

PREDICTION AND PREDICTABILITY IN POPULATION BIOLOGY

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To determine best predictors and quantify prediction uncertainties, we investigate an analytically solvable stochastic system from epidemiology for which the time dependent solution, the likelihood function and the Bayesian posterior can be explicitly calculated as functions of given data. We show analytical expressions for the prediction probability conditioned on best estimators of parameters versus prediction probability conditioned on data only, and marginalized over the parameters, observing that the prediction uncertainty is wider in the second case, as should be done in empirical studies. Though the concept becomes clear in the analytical study, the differences between prediction based on data directly and prediction based on best estimates of parameters is small due to the simplicity of the model. In a slightly more complex model which however already cannot be treated analytically, we clearly observe the expected large differences between the two predictions. [1]

References

- [1] N. Stollenwerk, L. Mateus, F. Rocha, U. Skwara, P. Ghaffari, and M. Aguiar (2015) *Prediction and Predictability in Population Biology: Noise and Chaos*, Math. Model. Nat. Phenom., Volume 10 **2**, 142–164.