional fabric of granular ensembles", *International Union of Theoretical and Applied Mechanics, IIT Kanpur*, Kanpur, India.

Hegde A., **Singh S.**, and Murthy T. G., (2019) "Random packings – insight from micro-computed tomography and contact dynamics", *Engineering Mechanics Institute Conference, CalTech*, Pasadena, California, United States.

Singh S. and Murthy T. G., (2019) "Weakly cemented sands: understanding at multiple length scales ", *7th International Congress on Computational Mechanics and Simulation, IIT Mandi*, Mandi, India.

National conferences

Singh S., Yadav S., and Murthy T.G., (Dec 2014) "Deformation fields in 1-g model tests of footing on granular ensemble", *Indian Geotechnical Conference*, JNTU Kakinada, India.

Kandasami R. K., **Singh S.**, and Murthy T. G., (Dec 2016) "Calibration and validation of Lade's constitutive model for weakly cemented sands", *Indian Geotechnical Conference*, IIT Madras, India.

Bhat M., **Singh S.**, and Murthy T.G., (July 2019) "Statistical study on spatial randomness of cemented granular particles", *Indian Conference on Applied Mechanics*, IISc Bangalore, India.