Opportunity – Geospatial Machine Learning of Geologic and Geophysical Properties

On the regional to global scale, our collective understanding of Earth properties is constrained by direct observations of geology (e.g., well logs, cores, etc.) or indirectly via remote sensing (e.g., geophysical or satellite observations). This fact results in either a sparse dataset of Earth properties at high spatial resolution (km to sub-km scale), or a continuous, but low-resolution dataset from satellite observations. Because of this, automated interpolation (e.g., kriging) and/or human informed contouring is needed to create a continuous understanding of these properties at high resolution. In this work we work to improve these methods. Utilizing machine learning, deep learning, and/or new developments in physics informed neural networks (PINNs) we intelligently interpolate, or predict, Earth parameters spatially and with depth. This work leverages a variety of data sources (i.e., "big data") of geologic observations, such as: scientific drilling, coring, and dredging, and geophysical observations, such as those collected by crewed vessels (e.g., ships), autonomous platforms (e.g., AUVs), and satellites. We combine these datasets with physics-based models of geologic processes (e.g., compaction) and data driven methods (e.g., machine learning) to produce continuous and accurate estimates of Earth properties. Examples of these approaches include predicting a continuous gravity field from sparse ship-board observations or predicting sediment lithologies vs depth using core data. We seek qualified applicants with experience in geology/geophysics, remote sensing/geodesy, machine learning/data science, and/or transport/rock physics modeling. Applicants will be expected to have some computational experience and be comfortable in basic programming/scripting (specific languages are not required). Basic geologic understanding is encouraged, but not required.

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