

# Artificial Intelligence for weather forecasts at the German Meteorological Service: Status and perspectives.

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Artificial intelligence (AI) is nowadays a central key to the improvement of methods in many modern applications and research areas, e.g. autonomous driving, image / face recognition and system simulation and optimization. In recent years, the potential of AI has been also recognized for climate and weather predictions, leading to a significant increase of projects in this area and potentially revolutionizing it (DeWitte et. al., 2021).

Also the German Meteorological Service (Deutscher Wetterdienst; DWD) has started to use AI methods in the context of short-term weather forecasting and post-processing of numerical weather prediction a couple of years ago. The respective research activities and applications are performed in close cooperation with the University of Mainz, the University of Osnabrück and the German Aerospace Center, whereby DWD works mainly on implementation and steering of the research. On an international level, DWD recently agreed on a closer cooperation with the AI section of the South-Korean Meteorological Agency as well.

This presentation will provide an overview about the AI applications developed at DWD covering the following topics:

- Deep learning for the early detection of thunderstorms as well as for the improvement of short-term forecasts of mature thunderstorms among others on the basis of U-Net (Brodehl et al., 2022).
- Operational usage of neural networks for the detection of volcanic ash and ice clouds based on satellite data (Bugliaro et al., 2022).
- AI concepts for a seamless integrated forecasting system including post-processing of data from numerical weather prediction .

However, AI, in particular machine learning, is also linked with handicaps. Thus, the pros and cons of AI will be discussed in comparison to classical methods. Within this scope, recent validation results and comparison with physical models will be considered as well.