Inference with Implicit Likelihoods

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Complex deterministic and stochastic models are often used to describe dynamic systems in climate science, ecology and biology. Inferring unknown parameters of these models is of interest, both for understanding the underlying scientific processes as well as for making valid predictions. Some of the challenges typically involved in inference for these models are: likelihood functions that are intractable or only implicitly specified by a computer model; computationally expensive model simulations; and high-dimensional, multivariate observations and model output. I will outline computationally expedient Gaussian process-based Bayesian inferential approaches in the context of two very different models, an Earth-system model used in climate science, and a spatial model for infectious diseases.