

# Large Scale Visual Data Analytics for Geospatial Applications

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## ***Abstract***

The widespread availability of high resolution aerial imagery covering wide geographical areas is spurring a revolution in large scale visual data analytics. Specifically, modern aerial wide area motion imagery (WAMI) platforms capture large high resolution at rates of 1-3 frames per second. The sequences of images, which individually span several square miles of ground area, represent rich spatio-temporal datasets that are key enablers for new applications. The effectiveness of such analytics can be enhanced by combining WAMI with alternative sources of rich geo-spatial information such as road maps or prior georegistered images. We present results from our recent research in this area covering three topics. First, we describe a novel method for pixel accurate, real-time registration of vector roadmaps to WAMI imagery based on moving vehicles in the scene. Next, we present a framework for tracking WAMI vehicles across multiple frames by using the registered roadmap and a new probabilistic framework that allows us to better estimate associations across multiple frames in a computationally tractable algorithm. Finally, in the third part, we highlight, how we can combine structure from motion and our proposed registration approach to obtain 3D georegistration for use in application such as change detection. We present results on multiple WAMI datasets, including nighttime infrared WAMI imagery, highlighting the effectiveness of the proposed methods through both visual and numerical comparisons. The talk particularly highlights how image processing and computer vision applications are a fertile ground for incorporating machine learning and data science methodologies.