PROJECT BACKGROUND

- Coal and Open-pit surface mining impacts on American Lands Follow-On (COAL-FO) is the successor project to the 2016-2017 COAL project. COAL initially aimed to deliver a suite of algorithms to identify, classify, characterize, and quantify (by reporting a number of key metrics) the direct and indirect impacts of mining operations and related destructive surface mining activities across the continental U.S (and further afield). COAL successfully delivered a Python library for processing hyperspectral imagery from remote sensing devices such as the Airborne Visible/InfraRed Imaging Spectrometer (AVIRIS) and a Science Data System for running COAL pipelines.

COAL-FO: COAL and Open-pit surface mining impacts on American Lands Follow-On

COAL-FO will allow researchers to analyze the mineral, mining and environmental impacts to American lands from Open-pit surface mining.

Project Description: The COAL-FO is a continuation of a previous project completed in the 2016-2017 capstone COAL project. The COAL project was a stable python toolkit providing examples, tests, packages, stable release and stable API that identified, classified, and quantified the effects of open-pit mining on the surrounding environment. The COAL-FO project improved the existing algorithms and general functionality as well as enabled the toolkit to work with more spectral libraries.

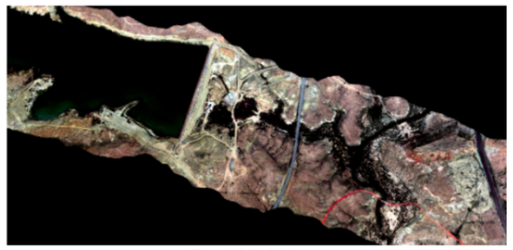


Figure 1: Visible-light image.

The Mineral Classification API provides methods for generating visible-light (Figure 1)

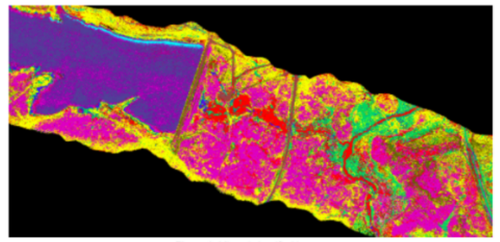


Figure 2: Mineral classified image.

The Mineral Classification API provides methods for mineral classified (Figure 2) images.

Figure 3: Mining classified image.

The Mining Identification API filters mineral classified images to identify specific classes of interest (figure 3)

Figure 4: Environmental correlation image.

The Environmental Correlation API finds pixels in a mining classified image that are within a certain number of meters from features in a vector layer (Figure 4)

AVIRIS: Airborne Visible / Infrared Imaging Spectrometer

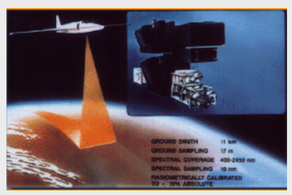


Figure 5: AVIRIS Flight

AVIRIS has been flown on four aircraft platforms: NASA's ER-2 jet, Twin Otter International's turboprop, Scaled Composites' Proteus, and NASA's WB-57.

Spectra: Wavelength values that vary over a range of reflectance.

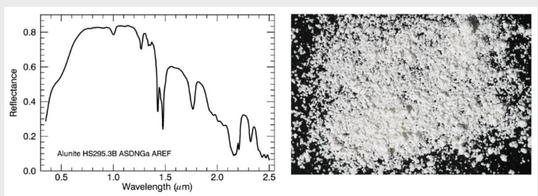


Figure 6: Example Spectra

USGS Spectral Library Version 7

Figure 7: RGB Visible Light Image

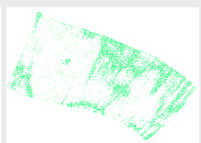


Figure 8: USGS Spectral Library Version 6 Mineral Classification

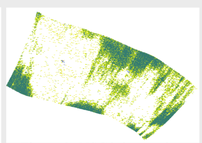


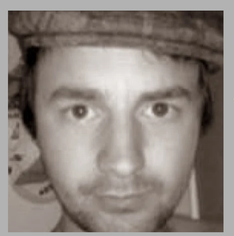
Figure 9: USGS Spectral Library Version 7 Mineral Classification

The COAL project used USGS Spectral Library Version 6. The COAL-FO capstone project has designed a method for convolving USGS Spectral Library Version 7 into envi file format. This allows pycoal to classify more spectra, improving the classification images. USGS Spectral Library Version 7 is the most up to date Spectral Library by USGS and contains more spectra than any other current spectral library.

Conclusion & Results

Bryce has improved QGIS/GDAL installation instructions to work with more systems, created a Command Line Interface(CLI), upgraded pycoal to use USGS Spectral Library Version 7 and found more data for pycoal to classify. Kenny has worked on exporting product imagery to AWS and creating a classifier callback.

THE TEAM:



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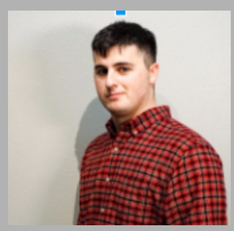

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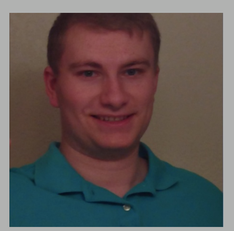

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