The future of work in mining

What will jobs look like in intelligent mining operations?

Specialist rock engineer

Responsible for designing tunnel supports and ensuring compliance with safety standards within mine tunnels, drawing on their rock mechanics expertise; uses data-driven insights from automated reports and live feedback from sensors to respond to seismic and support triggers and to inform tunnel support design

SPECIALIST ROCK ENGINEER

Summary

The specialist rock engineer provides rock mechanics services in accordance with mining regulations, which include designing safe and appropriate supports for stable excavations in rock as well as understanding the mining-induced seismicity for the mine. The specialist rock engineer also provides installation specifications and standards to support design.

The specialist rock engineer works closely with the Nerve Center data scientist who processes data from strata control officers, 3D scans, microseismic monitoring tools, geophones, etc., through advanced analytics. This data informs the specialist rock engineer of conditions on site and enables them to respond to major problems in real time, track trends, and plan accordingly. Advanced analytics helps the specialist rock engineer gain an enhanced understanding of ground conditions, seismic activity, and potential human errors in observations, thereby enabling better performance, more accurate work scheduling, enhanced productivity, and safer working conditions.

With tangible data on the team's performance, the specialist rock engineer can provide informed feedback to the team performance scientist to optimize the team's performance.

Responsibilities

- Works closely with the Nerve Center data scientist to ensure the algorithms and parameters used in advanced analytics are relevant, appropriate, and up to date

- Draws insights from data related to rock engineering and geotechnical conditions to design optimized mine excavations, extraction sequences, and ground support systems

- Uses integrated reports and real-time notifications enabled through advanced analytics (including AI) to optimize the investigation and address geotechnical issues, as well as optimize mine planning and work scheduling

- Uses data insights from the team's observation reports to inform learning strategies together with the team performance scientist

- Provides specifications for roof and excavation support

Time spent on activities

- Review mine planning
- Site inspections and actioning results
- Design and optimize mine excavations
- People management and collaboration
- Analyze inspection sheets and write reports on investigation results
- Generate mining insights

| 10% | 15% | 20% | 30% | 10% | 15% |

JIVAN MOODLEY

SPECIALIST ROCK ENGINEER
Mining Inc.

Jivan is a rock engineer with 19 years' experience. When he started as a young junior rock engineer, he was assessing hand-written reports from strata controllers and spent most of his days manually compiling reports for his mine manager. Now that he has IoT and observation report theme-grouping solutions, he has more time to coach his team and research innovative solutions for better ground stability.

Experience

Lead rock engineer
Mining Inc. | *Jun 2018–present*
Directs and manages all mine production activities

Rock engineer
Mining Inc | *Jun 2008–May 2018*
Provided pillar and support design, conducted underground geotechnical assessments, and categorized site data

Junior rock engineer
GolPlats | *Jun 2002–May 2008*
Assessed field work and excavation stability; prepared and assessed 2D and 3D models

Education

- The future of mining diploma
- Chamber of Mines Rock Mechanics certificate
- BSc., Engineering

Toolbox

Nuance
Software package that performs semantics and text topic clustering to assist the rock engineer with decision-making and improves efficiency of going through strata controller reports

Decipher
Software that processes scanned files into a typed document

Skills and endorsements

HUMAN

Coaching ·439
Endorsed by **Aparna**, who is highly skilled at this

Scientific reasoning ·397
Endorsed by **Kristy**, who is highly skilled at this

Driving performance ·374
Endorsed by **Anup** and **Jay**, who are highly skilled at this

Collaboration ·413
Endorsed by **Roger**, who is highly skilled at this

Innovative thinking ·412
Endorsed by **Andrew** and **Cobus**, who are highly skilled at this

Leadership skills ·357
Endorsed by **Josephine**, who is highly skilled at this

TECH

Digital fluency ·421
Endorsed by **Henry** and **Charl**, who are highly skilled at this

