

# THE FUTURE ROLE OF HUMANS IN WEATHER FORECASTING

Harvey Stern \*

Bureau of Meteorology, Australia

There is increasing interest in the question of what might be the future role for the human in the forecast process. It is asserted that computer-generated forecasts are unable (by themselves) to fully replicate the decision-making processes of human forecasters. Similarly, it is also asserted that human forecasters are unable (by themselves) to optimally integrate into the forecasting process, guidance from computer-generated predictions.

However, there is the accepted mathematical concept that two or more inaccurate but independent (or partially independent) predictions of the same future events may be combined to yield predictions that are, on the average, more accurate than either of them taken individually. Automated and human forecasts might be expected to "bring to the table" different knowledge sets, and this suggests the development of a weather forecasting system that mechanically combines human and computer-generated predictions.

This paper reports on the evaluation of a knowledge based system, modified in order to mechanically combine human and computer-generated predictions. The system's output is evaluated over an extended "real-time" trial. After 365 Day-1 to Day-7 forecasts for Melbourne, that is, 2555 individual predictions, the combined forecasts are shown to be substantially more accurate than the human (official) product. For example, combined forecasts explain 7.9% more variance of the observed weather (rainfall amount, sensible weather, minimum temperature, and maximum temperature) than that explained by corresponding official forecasts (refer to Table).

**Table: The lift in forecast accuracy achieved by combining forecasts.**

Element	Verification Parameter	Official	Combined
All Elements	% Variance Explained	33.4	41.3
Rain or No Rain	% Correct	70.1	76.8
√ (Rain Amount)	RMS Error (mm <sup>0.5</sup> )	1.05	0.97
Min Temp	RMS Error (°C)	2.39	2.27
Max Temp	RMS Error (°C)	2.82	2.49
Thunder	Critical Success Index (%)	17.9	21.6
Fog	Critical Success Index (%)	15.5	17.8

With computer-generated forecasts unable to fully incorporate human forecasters' valuable domain and contextual knowledge, there should be a role for the human forecaster well into the future. That role may be to provide input to a system that mechanically combines human predictions with computer-generated forecasts.

\*Corresponding author address: Harvey Stern, Bureau of Meteorology, Box 1636, Melbourne, Vic., 3001, Australia; e-mail: [h.stern@bom.gov.au](mailto:h.stern@bom.gov.au)