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MICROMINE applies Machine Learning to optimise core tray imagery

Members of MICROMINE's Perth office recently participated in The Newcrest Crowd, an industry-leading, crowdsourcing and partnership platform that challenges innovators around the world to solve specific mining problems through online competitions.

The "Get 2 the Core" competition focused on core tray photography and how companies can derive the value in historical core tray imagery. Core tray photography is currently underutilised due to the arduous process of capturing, processing and analysing core tray photography. With so much rich textural, mineralogical and geotechnical information contained in core tray photography, there is a lot of value in optimising current processes.

Photographs taken on Newcrest sites are mostly standardised, but they have millions of historic core images from 10s of thousands of drillholes. As technology evolves, image analysis techniques are becoming more powerful and prevalent within exploration and mining industry. These large image repositories will eventually become rich sources of quantitative data.

"Get 2 the Core" asked participants to build an algorithm that could determine and map the spatial extents of the core tray and then the individual rows contained within. The successful participant was awarded a prize of \$10,000, with a separate prize to be awarded for solutions that also solve the problem but do not exactly fit the scoring requirements.

MICROMINE's Wojciech Slabik commented "The Get 2 the Core was an exciting project to be involved in. We have been working with Machine Learning techniques to solve mining problems on our Pitram team and we immediately noticed that we could apply these methods also to the problem presented by Newcrest."

Provided to participants was a training dataset of images and completed masking instructions - the ground truth. The test data set consists of images only, for which the participants needed to predict the masking instructions via a CSV file. The solution needed to be able to perform on inconsistent photography where:

- Core boxes can be made from different materials (wood, steel, cardboard, plastic);
- Images are highly variable in terms resolution, aspect ratio and quality;
- The relative position of the core tray within the image can be variable.

The MICROMINE team applied machine learning skills using the relatively new Mask R-CNN technique.

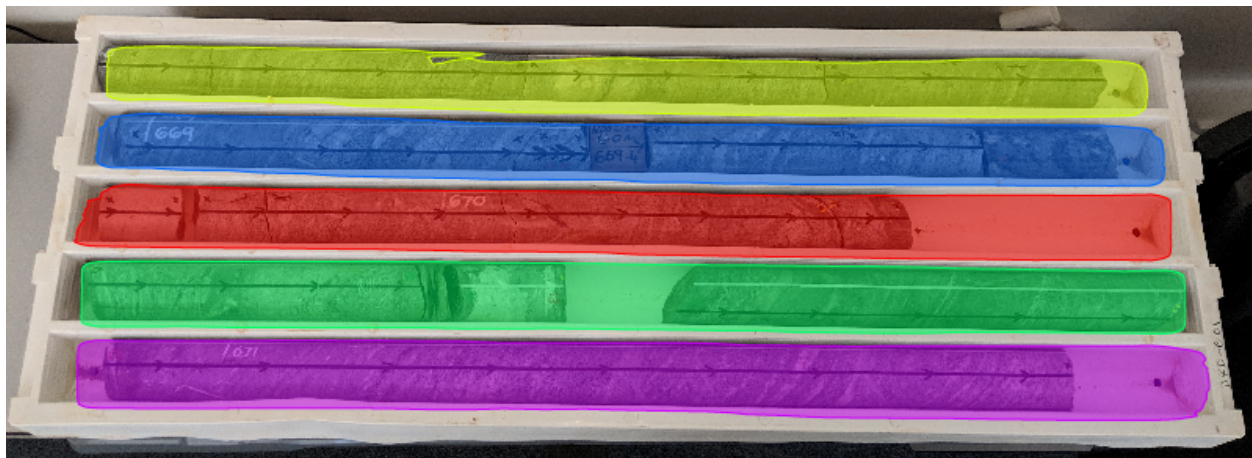
Wojciech adds “We utilised a technique known as Transfer Learning, so our Mask R-CNN learned very quickly to deal with the core tray data. Using Transfer Learning meant that we didn’t need thousands of labelled core trays to be able to train the machine. To generate the core bounding box, we then used more traditional edge detection techniques that used the mask from the Mask R-CNN.”.

The competition aimed to achieve the result of reducing the man hours required to manually review and analyse core tray photography. Due to the manual mark up, the labels may not be perfectly consistent across the entire dataset, however these labels represent the kind of work required to produce an outcome which is time consuming and labor intensive.

MICROMINE staff have combined expertise along with methodologies, from Machine Learning to more traditional techniques that can really assist with refining the work that the Machine Learning algorithm can do. The initial results achieved after only a few hours were remarkable.

Wojciech “The results we got in only few hours were much better than what we have initially expected. Future development will be focused on training the network to generate not just the bit mask outlining the drill core, but also the full bounding box”.

The judges were scoring on a combination of two loss functions, an IoU (Intersection over Union) loss to determine the accuracy of the bounding box predictions and a negative log likelihood for the multi-class multi-label classification task. The tasks were weighted such that 90% of the score comes from solving the bounding box prediction task.



Core tray photo from MICROMINE client with the core outlines generated by the Mask R-CNN.

MICROMINE would like to congratulate to the ‘Get 2 the Core’ competition winner, it was great to see so many participants coming up with impressive results using a variety of innovative techniques. The MICROMINE solution will be used to provide this functionality to the users of the Geobank data management solution. The speed and quality of the solution has encouraged MICROMINE to continue with further development using training data sourced from our existing Geobank clients. When

integrated into Geobank, core tray images can be transferred into the database and displayed in Geobank drillhole trace along with other downhole data.

The core tray photo conversion will be completed by the Machine Learning algorithm with minimum effort from the user.

– ENDS –

About MICROMINE:

MICROMINE is a leading provider of intuitive software solutions for the exploration and mining sector. MICROMINE's integrated suite of solutions covers the entire mining process, from exploration through to mine production.

MICROMINE understands the software and consultancy needs of operations around the world. Located in the world's major mineral producing capitals, our teams are close to clients' operations. This means MICROMINE can provide local support in the client's own language and time zone.

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