Finite element design ·343
Endorsed by **Neil**, who is highly skilled at this

Rock and soil strength modeling ·503
Endorsed by **Chester** and **Francois**, who are highly skilled at this

Programming ·221
Endorsed by **Louise**, who is highly skilled at this

A DAY IN THE LIFE

0 2 : 0 0 AM — Decipher and Nuance tools automatically retrieve, process, and integrate data from strata controllers' notes on the previous shift, while Jivan sleeps

0 6 : 3 0 AM — Starts the morning shift remotely with his first cup of coffee, while looking over the integrated strata control observation report

0 7 : 0 0 AM — Receives a notification that a primary support observation was marked as "low risk" by the same strata controller (Alex) for a second time this week, which was overridden by the trained algorithm to show as "high risk"

0 9 : 0 0 AM — Travels to the office and conducts a quick meeting with his team to discuss urgent issues drawn from the report. Also highlights preventative measures based on predictive analytics and schedules a check-in with Alex

1 1 : 3 0 AM — Reviews reports from video analytics to address any concerns related to flagged areas. Uses the ground condition trends to inform the mine planning team

0 1 : 0 0 PM — Grabs lunch with colleagues while the natural language processing platform automatically processes the latest observation reports within the Nerve Center

0 2 : 0 0 PM — Attends a virtual planning meeting with geologists and mine planners to discuss recurring trends noticed in the data collected. In the latest site report, the Northern Tunnel is consistently indicating a gradual decline in ground conditions, which is misaligned to original planning. This allows the mine planners to proactively amend their strategies

0 2 : 3 0 PM — Receives a real-time warning to respond to a seismic alert from an area with suboptimal support compliance. Data from a network of underground sensors is sent directly to procurement to ensure that enough roof bolts are ordered for the additional mesh support required

0 4 : 3 0 PM — Checks in with Jenna, the team performance scientist. Based on the latest risk overrides for some of his team members, identifies some critical developmental areas for his team. Informs Jenna so that she can identify the most effective way to address these developmental areas

0 5 : 0 0 PM — Does a digital handover of the day's findings to the upcoming shift, highlighting the past shift's flagged areas

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About the authors

ANDREW SWART Andrew Swart is both the global and Canadian leader of the Mining & Metals practice as well as the global leader for the sector. In his global roles, Swart leads a team from around the world and sets the strategic direction and go-to-market strategy for the global practice. With 20 years of industry and consulting experience, he is passionate about client service, having worked across many major mining and metals geographies, including Canada, Chile, Russia, Ukraine, Kazakhstan, Brazil, Germany, India, South Africa, the United Kingdom, and the United States. Swart's areas of expertise include corporate and competitive strategy engagements, digital and innovation systems, and large organizational transformation programs.

JANINE NEL Janine Nel is Deloitte's global Future of Work leader for Energy, Resources & Industrials, and Deloitte's global colead for the People & Diversity pillar of the mining and metals group. Leading delivery and thought leadership in the area of digital and its impact on work, Nel focuses on the workforce and the workplace in the future of work. She helps clients unpack the elements of work that are truly human, what can be done by machines, and what this means for people. She is also part of an effort that pioneers the people impacts of the mine of the future.

TALITHA MULLER Talitha Muller is the Future of Work program manager for Deloitte Africa and a member of the Global Future of Work Regional Leadership forum. Muller plays an integral part in leading the Future of Work movement within South Africa by providing strategic guidance to business leaders on navigating the complexity of digital disruptions pertaining to changes in work, workforce, and workplace, and how to create exponential professionals.

JENNA WING As an industrial psychologist with two years' experience within the energy and resources industry, Jenna Wing has worked with the Future of Work team on developing the digital nerve center solutions for the intelligent mine. She focuses on the future of the workforce, the change in skills and capabilities, how roles will be deconstructed, and the business case for reskilling/repurposing people. Through creative ways of working and learning, Wing wants to continue to be a part of, and build, high-performing teams by challenging everything we do from a personal, work, and mindset perspective.

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