Dr. Sudhir Kumar Singh

Assistant Professor - IIT(ISM) Dhanbad

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Profile Summary

- Accomplished in advanced data analytics and machine learning, adept at spearheading complex geotechnical research projects with significant improvements in prediction accuracy and process efficiency.
- Combines a rich academic background with practical industry experience, excelling in applying theoretical insights to real-world challenges.
- Passionate about innovative research in Geotechnical engineering, specializing in the application of novel technologies for advanced infrastructure monitoring and analysis.

Education

Indian Institute of Technology Kharagpur, India **2019 - 2024**
Ph.D. | Application of Machine Learning in Geotechnical Engineering
CGPA - 8.67

Indian Institute of Technology Kharagpur, India **2013 - 2017**
B. Tech. | Mining Engineering
CGPA - 8.09

Sunbeam English School, India **2012**
Senior Secondary School Examination
Aggregate Percentage - 95.4 %

Sunbeam English School, India **2010**
Secondary School Examination
CGPA - 9.8

Work Experience

Assistant Professor **2026 - Present**
IIT (ISM) Dhanbad Jharkhand, India

- **Assistant Professor, Department of Mining Engineering** — Conducting research at the intersection of artificial intelligence and geotechnical engineering, with a focus on slope stability prediction, mine automation, PSInSAR-based deformation monitoring, digital twins, and responsible AI.
- Teaching undergraduate and postgraduate courses including Mine Automation & Data Analytics and Geospatial Technologies for Natural Resources, while mentoring student research and contributing to institutional and academic administration.

Assistant Professor **2025 - 2026**
SR University Telangana, India

- **Assistant Professor, Department of Computer Science and Artificial Intelligence** — Designed and delivered undergraduate and postgraduate courses on Machine Learning, Natural Language Processing, Python for Data Science, and Ethics and Regulations in AI, fostering industry-aligned, application-driven learning outcomes.
- In addition to teaching, serve as **Assistant Dean (International Relations)** and **Coordinator** for the Clubs International Affairs and Digital Design & Branding Club, leading global collaborations, student engagement initiatives, and institutional branding efforts.

Assistant Professor **2024 - 2025**
NAMTECH: An Education Initiative by AMNS India Gujrat, India

- Contributed to the creation and delivery of modules on **Data Visualization with Node-RED Programming**, **AI in Smart Manufacturing**, and **Data Analytics**, equipping learners with practical skills and knowledge for industry applications.
- Mentored capstone projects including Visual Inspection Using AI/ML for Weld Detection, Handwritten Character Recognition Using Camera, and Fruit Quality Analyzer Using Jetson Orin Nano, providing guidance on applying cutting-edge AI/ML techniques to solve real-world problems.

Senior Research Fellow **2019 - 2024**
Indian Institute of Technology Kharagpur Kharagpur, India

- **Developed advanced machine learning models** for predicting pit slope stability under non-homogeneous and complex geotechnical conditions, resulting in a 99% improvement in prediction accuracy and culminating in a publication in a reputed SCI-indexed journal..
- **Designed and implemented customized machine learning architectures** for dump slope stability assessment, achieving 98.5% accuracy through the integration of SMOTE techniques. The work has been accepted for publication in a well-regarded SCI-indexed journal.
- **Integrated Convolutional and Variational Autoencoders** to enhance displacement prediction in slope stability analysis, offering a more robust and interpretable deep learning framework. The study has been completed and is currently under peer review for publication.

Management Trainee **2017 - 2018**
Coal India Limited Jharkhand, India

- Demonstrated leadership by managing and directing a team of 50, spearheading underground operations and leveraging data-driven strategies to enhance the productivity of the central conveying system

Technical Skills

- **Broad Area of Interest**: Artificial Intelligence, Machine Learning, Slope Stability, Rock Mechanics, Optimization, Remote Sensing, Numerical Modeling, Digital Twing, Mine Digitalisation
- **Programming Language &Tools**: GeoStudio, RocScience, Surpac, MineSight, MineX, ERDAS, QGIS, ArcGIS, R, NLP, Python, Deep Learning, Machine Learning, MySQL, AutoCAD
- **Data Visualization & Statistical Analysis Tools**: Tableau, Power BI, MATLAB, R, SPSS

Roles & Responsibilities

Curriculum Development **2023**

- Led the development of an advanced course curriculum for the Data Analytics Laboratory, specifically tailored for M.Tech students in the Department of Mining Engineering. The curriculum integrated cutting-edge analytical techniques and real-world case studies to strengthen practical learning outcomes.

