Seminario de Análisis y Aplicaciones

Viernes 21 de abril de 2023, **11:00–12:00**

Módulo 17 - Aula 520 (Departamento de Matemáticas, UAM)

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University of Bath

Studying nonlinear eigenvalue problems in L^∞ with convex analysis

Abstract:

We study a nonlinear eigenvalue problem associated with the Rayleigh quotient $\|u\|_{\mathrm{Lip}}/\|u\|_C$, where $\|u\|_{\mathrm{Lip}}$ is the Lipschitz constant of a function u defined on a bounded domain in $\mathbb{R}^n$ and $\|u\|_C$ is its supremum norm. The problem of minimising this Rayleigh quotient is closely related to the infinity Laplacian: minimisers include infinity-harmonic potentials and so-called infinity ground states defined as solutions of a certain limiting PDE obtained by taking the limit $p \to \infty$ in the p-Laplace eigenvalue problem. Another notable minimiser is the distance function to the boundary of the domain. Unlike existing literature that studies L-infinity problems as limits of L^p problems, we study the limiting problem directly using tools from convex analysis. This allows us to obtain results that hold for **all** minimisers of the Rayleigh quotient. We obtain optimality conditions in form of a divergence PDE using a novel characterisation of the subdifferential of the Lipschitz seminorm $u \mapsto \|u\|_{\mathrm{Lip}}$ as a functional on C. We also study a minimisation problem for the dual Rayleigh quotient involving Radon measures and a variant of the Kantorovich-Rubinstein norm, and relate minimisers of the L-infinity Rayleigh quotient to solutions of an optimal transport problem.

This is joint work with Leon Bungert, University of Bonn.

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