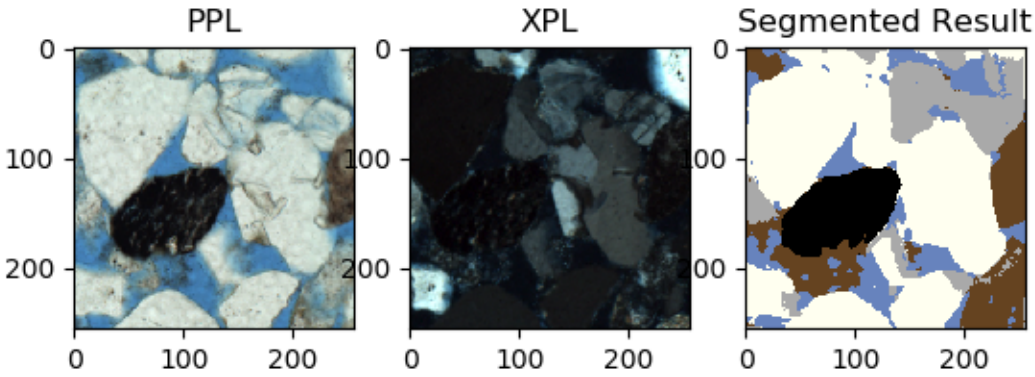
MACHINE LEARNING FOR POINT COUNTING AND SEGMENTATION IN THIN SECTIONS

David G. Tang[1], Kyle T. Spikes[1], and Kitty L. Milliken[2]

[1]Department of Geological Sciences, [2]Bureau of Economic Geology
The University of Texas at Austin

ABSTRACT

Thin sections provide geoscientists with a wealth of information about a rock's makeup and diagenetic history. For example, the amount of clay minerals or percentage of porosity can play a large role in the quality of a reservoir. However, the analysis of thin sections often requires many hours of manual labor, limiting the amount of analysis a single person can accomplish in a reasonable time frame. Here we apply a supervised machine learning method that only requires traced grains as inputs, which eliminates the need for an expert to hand design input features. The traced grains form a six-channel image (RGB color channels for both plane- and cross-polarized light images) and the algorithm provides a segmented image as an output. Preliminary results may be comparable to point counting. Once the model is trained, it quickly be applied to additional images. In addition to providing mineral percentages, a segmented thin section can be further used to describe the morphology of grains (e.g., angularity, ellipticity), or serve as the basis for digital rock physics experiments.



An example of a segmented result. Left: Plane-polarized input thin section. Middle: Cross-polarized input thin section. Right: Segmented result from the machine learning model. White grains have been identified as quartz, gray as feldspar, black as dense minerals, brown as lithic, and blue as pore space.