DENIS VINOKUROV, Université de Montréal

Eigenvalue optimisation via a first-variation formula

Optimization problems often become easier to solve when one allows more singular objects. In eigenvalue optimization, such a relaxation can lead to operators with nonempty essential spectrum and eigenvalues lying at its edge. In this talk, I will present a general approach to deriving extremality conditions in this setting, using weighted Laplace and Steklov eigenvalues as examples. Allowing singular weights leads to a short proof of the existence of maximizers. The resulting extremality conditions, in turn, improve the a priori regularity of maximizers and lead to a geometric description of all maximizing weights via harmonic maps into spheres and free boundary harmonic maps into balls, respectively.