

Mandeep Singh Basson

DEPARTMENT OF CIVIL ENGINEERING, UNIVERSITY OF CALIFORNIA, DAVIS

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Education

Ph.D. in Geotechnical Engineering

UNIVERSITY OF CALIFORNIA, DAVIS

Davis
Expected June 2023

DAAD Research Fellow

TECHNICAL UNIVERSITY OF MUNICH

Munich
Sep, 2017 - Apr, 2018

Masters in Geotechnical and Geoenvironmental Engineering

INDIAN INSTITUTE OF TECHNOLOGY, DELHI

New Delhi
July, 2016 - July, 2018

Bachelors in Civil Engineering

THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY

Patiala
June, 2011- June, 2015

Research Experience

Doctoral Research: Soil Fabric and Well-Graded Soils

PRIMARY ADVISOR: PROF. ALEJANDRO MARTINEZ

CO-ADVISORS: PROF. JASON T. DEJONG, PROF. KATERINA ZIOTOPOULOU

UC Davis
Sep 2018 - Present

- *Experimental and numerical quantification of soil fabric*
Developed a multi-orientation bender element system and conducted experiments to assess the stiffness anisotropy of sand specimens. Performed discrete element modeling (DEM) simulations to link the anisotropy of the state of stresses and fabric to the specimens' stiffness anisotropy
- *Framework to relate soil stiffness to soil fabric and stress state*
Developed a framework that provides a non-destructive and cost-efficient method to identify soil fabric and stress anisotropy in a specimen. Explored the applicability of this framework to the results from field testing. multi-orientation bender element system and conducted experiments to assess the stiffness anisotropy of sand specimens. Performed discrete element modeling (DEM) simulations to link the anisotropy of the state of stresses and fabric to the specimens' stiffness anisotropy
- *Effect of gradation on the monotonic shear strength and stress-dilatancy of coarse-grained soils.*
Performed DEM investigation consisting of drained and undrained triaxial simulations to study the influence of soil gradation on the monotonic response of soils. The obtained results emphasize that current frameworks based on poorly graded sands may underestimate strength parameters and that considering gradation effects can lead to increased efficiency of geosystems.
- *Effect of gradation on the cyclic strength of coarse-grained soils.*
Currently modeling the cyclic behavior of well-graded soils using DEM to study the effect of gradation on soil liquefaction. These results would highlight the changes in liquefaction resistance, the buildup of pore pressures, and overall deformations with changes in particle gradation.

Doctoral Research: BioGeotechnics

ADVISOR: PROF. ALEJANDRO MARTINEZ

CO-ADVISOR: PROF. JASON T. DEJONG

UC Davis
Sep 2020 - Present

- *Characterization of bio-inspired interfaces*
Co-developed the QuSTo (Quantification of Surface Topology) application to quantify the surface topology of biological surfaces for reconstruction for engineering applications.
- *Bio-mediated ground improvement*
Currently performing DEM investigation to study micro-scale cementation mechanisms to study the increase in shear strength and liquefaction resistance of microbial-induced calcite precipitation.

DAAD Research Fellow

ADVISORS: PROF. ROBERTO CUDMANI, PROF. G V RAMANA

TUM, Munich
Sep 2017 - Apr 2018

- Evaluated the stress-strain-volume change behavior of Karlsruhe sand under monotonic loading using DEM, and compared DEM results with results obtained for hypoplastic constitutive law.

Graduate Research Assistant

ADVISOR: PROF. G V RAMANA, PROF. AYOTHIRAMAN RAMANATHAN

IIT Delhi
July 2016 – July 2017

- Performed forensic analysis to estimate the undrained shear strength under a failed approach embankment.
- Performed laboratory testing to determine the extent and damage of shrinkage cracks for expansive clays by image processing techniques.

Undergraduate Research Assistant

ADVISOR: PROF. VIKAS PRATAP SINGH, PROF. SHWETA GOYAL

TIET, Patiala
Jan 2015 – July 2015

- Performed slope stability analysis to study the effect of level of saturation on the slope stability of slopes.
- Performed field trials to study the effect of steam curing on the strength of concrete

Teaching Experience

Instructor of Record: ECI 175 Geotechnical Earthquake Engineering

FACULTY ADVISOR: PROF. JASON T. DEJONG

UC Davis
Fall 2022

Currently teaching the *Geotechnical Earthquake Engineering* course to a class of 50 students composed of senior undergraduates and incoming graduate students. Preparing and delivering weekly lectures on ground motions, GMPEs, PSHA, fundamental soil mechanics, and liquefaction analysis. Creating weekly assignments and quizzes and holding office hours. Motivating students regarding prospects, including opportunities in industry and graduate school.

