

Operation and verification of AI-based model for precipitation nowcasting using weather radar data

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Precipitation nowcasting is of great importance for weather forecast users by providing very short-term of precipitation forecasting compare to the numerical weather prediction models. Recently, many of artificial intelligence (AI) methods had been proposed to various fields.

In this study, we show that the possibility to produce precipitation nowcast by using a data-driven neural network approach. The three deep learning models based on the convolutional neural networks (CNN) with U-Net architecture were developed using weather radar and in-situ precipitation data across South Korea for the period of 2018-2022. Our model has advanced by using various pre-training method and developing new loss function considering the unbalanced precipitation distribution. The models designed to provide forecast probability of precipitation classes at a lead time of up to one and six hours.

The model performance was evaluated by monthly, seasonal, annual, and rainfall types. Rainfall types were classified into 5 types using the clustering algorithm by the Changma Research Center. We used the traditional stochastic skill scores in forecasting, including the probability of detection (POD) for correct prediction, false alarm ratio (FAR) for false prediction, and critical success index (CSI) for the AI model validation.

Key words: Precipitation nowcasting, Machine learning, Deep neural network, Radar, Evaluation

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