A Study of Brownian Motion under Brachistochrone-type metrics.

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Abstract

I will derive some expressions for the transition density of a Brownian motion in upper-half spaces under Brachistochrone-type metrics. In one regime, 0<alpha< 2, these variable curvature metrics sit between Euclidean Brownian motion and hyperbolic Brownian motion. In this case the process has a killing time which can be expressed in terms of Bessel processes of negative dimension. In the other regime 2<alpha, they behave as more extreme analogs of hyperbolic Brownian motion which never exit the domain.

Keywords: Brownian motion, Bessel process and Brachistochrone-type.