THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

DEPARTMENT OF APPLIED MATHEMATICS
應 用 數 學 系

Colloquium

Yet Another Fast Variant of Newton's Method for Nonconvex Optimization

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Abstract

The talk will consider two recent proposals for the optimization of nonconvex functions in continuous variables. The first is a new variant of Newton's method for unconstrained problems, that alternates between regularized Newton and negative curvature steps in an iteration-dependent subspace. In most cases, the Hessian matrix is regularized with the square root of the current gradient and an additional term taking moderate negative curvature into account, a negative curvature step being taken only exceptionally. Practical variants are proposed where the subspaces are chosen to be the full space, or Krylov subspaces. In the first case, the proposed method only requires the solution of a single linear system at nearly all iterations. We establish that at most $O(|\log \epsilon| \epsilon^{-3/2})$ evaluations of the problem's objective function and derivatives are needed for the algorithm in the new class to obtain an ϵ-approximate first-order minimizer, and at most $O(|\log \epsilon| \epsilon^{-3})$ to obtain a second-order one.

This work is co-authored with S. Gratton and S. Jerad.

Biography

Professor Philippe L. Toint obtained his PhD in mathematics in 1978 under the supervision of Professor M.J.D. Powell (Cambridge). He was subsequently appointed as assistant professor and then full professor in mathematics (1993) at the University of Namur (Belgium), where he is now emeritus. He was awarded the Beale-Orchard-Hays prize for excellence in computational mathematical programming (1994), the Lagrange prize for continuous optimisation (SIAM, 2006); and the Belgian Franqui Chair (University of Leuven; 2008–2009). He was elected as an inaugural SIAM Fellow (2009), an honorary professor at the University of Edinburgh and was chair of the Mathematical Optimisation Society (2010–2013). He gave an invited talk at the 2018 International Congress of Mathematicians (ICM). His research interests are: smooth nonlinear optimization, with an emphasis on the algorithmic viewpoint, ranging from convergence and complexity theory to software development, as well as practical and multidisciplinary applications of optimization techniques in various areas including deep learning, weather forecasting and transportation systems.

Date
April 18, 2024 (Thursday)

Time
3:30pm – 4:30pm
(tea reception at 3pm)

Mode of Delivery
Hybrid

Venue
Y304, PolyU

Meeting ID | Password
837 2305 2713 | 0418

Zoom Link
https://polyu.hk/OBjgM

ALL ARE WELCOME

For enquiry, please contact Ms Ivy Fung (email: ivy-ling-yu.fung@polyu.edu.hk).