



THE UNIVERSITY OF
CHICAGO

Department of Statistics

STATISTICS COLLOQUIUM

*Joint seminar with the Committee on Computational and Applied
Mathematics (CCAM)*

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Elliptic PDEs on Regions with Corners

THURSDAY, January 16, 2020 at 4:00 PM
Jones 303, 5747 S. Ellis Avenue

ABSTRACT

Many of the boundary value problems frequently encountered in the simulation of physical problems (electrostatics, wave propagation, fluid dynamics in small devices, etc.) can be solved by reformulating them as boundary integral equations. This approach reduces the dimensionality of the problem, and enables high-order accuracy in complicated geometries. Unfortunately, in domains with sharp corners the solution to both the original governing equations as well as the corresponding boundary integral equations develop singularities at the corners. This poses significant challenges for many existing integral equation methods, typically requiring the introduction of many additional degrees of freedom. In this talk I show that the solutions to the Laplace, Helmholtz, and biharmonic equations in the vicinity of corners can be represented by a series of elementary functions. Knowledge of these representations can be leveraged to construct accurate and efficient Nyström discretizations for solving the resulting integral equations. I illustrate the performance of this method with several numerical examples.

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