Doctorate Dissertation Defense Announcement

ENSEMBLE LEARNING REGRESSION FOR ESTIMATING RIVER DISCHARGE USING REMOTELY SENSED DATA

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Abstract

Inland freshwater is regarded as one of the essential resources for ecosystems, yet we still have limited knowledge of river discharge variation due to its heterogeneities in time and space. The number of gauging stations has declined primarily due to the reduction of government funding for maintaining stream gauges. Instead, studies estimating river discharges have emerged using hydraulic variables (water levels, inundation areas, river widths, and surface water slopes) obtained from remote sensing with a multiplicative method, such as the Manning equation or a rating curve generated by comparing those hydraulic variables from remote sensing with in-situ discharge measurements. However, those methods require multiple hydraulic variables that may not be available everywhere or that depend on rating curves varying with high and low water seasons. Therefore, a new method to estimate river discharge may be required using remotely sensed data for better knowledge of the spatiotemporal dynamics of surface freshwater discharge. In this dissertation, firstly, the new approach to estimating river discharge using ensemble learning regression (ELQ) has been developed. Ensemble learning indicates a series of procedures to train several functions and combine their results based on an integrating rule. ELQ, which combines several rating curves linearly using altimetry-derived water levels at several locations and generates more accurate estimates of river discharge compared to those obtained from the single rating curve. Secondly, efforts have been made to improve the accuracy of estimates of discharge for poorly gauged rivers using remotely sensed data, a hydrologic model, and ELQ. In sum, this dissertation represents an attempt to estimate river discharge by harmonizing several rating curves at different locations in terms of the data-driven approach.