THE CRM APPLIED MATHEMATICAL AND PHYSICS (CAMP) SEMINARS

CENTRE DE RECERCA MATEMÀTICA

Nico Stollenwerk

Centro de Matemática e Aplicaçoes Fundamentais, Universidae de Lisboa

Fokker-Planck- and Hamilton-Jacobi approximations in parameter estimation and model evaluation of complex epidemiological

To describe fluctuations in dengue fever long time series from Thailand and neighbouring South East Asian countries where dengue is endemic, multistrain models with temporary cross-immunity and differences in primary versus secondary infection turned out to be adequate. For such systems with deterministically chaotic skeleton and complex interplay between population stochasticity and chaoticity, characterized by Lyapunov exponents, including coexistences of several attractors, methods from parameter estimation and model comparison have been developed recently, namely iterated particle filtering as one of the most promising methods. We investigate several approximation schemes to speed up the notoriously computationally intensive stochastic simulation for such filtering methods to make them feasable for e.g. the complex dengue models to finally (i) predict future outbreaks in endemic areas and (ii) to transfer the knowledge to describe present and future invasion scenarios of dengue fever into new world areas. Starting from general Markov processes, approximations like KramersMoyal expansion, van-Kampen approximation and the so called semiclassical approximations, also often refered to as eikonal approximation or WKB, will be presented and compared. As introduction we will give simple stochastic epidemiological processes, in which most steps towards parameter estimation in the maximum likelihood framework and as Bayesian approaches can be performed analytically, including model comparison and prediction. These concepts will then be extended to more complex systems, in which some or most of the steps have to be performed via numerical calculations.

Date:	**25th September , 2013**
Place:	**Room C1/028**
Time:	**15:00**