



New subroutines for large-scale optimization

Ladislav Lukšan, Ctirad Matonoha, Jan Vlček¹

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Abstract:

We present fourteen basic FORTRAN subroutines for large-scale optimization with simple bounds and large-scale systems of nonlinear equations. Subroutines PLIS and PLIP, intended for dense general optimization problems, are based on limited-memory variable metric methods. Subroutine PNET, also intended for dense general optimization problems, is based on an inexact truncated Newton method. Subroutines PNED and PNEC, intended for sparse general optimization problems, are based on modifications of the discrete Newton method. Subroutines PSED and PSEC, intended for partially separable optimization problems, are based on partitioned variable metric updates. Subroutine PSEN, intended for nonsmooth partially separable optimization problems, is based on partitioned variable metric updates and on an aggregation of subgradients. Subroutines PGAD and PGAC, intended for sparse nonlinear least squares problems, are based on modifications and corrections of the Gauss-Newton method. Subroutine PMAX, intended for minimization of a maximum value (minimax), is based on the primal line-search interior-point method. Subroutine PSUM, intended for minimization of a sum of absolute values, is based on the primal trust-region interior-point method. Subroutines PEQN and PEQL, intended for sparse systems of nonlinear equations, are based on the discrete Newton method and the inverse column-update quasi-Newton method, respectively. Besides the description of methods and codes, we propose computational experiments which demonstrate the efficiency of the proposed algorithms.

Keywords:

Large-scale optimization, Large-scale nonsmooth optimization, large-scale nonlinear least squares, large-scale nonlinear minimax, large-scale systems of nonlinear equations, sparse problems, partially separable problems, limited-memory methods, discrete Newton methods, quasi-Newton methods, primal interior-point methods.

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