

Prof. Dheeraj Kumar (<https://youtu.be/bPYGg0wdmK0>)

- **Professor (HAG Scale)**, Department of Mining Engineering, IIT (ISM) Dhanbad
- **Dy. Director**, Indian Institute of Technology (ISM) Dhanbad
- **Project Director**, Mining Technology Innovation Hub, DST, GoI
- **Director**, TEXMiN Foundation, a Section 8 company of DST, focusing on Mining Technology Development and Incubation
- **Director**, ACIC IIT (ISM) Foundation, a Section 8 company of NITI Aayog, working on Community Innovation and Startup Ecosystems



- 22+ years' experience in Academic, Research & Consultancy, and Administration
- Founded the Technology Innovation Hub (TIH) in "Mining Technology" in the name of **TEXMiN** for developing technologies, innovation, and start-up ecosystems in mining and earth science domains with substantial contributions from both Govt. and Industries
- 20+ start-up companies in the Mining Technology domain are incubated in TEXMiN with substantial financial support. Most of the founders are from top-notch institutions, including IITs.
- A group of 25+ engineering entrepreneurs are working under my mentorship in TEXMiN Technology Development, Innovation & Entrepreneurship activities.
- 40+ projects of Technology Development are presently executed in TEXMiN under my Guidance, out of which 10 technologies are commercialized and used in coal and metal mines.
- Significant credentials in Mining and Construction industries, with R&D projects (ongoing and completed projects) and CoEs with Rs. 400 Million funded by CIL, MoM, MOC, DST, DoS, MoWR & MoE.
- Developed and commercialized 3 nos of Indigenous mining technologies for safe, smart, sustainable mines.
- Guided 22 PhD Scholars in Mine digitization, Automation, Remote Sensing, and GIS.
- Published 50+ Journal papers in SCI indexed Journals (WoS database)
- Completed 80+ Industrial projects worth Rs. 350 Million on Mine Digitization, Monitoring, and digitalization, including Orientation and Alignment of the longest road tunnel (Chenani – Nasri Road Tunnel) connecting Jammu with Srinagar.
- Organized 50+ Professional Development Programmes (PDP) of one week to 14 weeks and trained 700+ Mining Executives in Mine Digitization, Monitoring, and digitalization.
- Started M. Tech Geomatics program with an emphasis on applications of LIDAR, AI-based Image Processing, Drone, and Remote Sensing (Optical and Microwave).
- Coordinator and member at various committees constituted by the Govt. and Industry, namely, Coordinator, Satellite-Based IIRS Outreach Programmes on GIS, GPS & Remote Sensing, IIRS; Member of GISAcademia Council of India; Member of National Geodetic and Geospatial Consortium (NGGC), DST, Govt. of India, Coordinator, RESPOND program of SAC, ISRO, Jharkhand Cluster, etc.
- Operationalizing International Relations and Alumni Cell, Centre for Innovation, Incubation, Entrepreneurship, Centre for Societal Mission, and Media and Branding Cell.

1. Academic Qualifications

Degree	Institution	Year	Marks	Awards/ Distinction
PhD (Mining Engg)	IIT Kharagpur	2003	A grade in coursework	Meritorious Scholar awards for three consecutive years (2001-2003)
M.Tech (Rock Excavation Engg.)	IIT (ISM), Dhanbad	1998	4.35/5.00	First Class Distinction
B. Tech (Mining Engg.)	Nagpur University	1997	79%	First Class Distinction with University Scroll of Honour

2. Leadership

Position Held	Organization/Institute	Time Period
Dy. Director	Indian Institute of Technology (Indian School of Mines), Dhanbad	29.04.22- till date
Assisting the Director in Academic and administrative work and maintaining liaison with other institutions of higher learning and research, industrial undertakings, etc. Guiding innovation & entrepreneurship, international relations & alumni affairs, developing infrastructure and facilities, etc.		

Dean (Innovation, Incubation, and Entrepreneurship)	Indian Institute of Technology (Indian School of Mines), Dhanbad	19.06.2021 – 28.04.22
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Major Achievements:

- **Incubated more than 50 start-ups in community innovations and mining technologies.**
- **Technology Innovation in Exploration & Mining Foundation (TEXMiN)**, a section 8 company under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS), Govt. of India at the Indian Institute of Technology (Indian School of Mines), Dhanbad
- **Atal Community Innovation Centre (ACIC) IIT (ISM) Foundation**, a section 8 company under the Atal Innovation Mission (AIM), NITI Aayog
- **SANDVIK Mine Automation Learning Centre (SMAC)**, a mine automation center established by SANDVIK at IIT (ISM) Dhanbad with hardware and software for capacity building in digital mining technologies
- **Dassault Mining Technology Centre, a CoE established by Dassault Systèmes with hardware and software** for 3D modeling, AR/VR training, Mine Planning, 3D rendering technologies for creating a realistic representation of mines for training, visualization, and remote operations purposes, design, and simulation of mechanical, electromechanical, mechatronics, and robotic systems
- **Coal India Innovation and Incubation Centre (CII Centre)**, to nurture early innovators to ideate in the mining technology and promote economically viable start-ups through pre-incubation and incubation
- **ESRI-TEXMiN Geospatial Centre, a COE established by ESRI** in the area of Remote Sensing for mining & exploration
- **Regional Centre of Geodesy**, a center sponsored by DST, GoI for promoting research and education in Geodesy & GNSS

Position Held	Organization/Institute	Time Period
Dean (International Relations & Alumni Affairs)	Indian Institute of Technology (Indian School of Mines), Dhanbad	21.05.2018- 18.06.2021

Major Achievements:

- **Setting up innovation, incubation, and entrepreneurship ecosystem**
- **Strengthening and linking the chapters globally:** 12 Indian and 4 overseas
- **Contributions from Alumni:** Developed Smart Classrooms and other Infrastructures. Secured Funds for Innovation

