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Geometry and topology of spectral minimal partitions

A minimal partition is a decomposition of a manifold into disjoint sets that minimizes a certain energy functional. In the bipartite case minimal partitions are closely related to eigenfunctions of the Laplacian, but in the non-bipartite case they are difficult to classify, even for simple domains like the square or the circle.

I will present new results that say a partition that minimizes energy locally is in fact a global minimum (in the bipartite case) and a minimum within a certain topological class of partitions in the non-bipartite case. I will also explain how to construct energy-decreasing deformations of a non-minimal partition, giving insight into the geometric structure of the true minimum. This is joint work with Gregory Berkolaiko, Yaiza Canzani, Peter Kuchment and Jeremy Marzuola.