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Pseudo-Riemannian Spectral Triples for the Standard Model

The classical Connes' formulation of the Standard Model of Particle Physics based on the so-called almost-commutative Euclidean geometry is a very powerful approach that allows for many predictions which were derived using the spectral action methods and renormalization group techniques. Nevertheless, there are a lot of open problems and puzzles that have to be solved. There are several question about the mathematical structure of this theory, especially the choice for the axioms of the noncommutative spectral triple. Another problems appear when one try to generalize this construction into Lorentzian, or more generally, psuedo-Riemannian geometries. There are several inequivalent approaches but none of them is already finished. We propose a new notion of the finite pseudo-Riemannian spectral triples of arbitrary signature that can be applied for the finite part of the modification of the usual spectral triple proposed by Connes. It is still an open problem how to extent this construction for infinite spectral triples in such a way that the algebraic relations will be replaced by the analytical one. It is an interesting direction for future searchings.

Summary

This is work in progress and will be used as a part of my master thesis dedicated to the geometrical structure of the Standard Model and based on the reverse engineering approach.

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