- **Alumni Database Creation:** 20000+ update records of Alumni (**Alumni Portal:** <http://alumni.iitism.ac.in>)
- **eStore collectibles merchandise portal:** <https://iitism.campusmall.in>
- **Establishment of Media and Branding Cell (MBC):** Quarterly Newsletters, LinkedIn, Facebook, Twitter handles, etc.
- **MSME Approved HI:** IIT (ISM) became a business incubator for MSME
- **Five Star rating to CIIE:** Best Incubation Centre in Eastern Region
- **Naresh Vashist Centre for Tinkering & Innovation** with the generous support of Rs. 8.20 Crores
- **Member of the prestigious Heritage Network** (19 leading Institutions).
- **IR portal with the online application process** (incoming and outgoing mobilities)
- **Significant increase in Duo India Fellowships, SHASTRI Mobility Programme, GIAN Courses**
- **Mitacs Globalink Research Internship:** 52 students (2018 and 19)
- **Collaborative International R&D Projects: 9**
- **MoUs with Foreign Universities: 22**
- **Foreign Mobilities:** 12(Faculty), 50+ (Students)
- **Foreign Admissions:** Increased foreign mobility through ICCR, ASEAN, Govt. of Ethiopia, MHE Afghanistan, OVL Mozambique, and Sudan
- **Significant increase in Alumni sponsored Scholarships** (52), Academic Excellence Awards (8), Best Teacher Award, and Best Innovator Award
- **KPMG World Ideation Challenge 2020 & Adobe Analytics Challenge 2020: Won by students of IIT (ISM)**
- **State and National level School Innovation Challenge/BeingArtifex Skillathon - 2021**
- **Skill Development Programme:** 500+ students of local villages
- **Free Coaching for Classes 9-12 and IIT-JEE**
- **Women Empowerment Programmes**

Position Held	Organization/Institute	Time Period
Assoc. Dean (Infrastructure)	Indian Institute of Technology (Indian School of Mines), Dhanbad	09-01-2018 – 20.05.2018
Major achievements: • Operationalization of the Central Library Building and 1000-capacity girl's hostel. • Acquisition of 226.98 acres of land for the second campus. • Plugging the unauthorized entry points to campus already existed in the periphery of the Institute • Dedicated power supply from DVC (Hotline)		

Other key Positions Held	Organization/Institute	Time Period
Convenor (Improvement Group) (A team of 25 persons comprising Deans, HoDs, and HoCs)	Indian Institute of Technology (Indian School of Mines), Dhanbad	20-10-2011 – 19.10.2017
• Formulating innovative strategies for improvement of existing systems and procedures to improve the quality of the deliverable and the pace of delivery and to usher in the spirit of innovation into the system • Suggesting possible improvements in the system and preparation of a roadmap for the implementation of new ideas as and when generated • Contributing significantly towards further growth of the Institute to make it at par with the leading institutes of the world (CRF, SAC, online Feedback Systems, MIS, CC, etc.)		

Co-Coordinator/Coordinator, TEQIP -II & III	Indian Institute of Technology (Indian School of Mines), Dhanbad	01-09-2011-19.07.2018
Chairman, Admissions	IBAT, KIIT University, Bhubaneswar	01.07.2004 – 09.08.2005
Head, Education & IT	Indian Institute for Production Management, L&T Kansbahal	01.04.2003- 30.06.2004

3. Academic and R&D Contributions

- Developed capabilities in Geospatial Technologies in Mining and allied areas with support from ISRO (IIRS & NRSC) and IITs (IITK, IITR).
- Enriched mine surveying and geomatics laboratory with modern surveying instruments, software, and techniques with funding support from FIST, TEQIP, and other sponsored projects.
- Started M. Tech Geomatics program with an emphasis on applications of LIDAR, AI-based Image Processing, Drone, and Remote Sensing (Optical and Microwave).
- Taught UG and PG courses [Mine Surveying, Geospatial Technologies for Natural Resources, Computer-Aided Mine Planning & design]
- Rated with a good feedback score of 9 + out of 10 in UG courses (Class strength 100+).
- Organized Satellite-based Outreach Programmes on Geodesy, GNSS, and Remote Sensing jointly with IIRS Dehradun & IIT (ISM) Dhanbad and trained more than 500 students with certificates from IIRS.
- Coordinator and member at various committees constituted by the Govt. and Industry, namely, Coordinator, Satellite-Based IIRS Outreach Programmes on GIS, GPS & Remote Sensing, IIRS; Member of GISAcademia Council of India; Member of National Geodetic and Geospatial Consortium (NGGC), DST, Govt. of India, Coordinator, RESPOND program of SAC, ISRO, Jharkhand Cluster, etc.

(a) Intellectual Property (Publications/Design/Developments/Patents, etc.): Annexure – I&II

- **Publications:** 3 books, 59 papers (SCI) (**Annexure-II**)
- **PhD. Guidance:** 23 (**Annexure-I**)
- **M.Tech Guidance:** 60
- **Published Patents:** 0244NF2016 (A method for efficient design of roof bolt-based breaker line support in mechanized depillaring).
- **Filed Patents:**
 - An Embedded Development Board [Application Number: 202431050119]
 - A Flight Controller Board for Unmanned Aerial Vehicles [Application Number: 202431013638]
 - A Modular High-Precision Real-Time Kinematic (RTK) Positioning System [Application Number: 202431094770]
- **Book Published:**
 - Emerging Tools and Techniques for Mine Safety and Disaster Management” chapter in the Book: Springer [ISBN:978-9401777643]
 - Uncharted Horizons | Unveiling the Dynamic Architecture of Blockchain [ISBN: 978-9358199697] Authors: Debashis Chatterjee & Prof. Dheeraj Kumar
 - Foundation on Coal Measure Rocks: Bearing Capacity and Settlement: Stability Analysis using Physical and Finite Element Modeling [ISBN: 978-3838380933]

(b) R&D Projects: Annexure III

- Significant credentials in Mining and Construction industries, with R&D projects (ongoing and completed projects) with Rs. 3870.57 Lakh funded by CIL, Tata Steel, MoM, MOC, DST, DoS, MoWR, MoE, Sandvik, Dassault Systems, etc.
- Developed and commercialized indigenous mining technologies for safe, smart, sustainable mines.

