

Change Point Detection and Visualization of Region of Interests on Weather Time Series Data Using Three-dimensional Convolutional Neural Network

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To understand long-term natural variation on meteorological observation data, it is necessary to exclude artificial variation factors. This research proposes a 3D Convolutional Neural Network (3D-CNN)-based method to detect changes caused by artificial factors such as relocation of an observation station which appear small perturbation patterns in observed data. The proposed method allows supervised learning by synthesizing training data with supervisory signal. This research conducts experiments with observation data by Automated Meteorological Data Acquisition System (AMeDAS). By cutting off the temperature change pattern observed at two neighboring stations at a certain time and exchanging the subsequent observation data, training data can be synthesized including the virtual observation station movements. Experimental results showed that it is possible to detect the observation station movements in a short distance of several kilometers or less even when using training data synthesized from observation stations that are several tens of kilometers away. In addition, by using guided gradient-weighted class activation mapping, the proposed method could visualize the region of interests on the observation data when detecting change points.

Keywords: Observation data by AMeDAS, 3D convolutional neural network, Change point detection, Visualization

