

Department of Applied Mathematics Seminar

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Topic

Multiscale Model Reduction in Heterogeneous Perforated Domains Based on CEM-GMsFEM

Date | Time

25 August 2025 (Monday) | 11:00am – 12:00nn (HK Time)

Venue

TU817

Abstract:

In this talk, we introduce a general framework for tackling multiscale complexities in heterogeneous perforated domains using the Constraint Energy Minimizing Generalized Multiscale Finite Element Method (CEM-GMsFEM). Simulations in such domains are computationally challenging due to the varying scales of perforations and domain structures. Our method is applied to both the Poisson equation and linear elasticity problems within these domains. The framework consists of two main stages: the offline stage and the online stage. In the offline stage, we first solve an eigenvalue problem within each coarse block and then solve a minimization problem over an oversampled domain to construct multiscale basis functions. In the online stage, we generate online basis functions based on the local residual to rapidly reduce error. Additionally, we explore the impact of varying the number of oversampling layers on the construction of local basis functions. This approach provides an efficient and accurate solution framework for complex multiscale problems in perforated domains.

ALL ARE WELCOME