(c) Innovations and R&D Facilities: Annexure IV

- Founded the **Technology Innovation Hub (TIH)** in “Mining Technology” in the name of TEXMiN for developing technologies, innovation, and startup ecosystems in mining and earth science domains with substantial contributions from both Govt. and Industries
- 25 startup companies in the Mining Technology domain are incubated in TEXMiN with substantial financial support. Most of the founders are from top-notch institutions, including IITs.
- 42 projects of Technology Development are presently executed in TEXMiN under my Guidance, out of which 10 technologies are commercialized and used in coal and metal mines.
- **SANDVIK Mine Automation Learning Centre (SMAC)**, an automation center established with SANDVIK collaboration for academic, R&D, and Capacity Building in Digital Mining Technologies
- **Dassault Mining Technology Centre, a CoE established in collaboration with Dassault Systems** for 3D mapping and monitoring, modeling, AR/VR training, Mine Planning, 3D rendering technologies for creating a realistic representation of mines for training, visualization and remote operations purposes, design, and simulation of mechanical, electromechanical, mechatronics, and robotic system.
- **The Coal India Innovation and Incubation Centre (CII Centre)** was established with collaboration from CIL to nurture early innovators to ideate in mining technology and promote economically viable startups through pre-incubation and incubation.
- **ESRI- Geospatial Centre, a COE collaborating with ESRI** in Remote Sensing for mining and exploration.
- **Regional Centre of Geodesy is a centre sponsored by DST, GoI**, to promote research and education in Geodesy & GNSS.
- **Hexagon Centre of Excellence (CoE)** - Centre for Digital Transformation & Excellence in Mining & Monitoring.

4. Sponsored Consultancy & Outreach Activities: Annexure V

- Completed 77 Industrial projects worth Rs. 3024 Lakhs on Mine Digitization, Monitoring, and digitalization, including Orientation and Alignment of the longest road tunnel (Chenani – Nasri Road Tunnel) connecting Jammu with Srinagar.
- Organized 52 Professional Development Programmes (PDP) for one week to 14 weeks and trained 674 mining professionals.

Some of the key outcomes

- Orientation and Alignment Survey at Chenani – Nasri Road Tunnel connecting Jammu with Srinagar
- Assessment and Monitoring of Land Surface Subsidence due to Stoping in Hard Rock Metal Mining
- Geofencing & georeferencing of the lease pillars and preparation of digital georeferenced map & generation of Geo-referenced shapefiles and 3D modeling of mine
- 3D Numerical Simulation of Subsidence due to Underground Mining & CBM
- Scientific study for Earthwork estimation in Coal Mine Projects using an integrated approach (3D LIDAR and Geodetic Techniques)
- Computer Aided Mine Planning & Design, including implementing Mining 4.0



5. Peer Recognition (National/International Honours, Awards, Prizes including honorary degree)

- Member, CII National Committee on Mining
- Member Taskforce, GIS Academia Council of India
- Advisory Council, Master Mentors Geo-enabling Indian Scholars (MMGEIS)
- Advisor, Society for Mining, Metallurgy, and Exploration (SME), USA
- Member, Central Empowered Committee (CEC) & Ore Assessment Committee (Constituted by Govt. of India)
- Member, PMMC, National Centre in Geodesy, DST
- Member, National Geodetic and Geospatial Consortium (NGGC)
- SBI Best Researcher award (five consecutive terms, 2012-2017)
- “Hindustan Zinc Limited Award” by the Institution of Engineers (INDIA)
- “Meritorious Scholar” awards at IIT Kharagpur (three consecutive terms, 2001-2004)
- President, IEI, Dhanbad Section

6. Membership/Fellowship of National/International Professional Bodies

- Society for Mining, Metallurgy & Exploration, USA
- Australasian Institute of Mining and Metallurgy (AusIMM), Australia
- The Mining, Geological & Metallurgical Institute of India (MGMI)
- Geospatial World Forum

Annexure I: PhD Research Work Supervised

S.No.	Thesis Title	Student name	Place	Role	Date of Award
1.	Assessment of Strata Behaviors and Support Performance in Longwall Panels of Indian Coal Mines Using Automated System	Shri Atul Kumar, Research Associate, IIT (ISM) Dhanbad	IIT (ISM) & Mines	Join Guide	19.12.2012
2.	A study of roof-pillar interaction for an efficient breaker-line design during mechanized depillaring	Shri Sahendra Ram, Sr. Technical Officer, CIMFR, Dhanbad	CIMFR & ISM	Principle Guide	28.10.2016
3.	Detection, Monitoring and Prediction of Coal Mine Fire Zone of Jharia Coal Field using integrated Satellite Remote Sensing and Thermal Modeling	Shri J. K. Pandey Sr. Technical Officer, CIMFR, Dhanbad	CIMFR & ISM	Principle Guide	10.03.2017
4.	Satellite Image Fusion and Quality Assessment Techniques for applications in Earth observation and resource monitoring: An application for urban object extraction	Shri Sumit Kumar Choudhary, JRF, IIT (ISM) Dhanbad	IIT (ISM) (JRF)	Guide	24.03.2017
5.	Characterization of Land Subsidence Phenomena in Jharia Coalfield, India Using Differential Interferometric SAR Techniques	Ms. Shailaja Thapa, JRF, IIRS (ISRO) Dehradun	IIRS (2018-19)	Principle Guide	27.11.2018
6.	Investigation into the Effect of Re-Vegetation on Mechanical Stability of Waste, Sub-Grade, and Fines Dumps in a Surface Iron Ore Mine	Mr. Vibhash Ranjan, AGM, Sharda Mines Pvt. Ltd., Barbil	Sharda Mines Pvt. Ltd., Barbil	Co-Guide	26.11.2018
7.	An Interoperability Model for Bio-resource Distributed Database Using Data Science	Ms. Priyanka, JRF, IIRS (ISRO) Dehradun	IIRS	Principle Guide	28.09.2019
8.	Vegetation Biophysical Parameters Retrieval using RISAT-1 Hybrid Polarimetric SAR data	Mr. Thota Sivasankar, JRF, IIRS (ISRO) Dehradun	IIRS	Principle Guide	30.11.2019
9.	Development of Design Norms for Rib/Snook During Mechanised Depillaring by Continuous Miner	Ashok Kumar, Scientist, CIMFR	IIT (ISM) and CIMFR	Principle Guide	02.06.2021
10.	Development of a Methodology for Detection, Monitoring, and Analysis of Mining Induced Subsidence using Spaceborne SAR Interferometry Techniques	Md. Soyeb Alam Assistant Professor Deptt. of Mining Engg., IIT (ISM) Dhanbad	IIT (ISM) and KCC	Principle Guide	02.03.2022
11.	Assessment and Prediction of Mining and Coal Fire induced Surface Land Subsidence in Jharia Coalfield Using Modified PSInSAR and GNSS Techniques	Shri Sunil Kumar, STA, Department of Mining Engineering, IIT (ISM) Dhanbad	IIT (ISM)	Guide	25.04.2022
12.	Detection and Assessment of Spatio-Temporal Dynamics of Jharia Coalfield Fire using Satellite-based Multi-Temporal Night-Time Thermal Imaging	Narendra Singh, SRF-IIT (ISM) Dhanbad	IIT(ISM) and IIRS	Principle Guide	07.08.2022
13.	Assessment of surface deformation in National Capital Regions (NCR) due to ground water depletion using geodetic technique and spaceborne SAR	Shri Kapil Kumar Malik, Manager, Radar System & Services, Chandigarh	Radar System & Services,	Guide	24.08.2022
14.	Design and Development of Smart Tracking and IoT Enabled Monitoring System for Underground Coal Mines	Shri Shankhajit Mitra, Technical (2), CSIR-CIMFR Dhanbad	CIMFR	Principle Guide	04.08.2022
15.	Retrieval of Soil moisture Using Hybrid polarimetric RISAT-1SAR data	Shri Pavan Kumar Sharma, Research Associate, IIRS (ISRO) Dehradun	IIRS (ISRO), Dehradun	Principle Guide	26.07.2022