Teaching Assistant: ECI 3 Introduction to Civil Engineering

(Outstanding Graduate Teaching Award Winner)

COURSE PROFESSOR: PROF. KATERINA ZIOTOPOULOU

UC Davis
Fall 2021

Created an *Introduction to Geotechnical Engineering* module, along with accompanying interactive lab sessions, to introduce the unique behaviors of soils originating from their granular nature and the effects of earthquakes on civil infrastructure for a class of 120 students. Prepared for and taught lab sessions, held office hours and assisted the course professor in grading lab reports and course assignments.

Teaching Assistant, ENG 171L Soil Mechanics Laboratory

COURSE PROFESSOR: PROF. ALEJANDRO MARTINEZ

UC Davis
Spring 2021

Prepared and taught lab sessions, held weekly office hours, and graded lab reports for over 15 students. Updated the content for particle shape analysis and seepage labs. All teaching was remotely administered.

Instructor, Python Programming Short Course

MENTOR: PROF. KATERINA ZIOTOPOULOU

UC Davis
2019-2022

Created and delivered a python programming short course for over 40 graduate and post-doctorate researchers in the civil and environmental engineering department. The workshop contents range from introduction to programming to engineering data analysis and post-processing using python. Advocated the use of open-source alternatives to engineering tools.

Teaching Assistant, ENG 104L Mechanics of Materials Laboratory

COURSE PROFESSOR: PROF. AMIT KANVINDE, PROF. JOHN BOLANDER

UC Davis
Spring 2018, Winter 2019

Taught lab sessions, held weekly office hours, and graded lab reports for over 45 students. Developed interactive activities to introduce the concept of pressure vessels and the state of stresses. Introduced risk-based analysis of failure modes using thought experiments.

Teaching Assistant, CVL 222 Introduction to Soil Mechanics

COURSE PROFESSOR: PROF. GV RAMANA

IIT Delhi
Spring 2017

Held weekly office hours and led midterm and final review sessions for a class of over 60 students. Assisted in the preparation and administration of student labs.

Mentor, Summer Research Fellowship Interns

ADVISOR: PROF. GV RAMANA

IIT Delhi
Summer 2017

Mentored seven summer research interns for a multitude of projects in geotechnical, structure, and transportation engineering. Conducted bi-weekly one-on-one sessions to check on updates and provide research plans.

Instructor for Geometry

GROUP: NATIONAL SERVICE SCHEME

IIT Delhi
Summer 2017

Taught Geometry to a group of 30 high school students, primarily from the 8th grade. Created interactive sessions to introduce concepts of perimeter and area.

Consulting Experience

I worked part-time as a consultant on industry projects assigned to IIT-Delhi.

Polavaram Project, State of Andhra Pradesh, India

MENTOR: DR. G V RAMANA

IIT Delhi
Jan 2017 - Dec 2018

Performed two-dimensional seepage and stress-deformation analysis for a plastic cutoff wall under a concrete face rockfill dam (CFRD) using the GeoStudio analysis package. Participated in meeting with government officials to discuss analysis results and provided design recommendations.

Kandla Port, State of Gujarat, India

MENTOR: DR. G V RAMANA

IIT Delhi
Jan 2017 - June 2017

Performed liquefaction and slope stability analysis for the design of rail track connectivity to a port of national importance, using StoneC and RocScience analysis packages. Designed stone columns for ground improvement for liquefaction-prone sections. Submitted report with analysis results and design recommendations.

Farakka Thermal Power Plant, State of West Bengal, India

MENTOR: DR. MANOJ DATTA, DR. G V RAMANA

IIT Delhi
Jan 2018 - May 2018

Performed three-dimensional seepage analysis to evaluate the feasibility of dewatering a section of the plant which was submerged due to seepage from a nearby canal. Submitted report with design recommendation on dewatering pump and hourly pump schedule.

Ghazipur Landfill Landslide, State of Delhi, India

MENTOR: DR. MANOJ DATTA, DR. G V RAMANA

IIT Delhi
June 2018 - August 2018

Performed forensic slope stability analysis to evaluate the material properties and pore pressures during landfill landslides after prolonged rainfall. Submitted report and sat on the committee regarding rehabilitation efforts for the area affected by the landslide.

Awards and Fellowships

2022	Outstanding Graduate Teaching Award (Campus-Wide) , Graduate Studies	UC Davis
2022	Best Teaching Assistant Award , College of Engineering	UC Davis
2022	Geosyntec Fellowship , Department of Civil Engineering	UC Davis
2022	Graduate Student Travel Award , ICSMGE 2022	UC Davis
2022	CEE Travel Fellowship , Department of Civil Engineering	UC Davis
2021	Fugro West Graduate Scholarship , Department of Civil Engineering	UC Davis
2021	Nominated for Excellence in Graduate Student Diversity, Equity, and Inclusion , College of Engineering	UC Davis
2018 -	Graduate Student Researcher Fellowship , Department of Civil Engineering	UC Davis
2020	Graduate Student Association Travel Award , GeoCongress 2020	UC Davis
2017-2018	Deutscher Akademischer Austauschdienst Master Sandwich Program , DAAD IIT-MSP	TUM
2016-2018	Ministry of Human Resource Development (MHRD) Scholarship ,	IIT-Delhi

Publications

JOURNAL PUBLICATIONS

Basson, M.S., Martinez, A. *A multi-orientation system for determining angular distributions of shear wave velocity in soil specimens*, Accepted for publication by Geotechnical Testing Journal.

