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## Feature Detector on the Moon Trek Portal

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The Moon Trek portal (<https://trek.nasa.gov/moon>) aims to provide the scientific community as well as the general public access to lunar data collected from various lunar missions. The portal also offers a suite of tools with the goal of allowing users to analyze the data for the purposes of education, mission planning, and research. Such tools include elevation profilers, crater and rock detection, lighting analysis, and slope analysis to name a few. Moon Trek is further expanding its analytic capabilities by adding feature detection to its toolset.

The feature detector, similar to the rock and crater detection tools, seeks to detect features on the lunar surface using orbital imagery. Unlike the detection tools currently available on the Moon Trek, the feature detector is built to be generic, trainable, and able to seek out any feature when provided a training set for the feature in question. The tool currently supports detection of craters, rocks, and lunar pits.

The feature detector takes a deep learning approach in finding features from orbital imagery. The model used in the latest detection tool is a Faster Region Based Convolutional Neural Network (Faster-RCNN) with a finetuning approach. More succinctly, the finetuning approach uses a model which has been developed and trained on a different and larger training set. The classification layer is replaced to detect features of the chosen domain (rocks, pits, craters, etc.) The model is then trained with smaller training sets.

Currently we use panchromatic Narrow Angle Camera (NAC) images from the Lunar Reconnaissance Orbiter Camera (LROC) as input. However, the model can be trained on orbital imagery from any mission. The tool's output includes the NAC image with bounding boxes over detected and an ascii file showing pixel coordinates of each detected feature.