Recent Progress for Elliptic Boundary Value Problems in Nonsmooth Domains

Marius Mitrea

Mathematics Department

202 Mathematical Sciences Building

University of Missouri

Columbia MO, 65211

USA

Pseudodifferential operator techniques have had tremendous success in the treatment of boundary value problems in smooth domains in the 60's. The Achilles' heel of this theory is its fundamental reliance on smoothness. Since the 70's, motivated by both practical and theoretical considerations, much effort has been devoted to developing tools which can cope with rough structures. A case in point is Calderon's program which has strongly promoted the thesis that harmonic analysis can be used to produce sharp results in PDE, particularly through the advancement of a robust theory of singular integral operators. In this mini-course I shall survey some of the recent progress on this front, while focusing on certain benchmark elliptic problems formulated in domains which are so rough that their boundaries cannot be described by the graphs of functions. In the process, I will be emphasizing the role played by tools from Geometric Measure Theory.