



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON APPLIED MATHEMATICS

Second-order flows for approaching stationary points of a class of non-convex energies via convex-splitting schemes

By

Prof. Ziqing XIE

LCSM, School of Mathematics and Statistics
Hunan Normal University

Abstract

The use of accelerated gradient flows is an emerging field in optimization, scientific computing and beyond. This paper contributes to the theoretical underpinnings of a recently introduced computational paradigm known as second-order flows, which demonstrate significant performance particularly for the minimization of non-convex energy functionals defined on Sobolev spaces, and are characterized by novel dissipative hyperbolic partial differential equations. Our approach hinges upon convex-splitting schemes, a tool which is not only pivotal for clarifying the well-posedness of second-order flows, but also yields a versatile array of robust numerical schemes through temporal and spatial discretization. We prove the convergence to stationary points of such schemes in the semi-discrete setting. Further, we establish their convergence to time-continuous solutions as the time-step tends to zero, and perform a comprehensive error analysis in the fully discrete case. Finally, these algorithms undergo thorough testing and validation in approaching stationary points of non-convex variational models in applied sciences, such as the Ginzburg-Landau energy in phase-field modeling and a specific case of the Landau-de Gennes energy of the Q-tensor model for liquid crystals.

Date : 06 February 2025 (Thursday)

Time : 3:00pm - 4:00pm

Venue : Room 3598 (Lift 27/28)

All are Welcome!