# *Optimization of the first eigenvalue of the heat diffusion in inhomogeneous media – Numerical studies towards mathematical analysis*

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In this talk, we study optimization of the first eigenvalue of

$$-\nabla \cdot (\rho(x)\nabla u) = \lambda u$$

in a bounded domain $\Omega \subset \mathbb{R}^n$ under several constraints for the function $\rho$. We consider this problem in various boundary conditions and various topologies of domains. As a result, we numerically observe several common criteria for $\rho$ for optimizing eigenvalues in terms of corresponding eigenfunctions, which are independent of topology of domains and boundary conditions. Geometric characterizations of optimizers are also numerically observed. If time permits, we also give a talk about mathematical analysis of this problem.

All contents in this talk are based on joint works with Prof. Hisashi Naito, Nagoya University.