Departmental Colloquia

Department of Mathematics
香港城市大學
City University of Hong Kong

# DEPARTMENT OF MATHEMATICS

## City University of Hong Kong

# Second-order flow approach for solving variational problems

**by**


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**Time: 10:30 – 11:30 am**
**Venue: B5-310, Yeung Kin Man Academic Building**

## ABSTRACT


In this talk, we introduce a so-called second-order flow approach, a novel computational framework based on dissipative second-order hyperbolic partial differential equations (PDEs) designed to tackle variational problems. Our focus lies on scenarios where energy functionals are nonconvex and may entail nonconvex constraints. This motivation stems from practical applications such as finding stationary points of Ginzburg-Landau energy in phase-field modeling, Landau-de Gennes energy of the Q-tensor model for liquid crystals, as well as simulating ground states for Bose-Einstein condensates. We explore both the analytical and numerical aspects of this novel framework, showing how discretizing the PDEs leads to original numerical methodologies for addressing variational problems. Analytically, for a class of unconstrained nonconvex variational problems, we demonstrate the convergence of second-order flows to stationary points and establish the well-posedness of the second-order flow equations. Our numerical findings underscore the superiority of second-order flow methods over gradient flow methods across all discussed application scenarios.


**~ALL ARE WELCOME~**