16.	Analyses on surface subsidence due to underground mining operations in the Singhbhum shear zone using an integrated approach of PSInSAR and Data Science techniques	Shri S. G. Ishwar, Assistant Manager, UCIL, Jaduguda	UCIL	Guide	08.09.2022
17.	Design and Development of IOT based Information and Communication System for Smart Goaf Edge Support System in Underground Coal Mines	Mr. Ankit Singh, Software Developer Bosch Thermotechnology, Lollar, Germany	Bosch Thermotechnology, Lollar, Germany	Principle Guide	08.08.2022
18.	An Assessment of Groundwater Depletion and Land Subsidence in North-West India by Space-borne Geophysical, SAR Interferometry, and Ground-based Observations	Pranshu Pranjali, JRF, IIT (ISM) Dhanbad	IIT (ISM) and IIRS	Principle Guide	15.09.2022
19.	Time series space-borne wide-swath thermal infrared data analysis and algorithm development for coal fire induced thermal anomaly detection in parts of the Gondwana Coalfields of India	Ritesh Mujawdiya, JRF, IIRS (ISRO) Dehradun	IIT (ISM) and IIRS	Principle Guide	11.11.2022
20.	An Assessment of the Effect of Spatial Information on Fuzzy based Classifiers	Shilpa Suman, JRF, IIT (ISM) Dhanbad	IIT (ISM) and IIRS	Principle Guide	19.05.2023
21.	Seismically Induced Hazard Assessment and Prediction in Indo Gangetic Piedmont Alluvial Region using Geospatial Analysis and Mapping	Abhishek Rawat, JRF, IIT (ISM) Dhanbad	IIT (ISM) and IIRS	Principle Guide	29.06.2023
22.	Assessment of Horizontal Stress Fields in Deeper Horizons and Development of Roof Hazards Maps of Coal Resources at Godavari Valley Coalfield	Mr. Vikram Shankar, Scientist – National Institute of Rock Mechanics, KGF	NIRM	Principle Guide	09.07.2024
23.	Integrating Computer Vision, Drone Technology, and Virtual Reality for Developing a Realtime Monitoring Framework to Optimize Dragline Operational Environment in Large Surface Coal Mines	Piyush Singh, JRF, IIT (ISM) Dhanbad	IIT (ISM)	Co-Guide	16.08.2024
24.	Mine Planning and Sustainable Management for Mass Exploitation of Coal Deposits: A Strategic Framework Development in Indian Context	Sanjay Kumar Singh, GM, SECL	IIT (ISM) and SECL	Guide	Thesis Clear (Viva due)

