Evaluating probabilistic forecasts using information theory

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Abstract

The problem of assessing the quality of an operational forecasting system that produces probabilistic forecasts is addressed using information theory. A measure of the quality of the forecasting scheme, based on the amount of a data compression it allows, is outlined. This measure, called ignorance, is a logarithmic scoring rule that is a modified version of relative entropy and can be calculated for real forecasts and realizations. It is equivalent to the expected returns that would be obtained by placing bets proportional to the forecast probabilities. Like the cost–loss score, ignorance is not equivalent to the Brier score, but, unlike cost–loss scores, ignorance easily generalizes beyond binary decision scenarios. The use of the skill score is illustrated by evaluating the ECMWF ensemble forecasts for temperature at London's Heathrow airport.