I.E. Livieris and P. Pintelas, A new class of spectral conjugate gradient methods based on a modified secant equation for unconstrained optimization .
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Abstract - Conjugate gradient methods have played a special role for solving large scale optimization problems due to the simplicity of their iteration, convergence properties and their low memory requirements. In this work, we propose a new class of spectral conjugate gradient methods which ensures sufficient descent independent of the accuracy of the line search. Moreover, an attractive property of our proposed methods is that they achieve a high-order accuracy in approximating the second order curvature information of the objective function by utilizing the modified secant condition proposed by Babaie-Kafaki et al. (J. Comput. Appl. Math. 234:1374--1386, 2010). Further, a global convergence result for general functions is established provided that the line search satisfies the Wolfe conditions. Our numerical experiments indicate that our proposed methods are preferable and in general superior to the classical conjugate gradient methods in terms of efficiency and robustness.