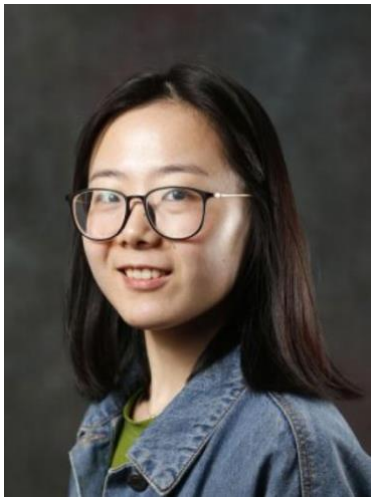
Environmental Science Graduate Program Seminar Series

Incorporating endmember variability and spatial contextual information into unmixing fractional vegetation cover from multispectral data



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Smith Laboratory, Room 3150

Abstract

Fractional vegetation cover (FVC, i.e., fraction/abundance of vegetation at a unit area, “pixel” in remote sensing imagery), as a major canopy structural component, plays a key role in many forest-related applications such as biomass estimation, energy and carbon balance, and forest management. Spectral unmixing enables large-scale and land cover-specific fraction mapping, outperforming other FVC estimation approaches, e.g., field sampling or manual interpretation of high-resolution images. Nevertheless, existing unmixing-based FVC estimation studies have seldomly considered local variability in endmember extraction and spatial continuity in abundance inversion, resulting in spiky and non-detailed FVCs. Here, we proposed an automatic endmember extraction method that integrates super-pixel segmentation and Fuzzy C Means clustering confidence to guarantee the variability and purity of endmembers. The extracted endmembers were fed to state-of-the-art unmixing techniques (with/without consideration of spatial contextual information) to inverse endmember-wise abundance maps. The obtained endmember-wise abundances were then aggregated to different land cover classes (i.e., tree-, non-tree vegetation) to produce their corresponding FVCs. Our results indicate that the proposed endmember extraction method can locate high-quality endmembers spectrally close to the reference data. Moreover, incorporating endmember variability and spatial contextual information improves the overall spatial details and continuity of the estimated FVCs. The presented FVC estimation method relies on satellite imagery only, which is of great value for large-scale and long-term forest structural monitoring and eco-related studies.

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