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Forecast sufficiency and scoring rules

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The concept of forecast sufficiency is revisited. Broadly speaking, a forecast system A is sufficient for a forecast system B if by applying a suitable randomisation to forecasts from system A, it is possible to generate forecasts with the same statistical properties as forecast system B. The concept of sufficiency applies to both deterministic and probabilistic forecasts. It provides a rigorous and, as of now, the most general way to formalise the intuitive notion of forecast system A being more informative than forecast system B. In this contribution, the connection between sufficiency and several measures of forecast quality will be elucidated. Proper scoring rules will be given particular attention; it is demonstrated that a forecast system A which is sufficient for a forecast system B will have a better potential score. (The actual score of the forecast is given by the potential score plus a term quantifying the lack of calibration.) Furthermore, the Receiver Operating Characteristic (ROC) is considered. Again, it is demonstrated that forecast system A leads to better predictions (in terms of the ROC) than forecast system B.