MAFIA - the seminar you can't refuse

Existence of minimizers for eigenvalues of the Dirichlet-Laplacian with a drift

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Abstract: This talk deals with the following eigenvalue problem

$$\begin{cases} -\Delta u - x \cdot \nabla u = \lambda u & \text{in } \Omega \\ u = 0 & \text{on } \partial\Omega, \end{cases} \tag{1}$$

or, equivalently, with the weighted eigenvalue problem

$$\begin{cases} -\text{div}\left(e^{|x|^2/2}\nabla u\right) = \lambda e^{|x|^2/2} u & \text{in } \Omega \\ u = 0 & \text{on } \partial\Omega, \end{cases} \tag{2}$$

where $\Omega \subset \mathbb{R}^N$ $(N \geq 2)$. We are interested in proving the existence of a set minimizing any eigenvalue λ_k under a suitable measure constraint suggested by the structure of the problem. More precisely we prove that for any $c > 0$ and $k \in \mathbb{N}$ the following minimization problem

$$\min\left\{\lambda_k(\Omega) : \ \Omega \text{ quasi-open set}, \ \int_\Omega e^{|x|^2/2} dx \leq c\right\}$$

has a solution.