BOYAN SIRAKOV, PUC-Rio

Exact multiplicity results for a nonlinear elliptic problem, and geometric structure of the set of solutions

We revisit a very classical result in the theory of nonlinear elliptic PDE - the Ambrosetti-Prodi problem. This problem is essentially solved when the underlying operator is self-adjoint, and a rather complete description of the set of solutions is available.

On the other hand, for non-divergence form elliptic operators only partial results are available. We develop a method based on elliptic regularity and maximum principle techniques, which lets us prove that the same results which were known in the divergence case are valid for non-divergence form operators, and even obtain some new results for self-adjoint operators. In particular, we show that the Ambrosetti-Prodi operator is a global fold from $W^{2,p}$ to L^p, $p \geq n$.

To our knowledge this is the first result of exact multiplicity of solutions (i.e. exact number of solutions different from 0 or 1) for non-divergence form elliptic PDE.

This is a joint work with C. Tomei and A. Zaccur.