Annexure II: Selected (Q1/Q2) Publications

1. N. Singh, R.S. Chatterjee, **D. Kumar**, D.C. Panigrahi. Spatio-temporal variation and propagation direction of coal fire in Jharia coalfield, India by satellite-based multi-temporal night-time land surface temperature imaging. *Int. J. Min. Sci. Technol.*, 31 (5) (2021), p. 765-778. <https://doi.org/10.1016/j.ijmst.2021.07.002> (Q1: IF-11.70).
2. Kumar, A. **Kumar**, D. Singh, A. K., Ram, S. Kumar, R. Development of an empirical model for strength estimation of irregular-shaped-heightened-rib/snook for mechanized depillaring, *Int. J. Rock Mech. Min. Sci.* 2021, 148, 104969. <https://doi.org/10.1016/j.ijrmms.2021.104969> (Q1: IF-7.00).
3. Kumar, A. Ram, S. **Kumar**, D. Singh, A. K., Kumar, R. Gorain, S. Development of design norms for rib/snook during mechanised depillaring by continuous miner. *Int. J. Rock Mech. Min. Sci.* 2023, 161, 105259. <https://doi.org/10.1016/j.ijrmms.2022.105259> (Q1: IF-7.00).
4. Kumar, A. **Kumar**, D. Singh, A. K., Ram, S. Kumar, R. Gautam, A. Singh, R., and Singh, A. K. Roof sagging limit in an early warning system for safe coal pillar extraction. *Int. J. Rock Mech. Min. Sci.* 2019, 123, 104131. <https://doi.org/10.1016/j.ijrmms.2019.104131> (Q1: IF-7.00).
5. Ram, S. **Kumar**, D. Singh, A.K. Kumar, A. and Singh R. Field and numerical modelling studies for an efficient placement of roof bolts as breaker line support, *Int J Rock Mech Min Sci*, 93 (2017):152–162 <https://doi.org/10.1016/j.ijrmms.2017.01.013> (Q1: IF-7.00).
6. Silvia Dutta, Manish Kumar Jain, **Dheeraj Kumar**. Evaluation of soil heavy metals in Raniganj open-cast coal mines in India: Spatial distribution, Positive Matrix Factorization and Monte Carlo Simulation, *Process Safety and Environmental Protection* 194, 2025, 1038-1055. <https://doi.org/10.1016/j.psep.2024.12.039> (Q1: IF-6.90)
7. R. S. Chatterjee, N. Singh, S. Thapa, D. Sharma and **D. Kumar**, "Retrieval of land surface temperature (LST) from Landsat TM6 and TIRS data by single channel radiative transfer algorithm using satellite and ground-based inputs", *Int. J. Appl. Earth Observ. Geoinf.*, vol. 58, pp. 264-277, Jun. 2017, <https://doi.org/10.1016/j.jag.2017.02.017> (Q1: IF-7.60).
8. Singh, P., Murthy, V., **Kumar**, D., & Raval, S. A comprehensive review on application of drone, virtual reality and augmented reality with their application in dragline excavation monitoring in surface mines. *Geomatics, Natural Hazards and Risk*, 15(1). <https://doi.org/10.1080/19475705.2024.2327399> (Q1: IF-4.50)
9. Singh, P., Murthy, V. M. S. R., **Kumar**, D., & Raval, S. Enhancing dragline operations supervision through computer vision: real time height measurement of dragline spoil piles dump using YOLO. *Geomatics, Natural Hazards and Risk*, 15(1). <https://doi.org/10.1080/19475705.2024.2322492> (Q1: IF-4.50)
10. Rawat, A., **Kumar**, D., Chatterjee, R. S., & Kumar, H. (2022). Reconstruction of liquefaction damage scenario in Northern Bihar during 1934 and 1988 earthquake using geospatial methods. *Geomatics, Natural Hazards and Risk*, 13(1), 2560–2578. <https://doi.org/10.1080/19475705.2022.2122591> (Q1: IF-4.50)
11. A. Singh, **D. Kumar**, J. Hötzel. IoT based information and communication system for enhancing underground mines safety and productivity: genesis, taxonomy and open issues. *Ad Hoc Netw.*, 78 (2018), pp. 115-129. , <https://doi.org/10.1016/j.adhoc.2018.06.008> (Q1: IF-4.40).
12. Singh, S.K., **Kumar**, D. (2024). Optimizing coal mine planning and design for sustainable development in the context of mass exploitation of coal deposits. *Heliyon*, 10(7): e28524. <https://doi.org/10.1016/j.heliyon.2024.e28524> (Q1: IF-3.40)
13. Kumar, S., **Kumar**, D., Donta, P.K. et al. Land subsidence prediction using recurrent neural networks. *Stoch Environ Res Risk Assess* 36, 373–388 (2022). <https://doi.org/10.1007/s00477-021-02138-2>. (Q1: IF-3.90).
14. Alam, M. S., **Kumar**, D., & Chatterjee, R. S. (2021). Improving the capability of integrated DInSAR and PSI approach for better detection, monitoring, and analysis of land surface deformation in underground mining environment. *Geocarto International*, 37(12), 3607–3641. <https://doi.org/10.1080/19475705.2024.2327399> (Q1: IF-3.30).
15. Mujawdiya, R., Chatterjee, R. S., & **Kumar**, D. (2020). MODIS land surface temperature time series decomposition for detecting and characterizing temporal intensity variations of coal fire induced thermal anomalies in Jharia coalfield, India. *Geocarto International*, 37(8), 2160–2174. <https://doi.org/10.1080/10106049.2020.1818853> (Q1: IF-3.30).
16. Singh, N., Chatterjee, R. S., **Kumar**, D., Panigrahi, D. C., & Mujawdiya, R. (2020). Retrieval of precise land

