From Ensembles to Predictive Distribution Functions

J. Broecker (1), L. A. Smith (1)

(1) Centre for the Analysis of Time Series, London School of Economics, United Kingdom, (cats@lse.ac.uk)

Several aspects of interpreting ensembles are discussed, where ''interpreting an ensemble'' is understood here as transforming an ensemble into a probability distribution. Common ensemble interpretation methods often tacitly assume the ensemble to be reliable, that is the verification and the ensemble are effectively assumed to be draws from the same underlying distribution. It is well known, of course, that most ensemble based forecasting systems are not reliable. An approach to interpreting ensembles is presented that does not assume reliability, but interprets ensemble members as mere sources of information rather than possible scenarios of reality. Ensemble interpretations are seen as maps between ensembles and probabilistic distributions. Common ensemble interpretation methods are revisited in this light, and an improvement to standard kernel dressing called ''affine kernel dressing'' is suggested. It assumes an affine mapping between ensemble members and verifications, the parameters of this mapping being determined in paralell to the other dressing parameters. This ammendment to standard kernel dressing, albeit simple, can improve performance significantly. In particular, it is appropriate for both over and underdispersed ensembles, unlike standard kernel dressing, which exacerbates any overdispersion. Numerical studies are presented using both operational numerical weather predictions for a variety of locations as well as data from the Lorenz63 system. The former demonstrates effectiveness given operational constraints, the latter providing a sufficient number of cases to obtain statistically significant results in a variety of settings.