Director of Blasting Solutions

Expertise	Drill and Blast Engineering, Wall Control, Mine Planning, Machine Learning
Education	Ph.D., Mineral Resource Engineering, 2022 University of Nevada Reno, United States M.Sc., Civil Mining Engineering, 2016 University of Santiago, Chile B.Sc., Mining Engineering, 2006 University of Santiago, Chile
Professional Affiliations	Member: International Society of Explosives Engineers (ISEE), Society for Mining, Metallurgy and Exploration (SME)
Honors	Appointed Subject Matter Expert in Blasting for Nevada Gold Mines Operations (2021) Dean's Merit Scholarship, University of Nevada Reno (2019) Fulbright (University of Nevada Reno) Scholarship (2017)
Keynote Lectures	International Society of Explosives Engineers (ISEE), Las Vegas, Nevada, 2022 Application of Computers and Operations Research in the Minerals Industries (APCOM), Johannesburg, South Africa, 2021 Application of Computers and Operations Research in the Minerals Industries (APCOM), Wroclaw, Poland, 2019

Professional Experience

2022 – Present	ITASCA Minneapolis Director of Blasting Solutions
2020 – 2022	Nevada Gold Mines, Battle Mountain, Nevada Senior Drill and Blast Engineer
2018 – 2020	University of Nevada Reno, Nevada Mining and Metallurgical Engineering Department Research and Teaching Assistant
2015 – 2018	GeoBlast, Santiago, Chile Project Manager
2014 – 2015	Antucoya Mine, Antofagasta Minerals, Antofagasta, Chile Operations Planning Engineer
2010 – 2013	Orica Mining Services, Codelco Andina Mine, Chile Technical Consultant of Rock on Ground and Rock with Specification contracts

2008 – 2010	Orica Mining Services, Collahuasi Mine, Chile
	Technical Consultant
2006 – 2008	GeoBlast, Santiago, Chile
	Project Engineer
2004 – 2006	Split Engineering, Santiago, Chile
	Field Engineer

Project Experience

Wall Control and Damage by Blasting: Using vibration monitoring and modeling (near and far field), definition of the best drill and blast parameters to take care of the highwalls in different open pit mines (Las Bambas, Collahuasi, Peñasquito, Zaldivar, Andina, Los Bronces, etc.).

Diagnostic and Evaluation of Drill and Blast Practices: Holistic reviews of drill and blast practices and recommendations for improvement based on world-class operations.

Drill and Blast Optimizations: Calculation of the best drill and blast parameters, including timing (e.g., burden relief) to reach adequate fragmentation levels while ensuring slope stability, producing a positive impact in the productivity of shovels/trucks, a reduction in maintenance costs, and better throughput in the processing plant.

Fragmentation Modeling: Data collection in different geological domains to develop site-specific fragmentation models to predict size particle distributions at different mine sites.

Enhancement of Explosive Energy Distribution in Open Pit Blasting Operations Using UAVs and Machine Learning: Application of photogrammetry, machine learning, and deep learning to control the drilling accuracy of drillholes to adjust explosives charges and timing to obtain optimal explosive energy distribution.

Oversize Control: Use of techniques and strategies to reduce and eliminate oversize controlled by the hardness of the rock and geological structures, among other factors.

Developing a New Tension Crack Analysis System to Increase the Safety of Open Pit Slopes: Machine learning techniques and convolutional neural networks to develop an early monitoring system to detect cracks using photogrammetry and data collected from mines in Nevada.

Photogrammetry for High-Resolution Modeling of Open Pit Geometry and Slope Stability Monitoring: Drones and machine learning to predict potential failures in highwalls using data collected throughout Nevada.

Mine to Mill: Development of the best strategies to obtain optimum fragmentation in the mine and therefore increase the recovery of the ore and/or reduce specific energy consumption in the SAG mill.

Voids: Special drill and blast configurations and practices to blast close to older underground operations, keeping the right levels of safety, stability of the walls, and fragmentation.

Autonomous Drilling: Comparison of autonomous drilling systems (e.g., Epiroc, Flanders), checking drilling performance for different rock formations, and analyzing key performance indicators to conclude the advantages and disadvantages of each system.

Other Experience

Project Management: Supervision, mentoring, and training of engineering staff. Development of new projects and/or services. Build and track forecasts and budgets ensuring compliance with the plan.

Technical Support: Technical support related with drill and blast projects and diverse software used in mining.

Software:
- Numerical Modeling: 3DEC, FLAC3D, PFC
- Modeling and Analysis: MATLAB (Machine Learning, Computer Vision), Python (Keras, Tensorflow), OpenCV, Processing
- Programming: Java, Android Studio, Python
- Apps: Android Studio, XCode
- Mine Design: Vulcan, Minesight, Surpac, Deswik
- Ore Estimation: Datamine
- Blasting Design and Analysis: ShotPlus, JKSimBlast
- Fragmentation: Split-Desktop, Wipfrag, Powersieve, Split-Online
- Statistics: Statgraphic, Statistica, Jump In
- Operative Research: WinQSB, Arena
- Ore Processing: JKSimMet

Research Projects:
- Developing a New Tension Crack Analysis System to Increase the Safety of Open Pit Slopes
- Photogrammetry for high-resolution modeling of open pit geometry and slope stability monitoring
- Automation Technologies for Drilling and Blasting Operation using UAV imaging, Photogrammetry and Machine Learning
- Enhancement of Explosive Energy Distribution in Open Pit Blasting Operations Using UAVs and Machine Learning
- Aerial Imaging and Photogrammetry applied to Blasting Analysis
- Blasting process optimization using empirical fragmentation modeling, aerial imaging and photogrammetry
- Challenges in high resolution imaging by UAVs in open pit mines
- Dilation Angle in Rock Mechanics and Photogrammetry