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**THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY**

**Department of Mathematics**

# SEMINAR ON APPLIED MATHEMATICS

## Overlapping Multiplicative Schwarz Preconditioning for Linear and Nonlinear Systems


**By**

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**Abstract**

For linear and nonlinear systems arising from the discretization of PDEs, multiplicative Schwarz preconditioners can be defined based on subsets of the unknowns that derive from domain decomposition, field splitting, or other collections of conveniently solved subproblems, and are well established theoretically for nonoverlapping subsets. For overlapping subsets, establishing the equivalence of the preconditioned and original iterations is less trivial. We derive herein an explicit formulation for a variety of multiplicative Schwarz preconditioners including overlaps representative of interfacial and bulk coupling in multiphysics systems, thus extending theoretical support for the nonlinear multiplicative Schwarz preconditioned inexact Newton (MSPIN) algorithm to these classes. For nonlinear multiplicative Schwarz preconditioners with overlaps, we illustrate the performance through numerical experiments involving applications such as a shocked duct flow and a natural convection cavity flow. We begin with a broad introduction to nonlinear preconditioning to set the context for those new to the technique. This is joint work with D. E. Keyes, L. Liu, and H. Yu.


**Date : 12 May 2025 (Monday)**
**Time : 10:00a.m.-11:00a.m.**
**Venue : Room 1409 (Lift 25/26)**

*All are Welcome!*