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Superlinear elliptic equations involving the p-laplacian

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This talk is concerned with the existence, nonexistence and multiplicity of solutions for the family of problems

$$\begin{cases} -\Delta_p u = f_\lambda(x,u) & \text{in } \Omega, \\ u > 0 & \text{in } \Omega, \\ u = 0 & \text{on } \partial\Omega, \end{cases} \tag{0.1}$$

where $\triangle_p u := \ div(|\nabla u|^{p-2}\nabla u)$ is the usual p-Laplacian, Ω is a bounded domain in $\mathbb{R}^N$, and $\lambda > 0$ is a real parameter. The initial purpose is to obtain weak solutions of (0.1). Using our hypotheses on f and the regularity theory, these solutions will be in $C^{1,\alpha}(\bar{\Omega})$. A basic feature of the family considered here is its monotone dependence on λ, i.e. $f_\lambda(x,s) \leqslant f_{\lambda'}(x,s)$ if $\lambda < \lambda'$. The function $f_\lambda(x,s)$ satisfies conditions of local "sublinearity "at 0 and of local "superlinearity"at ∞ mean, roughly speaking, that for x in a subset Ω_1 of Ω, one has

$$\lim_{\substack{s\to 0\\ s>0}} f_\lambda(x,s)/s^{p-1} = +\infty,$$

while for x in another subset Ω_2 of Ω, one has

$$\lim_{s\to +\infty} f_\lambda(x,s)/s^{p-1} = +\infty\,.$$

We discuss some works in collaboration with Djairo de Figueiredo and Jean Pierre Gossez as well as one with Humberto Ramos.

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