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Index Theory, past, present, and future

We review the Connes–Moscovici local index formula from Hopf cyclic cohomology point of view. We associate to each Lie–Cartan pseudogroup a noncommuative-noncocommutative Hopf algebra which is responsible for the local index formula of the geometry invariant under the pseudogroup. We develop appropriated apparatuses for computing the Hopf cyclic cohomology of the Hopf algebras. Finally we discuss some open problems.