SUBHENDU MISHRA

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PROFILE

A trained mining and mineral processing engineer with critical skills in problem identifying and solving, data analytics, and machine learning. Eager to implement the research aptitude accumulated over the course of doctoral training for solving problems pertinent to the mining and mineral processing industries that require systemic and holistic research and development.

QUALIFICATIONS

QUALIFICATION	YEAR	INSTITUTE	CPI
Ph.D.	2024	INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR, INDIA	8.90
B. TECH (MINING ENGINEERING)	2017	NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR, INDIA	8.85

WORK EXPERIENCE

INDIAN INSTITUTE OF TECHNOLOGY (INDIAN SCHOOL OF MINES) DHANBAD *[Feb 2024-till date]*

- Working as visiting assistant professor int the Department of Fuel, Minerals and Metallurgical Engineering

VEDANTA RESOURCES PRIVATE LIMITED *[June 2017-July 2018]*

- Worked as a full-time mining engineer (Graduate Engineer Trainee) in three different mines (Rajpura Dariba, Zawar, and Sindesar Khurd) of Hindustan Zinc Limited, Vedanta Resources, Udaipur, Rajasthan, India.

PHD THESIS

"ONLINE CONDITION MONITORING OF HYDROCYCLONE USING VIBROMETRY"

Research Contributions

PhD Contributions

- Acquisition and storage of vibration signals of the hydrocyclone test rig by using triaxial digital accelerometers interfaced with a Raspberry Pi system.
- Implementation of a unique vibration signal feature extraction technique for differentiating the vibration characteristics acquired during the spray and rope discharge conditions.
- Development of a robust algorithm for predicting the onset of roping and, thereby, incorporating remedial strategies to prevent any possible choking hazards in hydrocyclones.
- Development of a Python based user-friendly interface for distinguishing spray and rope discharge condition in a hydrocyclone in real time based on the vibration features.

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Other Research Contributions

- Implementation of LSTM and CNN combination-based modelling approach for partition curve prediction in hydrocyclones.
- Development of a deep learning-based modelling approach for predicting spray, transition, and rope discharge operating regime of a hydrocyclone.
- Implementation of Artificial Neural Network modelling for predicting gross calorific value of high ash Indian coals using proximate analysis-based parameters.
- Investigation of the influence of the coal geology and petrography on its gross calorific value.
- Basic application of Computational Fluid Dynamics in ANSYS (FLUENT) for simulating the two-phase flow-features prevailing inside the hydrocyclone.
- Efficiency enhancement of Wet High Intensity Magnetic Separator (WHIMS) for beneficiating low grade hematite ores.

PUBLICATIONS

+ Mishra S., and Majumder A.K. 2022. "Online techniques for performance and condition monitoring of hydrocyclone: Present status and the future", ***Mineral Processing & Extractive Metallurgy Review***, 44(4), pp. 281-296, https://doi.org/10.1080/08827508.2022.2047042
+ Mishra S., Tyeb M.H., Mandal B.B., and Majumder A.K. 2022. "Application potential of vibration sensors for online process monitoring of hydrocyclones", ***Mineral Processing & Extractive Metallurgy Review***, https://doi.org/10.1080/08827508.2022.2115488
+ Mishra S., Tyeb M.H., Mandal B.B., and Majumder A.K. 2022. "Development of a vibration sensor-based tool for online detection of roping in small-diameter hydrocyclones", ***Mineral Processing & Extractive Metallurgy Review***, https://doi.org/10.1080/08827508.2022.2155959
+ Tyeb M.H., Mishra S., and Majumder A.K. 2023. "Asymptotic water split behaviour of hydrocyclones; a unique design characterization methodology", ***Mineral Processing & Extractive Metallurgy Review***. https://doi.org/10.1080/08827508.2023.2243006
+ Pathak S.S., Mishra S., Tyeb M.H., and Majumder A.K. 2022 "Spigot design modification to alleviate roping in hydrocyclones", ***Mining, Metallurgy & Exploration***, 39, pp. 761-775, doi.org/10.1007/s42461-021-00503-x
+ Tyeb M.H., Mishra S., Singh A., Majumder A.K., 2024. "Prediction of operating state of hydrocyclones using vibrometry and 1D convolutional neural networks". ***Advanced Powder Technology***, 35 (2), doi.org/10.1016/j.apt.2024.104337
+ Kumar P., Tyeb M.H., Mishra S., Chakravarty S., and Majumder A.K. 2024. "Limitations Associated with Proximate Analysis-Based Gross Calorific Value Modeling for Coals." ***Mineral Processing & Extractive Metallurgy Review***, https://doi.org/10.1080/08827508.2024.2334962

