Advancing Mining Technology through AI and Sustainable Practices

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Status	Assistance Professor		
Affiliations	International Society of Environmental Geotechnology		
Keywords	Mining Engineering, Rock Excavation, Blasting, Sustainable Mining, Machine learning, AI		
Technical Support Skills	・Research on rock blasting and environmental sustainability ・Integrating digitalization and informatics in the field of mining and geoscience ・Developing predictive modelling based on machine learning techniques		

Research Contents Prediction of rock blasting outcomes using soft computing techniques

Mining plays a vital role in modern industries by supplying raw materials for construction, manufacturing, and energy production. One of the most critical operations in mining is rock blasting, which is used to fragment rock masses and extract valuable minerals. However, blasting often generates undesirable side effects, particularly ground vibrations that can lead to structural damage, environmental harm, and safety hazards for workers and nearby communities. Since ground vibrations are an inevitable consequence of blasting, accurate prediction and assessment are essential to minimize risks. Traditional empirical models have been widely used to estimate blast induced ground vibrations, but they often suffer from significant limitations due to their reliance on simplified assumptions and limited datasets. Advances in AI and machine learning (ML) present new opportunities to overcome these challenges. By leveraging large datasets, ML based models can capture complex relationships between blasting parameters and vibration outcomes, leading to more precise and reliable predictions. My research focuses on analyzing blasting outcomes by integrating controlled blasting data with statistical and machine learning techniques. This approach aims to enhance predictive accuracy and provide practical solutions for mitigating blast induced vibrations, ultimately improving safety and sustainability in mining operations.

Research expertise:

- Mining technology & rock blasting optimization
- Mining informatics & digitalization
- Sustainable resource & environmental management
- Machine learning & AI applications in mining
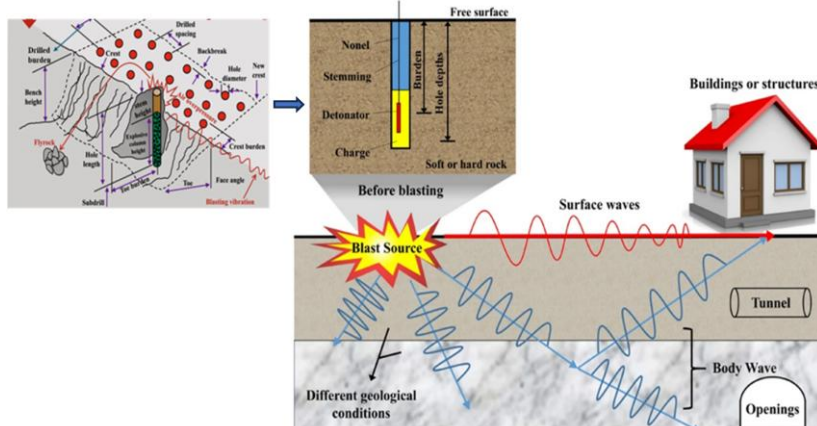
Available Facilities and Equipment

Data analysis	
Statistical analysis	
Machine learning	