Applications of Machine Learning Algorithms in Ore Finding

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Summary

There has been a surge of constructions in the last decade all over the world due to the rapid growth of population, leading to a high consumption of building material such as cement. The cement manufacturing process where raw materials, i.e., limestone, clay, sand, and iron ore, are crushed and ground is hazardous to human beings and cause harmful environmental impacts, such as acid rain and global warming.

To locate possible ores, heavy labors are often needed to drill the grounds to bring up the soils and rocks which later are tested and analyzed with the help of crushing, milling and separation methods. In order to alleviate the high cost and handling of toxic materials, the mining industry has been calling for solutions with little or less human labor by introducing innovative science and technologies.

In this work, we aim to use Machine Learning algorithms to help identify and locate ore with a goal to reduce the use of human labor and limit the environmental impact on the nature. In particular, we would take advantage of visual mining and classification algorithms on geological formation such as x-ray or chemical reaction results to identify the ores. Data can be analyzed from numerous sources i.e., remote sensing images using deep learning and convolutional neural networks (CNN) to determine such areas where the minerals are found feasibly.

In addition, data from mining equipment can be used to predict when failures were most likely to happen, which in turn to improve the operational productivity and optimize scheduled maintenance. Coupling with seismic monitoring systems, we can also apply data mining methods such as regression and Neural Networks to detecting and predicting seismic hazards in underground mines. In summary, we investigate applications of various machine learning algorithms in mining operations with a goal to speed the mining manufacturing process, reduce labor or machine handling, and create a more eco-friendly and safe working environment.