



University of Stuttgart

Stuttgart Research Center Systems Biology (SRC SB)

## Systems Biology Seminar Talk

„Modular algorithms for  
Markov process simulation  
and Bayesian parameter  
inference “

**Prof. Dr. Darren Wilkinson**

*Newcastle University, UK*



### Abstract:

Inferring the parameters of continuous-time Markov process models using partial discrete-time observations is an important practical problem in many fields of scientific research. Such models are very often "intractable", in the sense that the transition kernel of the process cannot be described in closed form, and is difficult to approximate well. Nevertheless, it is often possible to forward simulate realisations of trajectories of the process using stochastic simulation. There have been a number of recent developments in the literature relevant to the parameter estimation problem, involving a mixture of approximate, sequential and Markov chain Monte Carlo methods. This talk will compare some of the different "likelihood free" algorithms that have been proposed, including sequential ABC and particle marginal Metropolis Hastings, paying particular attention to how well they scale with model complexity. Emphasis will be placed on the problem of Bayesian parameter inference for the rate constants of stochastic biochemical network models, using noisy, partial high-resolution time course data.

### CV:

Darren Wilkinson is Professor of Stochastic Modelling within the School of Mathematics, Statistics and Physics at Newcastle University, and a Fellow of the Alan Turing Institute. His current research interests involve applications of Bayesian statistics to a variety of challenging big data problems in molecular biology and engineering. He is especially interested in parameter inference for dynamic models, on-line inference for high-velocity time series data, probabilistic programming, and the use of approximate models and emulators for rendering computationally prohibitive algorithms for expensive models more tractable. He is co-Director of Newcastle's EPSRC Centre for Doctoral Training in Cloud computing for Big Data, and leads a Turing research project on streaming data modelling. His popular textbook, Stochastic Modelling for Systems Biology, is now in its third edition.

**Thursday**  
**November 26, 2020**  
*4 p.m. – 5 p.m.*

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