

ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON
RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE
April 23-24-25, 2026 | Marrakech, Morocco



Three Term Conjugate Gradient Method Close to Memoryless BFGS Method for Large Scale Unconstrained Optimization Problems

Communication Info

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Keywords:

- (1) Unconstrained Optimization
- (2) Sufficient Descent Condition
- (3) Conjugate Gradient Method

Abstract

The conjugate gradient (CG) method is extensively utilised for solving non-linear optimisation functions. Additionally, there are numerous CG method applications, for instance, image restoration, medical science, electrical engineering as well as many others. In this paper, we introduce memoryless conjugate gradient method which produces a search direction similar to that of the memoryless of BFGS Quasi-Newton approach. The new search direction satisfies the decent property and convergence analysis for general non-linear functions. The proposed method is evaluated against several prominent techniques developed in recent decades, including CG-Descent 6.8 and the non-negative Dai-Lio approaches, by testing on over 133 functions from the CUTEst library. The results demonstrate that the new method outperforms these established algorithms in terms of gradient evaluations, function calls, CPU time, and iteration counts. Furthermore, the paper highlights the relevance of the CG method in practical applications such as image reconstruction.

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