Publ. Mat. **66** (2022), 441–455
DOI: 10.5565/PUBLMAT6622201

REVERSE FABER–KRAHN INEQUALITY FOR A TRUNCATED LAPLACIAN OPERATOR

Enea Parini, Julio D. Rossi, and Ariel Salort

Abstract: In this paper we prove a reverse Faber–Krahn inequality for the principal eigenvalue $\mu_1(\Omega)$ of the fully nonlinear eigenvalue problem

$$\begin{cases} -\lambda_N(D^2u) = \mu u & \text{in } \Omega, \\ u = 0 & \text{on } \partial\Omega. \end{cases}$$

Here $\lambda_N(D^2u)$ stands for the largest eigenvalue of the Hessian matrix of u. More precisely, we prove that, for an open, bounded, convex domain $\Omega \subset \mathbb{R}^N$, the inequality

$$\mu_1(\Omega) \leq \frac{\pi^2}{[\operatorname{diam}(\Omega)]^2} = \mu_1(B_{\operatorname{diam}(\Omega)/2}),$$

where $\operatorname{diam}(\Omega)$ is the diameter of Ω, holds true. The inequality actually implies a stronger result, namely, the maximality of the ball under a diameter constraint.

Furthermore, we discuss the minimization of $\mu_1(\Omega)$ under different kinds of constraints.

2020 Mathematics Subject Classification: Primary: 35J60, 35P30. Secondary: 35J70, 35J75, 35P15, 49Q10.

Key words: truncated Laplacian, reverse Faber–Krahn inequality, spectral optimization.