- surface temperature from ASTER night-time thermal infrared data by split window algorithm for improved coal fire detection in Jharia Coalfield, India. *Geocarto International*, 37(3), 926–943. <https://doi.org/10.1080/10106049.2020.1753820> (Q1: IF-3.30).
17. Sivasankar, T., **Kumar, D.**, Shanker Srivastava, H., & Patel, P. (2019). Wheat leaf area index retrieval using RISAT-1 hybrid polarized SAR data. *Geocarto International*, 35(8), 905–915. <https://doi.org/10.1080/10106049.2019.1566404> (Q1: IF-3.30).
 18. Ranjan, V. Sen, P. **Kumar, D.** and Sarsawat, A. A review on dump slope stabilization by revegetation with reference to indigenous plant. *Ecol Process* 4, 14 (2015). <https://doi.org/10.1186/s13717-015-0041-1> (Q1: IF-4.60).
 19. K. Malik, **D. Kumar**, D. Perissin, B. Pradhan. Estimation of ground subsidence of New Delhi, India using PS-InSAR technique and Multi-sensor Radar data *Adv. Space Res.*, 69 (4) (2022), pp. 1863-1882. <https://doi.org/10.1016/j.asr.2021.08.032> (Q1: IF-2.8).
 20. Suman, S.; **Kumar, D.**; Kumar, A . Fuzzy Based Convolutional Noise Clustering Classifier to Handle the Noise and Heterogeneity in Image Classification. *Mathematics* 2022, 10, 4056. <https://doi.org/10.3390/math10214056> (Q1: IF-3.00).
 21. Kumar, S., Agarwal, A., Villuri, V.G.K. **Kumar, D** Constructed wetland management in urban catchments for mitigating floods. *Stoch Environ Res Risk Assess* 35, 2105–2124 (2021). <https://doi.org/10.1007/s00477-021-02004-1> (Q1: IF-3.90).
 22. N. Kayet, K. Pathak, C.P. Singh, V.M. Chowdary, B.K. Bhattacharya, **D. Kumar**, S. Kumar, I. Shaik. Application of vegetation index and brightness temperature for drought detection. *Ecotox. Environ. Safe.*, 239 (2022), Article 113650. <https://doi.org/10.1016/j.ecoenv.2022.113650> (Q1: IF-6.2)
 23. Kumar S.; Agarwal A.; Ganapathy A.; Villuri V.G.K.; Pasupuleti S.; **Kumar D.**; Kaushal D.R.; Gosain A.K.; Sivakumar B. Impact of climate change on stormwater drainage in urban areas. *Stoch Environ Res Risk Assess* 36, 77–96 (2022). <https://doi.org/10.1007/s00477-021-02105-x> (Q1: IF-3.9)
 24. Chatterjee, R.; Singha, S.; Aggarwal, A.; Sharma, V.; Pranjal, P.; Karunakalage, A.; Jain, P.; Nagar, A.; Mitra, D.; **Kumar, D.**; et al. Reconnaissance to characterization of land subsidence due to groundwater overdraft and oil extraction in and around Mehsana City, Gujarat, India by long-term hybrid differential interferometric SAR technique. *J. Hydrol.* 2023, 627, 130441, <https://doi.org/10.1016/j.jhydrol.2023.130441> (Q1: IF-5.9)
 25. Chatterjee, R.S. Pranjal, P. Jally, S. Kumar, B. Dadhwal, V. K. Srivastav, S. K. **Kumar, D.** Potential groundwater recharge in north-western India vs spaceborne GRACE gravity anomaly based monsoonal groundwater storage change for evaluation of groundwater potential and sustainability, *Groundwater for Sustainable Development* 10 (2020) 100307: 1-14, <https://doi.org/10.1016/j.gsd.2019.100307> (Q1: IF-4.9) .
 26. J. Pandey, **D. Kumar**, N. K. Mohalik, R. K. Mishra, A. Khalkho, & V. K. Singh Investigation of the Role of Fire Retardants in Preventing Spontaneous Heating of Coal and Controlling Coal Mine Fires. *Fire Technol* 51, 227–245 (2015). <https://doi.org/10.1007/s10694-012-0302-9> (Q2: IF-3.3).
 27. Chatterjee, R. S., Singh, K. B., Thapa, S., & **Kumar, D.** (2015). The present status of subsiding land vulnerable to roof collapse in the Jharia Coalfield, India, as obtained from shorter temporal baseline C-band DInSAR by smaller spatial subset unwrapped phase profiling. *International Journal of Remote Sensing*, 37(1), 176–190. <https://doi.org/10.1080/2150704X.2015.1126376> (Q2: IF-3.3).
 28. Ranjan, V., Sen, P., **Kumar, D.** et al. Enhancement of mechanical stability of waste dump slope through establishing vegetation in a surface iron ore mine. *Environ Earth Sci* 76, 35 (2017). <https://doi.org/10.1007/s12665-016-6350-6> (Q2: IF-3.0).
 29. Pandey, J., Kumar, D., Panigrahi, D.C. et al. Temporal transition analysis of coal mine fire of Jharia coalfield, India, using Landsat satellite imageries. *Environ Earth Sci* 76, 439 (2017). <https://doi.org/10.1007/s12665-017-6765-8> (Q2: IF-3.0).
 30. Rawat, A., **Kumar, D.**, Chatterjee, R.S. et al. A GIS-based liquefaction susceptibility mapping utilising the morphotectonic analysis to highlight potential hazard zones in the East Ganga plain. *Environ Earth Sci* 81, 358 (2022). <https://doi.org/10.1007/s12665-022-10468-9> (Q2: IF-3.0).
 31. Singh, A.K., Kumar, A., **Kumar, D.** et al. Coal Pillar Extraction Under Weak Roof. *Mining, Metallurgy & Exploration* 37, 1451–1459 (2020). <https://doi.org/10.1007/s42461-020-00277-8> (Q2: IF-2.8).
 32. Kadiyan, N., Chatterjee, R.S., Pranjal, P. **Kumar, D.** (2021). Assessment of groundwater depletion–induced land subsidence and characterisation of damaging cracks on houses: a case study in Mohali-Chandigarh area,

India. Bull Eng Geol Environ 80, 3217–3231 (2021). <https://doi.org/10.1007/s10064-021-02111-x> (Q2: IF-3.7).

33. Pranjal P. Kadiyan N. Chatterjee R.S. **Kumar D.** Sati M.S. (2021). Interpreting land subsidence impacts due to groundwater depletion using remote sensing-based GRACE gravity anomaly and DInSAR technique: a study on north-western parts of India. Environ Earth Sci 80, 596 (2021). <https://doi.org/10.1007/s12665-021-09905-y> (Q2: IF-2.8).
34. Vivek Singh, Purnendu Sardar, Sukha Ranjan Samadder, **Dheeraj Kumar**, Vasant Govind K. Villuri. Predicting the future landscape of Dhanbad District: an analysis of land-use change and urban sprawl through cloud computing and neural networks. Environ Dev Sustain 26, 30749–30770 (2024). <https://doi.org/10.1007/s10668-023-03998-0> (Q2: IF -4.7)
35. Pranjal, P., **Kumar, D.**, Soni, A. et al. Assessment of groundwater level using satellite-based hydrological parameters in North-West India: A deep learning approach. Earth Sci Inform 17, 2129–2142 (2024). <https://doi.org/10.1007/s12145-024-01263-0> (Q2: IF-2.9).

