Nonlocal, nonlinear, nonsmooth
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In this talk we consider problems involving fractional-order operators on bounded domains. The first part reviews the (linear) Dirichlet problem for the integral fractional Laplacian; we discuss regularity of solutions, analyze a direct finite element implementation and derive convergence rates. The limited regularity of solutions near the boundary of the domain leads to the consideration of discrete solutions on graded meshes and permits to obtain optimal convergence rates in two-dimensional domains.
The second part of the talk is devoted to two nonlinear problems: the fractional obstacle problem and the computation of nonlocal minimal surfaces. We discuss regularity of solutions to these problems, propose finite element schemes to numerically solve them, and analyze their convergence properties.