IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Hands-on Space Education and Outreach (8)

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DATA MINING FOR EARTH OBSERVATION – USING GOOGLE EARTH ENGINE AS AN EDUCATIONAL TOOL

Abstract

The data produced from Earth Observation (EO) satellites has recently become so abundant that manual processing is sometimes no longer an option for analysis. The main challenges for studying this data are its size, its complex nature, a high barrier to entry, and the availability of datasets used for training data. Because of this, there has been a prominent trend in techniques used to automate this process and host the processing in massive online cloud servers.

This paper, presentation and demonstration will show how some of these techniques are currently being used in the field of earth observation. Google Earth Engine (EE) has been chosen as the tool for this study. EE is currently able to display 40 years of historical satellite imagery, including publicly available datasets such as Landsat, and Sentinel data from Copernicus.

Until a few years ago, most tools for mining EO data required a proficiency in various programming languages. It is only in the last few years that there has been a focus on making tools easier to use for non-developers. EE has a built in JavaScript API and a number of pre-configured scripts to reduce the barrier to entry.

The size of the data can also be restrictive for most independent or student researchers as processing on personal computers generally requires systems with multiple graphic processing units (GPUs). EE makes geospatial analysis across petabytes of data possible in the Google Cloud Platform. This means that a local installation is not necessary, only a browser and login, and all computations can be executed in the cloud. This opens access to students and individuals wishing to analyse large amounts of data and reduces the time taken to process it from days, in the case of traditional tools, to a few minutes.

In a workshop, students can be given an introduction to different type of EO properties. These include data catalogues, resolutions, understanding how layers and satellite instruments work, and variations that can be used to highlight different aspects of the landscape, such as using bands to produce, false colour. In the demonstration, real world examples of the tool can be shown with real time processing. These include viewing large algal blooms in the Baltic and the Caribbean seas, the effects of forest fires, urban sprawl and deforestation.