

# Geological Evaluation of Tunnel Face Using Artificial Intelligence

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In the new evaluation system, AI determines the geology of the tunnel face.

The AI incorporates knowledge and experience of experts in rock mechanics and geology.

When an image of tunnel face is uploaded to a cloud server, AI immediately determines the geological conditions such as weathering alteration and crack condition.

The field engineers use the results to select support design and auxiliary construction methods for the tunnel.

## Features of this AI system

- (1) Use of deep learning
  - It utilizes a multi-layered neural network "AlexNet".
  - Learning data based on the evaluation of 70 tunnel face is used for geological evaluation.
- (2) Use of cloud computing system
  - Anytime, anywhere, anyone can evaluate the bedrock appropriately in a short time. (Figure 1)
- (3) Evaluation by subdividing the face
  - Unlike the conventional 3 division method, the tunnel face is divided into about 70 parts for evaluation. (Photo 1)
- (4) High hitting ratio
  - Compared to geological experts, the system can get correct answers with hitting ratio of 70 % or more on seven items — strength of bedrock, weathering alteration, crack interval, crack condition, strike dip, amount of sump water and degree of deterioration.

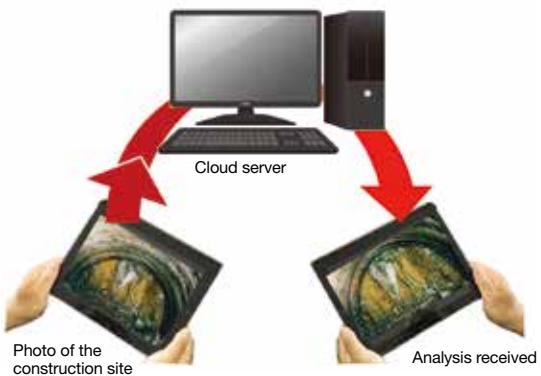


Fig.1 AI system for tunnel face evaluation

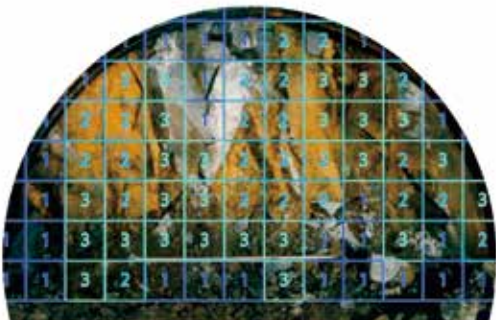


Photo 1 Evaluation of bedrock: heat map (subdivided evaluation)