

國立中央大學數學系

專題演講

主 講 人：黃德國先生 (國立中央大學數學系)

演講題目：A family of quasi-Newton methods for solving
nonlinear least-squares, symmetric nonlinear
equations and the nearest correlation matrix
problems

演講時間：2024年06月18日(星期二) 12:00 p.m. ~ 1:00 p.m.

演講地點：中央大學鴻經館M107

Abstract：

This thesis investigates the unconstrained optimization problem and its special cases, such as nonlinear least-squares and nonlinear equations, which hold substantial importance in numerical optimization and have numerous practical uses.

Various methods are available to address these optimization challenges. This thesis investigates a family of quasi-Newton methods, a class of iterative techniques for solving these problems, and demonstrates their advantages over traditional optimization methods such as the steepest descent and Newton's method. Quasi-Newton methods approximate the Hessian matrix, which encodes second-order information about the objective function, using only gradient evaluations. This approximation significantly reduces computational cost and complexity, making quasi-Newton methods particularly appealing for large-sized problems where calculating the exact Hessian is impractical or impossible.

By using secant-like diagonal matrix approximations, quasi-Newton methods provide efficient solutions for a wide range of optimization problems, demonstrating their effectiveness across diverse scenarios. These methods also exhibit global convergence properties under suitable conditions.

This thesis advances the understanding and application of quasi-Newton methods in solving nonlinear least squares and symmetric nonlinear equations. Additionally, by exploring their use in addressing the nearest correlation matrix problems through numerical experiments, this study establishes a foundation for further research and practical implementations in real-world applications.

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