Scientific Visualization of Climate Simulation Data for Deep Convolutional Neural Network

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Deep learning using convolutional neural network (CNN) is effective to image pattern recognition and classification in various fields. In order to obtain high recognition accuracy using deep learning, domain specific techniques are needed. However, in the climate science field, such know-how is not sufficiently accumulated. In the present study, we investigated about input data format of climate simulation data (especially cloud and wind velocity) which can be recognized with high accuracy as fundamental research for applying deep learning to climate science. We prepare original data (single precision real number), normal image data, shading image for cloud, vector field visualization image for wind velocity, and multivariate visualization image for cloud and wind velocity (image data is 256 step gray scale). As a result of sensitivity experiments with multiple CNN architecture, it is found that the highest accuracy can be obtained with multi-channel real number for binary classification task (positive: Tropical Cyclone, negative: not Tropical Cyclone). On the other hand, multivariate visualization image (one channel and 256 step integer number) also obtains the accuracy applicable a practical use at minimum CNN architecture with minimum epoch number (the number of iterative learning).

Keywords: Visualization, Deel learning, Image recognition

