

SANKHANEEL SINHA

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EDUCATION

- Ph.D. Geological Engineering** August 2020
Colorado School of Mines (CSM), Golden, CO, USA
- M.S. Mining Engineering** August 2016
Southern Illinois University, Carbondale (SIUC), Illinois, USA
- B.Eng. Mining Engineering** May 2014
Indian Institute of Engineering, Science and Technology (IIST), Shibpur, India

ACADEMIC RESEARCH EXPERIENCE

- Post-Doctoral Researcher, Geological Engineering, CSM, USA** 2020-2022
- Large-scale compression tests on coal and limestone blocks of different aspect ratio with and without supports to explicitly capture the rock-support interaction (analysis using 3D Digital Image Correlation).
 - Rock characterization using conventional compression tests and investigating scale-effect using data from the large-scale compression tests.
 - Grain-based discrete element modeling of coal pillars and analyzing the effect of rockbolts on rib behavior.
- Graduate Research Assistant, Geological Engineering, CSM, USA** 2016-2020
Advancing continuum and discontinuum models of brittle rock damage and rock-support interaction
- Development of a rock constitutive model that is based on the local damage processes
 - Analysis of pillar behavior using new rock constitutive model in FLAC^{3D} and discrete element method
 - Simulation of rock-support interaction using grain-based models (UDEC)
 - Analysis of data obtained from compression tests and simulations of rock fracturing in laboratory-scale specimens using grain-based UDEC models
 - Instrumentation of a coal mine and numerical back-analysis using the field data for improving the understanding of rib failure mechanisms and develop approaches to minimize them
 - Analysis of stress cell data from a longwall mine in New Mexico and comparison to empirical relationships
- Graduate Research Assistant, Mining Engineering, SIUC, USA** 2014-2016
Analyses for design and support of coal mine intersections
- Analyze stress and displacement fields around a coal mine intersection using linear and non-linear numerical modeling (FLAC^{3D}) techniques
 - Analyze currently used and alternate roof support plans (with primary and secondary supports) to minimize the instabilities around intersections
 - Statistical analysis of Short Encapsulation Pull Test data obtained from a bolt manufacturer in Illinois
 - Monitoring roof movements at bolt head over time at a coal mine intersection using total station.

PROFESSIONAL EXPERIENCE

- Assistant Professor (Grade I), IIT Kharagpur, India.** 2024-present
- Tenured track faculty position in the Department of Mining Engineering.
- Rock Mechanics Engineer, Equilibrium Mining, Kolkata, West Bengal, India** 2023-2024
- Structural design of openpit and underground mining infrastructures.
 - Tasks involve structural data analysis, DFN characterization, kinematic assessment, automation using Python scripts, developing and running mine-scale FLAC3D and RS2 models.
- Geotechnical Engineer, WSP (Golder), Phoenix, Arizona, USA** 2022-2023
- Structural design of openpit and underground mining infrastructures.
 - Tasks involve structural data analysis, DFN characterization, kinematic assessment, automation using Python scripts, developing and running mine-scale and local excavation-scale FLAC3D models.
- Adjunct Faculty, Geological Engineering, CSM, USA** 2021-2022
- Teaching two graduate level courses titled 'GEGN 563: Applied Numerical Modeling for Geomechanics'

and 'GEGN 561: Underground Construction Engineering – Laboratory 1' at Colorado School of Mines

- GEGN 563 is intended to expose students to a wide array of numerical modelling tools and focuses on the applications and limitations of numerical models in problems related to geomechanics.
- GEGN 561 (1) provides hands on experience with characterizing rockmass using rock mass classification schemes at an outcrop within CSM campus and, (2) introduces the concepts of numerical models and its application in studying stress redistribution due to creation of single and multiple excavations.

AIM PhD Fellow (Intern), Freeport-McMoRan, Oro Valley, Phenix, USA

2018-2018

- Analysis of pit slope angles using LiDAR scans in MAPTEK
- Conduct experiments by rolling rocks down a pit and using the data for rockfall analysis in RAMMS.

TECHNICAL SKILLS AND STRENGTHS

- **Rock Characterization:** Conventional laboratory tests and data analysis, Digital Image Correlation
- **Programming Languages, Software and Simulation Tools:** Python, MATLAB, Rocscience software suite, FLAC3D, UDEC, MAPTEK Vulcan & Pointmodeller, Machine Learning certification.
- **Communication:** Experience with formal presentations and public speaking, ability to work in teams and research groups; technical writing in journal papers, proposals and reports
- **Teaching and Supervision:** Laboratory and classroom teaching; supervision of graduate students.

SELECTED PUBLICATIONS

- **Sinha S**, Masoumi H and Walton G. Conceptual frameworks to explain reverse size effect in intact rocks considering end and annulus damage. *International Journal of Geomechanics*. 2024; R1 submitted.
- Chaurasia A, Walton G, **Sinha S**, Batchler TJ, Moore K, Vlachopoulos N, Forbes B. Large-scale laboratory investigation of pillar-support interaction. *Journal of Rock Mechanics and Geotechnical Engineering*. 2024. In Press.
- **Sinha S**, Walton G and Shirole D. Assessment of ground-support interaction using continuum grain-based RS2 models. Proceedings of the *58th US Rock Mechanics/Geomechanics Symposium*, Golden CO. 2024.
- West I, Walton G, **Sinha S**. Evaluating the accuracy of bonded block models for prediction of rockmass analog mechanical behavior. *Materials*. 2023; 17(1):88.
- Contreras Inga CE, **Sinha S**, Walton G, Holley E. Modeling Brazilian tensile strength tests on a brittle rock using deterministic, semi-deterministic, and Voronoi bonded block models. *Rock Mechanics and Rock Engineering*. 2023; 56: 5293-5313.
- **Sinha S** and Walton G. Application of an integrated 3D–2D modeling approach for pillar support design in a Western US Underground coal mine. *Geosciences*. 2023; 13(11):333.
- **Sinha S**, Walton G, Chaurasia A, Diederichs M, Batchler T. Evaluating size effects for a porous, weak, homogeneous limestone. *Rock Mechanics and Rock Engineering*. 2023; 56(5):3755-72.
- Walton G, **Sinha S**. Challenges associated with numerical back analysis in rock mechanics. *Journal of Rock Mechanics and Geotechnical Engineering*. 2022; 14(6):2058-71.
- Other publications can be found at scholar.google.com/citations?user=-G5k63kAAAAJ&hl=en&oi=ao

HIGHLIGHTED AWARDS AND SCHOLARSHIP

- Recipient, Syd S. and Felicia F. Peng Ground Control in Mining scholarship, Society for Mining, Metallurgy & Exploration (SME). 2019.
- Recipient, Best Graduate Poster Award, GRADS Symposium at Colorado School of Mines. (2019)
- Recipient, Best Graduate Poster Award, GE Research Fair at Colorado School of Mines. (2017)
- Recipient, Poate's Fellowship, Colorado School of Mines. (2016-2017)
- Recipient, Master's Fellowship, SIUC. (2015-2016)
- Recipient, Institute Silver Medal at IEST for graduating first in class of Mining Engineering. (2014)
- Recipient, S. Lal Award for Mining Engineering, Mining, Geological and Metallurgical Institute of India (MGMI). 2014.

PROFESSIONAL ORGANIZATIONS

- American Rock Mechanics Association (ARMA)
- International Society of Rock Mechanics (ISRM)
- Society for Mining, Metallurgy & Exploration (SME)