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A Bochner Formula on Path Space for the Ricci Flow

Aaron Naber (Northwestern) and Robert Haslhofer (Toronto) have characterized solutions of the Einstein equation $\mathrm{Rc}(g) = \lambda g$ in terms of both sharp gradient estimates for Brownian motion and a Bochner formula on elliptic path space PM. They also successfully characterized solutions of the Ricci flow $\partial_t g = -2\mathrm{Rc}(g)$ in terms of an infinite-dimensional gradient estimate on parabolic path space $P\mathcal{M}$ of space-time $\mathcal{M} = M \times [0, T]$.

In this talk, we shall generalize the classical Bochner formula for the heat flow on evolving manifolds $(M, g_t)_{t \in [0,T]}$ to an infinite-dimensional Bochner formula for martingales, thus proving the parabolic counterpart of recent results in the elliptic setting as well as characterizing solutions of the Ricci flow in terms of Bochner inequalities on parabolic path space. Time-permitting, we shall also discuss gradient and Hessian estimates for martingales on parabolic path space as well as a condensed proof of previous characterizations of the Ricci flow.