Front propagation in non-local reaction-diffusion equations

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We study functional reaction-diffusion equations. By using topological methods suitably combined with upper and lower-solutions techniques, we establish sufficient conditions for the existence of traveling wave solutions. Our results apply to equations having reaction terms with delay or depending on convolution integrals.

On the boundedness of solutions to a nonlinear singular oscillator

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We study a second order scalar equation of the form \(x'' + V'(x) = p(t)\), where \(p\) is a \(\pi\)-periodic function and \(V\) is a singular potential. We give sufficient conditions on \(V,p\) ensuring that all solutions are bounded; we prove the existence of Aubry-Mather sets as well.

Heteroclinic solutions for non-autonomous boundary value problems with singular \(\Phi\)-Laplacian operators

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We study the solvability of a non-autonomous boundary value problem on the real line with an operator of the type \(\Phi(u')\), where \(\Phi\) is a singular homeomorphism in the terminology introduced by Bereanu and Mawhin. Our main tools include a symmetry argument together with an approximation procedure.

Infinitely many one-bubble solutions to the Bahri-Coron problem in a domain with a shrinking hole

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We show existence of arbitrarily many solutions to the pure critical exponent problem in a bounded domain with a small enough hole which look like a standard bubble centered at a point inside the domain. We prove also existence of arbitrarily many nonradial solutions to this problem in thick enough annuli.

SHARP WEIGHTED-NORM INEQUALITIES FOR FUNCTIONS WITH COMPACT SUPPORT IN \(\mathbb{R}^N\setminus\{0\}\)

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We present a class of Caffarelli-Kohn-Nirenberg inequalities without restricting the pertinent parameters. In particular, we determine the values of the corresponding optimal constants and the functions that achieve them, i.e., minimizers of a suitable functional. By studying a corresponding Euler-Lagrange equation, we also determine infinitely many sign-changing solutions at higher energy levels in addition to the found ground-state solutions.
Travelling waves in some reaction-diffusion-aggregation models

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We deal with a reaction-diffusion-aggregation equation with a monostable (i.e. Fisher-type) nonlinear reaction term and a changing-sign nonlinear term, modeling repulsive-attractive population dynamic.

We prove the existence of travelling fronts having speed varying in a half-line and provide an estimate for the minimal speed. We also investigate the possible existence of fronts reaching the equilibria at finite values.

Existence and Multiplicity of Solutions for Neumann p-Laplacian-Type Equations

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We consider nonlinear Neumann problems driven by p-Laplacian-type operators which are not homogeneous in general. We prove an existence and a multiplicity result for such problems. In the existence theorem, we assume that the right hand side nonlinearity is p-superlinear but need not satisfy the Ambrosetti-Rabinowitz condition. In the multiplicity result, when specialized to the case of the p-Laplacian, we allow strong resonance at infinity and resonance at 0.

Multiplicity of positive solutions for some semilinear or quasilinear elliptic problems

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D.de Figueiredo and P.Ubilla

We consider a family of problems which are locally superlinear at infinity and locally sublinear at zero. A typical example is the well-known convex-concave nonlinearity, however here with coefficients which may vanish or even change sign. The laplacian case as well as the p-laplacian case will be considered.

Solutions and multiple solutions for periodic systems with nonhomogeneous differential operators

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We consider nonlinear periodic systems driven by the nonhomogeneous vector p-Laplacian differential operator and with a nonsmooth potential. Using variational techniques, based on the nonsmooth critical point theory, we prove existence and multiplicity results. Finally, we obtain an existence result for systems driven by the ordinary vector p-Laplacian and we show that it is still true in the more general framework of the previous results.

Non-variational Elliptic Systems in Dimension Two

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D.G. de Figueiredo and J.M. do O'

We establish a priori bounds for positive solutions of semilinear elliptic systems in bounded domains in $\mathbb{R}^d$, with nonlinearities which have a growth of exponential type. The considered systems are non-variational. The bounds are obtained by some new type of inequalities, and in the limiting situation by
methods introduced by Brezis-Merle for the scalar case. Finally, based on these bounds, the existence of positive solutions for these systems is proved.

On the Fucik spectrum of the wave operator

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Professor Pedro Girao

In this talk we provide some new results on the structure of the Fucik spectrum of the one dimensional wave operator. These will be applied to the problem of finding solutions to some classes of nonlinear wave equations.