# Evolutionary Computation for Problems in Computational Statistics

Robin Nunkesser[1], Thorsten Bernholt[1], Oliver Morell[2], and Holger Schwender[2]

[1] Department of Computer Science, Univ. Dortmund, 44221 Dortmund, Germany
[2] Department of Statistics, Univ. Dortmund, 44221 Dortmund, Germany
robin.nunkesser@udo.edu

**Abstract.** In Computational Statistics like in every field of research involving computers, we are confronted with problems that are very hard to compute exactly or that are not computable at all in reasonable time. A typical approach to tackle these problems is to use heuristics. Monte Carlo methods are an example of random search heuristics that are already frequently used in Computational Statistics. Evolutionary computation (EC) on the other hand has gained considerable importance in Computer Science, but is not yet very common in Computational Statistics. We present introductory background on EC, two application examples, and an R interface to an evolutionary computation toolkit.
The first application example is the identification of high-order interactions in a genetic association study. The usage of EC allows us to search for interactions that the presently used MCMC methods do not find. The second application example is an evolutionary algorithm (EA) for different robust regression methods, where we concentrate on least trimmed of squares regression. The EA is better suited to overcome local optima than other existing algorithms for this problem.
Further, we point out some additional areas, where we consider EC to be useful in the future.