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Fatou Theorems for Elliptic Systems in Uniformly Rectifiable Domains

Abstract: The trademark blueprint of a Fatou-type theorem is that size and integrability properties of the nontangential maximal operator for a null-solution of an elliptic equation in a certain domain implies the a.e. existence of the pointwise nontangential boundary trace of the said function. It is natural to call such a theorem quantitative if the boundary trace does not just simply exists but encodes significant information regarding the size of the original function.

In this talk, I will be presenting a quantitative Fatou-type theorem for null-solutions of an injectively elliptic first-order (homogeneous, constant complex coefficient) system of differential operators in an arbitrary uniformly rectifiable domain in the n-dimensional Euclidean space, assuming that the nontangential maximal operator is p-th power integrable (with respect to the Hausdorff measure) for some integrability exponent larger than $(n-1)/n$. Such a result has a wide range of applications, including the theory of Hardy spaces associated with injectively elliptic first-order systems in uniformly rectifiable domains. The approach I develop, also produces a Fatou-type theorem for the gradient of null-solutions of elliptic second-order systems in arbitrary uniformly rectifiable domains.