

Machine versus Human – Imagery Geotechnical Data Collection

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Summary (All headings should be Arial 12pt bold, DELETE SECTIONS THAT ARE NOT USED)

Mining Industry and Geotechnical Engineering are getting significant exposure to Machine Learning and Artificial Intelligence (AI). ALS GoldSpot, as a mining and geoscience consulting firm, is frequently exposed to a very common question: "How is data collection using AI more accurate than using people? Can AI replace geologists?" The simple answer to the second question is no, AI cannot replace geologists, and we believe it is not even the intention to replace the human factor. The answer to the first question is a bit more complex. We would like to bring greater clarity to this question through the following study.

Theory / Method / Workflow

The first selected candidate to focus on was the alpha angle. Alpha and beta angles in geotechnical engineering are a crucial tandem of values to the determinate orientation of fractures, faults and potential failures. ALS GoldSpot selected two alpha angle datasets for this study - one collected from the field, and one collected from photo logging by geologists. Photo logging has been conducted on the same images as Machine Learning. These datasets were then compared to the Deep Machine Learning application.

Results, Observations and Conclusions

The AI method demonstrated consistency and ability to collect challenging data such as low alpha angles, and in a short time span (Figure 1). On the other hand, the comparison to the field data was challenging due to multiple factors, such as potential core distribution after the core logging task or different standards in various drilling programs.

Moreover, it was found that the distribution of field-collected data was very comparable to AI-collected data. However, the geotechnical classification of joints and the spatial localization were more precise from photo logging.

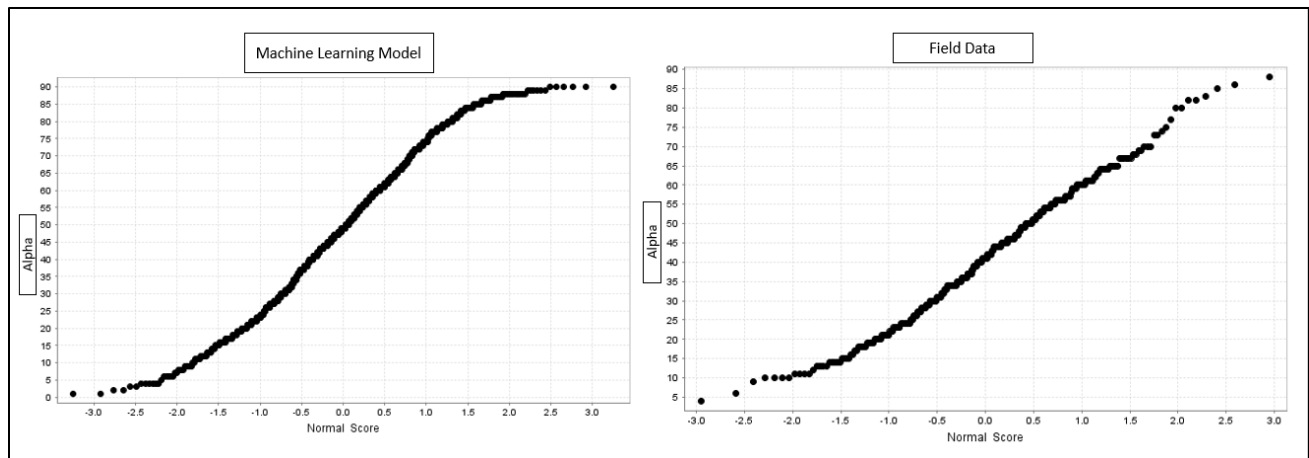


Figure 1. Machine Learning data and Filed Data in the SPOLOT diagram.

Novel/Additive Information

Geotechnical data imagery collection is a novel method for collecting geotechnical data. It increases geotechnical data density and provides crucial information which would otherwise be lost in the geological core yard or on the hard drive. Moreover, before any potential Machine Learning and field data comparison can be done, it is essential to be objective regarding the nature of data collection.

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