

Challenges in making Useful Forecasts and Predictions

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Abstract

Few tasks are more challenging than making useful, quantitative forecasts regarding the future. One of those more challenging tasks is to actually use quantitative forecasts in real-time decision support. Nonlinearity, and to a lesser extent “chaos”, suggests that providing precise simulation-based forecasts of what will occur is suboptimal, even when a perfect dynamical model of the system is in hand; this has motivated the construction of probability forecasts. The use of probability forecasts as probabilities is, in practice, a good deal more challenging than introductory decision theory courses lead one to believe. It is suggested that even those are challenges that lie beyond our reach, as probability forecasts are almost certainly (that is: with Probability One) beyond our grasp. Structural model error (and the loss of topological conjugacy) place accountable probability forecasts beyond our reach in a manner reminiscent to the way that nonlinearity and chaos disqualified precise point forecasts as a rational goal in forecasting. After briefly arguing the points above, an alternative, achievable aim for the forecasting enterprise is introduced: better early(er) warning of high impact events. This returns us rather close to the aims and challenges (both scientific and professional) of Admiral Fitzroy’s original storm warnings. Illustrations will be drawn from Disaster Risk Reduction, the design, use and regulation of long lived infrastructure, the insurance sector, and American professional football. While discussed primarily in terms of weather phenomena, the basic challenges faced in obtaining Just Enough Decisive Information for decision support are expected in all simulation-based probabilistic forecasting endeavours.