

Date: Thursday February 5, 2026**Time:** 15:00 CET**Room:** UB iA (Universitat de Barcelona)

Eigenvalue curves for Dirac operators: a strategy for shape optimization

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In this talk, I will present a shape optimization problem for a Dirac operator and a strategy to approach it. It consists of considering a specific operator within a family of Dirac operators whose boundary conditions depend on a parameter. I will explain how to describe the spectrum of these operators using eigenvalue curves, and how properties of these curves can be used to obtain positive results in shape optimization. In particular, I will describe the connections between this problem and related shape optimization questions for the Dirichlet Laplacian, a complex version of the Robin Laplacian, and the embedding of a Hardy space into a Bergman space.

The talk is based on a joint article with Naiara Arrizabalaga, Albert Mas, and Luis Vega (2023), and specially on two recent works from 2026: one by Joaquim Duran, and another in collaboration with J. Duran and A. Mas.