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Συντονιστές: Ε. Μηλάκης, Γ. Μπαρμπάτης, Γ. Σακελλάρης

Α. Τερτίκας, Α. Χαραλαμπόπουλος

Ομιλητές

Ιωάννης Αρκούδης (Institute of Mathematics of the Polish Academy of Sciences)

Biharmonic nonlinear vector field equations in $\mathbb{R}^4$

Following the approach of Brezis and Lieb, we prove the existence of a ground state solution for the biharmonic nonlinear vector field equations in the limiting case of space dimension 4. Our results complete those obtained by Mederski and Siemianowski for dimensions $d \geq 5$ and extend their biharmonic logarithmic Sobolev inequality to dimension 4.

Joint work with Panayotis Smyrnelis.

Δημήτριος Γαζούλης (Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών)

A Gradient Bound for Pucci's equations and applications

We consider Pucci's extremal operators in $\mathbb{R}^n$ and establish a pointwise gradient estimate for entire solutions of the respective Pucci's equations. This bound can be seen as a generalization of the Modica inequality for fully nonlinear elliptic equations. Some applications are Liouville-type theorems, De Giorgi-type properties and Harnack inequalities.

Μυρτώ Γαλανοπούλου (University of Sussex)

The equations of polyconvex and quasiconvex thermoelasticity

For thermoelastic materials, convexity of the stored energy does not comply with the notion of frame indifference. In this talk I will discuss the equations of thermoelasticity equipped with an energy that satisfies some weaker notions of convexity, namely polyconvexity and quasiconvexity. After putting the equations of thermoelasticity into the perspective of symmetrizable systems of conservation laws, I will show several results on existence, uniqueness and convergence of solutions for instance, in the zero-viscosity and zero-thermal conductivity limits.

Ιωάννης Γιαννούλης (Πανεπιστήμιο Ιωαννίνων)

On the solvability of Fokker-Planck equations with Coulomb type potentials

We discuss the existence of weak solutions to a Fokker-Planck equation for a time-dependent joint probability distribution function (density) of positions and momenta on $\mathbb{R}^{2d}$, $d = Nn$, which arises from a Langevin equation for the dynamics of N particles in the configuration space $\mathbb{R}^n$. The potential V in the underlying Hamiltonian contains the repulsive pairwise interaction potentials between the particles. We are particularly interested in results covering the case of Coulomb type interaction in physical space $n = 3$.

This is joint work with Gero Friesecke, TU München.

Κωνσταντίνος Γκίκας (Πανεπιστήμιο Αιγαίου)

Nonlinear nonlocal equations involving source terms and measure data

Let $s \in (0,1)$, $1 < p < \frac{N}{s}$ and $\Omega \subset \mathbb{R}^N$ be an open bounded set. In this work we study the existence of solutions to problem (E) $Lu - g(u) = \mu$ and $u = 0$ a.e. in $\mathbb{R}^N \setminus \Omega$, where $g \in C(\mathbb{R})$ is a nondecreasing function, μ is a bounded Radon measure on Ω and L is an integro-differential operator with order of differentiability $s \in (0,1)$ and summability $p \in (1, \frac{N}{s})$. More precisely, L is a fractional $p-$Laplace type operator. We establish sufficient conditions for the solvability of problems (E). In the particular case $g(t) = |t|^{\kappa-1}t$; $\kappa > p-1$, these conditions are expressed in terms of Bessel capacities.

Νικόλαος Επταμηνιτάκης (Leibniz University Hannover)

Tensor Tomography on Asymptotically Hyperbolic Surfaces

Given a Riemannian manifold, the geodesic X-ray transform of a symmetric tensor field is defined by the line integrals of the latter over geodesics, and it is a central object in geometric inverse problems. Broadly speaking, one is interested in recovering information about the unknown tensor field from its X-ray transform, and the extent to which this is possible depends heavily on the underlying geometry. In this talk, we focus on the geodesic X-ray transform in the geometric setting of two-dimensional asymptotically hyperbolic manifolds, which are non-constant curvature generalizations of hyperbolic space. This setting has connections to theoretical physics and is interesting from an analytic perspective due to its completeness and non-compactness.

The geodesic X-ray transform on symmetric tensor fields of positive rank has a natural nullspace, implying that such a tensor field cannot be uniquely recovered from its X-ray transform. For even rank symmetric tensors on simply connected, oriented asymptotically hyperbolic surfaces we propose gauge representatives modulo the nullspace of the transform to be reconstructed from the data, by proving a "transverse traceless-conformal-potential" decomposition. We then use our tensor decompositions to characterize the range of the geodesic X-ray transform over even rank tensors in the special case of 2-dimensional hyperbolic space, as well as to develop reconstruction procedures.

Based on joint work with François Monard and Yuzhou Zou.