Basson, M.S., Martinez, A. *Numerical and experimental estimation of fabric in granular soils using multi-orientation shear wave velocity measurements.*, Submitted to Granular Matter.

Martinez, A., Nguyen, D., **Basson, M.S.**, Medina, J., Irschick, D.J., Baeckens, S., (2021) *Quantifying surface topography of biological systems from 3D scans.*, Methods in Ecology and Evolution 12(7), 1265–1276.

Basson, M.S., Ayothiraman, R. (2020) *Effect of human hair fiber reinforcement on shrinkage cracking potential of expansive clay.*, Bulletin of Engineering Geology and the Environment, 79, 2159–2168.

Mishra, M., **Basson, M.S.**, Ramana, G.V. et al. (2020) *Ant colony optimization for slope stability analysis applied to an embankment failure in eastern India.*, Geo-Engineering 11, 3.

Basson, M.S., Martinez, A., DeJong J.T. *Effect of particle size distribution and contact parameters on the inter-particle stress transmission in a soil specimen.*, In Preparation.

Basson, M.S., Martinez, A., DeJong J.T. *Effect of particle size distribution on monotonic shear strength and stress-dilatancy of coarse-grained soils.*, In Preparation.

Basson, M.S., Martinez, A., DeJong J.T. *Evaluation of liquefaction potential of well-graded coarse-grained soils using DEM simulations.*, In Preparation.

BOOK CHAPTERS

Basson, M.S. Cudmani R., Ramana G.V. (2020) *Evaluation of Macroscopic Soil Model Parameters Using the Discrete Element Method.* In: Prashant A., Sachan A., Desai C. (eds) *Advances in Computer Methods and Geomechanics. Lecture Notes in Civil Engineering*, vol 55. Springer, Singapore.

Basson, M.S., Venkataraman R., Ramana G.V. (2020) *Comparison of Slope Stability Using Smoothed Particle Hydrodynamics, Finite Element Method, and Limit Equilibrium Method.* In Latha Gali M., P. R.R. (eds) *Geotechnical Characterization and Modelling. Lecture Notes in Civil Engineering*, vol 85. Springer, Singapore.

CONFERENCE PAPERS

Basson, M.S., Martinez, A., DeJong J.T. (2023) *Effect of particle size distribution on monotonic shear strength and stress-dilatancy of coarse-grained soils* Abstract accepted for GeoCongress 2023, Los Angeles.

Basson, M.S., Martinez, A. (2022) *Experimental and numerical assessment of fabric anisotropy using multi-orientation shear wave velocity measurements.* In Proceedings of 20th ICSMGE 2022, Sydney, Australia.

Basson, M.S., Miller, J., Martinez, A. (2020) *Experimental estimation of fabric in granular materials using shear wave velocity measurements* In Proceedings of 7ICRAGEE 2020, IISc Bangalore, India.

Basson, M.S., Martinez, A. (2020) *A DEM Study of the Evolution of Fabric of Coarse-Grained Materials during Oedometric and Isotropic Compression.* In Geo-Congress 2020, Minneapolis, Minnesota: American Society of Civil Engineers, 2020, 473–81.

Humire, F., Ziotopoulou, K., **Basson, M.S.**, Martinez, A. (2019). *Framework for tracking the accumulation of shear strains during cyclic mobility.* In Earthquake Geotechnical Engineering for Protection and Development of Environment and Constructions- Proceedings of the 7th International Conference on Earthquake Geotechnical Engineering, 2019.

Basson, M.S., Singh, V. P. (2015). *Active Seismic Earth Pressure due to Unsaturated Backfill.* In Proceeding of Indian Geotechnical Conference, 2015, College of Engineering Pune, India, SubNo 112.

Basson, M.S., Goyal, Shweta (2015). *Effect of Steam Curing on Precast Segments used as Tunnel Lining for Tunnel Bored by Shield TBM.* In Proceeding of UKIERI Concrete Congress, 2015, N.I.T Jalandhar, India pp.493-504.

Basson, M.S., Singh, V. P. (2014). *Influence of Matric Suction on Short Term Stability Analysis of Unsaturated Slopes* In Proceeding of International Conference on Sustainable Civil Infrastructure (ICSCI), 2014, Hyderabad, India pp.437-442.

