Principal Eigenvalue for a Quasilinear Elliptic Problem in an Unbounded Domain

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Abstract. In this talk, we will be concerned with the existence of a positive principal eigenvalue for the following quasilinear elliptic equation:

\[
\Delta_p u + q(x)|u|^{p-2}u = \lambda g(x)|u|^{p-2}u \quad \text{in } \Omega, \quad u = 0 \quad \text{in } \partial\Omega.
\] (1)

Here \(\Omega\) is an unbounded smooth domain in \(\mathbb{R}^N\), \(\Delta_p\), \(1 < p < \infty\), is the \(p\)-Laplacian, \(\lambda\) is the eigenvalue parameter and \(g, q\) are given weight functions; whose properties will be specified later. Our purpose in the present talk is to derive the principal eigenvalue in some situation where \(\Omega\) is unbounded, \(g\) and \(q\) are not necessarily negative at infinity. The validity on \(\Omega\) of a weighted Poincaré inequality is of importance in this study. We proceed our talk by presenting the Ljusternik-Schnirlmann theory to compare our results.