

Automated drillcore description based on core images and machine learning

Martin Blouin, Geolearn, Milan, Italy

Geologists commonly interpret lithologies, alteration types, or exploration vectors from drillcore using visual observations, and seldom rely on geochemical analysis, geophysical surveys or multispectral images due to the cost and time consumption related to these quantitative methods. However, visual geological description involves a series of drawbacks: 1) they are subjective and qualitative to semi-quantitative at most; 2) they are not reproducible. Results vary from one geologist to another and from one time period to another; 3) quality assessment and quality control are difficult to implement on visual descriptions; and 4) the data collected is limited, and if further information is required, geologists have to unstack core boxes. All these issues have an impact on deposit modelling and, later, on resource estimations. Important time losses and economical prejudices can arise from the quality of drillcore descriptions.

Linearized core images accessible along the core descriptions as implemented in GeoticLog allow the digitalization of the core for later access. Quality control on descriptions and the addition of new information is possible even if the core itself is no longer accessible. This practice is becoming a standard in the mining industry, and the quality and quantity of core images collected has increased significantly. The nature of core images make them inexpensive to acquire, and easy and quick to use by the modelling geologist. The next technological step is to use these images to help the logging geologist during his description work.

Machine learning is a field of artificial intelligence which identifies patterns in data and makes predictions based on those patterns. With applications ranging from mineral prospectivity to geological modelling, machine learning is increasingly used in the mining industry. Geolearn has developed Predikor, a machine-learning application based on linearized core images produced by GeoticLog, capable of describing lithologies, alteration, and veins along drillcore automatically. Geolearn algorithms learn from already described drillcores to produce a predictive model synthesizing description standards applied to a particular deposit. These descriptions are reproducible and quantitative. They can be adapted to a project and modified at will by retraining the model.

Automatically generated drillcore descriptions can be used by logging geologists as a base to their own descriptions to speed up, standardize, and increase the description quality. The workflow proposed here has the potential to dramatically improve core descriptions, and consequently the resulting models and resources.