

## **Extension and applications of BUGS in models defined by differential equations**

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In this talk I will describe infrastructure in the BUGS (Bayesian inference Using Gibbs Sampling) modelling framework for implementing dynamic models via differential equations. One of the principal philosophies underpinning BUGS is to afford the user maximal flexibility with respect to model specification, via a specialized language designed for communicating 'local' relationships (graphical modelling). It is straightforward, for example, to specify arbitrary hierarchical/mixed-effects models, including those involving dynamical systems. A Bayesian approach to these types of problem allows us to also specify informative prior distributions for the unknown parameters, which can be crucial for parameter identifiability in complex systems. I will illustrate use of the developed infrastructure using data from a novel study to investigate the effects of circulating non-esterified fatty acid (NEFA) levels on first phase insulin secretion and insulin sensitivity.