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The Ricci Flow for Homogeneous Spaces

A nilmanifold is a nilpotent Lie group endowed with a left-invariant Riemannian metric. We will discuss the Ricci flow for simply connected nilmanifolds.

We describe how to set up a system of ODE's for the Ricci flow for a nilmanifold (N, g) , and how to use a change of variables to write the system in terms of a symmetric matrix naturally associated to (N, g) . We'll describe qualitative features of the Ricci flow, such as the rate of decay of the sectional curvature, collapsing of metrics, and monotone quantities for the flow.

We define a simultaneous projectivized Ricci flow on the space of all volume-normalized nilmanifolds of fixed dimension, and we discuss asymptotic properties of the flow and stability of fixed points.

Along the way, we illustrate these ideas with examples in low dimensions.