

Problem Statement: Coal and Open-pit surface mining impacts on American Lands Follow-On (COAL-FO)

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Abstract

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It is important for us to build models to monitor the effects of coal and open pit surface mining on American Lands. To do this our project will have four primary objectives we intend to complete. We want to improve on the existing method of COAL imagery processing algorithms which identify mining activity in the U.S. We want to improve the accuracy of finding correlations between location of mining and related activities and their effects on those nearby lands. Such as comparing similar areas land in which certain practices and methods of mining have been in use. We want to come up with a baseline suite of reporting metrics to appropriately rank and document the changes within land as well as streams or other natural barriers and landmasses nearby. We want to extend this project 'COAL' so it can be have reusable components that can be used cloud platforms for other projects or researchers who wish to apply this program to their own field.

Definition and Description

This project will create new and improve upon methods to classify, characterize and quantify impacts of mining and other destructive surface mining activities across the United States. The COAL project recently won an award and funding to go on XSEDE a single virtual system where individuals will be able to share computing resources. We will make this project work on XSEDE so other individuals will be able to use the program and data that comes from the COAL project. Putting the COAL project on XSEDE will enable us to further improve the algorithms, execution runtime performance and geospatial output results. The original COAL project focused on gathering data from remote sensing devices, providing a suite of algorithms for classifying land cover, identifying mines and other graphical features, and correlating them with environmental data sets as described on the coal capstone github page. We will also spend time on this project reviewing and understanding the previous code that was done by the group before us since this is a follow on project. Along with updating the blog for the COAL follow on project in hopes that future groups or people trying to incorporate COAL into their own project will be able to understand our goals and how our code functions. This is the fourth capstone project and hundreds of people have forked the code for this project. So it is very important that we document our work so that people using our code and data collected in the future will be able to easily understand what we did. It is also very important to track and monitor the environmental changes and effects coal has on surrounding lands since Coal is one of Americas main sources of energy. We of course want to make sure we are extracting coal and using it safely for the sake of the environment and for people who live near these areas. Satellite imaging using remote sensing devices allows us to gather much more data than a human eye would be able to. Satellite imaging can give us a picture of an entire area of land and see things such as methane emissions which a human eye would not be able to see. The NASA Jet Propulsion Lab has deployed drones and satellites to gather data which we will be able to use for this project.

Proposed Solution

In order to solve the problem addressed so far we wish to put the COAL-FO (COAL follow on) project on XSEDE. XSEDE only allows for 2 terabytes so we will come up with a method to loop through the data so that users can pull up any of the images on XSEDE. The main priority for our capstone project is making a searchable port for the COAL project. We also plan on having meetings every two weeks where we will turn in and discuss past week deliverables and plan future deliverables. This is where we will create a schedule of how to complete the project. As already discussed we will also plan on improving the existing COAL architecture and systems. We also hope to improve the imagery processing algorithms currently in use. Then we will hope to create a new baseline suite to rank changes to areas of land over time to determine if the changes

in one particular area our significant or not.

Performance Metrics

The performance metrics for this capstone project will be if we sufficiently meet the objectives as discussed in the abstract and the project description. Our main priority according to our client is to create a searchable port for the project. Once we complete this we will move on to the other objectives such as putting the project on XSEDE and improving accuracy and time of the current algorithms that are in use. We will also have performance metrics from week to week based on the meeting we have with our client and the deliverable we choose to set every other week. If we can complete those and the high priority objectives then this project will be a success. We don't necessarily need to complete all the objectives for this project to be successful as long as the high priority ones like the searchable port and putting the project on XSEDE are done or mostly finished. The objectives while important should only be worked on once we have completed work on the high priority objective discussed. These lower priority objectives would include improving existing algorithms and improving the accuracy of finding correlations between land changes in different images. Overall this project looks challenging and it seems like a lot of work but if we focus on one objective at a time and use the resources available to us I believe we can accomplish several of the high priority objectives. We also hope that the work we do on this project will make it more accessible and usable for other individuals working on their own projects and research. We look forward to working with the NASA Jet Propulsion Lab and the members of COAL project from last year.