Minimizing combinations of Laplace eigenvalues and applications

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We give a variational method for existence and regularity of metrics which minimize combinations of eigenvalues of the Laplacian among metrics of unit area on a surface. We show that there are minimal immersions into ellipsoids parametrized by eigenvalues, such that the coordinate functions are eigenfunctions with respect to the minimal metrics. As one of the applications, we explain a new method to construct non-planar minimal spheres into 3d-ellipsoids after Haslhofer-Ketover and Bettiol-Piccione.