PhD Research opportunity in the EarthByte Group

Project description

The emerging suite of machine learning tools have enabled data scientists to make sense of big data. Given the abundance of a large and diverse geodata sets, these tools are gaining traction in the geosciences to unearth hidden relationships in geological and geophysical data used for for mineral exploration. With the rising demand for critical minerals to power the renewable economy, a data-driven framework is required to map these resources through space and time.

The EarthByte Group is developing plate reconstructions, coupled plate-mantle models and spatio-temporal data analysis technologies, adding a deep-time dimension to ore deposit data analysis. This project aims to assimilate plate kinematic and geodynamic information, using pyGPlates, with the formation ages of mineral deposits for better understanding the tectonic niche environments of ore deposits. Spatio-temporal data mining will provide new insights into the formation and preservation potential of:

- Subduction-related deposits – porphyry copper deposits form in arc settings. The formation of this commodity is sensitive to subduction convergence kinematics.
- Sediment-hosted deposits – concentrated by mineral-bearing fluid flow, these deposits are sensitive to extension rates that drive sedimentary basin evolution.

The candidate will develop a data-driven machine learning framework to target critical mineral exploration by:

1. Constructing training datasets from deep time variables, e.g. plate kinematic parameters, crustal ages, geophysical data, regional geology, etc.
2. Supervised machine learning on known deposits, tailored to specific commodities.
3. Predicting the location and potential grade of resources that have not yet been discovered.

The candidate will be co-supervised by a geologist at Geoscience Australia and will have the opportunity to interact with data scientists from the Sydney Informatics Hub (SIH). The SIH will offer courses on programming in Python and machine learning, covering relevant know-how for the project, and provide broad, transferable skills for industry, government organisations or academia after the completion of the PhD.

Student experience

The successful candidate will join a dynamic team of Earth scientists at the University of Sydney. The EarthByte Group is an engaged community of earth scientists from a broad range of disciplines (www.earthbyte.org). We have a recognised track record in community software development, open-access data sets and virtual Earth modelling. We foster cross-disciplinary collaboration across a range of interests and research areas in Australia and overseas. Opportunities to attend national
and international conferences are encouraged to disseminate scientific research and collaborate with researchers and industry partners.

Informal enquiries

For further information and informal expressions of interest, please do not hesistate to contact the prospective academic supervisors:

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