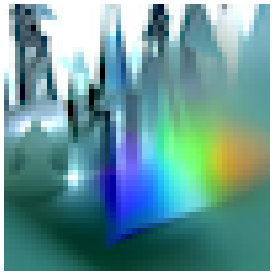

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Lorentzian spectral zeta functions

Thursday 29 September 2022 14:30 (1 hour)

The spectral theory of the Laplace–Beltrami operator on Riemannian manifolds is known to be intimately related to geometric invariants such as the Einstein-Hilbert action. These relationships have inspired many developments in physics including the Chamseddine–Connes action principle in the non-commutative geometry programme. However, a priori they do only apply to the case of Euclidean signature. The physical setting of Lorentzian manifolds has in fact remained problematic for very fundamental reasons. In this talk I will present results that demonstrate that there is a well-posed Lorentzian spectral theory nevertheless, and it is related to Lorentzian geometry in a way that resembles results known so far only in Euclidean signature. Namely, we consider perturbations of Minkowski space and more general spacetimes on which the d'Alembertian P is essentially self-adjoint. It is then possible to define functions of P, and we demonstrate (in a joint work with Nguyen Viet Dang, Sorbonne Université) that their Schwartz kernels have geometric content largely analogous to the Riemannian setting. In particular, we define a Lorentzian spectral zeta function and relate one of its poles to the Einstein–Hilbert action. If time permits, I will also sketch new advances on the closely related case of the square of the Lorentzian Dirac operator.

Presenter: WROCHNA, Michał

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