THE OHIO STATE UNIVERSITY
DEPARTMENT OF GEOGRAPHY
THESIS PRESENTATION

A Spatial-Temporal Contextual Kernel Method for Generating High-Quality Land-Cover Time Series

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In order to understand the variability, drivers, and effects of the currently unprecedented rate, extent, and intensity of land-cover change, land change science requires remote sensing classification products that are both highly accurate and spatial-temporally consistent. This need for accuracy is exacerbated from the shift in the discipline from the detection of change between two points in time to the analysis of trajectories of change over time. As the length of temporal record increases, the problem becomes more severe. Land-cover classifiers that can better utilize spatial and temporal information offer the chance to increase the accuracy of change detection and the consistency of classification results, producing higher quality land-cover products. Such products enable more accurate and consistent detection, monitoring, and quantification of land-cover change and therefore can have wide-reaching impacts on downstream environmental, ecological, and social research.

To address these problems fundamental to the creation of multi-temporal land-cover products, this thesis seeks to develop an improved contextual classifier for multi-temporal land-cover mapping that fully utilizes spatial-temporal information, while remaining resistant to future advances in the spatial and spectral characteristics of remote sensor technology. By combining the strengths of leading classification techniques in a novel spatial-temporal kernel method, this goal can be achieved for the betterment of multi-temporal remote sensing. Improvement of the technique makes it tractable to obtain highly accurate and spatial-temporally consistent multi-temporal land-cover maps automatically and without post-processing. Application of this proposed classifier shows significant improvement upon the state-of-the-art in multi-temporal land-cover mapping. The accuracy of change detection, accuracy of individual dates, and temporal consistency among land-cover change trajectories are all significantly improved over competitive techniques. Altogether, this work addresses fundamental issues in data quality by better using geographic information to enable the accurate and consistent explanation of the places, periods, and types of land-cover change occurring on our Earth.

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