Critical Domains for Eigenvalues of the Grushin Laplacian on Cartisian Product Manifolds

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In this talk, we investigate properties of the sequences of extremal values that could be achieved by the eigenvalues of the Grushin operator $\Delta_G := \Delta^{R^k} + |x|^{2s}\Delta^N$ on bounded domains Ω of $\mathbb{R}^k \times \mathbb{N}$ under Dirichlet and Neumann boundary conditions, respectively. We analyze locally extremal domains for the first nontrivial eigenvalue with respect to volume-preserving domain per- turbations and show a relation with overdetermined boundary problems. The main technique used is based on an extension of the Hadamard shape derivative formula for the eigenvalues. This is a joint work with Naísa Garcia and Wanessa Tavares.