Characterizations of Bounded Ricci Curvature on Smooth and Nonsmooth Spaces

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Abstract

In this talk we discuss several new estimates on manifold with bounded Ricci curvature, and in particular Einstein manifolds. In fact, the estimates are not only implied by bounded Ricci curvature, but turn out to be equivalent to bounded Ricci curvature. We will see that bounded Ricci curvature controls analysis on the path space P(M) of a manifold in much the same way that lower Ricci curvature controls analysis on M. There are three distinct such characterizations given. The first is a gradient estimate that acts as an infinite dimensional analogue of the Bakry-Emery gradient estimate on path space. The second is a $C^{1/2}$-Holder estimate on the time regularity of the martingale decomposition of functions on path space. For the third we consider the Ornstein-Uhlenbeck operator, a form of infinite dimensional laplace operator, and show that bounded Ricci curvature is equivalent to an appropriate spectral gap. One can use these notions to make sense of bounded Ricci curvature on abstract metric-measure spaces.