

A quasi-likelihood approach to general parameter estimation problems with application to a Boolean model with discs.

Markus Baaske *

Institute of Stochastics, Faculty of Mathematics and Computer Science,
TU Bergakademie Freiberg, D-09596 Freiberg, Germany

Keywords: Quasi-likelihood parameter estimation, kriging, simulation-based optimization

Abstract In the absence of likelihoods or distribution characteristics, which is often the case in stochastic geometric modelling, one general approach for fitting statistical models is the so called quasi-likelihood (QL) method [1]. Essentially, the QL method consists of finding solutions to certain quasi-score equations as possible candidates of the unknown model parameter. In addition, derivative-information of expectations and variances are needed to evaluate the involved quantities which in turn depend on the unknown model parameter and are typically unavailable as a closed form expression in practice. Therefore, putting the QL approach into a stochastic simulation setting we propose a simulation-based optimization method for solving these equations using a sequence of approximating quasi-score functions.

As a simple demonstrating example, the method is applied to a special parameter estimation problem of a planar Boolean model with discs. Here, the quasi-score function has a half-analytical, numerically tractable representation and allows for the comparison of the model parameter estimates found by the simulation-based method and obtained from solving the exact quasi-score equations.

References

- [1] C. C. Heyde. *Quasi-likelihood and its applications: a general approach to optimal parameter estimation*. Springer, New York, 1997.

*markus.baaske@math.tu-freiberg.de