Annexure III: Selected R&D Projects (recently closed/started)

(a) As Project Leader /Principal Investigator

S.No.	Project No.	Title	Date of Start	Funding Agency	Value (Rs. Lakh)
1.	CIL(11)/2019-2020/655/ME	Development and Field Trial of 500 T Capacity SAGES-III for Use with Continuous Miners (Phase-III)	23.04.2019	Ministry of Coal (MoC)	396.69
2.	DST(SERB)(TIH)(256)/2020-2021/712	Technologies for Mining under National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)	03.03.2020	DST (SERB)	11000
3.	SAIL(6)/2021-2022/802/ME	Scientific study for preparation of Computer Aided 3-D Model of Ground Level of Tasra Open Cast Project, SAIL-Collieries Division	27.03.2021	Steel Authority of India Limited (SAIL)	11.06
4.	DSF/2022/11158 (TEXMiN)	Hyperspectral Image Processing and Analysis for Exploration in the Mining Industry	07.12.2022	Dassault Systemes	31.75
5.	2022/TTDF/01/711 (TEXMiN)	Digital Mining Infrastructure for safety and sustainability using private 5G network	07.02.2024	TCoE India	428
6.	CRDP/1166G	NeTS Small NSF-DST Modernizing Underground Mining Operations with Millimeter-Wave Imaging and Networking	10.01.2025	National Science Foundation (NSF), USA & DST	68.84

(b) As Co-Principal investigator

S.No.	Project No.	Title	Date of Start	Funding Agency	Value (Rs. Lakh)
1.	SAIL(4)/2020-2021/728/ME	Assessment of change detection due to mining activities at the iron ore mines of SAIL at a scale of cadastral using Deep Learning Neural Networks technique	20.06.2020	Steel Authority of India Limited (SAIL) Co-PI	91.5
2.	HCL/2022-2023/985/MNE	Scientific Study of Subsidence at Surda Mining Lease, Kendadih Mining Lease, and Rakha Mining Lease	08.02.2023	Hindustan Copper Limited Co-PI	88.50
3.	DST(SERB)(382)/2022-2023/995/MNE	Slope Instability Severity (SIS) Assessment at the Coalfield Level using Integration of Innovative Spaceborne InSAR and Relevant Data for Enhanced Slope Failure Predictions	01.03.2023	DST (SERB) Co-PI	56.94
4.	BCCL/2023-2024/1010/MNE	Detection and Monitoring of Longwall Subsidence of Moonidih Colliery, BCCL, using Spaceborne SAR Interferometry (InSAR) Techniques	11.05.2023	Bharat Coking Coal Limited (BCCL) CO-PI	39.90

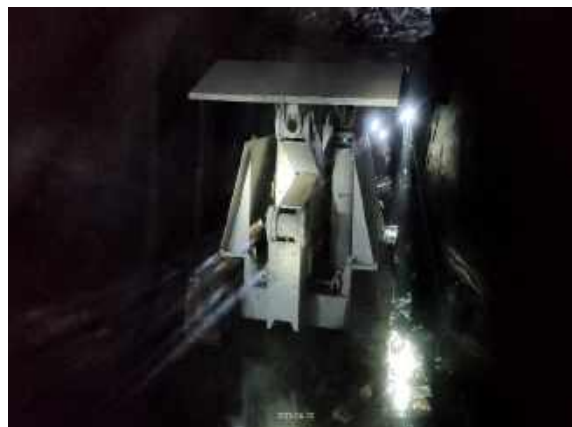
5.	CIL(9)/2017-2018/540/ME	Development of Virtual Reality Mine Simulator (VRMS) for improving safety and productivity in coal mines	28.08.2017	CIL R&D Board	1410
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(c) Centre of Excellence / Centres

1.	CIL(CoE)/2024-2025/06/TEXMiN	IMiN - Centre of Excellence for Mining 4.0 at TEXMiN at IIT(ISM) Dhanbad campus	18.06.24	CIL	6745
2.	DST(NRDMS)(385)/2023-2024/1000/MNE	Regional Centre for Geodesy	31.03.2022	DST (NRDMS)	141

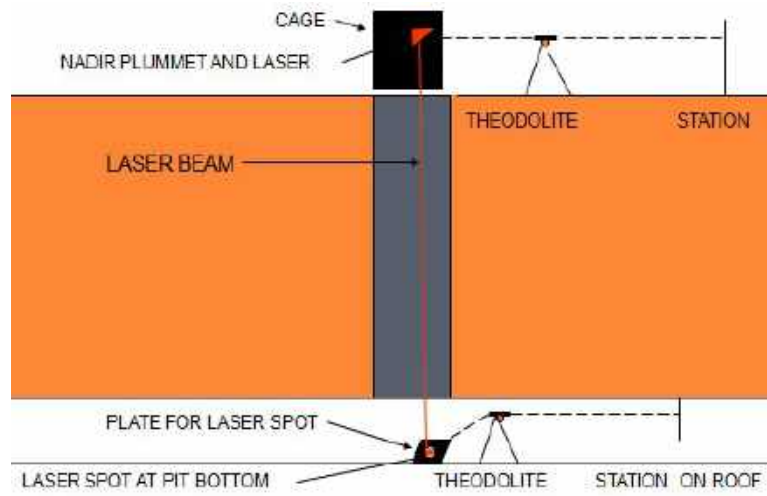
Major Technology developed and commercialized in the last five years

- Designed, developed, and commercialized a lightweight, medium-duty 2X200t capacity SAGES with a remote radio-controlled and digital display system (Commercialized)

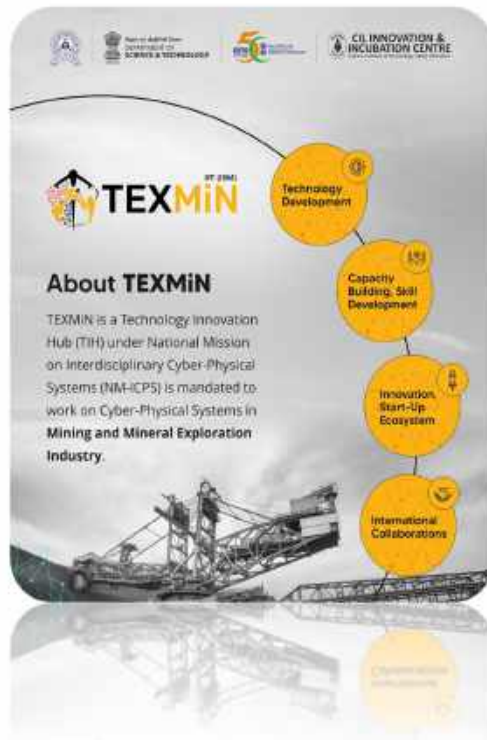


(An IIT (ISM) breakthrough in the mission of Make in India – Design and Development of Automated Roof Support System “SAGES” for SAFE, PRODUCTIVE, and ECONOMIC extraction of locked coals from underground mines. SAGES is unique in terms of its patented design of base to slide inside the undercarriage, which is cheaper, lightweight, and compact.)