Presentations

ORAL PRESENTATIONS

Basson, M.S. (2022) *Understanding granular fabric: measurements, interpretation and effects.* Lunchtime Talk, Geotechnical Graduate Student Society (GGSS) Lecture Series, UC Davis, November 2022.

Basson, M.S., Martinez, A. (2022) *Experimental and numerical assessment of fabric anisotropy using multi-orientation shear wave velocity measurements.*, Virtual Presentation, 20th ICSMGE 2022, Sydney, Australia, May 2022.

Basson, M.S. (2021) *Understanding granular fabric: measurements and interpretation* Invited Talk, Geotechnical Graduate Student Society (GGSS) Seminar Series, UC Davis, October 2021.

Basson, M.S., Martinez, A. (2020) *A DEM Study of the Evolution of Fabric of Coarse-Grained Materials during Oedometric and Isotropic Compression.* Geo-Congress 2020, Minneapolis, Minnesota, March 2020.

Basson, M.S. (2020) *Experimental and Numerical quantification of Fabric.* Lunchtime Talk, Geotechnical Graduate Student Society (GGSS) Institute, UC Davis, January 2020.

Basson, M.S., Singh, V. P. (2015). *Active Seismic Earth Pressure due to Unsaturated Backfill.* Indian Geotechnical Conference, 2015, College of Engineering Pune, India.

Basson, M.S., Goyal, Shweta (2015). *Effect of Steam Curing on Precast Segments used as Tunnel Lining for Tunnel Bored by Shield TBM.* UKIERI Concrete Congress, 2015, N.I.T Jalandhar, India.

Basson, M.S., Singh, V. P. (2014). *Influence of Matric Suction on Short Term Stability Analysis of Unsaturated Slopes* International Conference on Sustainable Civil Infrastructure (ICSCI), 2014, Hyderabad, India.

POSTER PRESENTATIONS

- Basson, M.S.** (2021) *Understanding granular fabric: experimental and numerical measurements with interpretation* Round Table Poster, Geotechnical Graduate Student Society (GGSS), UC Davis, March 2021.
- Basson, M.S.**, Martinez, A. (2020) *A DEM Study of the Evolution of Fabric of Coarse-Grained Materials during Oedometric and Isotropic Compression*. Geo-Congress 2020, Minneapolis, Minnesota, March 2020.
- Basson, M.S.** (2020) *Experimental estimation of fabric in granular materials using multi- Vs measurements* Round Table Poster, Geotechnical Graduate Student Society (GGSS), UC Davis, April 2020.
- Basson, M.S.** (2019) *Micro-mechanics and Fabric Evolution of Sands during Monotonic and Cyclic Loading* Round Table Poster, Geotechnical Graduate Student Society (GGSS), UC Davis, March 2020.

Mentoring

2021-2022	Riya Anilkumar , Ph.D. student, <i>GGSS mentorship program</i>	UC Davis
2020-2021	Irene Liou , Masters student, <i>GGSS mentorship program</i>	UC Davis
2020-2021	Damon Nguyen , Bachelors student, <i>Python code for surface topology quantification</i>	UC Davis
2020-2021	Kody Vandervort , Bachelors student, <i>Atterberg limits for Fly Ash</i> .	UC Davis
Sum. 2019	Jasmine Miller , Bachelors student, <i>Fabric evolution in granular soils</i>	UC Davis
Sum. 2018	Ramesh Venkataraman , Bachelors student, <i>Slope Stability analysis using SPH</i>	IIT Delhi
Sum. 2017	Parminder Singh Padam , Bachelors student, <i>Macroscopic properties of aggregates</i>	IIT Delhi

Service

2022-2023	Member , Graduate Program Committee, Department of Civil Engineering	UC Davis
2020-2022	Fellow , Global Education for All (GE4A)	UC Davis
2020-2021	Outreach Coordinator , Geotechnical Graduate Student Society (GGSS)	UC Davis
2019-2020	Field Trip Coordinator , Geotechnical Graduate Student Society (GGSS)	UC Davis
2019-2021	Webmaster , Geotechnical Graduate Student Society (GGSS)	UC Davis
2020-	Member , Black, Indigenous and People Of Color (BIPOC) society	UC Davis
2018-2020	Member , Academic Senate Committee for Distinguished Teaching Award	UC Davis
2018-now	Department Representation Member , Graduate Student Association	UC Davis
2018-2019	Member , Teaching Assistant Well Being Program	UC Davis
2016-2018	Member , National Service Scheme	IIT Delhi

Certification and Affiliations

Engineer-in-Training (EIT) License, California, No. 175556
 Member, American Society of Civil Engineers (ASCE)
 Lifetime Member, Indian Geotechnical Society (IGS)

References

Alejandro Martinez

Associate Professor, Department of Civil and Environmental Engineering
 University of California Davis
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