

國立陽明交通大學應用數學系

學術演講公告

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講題：Neural-Accelerated Boundary Integral Solvers: From IBIM to
Multi-Level Training

時間：114 年 12 月 9 日(星期二) 下午 14:00 –15:00

地點：(光復校區) 科學一館 213 室

Abstract

Boundary integral equations (BIEs) efficiently reduce elliptic and wave problems to the boundary, but standard implementations require explicit surface parametrizations and produce fully dense matrices. The Implicit Boundary Integral Method (IBIM) avoids parametrization by using a level-set representation and evaluating layer potentials in a tubular neighborhood of a Cartesian grid, at the cost of dense extended operators and high computational expense.

I will present a complementary approach based on spectral-bias-aided multilevel training of neural-network surrogates for IBIM operators. Exploiting the tendency of neural networks to learn low frequencies first, we design a coarse-to-fine training strategy aligned with the IBIM grid hierarchy. This allows information from coarse levels to accelerate training and inference on finer grids, yielding speedups of about 40–600×. I will show results for Laplace and Poisson problems, and briefly discuss extensions to Helmholtz equations and “numerically consistent” machine learning for scientific computing.

敬請公告 歡迎參加

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