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COMBINING DYNAMICAL AND STATISTICAL ENSEMBLES – THE SCIENCE BEHIND THE DIME PROJECT

J. Bröcker (1), L.A. Smith (1,2) and M. Roulston (1,2)

(1) London School of Economics, London (j.broecker@lse.ac.uk), (2) Pembroke College, Oxford University

Prediction of real world systems, e.g. numerical weather prediction always has to cope with several sources of uncertainty and error [1]. Model imperfections lead to a wrong prediction of the future, even for accurate input data. Furthermore, accurate input data is almost never available as well, leading again to deterioration of the prediction. Even if the model was correct, noisy data lead to indistinguishable states [2], i.e. predictions which are equally likely on the basis of the given data.

The model output is often used only to predict other quantities of interest. A concrete example is given by weather dependent business (see `www.dime.lse.ac.uk`). The business is not interested in a direct weather forecast but in future business profit, i.e. if the profit is a function $p(i, w)$ of the investment i and the future weather w, we are interested in the expected profit $E[p(i, w)]$. Using a single forecast to predict the profit amounts to the calculation of $p(i, E[w])$, which is a poor estimate of $E[p(i, w)]$. In order to adress this, the uncertainty in w has to be maintained through the profit, whence the error statistics of w are required. In this talk we show how the forecast skill of ensemble weather forecasts can be improved by bootstrapping from historical error archives. We also discuss how models featuring different output error statistics can be combined to a single forecast distribution.

[1] L.A. Smith, Predictability Past Predictability Present, *2002 ECMWF Seminar on Predictability*, (2003), 219–242, ECMWF, Reading, UK.

[2] K. Judd & L.A. Smith, Indistinguishable States I: The Perfect Model Scenario, *Physica D 151*, (2001), 125–141.