Optimization of high-resolution hyperspectral data processing for the description of drill cores

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Exploring ground resources has become challenging as the need for raw materials or for characterization of underground pollution has increased. Hyperspectral imaging of drill cores has been gaining popularity, especially in mining field, as it allows a fast and reliable estimation of mineral distribution[1]. However, with the increasing resolution of hyperspectral images, the size of the datasets (> 1 Tb) to process is exploding, impairing the capacity of the mineral mapping algorithms to work in near real-time[2].

The Sonic On-Line Sampling & Analysis (SOLSA) is a combination of sonic drilling and automated mobile analyses that highlights multiple insights of the ore body knowledge, on site and in real-time, to aid in the exploration, mining processing and decision-making (https://solsa-dem-up.eu/en). Chemical and mineralogical information is provided by profilometric, X-ray fluorescence (XRF), RGB and hyperspectral (HSI) sensors.

To ensure runtimes compliant with the operational requirements, we develop a framework allowing to reduce the computational cost of hyperspectral images processing of a drill-core and to generate mineral maps. It embeds different algorithms for hyperspectral data pre-processing, spectral and spatial reductions as well as mineral matching. These last two treatments heavily rely on similarity metrics (i.e., clustering). Finally, comparisons with chemical and roughness data of the other devices are also proposed to refine the location of ore deposits.

We demonstrate the capabilities of this framework to generate reliable and precise maps by processing a 10-meter core sampled at the closed tin mining site located in Abbaretz (France).

References

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