Unlocking the Potential of Core Photography Leveraging SOTA Open-Source Computer Vision Models

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In mineral exploration, drilling for a target represents the ultimate test of our hypotheses about what lies beneath the Earth's surface. This process generates a wealth of sensor information, including core photography, which provides invaluable insights into subsurface geology. However, these photographic data are often collected in non-analytics formats, limiting their potential for advanced analysis and interpretation.

To address this challenge, Rio Tinto's exploration division has incorporated open-source AI models, such as Meta's Computer Vision models, to transform raw core photos into analytics-ready formats through human-in-the-loop prompts. Rio Tinto has built an end-to-end Python app-based workflow with cloud connections, allowing users to ingest and view core photography from recent or historical drilling projects. This workflow allows human prompts for core and depth markers through a cloud labelling template and invokes open-source models hosted within Rio Tinto's firewalls to carry out core segmentation and depth registration. Ultimately, this allows users to validate the quality of 'analytics-ready' core photography, which can later be used for geoscience-specific machine learning analysis.

By leveraging segmentation-by-prompting capabilities of these open-source models from leading technology and research sectors, mineral exploration can accelerate its analytics workflow. Building a machine learning model from scratch can be laborious and time-consuming, leaving little opportunity to influence the next drill targets based on insights from core photography.

Rio Tinto's approach defines the boundaries where open-source machine learning models intersect with geoscience datasets to create 'analytics-ready' datasets which can be utilized for more specialized geoscience-specific models. The combination of AI-assisted segmentation and human expertise allows for the rapid development of large, diverse datasets that can be used to train generic models for core image segmentation across various geological settings.