Αντώνιος Κατσαμπάκος (Εθνικό Μετσόβιο Πολυτεχνείο)

The linearized inverse boundary value problem in strain gradient elasticity

The topic of this talk will be the study of the linearized version of the strain gradient elasticity equation in $\mathbb{R}^2$ with constant coefficients. We prove that one can determine the two Lamé coefficients λ, μ as well as the internal strain gradient parameter g, as indicated by Mindlin in his revolutionary papers in 1963-1965, by boundary measurements. This is accomplished via the investigation of the corresponding Steklov-Poincaré operator, which, in the current situation, stems from a fourth order boundary value problem and merits several qualitative differences in comparison to the classical elasticity problem. The investigation of the Fréchet derivative of this operator is the cornerstone in the realm of the solvability of the inverse problem.

Αγγελική Μενεγάκη (Imperial College London)

Phonon Boltzmann Equation: Entropy maximisers and their stability

In this talk we consider the four-waves spatially homogeneous kinetic equation arising in weak wave turbulence theory from one-dimensional microscopic oscillator chains. This is the Phonon Boltzmann Equation. I will discuss the entropy maximisation problem, the collisional invariants, and properties of solutions of the kinetic equation near the Rayleigh-Jeans (RJ) thermodynamic equilibria.

This is based on joint works with Pierre Germain (Imperial College London), Joonhyun La (KIAS) and with Miguel Escobedo (Bilbao).

Μιλτιάδης Πασχάλης (ΕΚΠΑ και ΕΜΠ)

Semilinear Schrödinger equations with critical Hardy potentials involving the distance from boundary submanifolds

Let $\Omega \subset \mathbb{R}^N$ $(N \geqslant 3)$ be a bounded C^2 domain and $\Sigma \subset \partial\Omega$ be a compact C^2 submanifold of dimension k. Denote the distance from Σ by d_Σ. In this paper, we study positive solutions of the equation $(*)$ $\Delta u - \mu u/d_\Sigma^2 = g(u, |\nabla u|)$ in Ω, where $\mu \leqslant \left(\frac{N-k}{2}\right)^2$ and the source term $g : \mathbb{R} \times \mathbb{R}_+ \to \mathbb{R}_+$ is continuous and non-decreasing in its arguments with $g(0,0) = 0$. In particular, we prove the existence of solutions of $(*)$ with boundary measure data $u = \nu$ in the case g satisfies some subcriticality conditions that always ensure the existence of solutions, provided that the total mass of ν is small.

Ελευθέριος Πρωτοπαπάς (Εθνικό Μετσόβιο Πολυτεχνείο και Ελληνικό Ανοικτό Πανεπιστήμιο)

Eigenfunctions of a fourth order elliptic operator in parabolic geometry

The bistream Stokes operator is a fourth-order partial differential operator of elliptic type. The eigenfunctions of the operator have been calculated in the spherical, spheroidal, toroidal and inverse spheroidal coordinate systems. In this talk, we calculate its eigenfunctions in the parabolic coordinate system, which are expressed in terms of Bessel functions or modified Bessel functions of the first and second kind. The derived solutions are applied to solve the axisymmetric creeping flow around a solid paraboloid.

Παναγιώτης Σμυρνέλης (Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών)

Ground state of some variational problems in Hilbert spaces and applications to P.D.E.

In this joint work with Ioannis Arkoudis, we prove the existence of a ground state for some variational problems in Hilbert spaces, following the approach of Berestycki and Lions. Next, we examine the problem of constructing ground state solutions $u : \mathbb{R}^{d+k} \to \mathbb{R}^m$ of the system $\Delta u(x) = \nabla W(u(x))$ (with $W : \mathbb{R}^m \to \mathbb{R}$), corresponding to some nontrivial stable solutions $e : \mathbb{R}^k \to \mathbb{R}^m$. The method we propose is based on a reduction to a ground state problem in a space of functions $\mathcal{H}$, where e is viewed as a local minimum of an effective potential defined in $\mathcal{H}$. As an application, by considering a heteroclinic orbit $e : \mathbb{R} \to \mathbb{R}^m$, we obtain nontrivial solutions $u : \mathbb{R}^{d+1} \to \mathbb{R}^m$ $(d \geq 2)$, converging asymptotically to e, which can be seen as the homoclinic analogs of the heteroclinic double layers, initially constructed by Alama-Bronsard-Gui and Schatzman.

Χρήστος Σούρδης (19ο Γυμνάσιο Αθηνών)

On a linear equation arising in the study of phase separation of Bose-Einstein condensates

We consider the inner limit system describing the phase separation in two-component Bose-Einstein condensates linearized around the one-dimensional solution in an infinite strip with zero and periodic boundary conditions, and obtain optimal invertibility estimates for the Fourier modes without necessarily assuming orthogonality conditions.

Γεώργιος Ψαραδάκης (Πανεπιστήμιο Δυτικής Μακεδονίας)

Hardy inequalities with optimally weighted Sobolev remainders

The talk presents a concise overview of all optimally weighted critical Sobolev residual terms in the n-dimensional L^p-Hardy inequality depending on whether $p < n$, $p = n$, or $p > n$. The picture was completed very recently with the extension of the related inequality to a series when $p = n$. If there is enough time, I will cover the case $p = 1$ too.