Automated Coal Picking in MWD Logs

Katie Silversides[1], Rian Dutch[1], Nurassyl Battalgazy[2], John Jackson[2], Tom Carmichael[1]
[1]Datarock, Melbourne, Australia, [2]IMDEX, Brisbane, Australia

Measure while drilling (MWD) data can be routinely collected from drill rigs without requiring additional scanning equipment or time. MWD can provide useful information about the rock drilled, particularly about the relative hardness. However, MWD data is noisy and can be difficult to interpret. Additionally, when collected during blast hole drilling the dataset can quickly become very large.

This study uses data MWD collected during blast hole drilling in a coal mine. The aim is to identify holes where the drill stops at the top of the coal seam and use these to model the coal seam. Accurately knowing the depth of the coal helps prevent damaging the coal when blasting.

A manually labelled dataset was used to create a MWD library containing two classes, touch coals and not coal. A 1D convolutional neural network (CNN) was trained on this dataset. The trained model was then applied to holes from different benches, processing the last 3m of each hole to determine if a touch coal was present. Additional rules were then applied to identify the exact boundary depth and eliminate some of the false picks.

The coal pick model had an accuracy of 86% when compared to the manual labels, with most of the errors being missed touch coals (13%). These missed coals most often occurred where the MWD did not continue far enough into the coal. Another cause of errors was artefacts in the MWD. Where the touch coals were correctly labelled, 89.9% were within 30cm of the manually labelled coal, and 99.2% were within 1m.

The manual and CNN coal picks were then used to create surfaces representing the top of the coal seam. The two surfaces were highly similar, indicating that the CNN method of identifying coal picks is suitable for use in this case.