Towards User Friendly Data-Driven Minerals Exploration: Lithological Mapping in an Orogenic Gold Setting

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Geophysical and remote sensing methods are routinely used to supplement geological observations. They are also of value where geological observations are not available due to a thick regolith profile or where ground access is restricted. Dealing with these large, disparate datasets poses an increasing challenge and opportunity, to the mineral exploration industry. Machine learning algorithms present an efficient, data-driven means of adding value to these data through semi-automated lithological mapping.

Recent research has demonstrated that the combination of the Random Forests™ and Self Organizing Maps classification methods significantly improved lithological mapping in a VHMS setting. This study applies these algorithms to the orogenic gold setting, using an exemplar case study located in Australia's Eastern Gold Fields. The study area is characterized by Archean stratigraphy overlain by regolith comprising up to 80 m of in situ saprolite and Tertiary transported cover. We address the capacity of these algorithms to improve lithological mapping in the study area and which data are required for the best results. We examine the value of implementing this method at various stages of a projects life cycle.

Using Random Forests and Self Organizing maps, we are able to produce a data-driven lithological map of the study area. This has been achieved using a desktop computer and an interoperable combination of industry standard and freely available open source software. Quantifying uncertainty in the classification allows us to better identify areas where the available data adequately facilitates mapping and targeting; and those areas of high complexity where further exploration effort is required.