Fractal Laplacians and Krein Strings

Desmond Li

University of Bristol

Abstract:

The classical spectral theory of Laplacian focuses only on smooth structures e.g. smooth surface, smooth manifolds, but never on fractals. Although in some cases, we might have a surface with a fractal boundary, say a filled Julia set, but the interior is always smooth. This motivates us to try and construct a Laplacian that extends the domain of definition to fractals as well. The hope is that, by studying spectral theory problems on fractals, we would shed some light to our original classical problems which might be difficult or even inaccessible to solve if we only restrict ourselves to a smooth definition. For my talk I will briefly explain the work of Kigami and Krein on their fractal Laplacian definition and various results. Then, I will talk about results I obtained by applying the definition and similar methods to the periodic boundary condition which was not well studied.