



DeepRain – Improved local-scale prediction of precipitation through deep learning

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The reliable, quantitative prediction of precipitation at local scales presents one of the greatest challenges in weather forecasting while in particular extreme rainfall events can have severe consequences for the population and local infrastructures with ensuing economic losses. Numerical models show limited skill and substantial bias in the accurate prediction of the location and amount of rainfall. Statistical downscaling methods have been used to improve the model-generated predictions, but these are only applicable to locations where meteorological observations are made. In the DeepRain project, a consortium of German meteorologists and data scientists address the challenge of local-scale rainfall prediction through the application of deep learning methods for improved downscaling. By combining the information from ensemble model forecasts, high-resolution topographic data, and weather radar observations we assemble a unique information source from which a combination of convolutional neural networks and long-short-term-memory networks shall learn to recognize fine-scale patterns and apply regression for the quantitative probabilistic prediction of rainfall in three event categories (low, medium, and heavy precipitation) at the kilometer/hour scales. Scalability of the approach is achieved by employing an Array Database System for managing and accessing the massive multi-dimensional arrays involved. The machine learning results will be compared to those from standard downscaling methods to evaluate and assess the added value. The DeepRain project is funded by the German ministry of education and research.