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Visualizing Uncertainty for Probabilistic Weather Forecasting based on Reforecast Analogs

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Numerical weather forecasts are prone to uncertainty coming from inaccuracies in the initial and boundary conditions and lack of precision in numerical models. Ensemble of forecasts partially addresses these problems by considering several runs of the numerical model. Each forecast is generated with different initial and boundary conditions and different model configurations [GR05]. The ensembles can be expressed as probabilistic forecasts, which have proven to be very effective in the decision-making processes [DE06]. The ensemble of forecasts represents only some of the possible future atmospheric states, usually underestimating the degree of uncertainty in the predictions [KAL03, PH06]. Hamill and Whitaker [HW06] introduced the "Reforecast Analog Regression" (RAR) technique to overcome the limitations of ensemble forecasting. This technique produces probabilistic predictions based on the analysis of historical forecasts and observations. Visual analytics provides tools for processing, visualizing, and exploring data to get new insights and discover hidden information patterns in an interactive exchange between the user and the application [KMS08].
In this work, we introduce Albero, a visual analytics solution for probabilistic weather forecasting based on the RAR technique. Albero targets at least two different type of users: "forecasters", who are meteorologists working in operational weather forecasting and "researchers", who work in the construction of numerical prediction models.
Albero is an efficient tool for analyzing precipitation forecasts, allowing forecasters to make and communicate quick decisions. Our solution facilitates the analysis of a set of probabilistic forecasts, associated statistical data, observations and uncertainty. A dashboard with small-multiples of probabilistic forecasts allows the forecasters to analyze at a glance the distribution of probabilities as a function of time, space, and magnitude. It provides the user with a more accurate measure of forecast uncertainty that could result in better decision-making. It offers different level of abstractions to help with the recalibration of the RAR method. It also has an inspection tool that displays the selected analogs, their observations and statistical data. It gives the users access to inner parts of the method, unveiling hidden information.

References

[GR05] GNEITING T., RAFTERY A. E.: Weather forecasting with ensemble methods. Science 310, 5746, 248–249, 2005.

[KAL03] KALNAY E.: Atmospheric modeling, data assimilation and predictability. Cambridge University Press, 2003.

[PH06] PALMER T., HAGEDORN R.: Predictability of weather and climate. Cambridge University Press, 2006.

[HW06] HAMILL T. M., WHITAKER J. S.: Probabilistic quantitative precipitation forecasts based on reforecast analogs: Theory and application. Monthly Weather Review 134, 11, 3209–3229, 2006.

[DE06] DEITRICK S., EDSALL R.: The influence of uncertainty visualization on decision making: An empirical evaluation. Springer, 2006.

[KMS08] KEIM D. A., MANSMANN F., SCHNEIDEWIND J., THOMAS J., ZIEGLER H.: Visual ana-

lytics: Scope and challenges. Springer, 2008.