Public Abstract

First Name:Dat

Middle Name:Tien

Last Name:Cao

Adviser's First Name:Igor

Adviser's Last Name:Verbitsky

Co-Adviser's First Name:

Co-Adviser's Last Name:

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Title:Quasilinear elliptic equations with sub-natural growth and nonlinear potentials

In this thesis, we study quasilinear elliptic equations with sub-natural growth.

Necessary and sufficient conditions for the existence of finite energy and weak solutions are given. Sharp global pointwise estimates of solutions are obtained as well. We also discuss the uniqueness and regularity properties of solutions. As a consequence, characterization of solvability of the equations with singular natural growth in the gradient terms is deduced.

Our main tools are Wolff potential estimates, dyadic models, and related integral inequalities. Special nonlinear potentials of Wolff type associated with "sublinear" problems are constructed to obtain sharp bounds of solutions. We also treat equations with the fractional Laplacians. Our approach is applicable to more general quasilinear A-Laplace operators as well as the fully nonlinear k-Hessian operators.