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Sinopsis

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The p-Laplace equation is the main prototype for nonlinear elliptic problems and forms a basis for various applications, such as injection moulding of plastics, nonlinear elasticity theory, and image processing. Its solutions, called p-harmonic functions, have been studied in various contexts since the 1960s, first on Euclidean spaces and later on Riemannian manifolds, graphs, and Heisenberg groups. Nonlinear potential theory of p-harmonic functions on metric spaces has been developing since the 1990s and generalizes and unites these earlier theories.

This monograph gives a unified treatment of the subject and covers most of the available results in the field, so far scattered over a large number of research papers. The aim is to serve both as an introduction to the area for interested readers and as a reference text for active researchers. The presentation is rather self contained, but it is assumed that readers know measure theory and functional analysis.

The first half of the book deals with Sobolev type spaces, so-called Newtonian spaces, based on upper gradients on general metric spaces. In the second half, these spaces are used to study p-harmonic functions on metric spaces, and a nonlinear potential theory is developed under some additional, but natural, assumptions on the underlying metric space. Each chapter contains historical notes with relevant references, and an extensive index is provided at the end of the book.

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