- Designed and developed a heavy-duty 500t SAGES with a remote radio-controlled and digital display system to be used with a continuous miner for depillaring operations in underground coal mines.
- SAGES are approved by the Directorate General of Mines Safety (DGMS) for the full-scale deployment in underground coal mines. Coal India Limited and SCCL have acknowledged SAGES's technical and economic viability for Goaf Edge Support in depillaring operations in underground coal mines. A few orders from one of the Mining Industries have been received for their deployment in Underground Longwall Coal Mining as gate road supports.
- Developed a methodology for laser-guided orientation and correlation surveys in mines (Methodology presently used in mines) and implemented it at UG mines of Tata Steel, UCIL, CIL, and others. Successfully carried out orientation and alignment Survey at Chenani – Nasri Road Tunnel to connect Jammu with Srinagar precisely.
- Developed methodology and guidelines for microwave remote-sensing applications of Assessment and Monitoring of Land Surface Subsidence due to Stoping Hard Rock Metal Mining



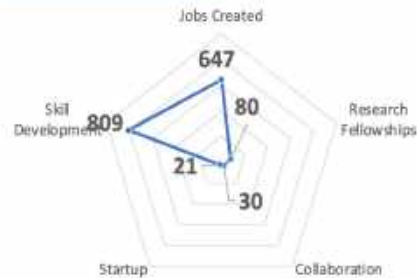
Annexure IV: R&D and innovation facilities developed



TEXMin Foundation

Section 8 company funded by Department of Science & Technology, Govt of Technology Innovation Hub at IIT (ISM) Dhanbad. Funding of INR 110 crores under NMICPS Scheme, DST, Govt

Achievement in numbers



Governing Structure

- MCB (Mission Governing Board)
- Scientific Advisory Council
- IMCC (Inter-Ministerial Coordination Committee)
- HGB - Consists of Top academia, Govt and Industry
- ICD - Dr. IIT (ISM), Project Director, Industry, Academia

45+ Technologies and Products developed so far...

Mining 4.0

Exploration 4.0



Annexure V: Top 10 Key Consultancy and Outreach Programmes in recent years

a) Consultancy Projects

Sl No.	Consultancy No.	Title	Client	Value (Rs. Lakh)
1.	CONS 7399C	Feasibility Study for Jamadoba Group of Mines	Tata Steel (RMD)	21.24
2.	CONS 7207	Scientific Study of various survey measurements at HEMM patches of BCCL	Bharat Coking Coal Limited	712.00
3.	CONS 7178	Slope Monitoring Study of South Kaliapani Chromite Mine and Sukrangi Chromite Mine of Odisha Mining Corporation Ltd.	Odisha Mining Corporation Ltd.	53.00
4.	CONS 7190	Mine Closure Audit of the Mines of Jharia Division	Tata Steel (RMD)	34.00
5.	CONS 7065	Scientific Study for OGL and Different Survey Works of Kerandari Coal Mining Project	NTPC Mining, Ranchi	435.00
6.	CONS 6097	Geofencing & georeferencing of the lease pillars and preparation of digital georeferenced map & generation of Geo-referenced shape files and 3D modelling of iron ore stacks within the lease area along the western part of the lease boundary at Vijaya II Mines	Tata Steel (RMD)	60.79
7.	CONS 6055	3-D subsidence prediction model for Kenda, Rakha, and Surda mines of HCL	Hindustan Copper Ltd.	33.04
8.	CONS 7001	Subsidence Study of Khetri Copper Mine and Kolihan Copper Mine, Hindustan Copper Limited (HCL), Khetri Copper Complex (KCC), Rajasthan	Hindustan Copper Limited	98.00
9.	CONS 6091	Scientific Study for 3D advanced different survey work of ChattiBariatu Coal Mining Project, NTPC	NTPC Mining, Ranchi	72.36
10.	CONS 3374	Identification & demarcation of the area under Sand mining leases of Tata Steel, Jharia Division by DGPS survey and preparation of geo-referenced Cadastral map of the mining leases	Tata Steel (RMD)	41.4

b) Outreach Programmes/EDPs

Sl No.	EDP No.	Title	Client	Value (Rs. Lakh)
1	EDP/7252/2024-25	Six Week Intensive Course on "Advances in Mine Surveying Technology"	CIL & its Subsidiaries	154.00
2	EDP/7112/2023-24	Six Week Intensive Course on "Advances in Mine Surveying Technology"	CIL & its Subsidiaries	124.00
3	CONS 7343 E/2024	Four Weeks Course on Mine Surveying Techniques	MCL & BCCL	46.18
4	EDP/7017/2022-23	Advances in Mine Surveying Techniques	CIL & its Subsidiaries	67.00
5	EDP/5051/2019-2020	Modern Mine Surveying Techniques.	Hindustan Zinc, Ltd.	16.99

6	EDP/5045/2019-2020	Informal Learning Opportunity for the Ministry of Mines & Petroleum (Afghanistan) officials.	Australian High Commission, New Delhi	17.41
7	EDP/5090/2019-2020	Developing Indo-Australian Collaboration for Sustainable Mining in India	RMIT University and CSIRO Australia	14.86
8	EDP/5023/2019-2020	AI Master Analyst Programme	Various industries	6.86
9	CONS/3804/2017-2018	Surface and underground Metal Mining-some Advanced Aspects	Infosys Ltd	7.50
10	EDP/4087/2018-2019	Informal Learning Opportunity for the Ministry of Mines & Petroleum (Afghanistan) officials.	Scope Global Pty Ltd.	17.37