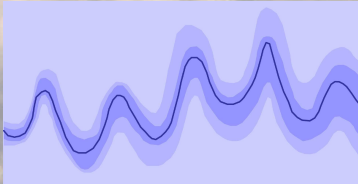


Presenting Probabilistic Forecasts



COMMUNICATING UNCERTAINTY IN WEATHER FORECASTS

Met Office / University of Bristol

The need

Small errors in observations of the current state of the atmosphere can lead to uncertainty in the weather forecast. Ensemble modelling techniques use multiple realisations of these initial conditions to estimate the forecast uncertainty. The Met Office routinely produces and collates these ensemble forecasts, but knowing how best to present probabilistic raw information directly to the public has proved difficult.

Many believe that the general public are not able to understand or utilise probabilistic forecast information and / or that this information is too difficult to communicate. There is therefore a clear need to improve upon how probabilistic weather forecasts are communicated, and to determine the factors that affect an individual's ability to make decisions using these forecasts.

The outcomes

An online game was developed to gather information on the optimal methods of presenting probabilistic rainfall and temperature forecasts to the public. Launched in August 2011, this novel use of an online game proved a highly successful platform for engaging with a wide range of users: within the course of a month it was played by over 8000 unique participants, received favourable press coverage internationally, was 'tweeted' around 1000 times and featured on BBC Radio 4's 'Material World'.

An analysis of the information collected from the game led to considerable insight into the methods that the Met Office

should employ to communicate ensemble forecasts. A key finding was that users demonstrated that they were able to make better decisions when presented with probabilistic information, and this information did not lead to unnecessary confusion when decisions could be made adequately using deterministic presentation methods.

Clear differences between participant responses were seen for the different presentation types tested, and though the presentation type was found to be the strongest influence on decision making ability, the participants' age and educational attainment also played a role.

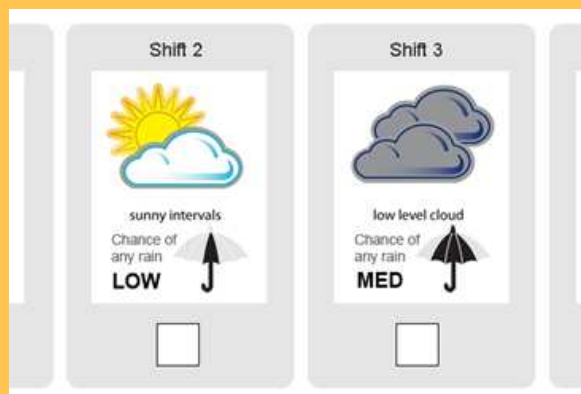
"Communicating probabilistic information to the General Public has been a challenge for the Met Office. By adopting a fresh approach, Liz was able to clearly demonstrate that the Public make better decisions when presented with probabilistic information. The outputs from her work will be extremely useful in designing new products."

Dr. Mark Harrison, Met Office

Technical summary

The Met Office weather game employed a randomised structure to allocate to each participant a method of presenting the rainfall and temperature forecasts. These presentation methods varied in terms of their style and the complexity of information that they contained.

Before beginning the actual game each participant was asked a number of questions to collect information on their age, location, educational attainment, whether they had experience of environmental modelling, and whether they had played the game already.



The participants played through 4 'weeks' of rainfall and temperature questions. In each week they were asked to make a decision based on the forecast, and to rate their confidence that it would rain or a particular temperature threshold would be met. This allowed an assessment to be made regarding whether participants can accurately decipher a probability from the probabilistic information. The order in which the set questions appeared was randomised to take into account any potential learning effects.

To allow the participants to 'experience' probabilities, the outcomes were linked to the stated probability. At the end of each week the participant was provided with a score calculated using these outcomes within a modified Brier Scoring rule that penalises over confidence.

Descriptive statistics were used and a visual examination of the data was performed for preliminary evaluation of key indicators of a participant's performance, with regression analysis techniques used to support any conclusions made. The intention is that once the initial findings have been published the dataset will be made freely available for interpretation by others.

"This project enabled me to gain more insight into the needs and abilities of end-users of probabilistic forecasts and predictions, thereby grounding the perspective of my Ph.D. research. It has also provided me with valuable project-management skills and numerous networking opportunities"

Liz Stephens
University of Bristol

"This has been a fine collaboration. It's often casually said that the public 'don't understand' probability or risk, but this project has used a rigorous randomised design to show that probabilistic information can be useful and need not confuse."

Professor David Spiegelhalter
University of Cambridge

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EPSRC

Engineering and Physical Sciences
Research Council

Project Details

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Met Office
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Project investment

£39,000

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