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RESEARCH PROJECTS

1. **"Online condition monitoring of hydrocyclone using vibrometry"** under the guidance of Prof. Arun Kumar Majumder, Department of Mining Engineering, IIT Kharagpur, Kharagpur, India (ongoing)**.**
2. **"Estimation of bulk density of ROM coal and measurement of in-situ coal density"** for two coal blocks of **National Thermal Power Corporation Pvt. Ltd**., India under the guidance of Prof. Kaushik Dey and Prof. Arun Kumar Majumder, Department of Mining Engineering, IIT Kharagpur, Kharagpur, India (completed). ***[Funded by National Thermal Power Corporation Pvt. Ltd. India]***

TEACHING EXPERIENCE

PMRF Teaching Assistantship

+ **Online course on Mineral Processing –** *[Jan, 2023 – Mar, 2023]*

24 hours lecture on Mineral Processing for diploma students of Govt. Polytechnic College, Surajpur, affiliated to Chhattisgarh Swami Vivekanand Technical university, Chhattisgarh, India as part of PMRF teaching assistantship.

+ **Online course on Fluid Mechanics and Vibration Analysis –** *[Jan, 2023 – Mar, 2023]*

24 hours lecture on Fluid Mechanics for second year undergraduate students of School of Engineering and Technology, Madhubani, affiliated to Sandip university, Bihar, India as part of PMRF teaching assistantship.

+ **Online course on Quantum Chemistry –** *[Sep, 2022 – Nov, 2022]*

18 hours lecture on Quantum Chemistry for second year undergraduate students of Hijli College, Kharagpur, affiliated to Vidyasagar university, West Bengal, India as part of PMRF teaching assistantship.

NPTEL Teaching Assistantship

+ **National Programme on Technology Enhanced Learning (NPTEL) –** *[2021-2022, 2022-2023]*

Teaching assistant for the NPTEL online certification course on "**Introduction to Mineral Processing**" delivered by Prof. Arun Kumar Majumder, Department of Mining Engineering, IIT Kharagpur, Kharagpur, India. Responsibility of setting question papers, conducting doubt clearance sessions, problem solving sessions, final evaluation, etc.

Semester Laboratory Courses Assistantship

+ **Material Handling and Mineral Engineering Laboratory –** *[2022-2023, 2023-2024]*

Teaching assistant of the laboratory course "**Material Handling & Mineral Engineering**" delivered by Prof. Arun Kumar Majumder and Prof. Bibhuti Bhusan Mandal, Department of Mining Engineering, IIT Kharagpur, India, during the session 2022-2023. Responsibility of laboratory manual preparation, setting up of experimental setups, material sampling, and laboratory experimental record corrections.

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19/6/24

Semester Theory Courses Assistantship

+ **Material Handling & Mineral Engineering –** *[2023-2024, 2022-2023]*

Teaching assistant of the course "**Material Handling & Mineral Engineering**" delivered by Prof. Arun Kumar Majumder, Department of Mining Engineering, IIT Kharagpur, India. Organised and took tutorial classes for the undergraduate students.

+ **Coal Preparation –** *[2022-2023, 2021-2022, 2020-2021, 2019-2020]*

Teaching assistant of the course "**Coal Preparation**" delivered by Prof. Arun Kumar Majumder, Department of Mining Engineering, IIT Kharagpur, India. Organised and took tutorial classes for the undergraduate students.

+ **Principles of Mineral Processing –** *[2021-2022, 2020-2021, 2019-2020]*

Teaching assistant of the course "**Principles of Mineral Processing**" delivered by Prof. Arun Kumar Majumder, Department of Mining Engineering, IIT Kharagpur, India. Organised and took tutorial classes for the undergraduate students.

+ **Environment Engineering and Management –** *[2021-2022, 2020-2021, 2019-2020]*

Teaching assistant of the course "**Environment Engineering and Management**" delivered by Prof. Arun Kumar Majumder, Department of Mining Engineering, IIT Kharagpur, India. Organised and took tutorial classes for the undergraduate students.

ACADEMIC ACHIEVMENTS

PMRF – Awarded with the prestigious PMRF fellowship in Dec. 2018 for pursuing Ph.D.

Special recognition for the PhD thesis during PMRF review 2023

Gold Medal – Awarded with a gold medal for best paper presentation on the Research Scholars' Day organized by the Department of Mining Engineering, IIT Kharagpur. Selected as the best paper presentation amongst all other research scholars of the department.

Lecture in NML Jamshedpur – Delivered two hours lecture to the scientists of National Metallurgical Laboratory, CSIR, Jamshedpur, India on "Application prospects of Machine Learning algorithms in the mining and mineral processing industries."

Demonstration to TCS delegates, Kolkata – Delivered a demonstration of my Ph.D. research on 'hydrocyclone-vibration signal processing and its application for roping detection' to the top-level delegates of Tata Consultancy Services, Kolkata.

SOFTWARE AND PROGRAMMING SKILLS

PYTHON– Python programming for vibration analysis, signal processing, Machine Learning algorithms

ANSYS (FLUENT) – Flow profile simulation with finite volume approach using Computational Fluid Dynamics.

MATLAB – Basic knowledge of MATLAB for solving differential equations, image processing, signal processing.

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