# WELL-POSEDNESS AND APPROXIMATION SCHEMES FOR NONLOCAL BOUNDARY-VALUE PROBLEMS

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Space-fractional differential operators have been shown to incorporate the multi-scale effects of transport processes taking place in heterogeneous media (e.g. cardiac electrical propagation).

A prototypical space-fractional operator is the *fractional Laplacian*, for which many definitions exist (e.g., via Fourier multiplier, hypersingular integral, heat semigroup, extension problem, etc.). These definitions are proved to be equivalent for sufficiently smooth functions in $\mathbb{R}^d$ (with $d \geq 1$); however, when the fractional Laplacian is considered on bounded domains, this equivalence no longer holds true.

The work presented in this talk is based on the spectral definition of the fractional Laplacian in a bounded domain $\Omega \subset \mathbb{R}^d$ ($d \geq 1$). More precisely, the aim of this talk is to present some recent results on the well-posedness and numerical approximation of solutions for an elliptic boundary-value problem associated with a nonlocal operator that generalizes the *spectral fractional Laplacian* by allowing for different orders of fractional diffusion in different regions of a domain.