



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON APPLIED MATHEMATICS

**Fast Evaluation of Convolution Potentials
and Linear Response Problems**

By

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Abstract

Convolution-type potential and linear response problems are widely encountered in science and engineering disciplines, including physics, chemistry, and materials science. Convolution potentials are common and important in many science and engineering fields, and representative convolution kernels include the Coulomb potential, dipole potential, Yukawa potential, and others. Its Efficient and accurate evaluation are essential in practical simulations due to its non locality, singularity and strong anisotropy. In this talk, we shall report a suite of fast and spectral solvers, including the non uniform fast Fourier transform, Gaussian sum method, kernel truncation method, anisotropic kernel truncation method, far field approximation, and moment matching method, together with their applications. The linear response problem corresponds to a special class of non symmetric eigenvalue problems, which finds broad applications in condensed matter physics and electronic structure calculations. Leveraging the biorthogonal structure of its eigenspace, we develop a massively parallel large scale solver. By fully exploiting the structure of its null invariant subspace, the solver enables high precision and efficient solutions for high dimensional Bogoliubov de Gennes (BdG) problems.

Date : 23 September 2026 (Wednesday)

Time : 3:00p.m. – 4:00p.m.

Venue : Room 3598 (near Lift 27/28)

All are Welcome!