Sensitivity Analysis of the Hyperparameters of CNN for Precipitation Downscaling

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Nowadays, a convolutional neural network (CNN), which is a kind of deep neural network has been shown to have high applicability to precipitation downscaling in previous studies. CNN has various hyperparameters, which greatly affect the estimation accuracy. In the field of computer science, researches on hyperparameter settings have been conducted, especially for image recognition. However, there are few studies that investigated the sensitivity analysis of hyperparameters on precipitation downscaling by means of CNN. Therefore, this study conducted a sensitivity analysis of the hyperparameters of CNN for precipitation downscaling. For this study, atmospheric reanalysis data were used as the inputs for precipitation downscaling by means of CNN, and daily average precipitation at the basin level were used as the target data. Then, this study focused on the hyperparameters of CNN that have a great influence on the feature extraction of input data (such as kernel size, number of output channels in the convolutional layer, etc.). Considering that the learning process of CNN has randomness, CNN was trained 200 times for the setting conditions of each hyperparameter and evaluated the estimation accuracy. As the results of detailed sensitivity analysis, it was shown that the estimation accuracy may not be improved even if the structure of CNN deeper. Contrarily, It was also shown that initial conditions such as batch selection and bias in the CNN learning process may have relatively large effects on the learning results.