Deep Learning-based Post-Processing of Numerical Weather Predictions

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Precipitation forecasting is an important scientific challenge that has wide-reaching impacts on society. Historically, this challenge has been tackled using numerical weather prediction (NWP) models, grounded on physics-based simulations. Recently, many works have proposed an alternative approach, using end-to-end deep learning (DL) models to replace physics-based NWP models. While these DL methods show improved performance and computational efficiency, they exhibit limitations in long-term forecasting and lack the explainability. In this work, we present a hybrid NWP-DL workflow to fill the gap between standalone NWP and DL approaches. Under this workflow, the outputs of NWP models are fed into a deep neural network, which post-processes the data to yield a refined precipitation forecast. The deep model is trained with supervision, using Automatic Weather Station (AWS) observations as ground-truth labels. This can achieve the best of both worlds, and can even benefit from future improvements in NWP technology. To facilitate study in this direction, we present a novel dataset focused on the Korean Peninsula, termed KoMet (Korea Meteorological Dataset), comprised of NWP outputs and AWS observations. For the NWP model, the Global Data Assimilation and Prediction Systems-Korea Integrated Model (GDAPS-KIM) is utilized.

Key words: numerical weather prediction, precipitation forecasting, deep learning, post-process

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