

# Perfect Sampling and Unbiased Estimation for Gibbs Point Processes

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## Abstract

Various phenomena in physics, chemistry and biology are modelled by Gibbs point processes. A Gibbs point process is a spatial point process whose distribution is absolutely continuous with respect to that of a Poisson point process (PPP). Pairwise interaction point (PIP) processes, such as hard-spheres models, and penetrable spheres mixture (PSM) models are two widely studied examples of Gibbs processes. Perfect sampling (or unbiased sampling) and unbiased estimation are two active research areas in applied probability, due to both theoretical interest and practical applications. In this talk, we first focus on the partial rejection based perfect sampling for PIP processes and PSM models (a joint work with D. Kroese). We then discuss a new importance sampling based perfect sampling and unbiased estimation for the hard-spheres models (joint works with S. Juneja, D. Kroese and M. R. H. Mandjes). We also focus on the efficiency of the proposed methods as a function of the intensity of the underlying PPP.