EGU24-9528, updated on 16 Jul 2024
https://doi.org/10.5194/egusphere-egu24-9528
EGU General Assembly 2024

Ensemble forecast post-processing based on neural networks and normalizing flows

Peter Mlakar[1], Janko Merše[2], and Jana Faganeli Pucer[3]
[1]Section for Meteorological, Hydrological and Oceanographic Products, Slovenian Environment Agency, Slovenia (peter.mlakar@gov.si)
[2]Section for Meteorological, Hydrological and Oceanographic Products, Slovenian Environment Agency, Slovenia (janko.merse@gov.si)
[3]Faculty of Computer and Information Science, University of Ljubljana, Slovenia (Jana.Faganeli@fri.uni-lj.si)

Ensemble weather forecast post-processing can generate more reliable probabilistic weather forecasts compared to the raw ensemble. Often, the post-processing method models the future weather probability distribution in terms of a pre-specified distribution family, which can limit their expressive power. To combat these issues, we propose a novel, neural network-based approach, which produces forecasts for multiple lead times jointly, using a single model to post-process forecasts at each station of interest. We use normalizing flows as parametric models to relax the distributional assumption, offering additional modeling flexibility.We evaluate our method for the task of temperature post-processing on the EUPPBench benchmark dataset. We show that our approach exhibits state-of-the-art performance on the benchmark, improving upon other well-performing entries. Additionally, we analyze the performance of different parametric distribution models in conjunction with our parameter regression neural network, to better understand the contribution of normalizing flows in the post-processing context. Finally, we provide a possible explanation as to why our method performs well, exploring per-lead time input importance.