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Verification of probabilistic rainfall forecasts: Getting new insights into forecast services

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The Australian Bureau of Meteorology's public rainfall forecast service comprises a probability forecast consisting of the chance of rain and likely range of rainfall amount, coupled with derived text and iconographic products. We undertook a project to assess the potential for automation of the service, using forecasts developed by the Guidance Post-Processing team within the Bureau. A large part of this project was the verification we conducted to answer the question: "Is this automated forecast process good enough for operational use?"

Our approach was to compare the automated forecast to the Bureau's official, manually produced forecasts. In liaison with forecasters, we chose a variety of verification metrics to assess elements of the probability forecast. These included the reliability, resolution and uncertainty components of the Brier Score, the Brier Score itself, Reliability Diagrams, Relative Economic Value, and contingency table based metrics. The metrics were computed over various spatial and temporal stratifications and displayed on an interactive, web-based dashboard.

Important findings were the identification of large under-forecast biases in the manually produced forecasts over inland areas during winter months, and large over-forecast biases of the automated forecast in tropical and coastal regions. This is the 'hard' data which allows us to iterate towards better automated forecast processes.

Less expected, but equally important, were insights into how forecasters view the probability forecasts, text and iconographic services they deliver. Discussions with forecasters, supported by verification results, taught us that forecasters have been prepared to hedge the probabilistic forecasts to obtain the desired derived text and iconographic products. We share these stories to demonstrate how consultatively developed verification can highlight tensions within a forecasting service.

Finally, there is evidence in the verification statistics of a jump in the skill of some forecast offices relative to the automated forecast, which may be a result of forecaster exposure to the verification. This has interesting implications for making decisions to automate based on comparisons of automated and manual forecasts from before the verification was available.