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Statistical post-processing of wind speed forecasts using convolutional neural networks

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Current statistical post-processing methods for providing a probabilistic forecast are not capable of using full spatial patterns from the numerical weather prediction (NWP) model output. Recent developments in deep learning (notably convolutional neural networks) have made it possible to use large gridded input data sets. This could potentially be useful in statistical post-processing, since it allows us to use more spatial information.

In this study we consider wind speed forecasts for 48 hours ahead, as provided by KNMI's Harmonie-Arome model. Convolutional neural networks, fully connected neural networks and quantile regression forests are used to obtain probabilistic wind speed forecasts. Comparing these methods shows that convolutional neural networks are more skillful than the other methods, especially for medium to higher wind speeds.