Defense Announcement

Deep Learning for Building Extraction and Change Detection from Remote Sensing Imagery

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Degree: MS, Electrical Engineering

Date: 8/6/2018 **Time:** 10:00 am

Location: ECE Large Conference Room

Committee Chair: Dr. Saurabh Prasad

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We have investigated the use of convolutional neural networks (CNN) to perform building extraction and change detection on multispectral remote sensing imagery. Our method is intended to locate structures that have been constructed or removed in the time between image acquisitions of a given area. Potential applications of this approach include urban planning and disaster management. The network compares pairs of coregistered image tiles and assigns class labels to individual pixels. Building extraction is accomplished by training CNNs, such as fully convolutional networks and residual U-Nets, to perform binary semantic segmentation of remote sensing imagery. Fully convolutional networks are semantic segmentation networks initialized with weights from image classification CNNs. Residual U-Nets are an extension of the original U-Net encoder-decoder architecture for semantic segmentation. Change detection is accomplished by performing Boolean operations on the resulting binary classification maps to distinguish buildings that have been added or removed from those that are unchanged. Building extraction and change detection results for one FCN and two residual U-Nets are presented. Convolutional long short-term memory (LSTM) networks are investigated as an alternative approach to change detection. Convolutional LSTM units incorporate convolution kernels and recurrent connections in the same unit, making them suitable for processing time series imagery. Multispectral, three and four-band aerial images from the National Agriculture Imagery Program are used for training and testing. Building footprints were provided by Oak Ridge National Laboratory.