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Regularity theory for nonlinear PDEs

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Abstract

Regularity theory is a branch of Mathematical Analysis dedicated to qualitative properties of solutions to partial differential equations (PDE). In particular, once a function solves a PDE in some weak sense, the fundamental question concerns the effects of the equation on the nature of the solutions. Namely, on their degree of smoothness and integrability. We focus on fully nonlinear elliptic equations and discuss recent developments in the theory, mostly driven by approximation methods and the so-called Harnack approach. To highlight the scope of this class of methods, we examine the concrete example of the Isaacs equation. A number of open problems and research directions complete the talk.

Keywords Regularity theory; fully nonlinear equations; approximation methods; Isaacs equation; regularity results in Hölder and Sobolev spaces.