Abstract

Mgr. Roman Kukumberg: *Modern methods for solving convex optimization problems* [Dissertation thesis]; Comenius University in Bratislava; Faculty of mathematics, physics and informatics; Department of applied mathematics and statistics;
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The dissertation thesis deals with modern methods for solving convex optimization problems, more precisely large-scale unconstrained optimization problems with a special structure, where the objective function can be split into a convex differentiable and non-differentiable part. We mainly deal with the so-called l_1-regularized problems that have a wide application in practice. The most important representatives of these problems are the l_1-regularized least squares and the l_1-regularized logistic regression, in which we made an overview of applications and solution methods. Modern methods include proximal methods and interior-point methods, which we examine in more detail, propose modifications and numerical improvements. We propose a hybrid method that combines the algorithm of the primal-dual interior-point method with the proximal-gradient method. We also discuss how to implement methods for solving l_1-regularized problems. We perform extensive numerical experiments and comparison of methods on generated data under different conditions. For example, we test the effect of problem size, data sparsity, or the effect of the regularization parameter λ on the performance of methods. We also apply selected methods to solve real problems from various areas such as optimal topology design, signal processing, medicine, text categorization.

Keywords: proximal operator, proximal-gradient method, primal-dual interior point method, l_1-regularized problems, l_1-regularized least squares, l_1-regularized logistic regression, truss topology design, sparse signal reconstruction