

Majorization and Minorization Algorithms in Statistics

Patrick J.F. Groenen

Econometric Institute, Erasmus University Rotterdam, The Netherlands

Abstract

As an optimization method, majorization and minorization (MM) algorithms have been applied with success in a variety of models arising in the area of statistics. A key property of majorization algorithms is guaranteed descent, that is, the function value decreases in each step. In practical cases, the function is decreased until it has converged to a local minimum. The auxiliary function, the so-called majorizing function, is often quadratic so that an update can be obtained in one step. In this paper, we present a review of MM-algorithms. We present a classification of situations where iterative majorization can be used and show several inequalities that can be used for iterative majorization. We show how certain constraints can be easily imposed. Some guidelines are given for developing majorizing algorithms. We will present several examples of applications of MM algorithms in multidimensional scaling, logistic regression, support vector machines, and weighted principal components analysis.