Project Supervision **2023**

- Successfully guided two high-impact B.Tech projects:
- PSInSAR-Based Deformation Monitoring: Provided expert mentorship on a project focused on utilizing PSInSAR (Persistent Scatterer Interferometric Synthetic Aperture Radar) for advanced deformation monitoring.
- Mineral Identification using Machine Learning: Led a pioneering project exploring the application of machine learning techniques in the accurate identification of minerals, demonstrating a novel intersection of technology and mining science.

Consultancy Projects **2019-2023**

- Played a pivotal role in numerous consultancy projects, specializing in slope stability assessment for various opencast mines across India. This involved comprehensive analysis, risk assessment, and providing actionable insights to enhance safety and efficiency.

Publications

- A. Kumar, **S.K. Singh**, B. Samanta, et al. Risk assessment in sociotechnical systems based on functional resonance analysis method and hierarchical fuzzy inference tree. Sci Rep 15, 23827 (2025). **SCIE**. DOI: https://doi.org/10.1038/s41598-025-10063-5
- A Pandey, **S.K. Singh**, SJ Sridharan, et al. Predictive control of underground mine spray chambers: An integrated machine learning and IoT Approach. International Journal of Refrigeration 179, 142-155 (2025). **SCIE**. DOI:https://doi.org/10.1016/j.ijrefrig.2025.08.009
- **S.K. Singh**, D. Chakravarty, Predicting the Stability of Rock Slopes in the Presence of Diverse Joint Networks and External Factors Using Machine Learning Algorithms. Mining, Metallurgy Exploration. 41, 2421–2440 (2024). **SCIE**. DOI: 10.1007/s42461-024-01060-9
- **S.K. Singh**, D. Chakravarty (2024), Advanced Machine Learning for Slope Stability Analysis Under Non-homogeneous Conditions: A Comprehensive Mine Study. In: Gorai, A.K., Ram, S., Bishwal, R.M., Bhowmik, S. (eds) Sustainable and Innovative Mining Practices. ICSIMP 2023. Springer Proceedings in Earth and Environmental Sciences. Springer, Cham. DOI: 10.1007/978-3-031-76614-5_22
- **S.K. Singh**, D. Chakravarty, Assessment of Slope Stability using Classification and Regression Algorithms Subjected to Internal and External Factors. Archives of Mining Sciences. 68 (1), 87–102 (2023). **SCIE**. DOI: 10.24425/ams.2023.144319
- **S.K. Singh**, D. Chakravarty, Efficient and Reliable Prediction of Dump Slope Stability in Mines using Machine Learning: An in-depth Feature Importance Analysis. Archives of Mining Sciences. (2023). **SCIE**. DOI: 10.24425/ams.2023.148157
- **S.K. Singh**, D. Chakravarty (2023). Interpretable Predictions: Machine Learning Approaches to Understand Slope Stability in the Presence of Joint Networks. In: Sinha, A., Sarkar, B.C., Mandal, P.K. (eds) Proceedings of the 10th Asian Mining Congress 2023. AMC 2023. Springer Proceedings in Earth and Environmental Sciences. Springer, Cham. DOI: https://doi.org/10.1007/978-3-031-46966-4_16

Conferences

• S.K. Singh, D. Chakravarty, Tailoring Machine Learning Models for Robust Prediction of Dump Slope Stability: A Journey Towards Full Model Interpretability in Mining Applications. International Conference on "Safe, Smart and Sustainable Mining (3SM) (2023), Goa, India

• S.K. Singh, D. Chakravarty, Advanced Machine Learning for Slope Stability Analysis Under Non-Homogeneous Conditions: A Comprehensive Mine Study. International Conference on Sustainable and Innovative Mining Practices (2023), Rourkela, India

• S.K. Singh, D. Chakravarty, Review of Slope Monitoring in Mines using Advanced Sensors and Data Analysis Approaches. Proceedings in Recent Advances in Mining Technology- RAMT (2019), Bangalore, India

• S.K. Singh, K. Biswas, D. Chakravarty, Change Detection in the Mining Region of Jharia Coalfield using Landsat 7. Proceedings in Advances in Mining (2020), CSIR-CIMFR, Dhanbad, India