FUDAN UNIVERSITY

Applied Math Ph.D. Seminar

High-Order Perturbations and Predictor-corrector scheme in Accelerated First-Order Methods

Speaker: Mingqi Song (Fudan University)

Time: 2026-06-04, 16:10 to 17:00

Location: Rm 1801, Guanghua East Tower

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Abstract: The high-resolution ODE framework provides a useful perspective for analyzing accelerated gradient methods by capturing higher-order effects such as Hessian-driven damping. While such damping can reduce oscillations and improve convergence, gradient-correction terms alone may sometimes slow down function-value convergence. We study a generalized perturbed ODE and show that suitable combinations of gradient and gradient-correction perturbations can preserve accelerated behavior. We also investigate Gauss-Seidel splitting with a predictor-corrector scheme (GS-PC). The corrector step naturally introduces Hessian-driven damping into both the discrete algorithms and their associated high-resolution ODEs. This viewpoint extends to composite optimization and operator zero-finding problems, offering a unified interpretation of several accelerated methods, including Nesterov-type schemes and fast Krasnosel'skii-Mann iterations.