Suggested readings for breakout session on
Statistical parameter estimation and inference for dynamical models
June 1, 2017

Overview:
In the study of biological, ecological, or environmental dynamical processes, many theoretical models have been developed but it is not common practice to estimate model parameters using statistical functions of observed data. In this breakout session we will discuss methods that have been proposed to enable statistical inference for parameters of dynamical models such as ordinary differential equation, continuous-time Markov chain, and stochastic differential equation models. A challenge for statisticians is to develop methods to address the issue of the computationally intensive or intractable likelihoods required for these problems. One focus of the breakout session will needs and areas of future work in this area.

The suggested readings give an overview of this area that spans from easier-to-implement to more complex approaches.

Suggested readings:

1. Andrieu, C., Doucet, A., & Holenstein, R. (2010). Particle markov chain monte carlo methods. Journal of the Royal Statistical Society: Series B (Statistical Methodology), 72(3), 269-342.
2. Hooten, M. B., & Wikle, C. K. (2008). A hierarchical Bayesian non-linear spatio-temporal model for the spread of invasive species with application to the Eurasian Collared-Dove. Environmental and Ecological Statistics, 15(1), 59-70.
3. Ionides, E. L., Bretó, C., & King, A. A. (2006). Inference for nonlinear dynamical systems. Proceedings of the National Academy of Sciences, 103(49), 18438-18443. More recent work: Nguyen and Ionides (2016) Statistics and Computing.
4. Liang, H., & Wu, H. (2008). Parameter estimation for differential equation models using a framework of measurement error in regression models. Journal of the American Statistical Association, 103(484), 1570-1583.
5. Ramsay, J. O., Hooker, G., Campbell, D., & Cao, J. (2007). Parameter estimation for differential equations: a generalized smoothing approach. Journal of the Royal Statistical Society: Series B (Statistical Methodology), 69(5), 741-796.
6. Sun, L., Lee, C., & Hoeting, J. A. (2015). Parameter inference and model selection in deterministic and stochastic dynamical models via approximate Bayesian computation: modeling a wildlife epidemic. Environmetrics, 26(7), 451-462.
7. Sun, L., Lee, C., & Hoeting, J. A. (2015). A penalized simulated maximum likelihood approach in parameter estimation for stochastic differential equations. Computational Statistics & Data Analysis, 84, 54-67.
8. Toni, T., Welch, D., Strelkowa, N., Ipsen, A., & Stumpf, M. P. (2009). Approximate Bayesian computation scheme for parameter inference and model selection in dynamical systems. Journal of the Royal Society Interface, 6(31), 187-202.

If you would like to suggest additional readings, please email Jennifer Hoeting.