Contribution ID: **42** Type: **Contributed Talk**

Curvature in nonsmooth spacetimes

Friday, 27 February 2026 09:30 (20 minutes)

Timelike lower Ricci curvature bounds in smooth spacetimes are known to be characterised by the convexity of a suitable entropy functional along geodesics in the space of probability measures. Such geodesics are defined via optimal transport, in analogy with the Wasserstein distance in the Riemannian setting. Pioneering work in this direction was carried out by McCann [1] and by Mondino–Suhr [2], who considered cost functions given by the p-th power of the time separation function for $0 < p \leq 1$.

In this talk, I will discuss an approach based on more general cost functions, namely Lorentz–Orlicz costs. I will introduce the associated optimal transport problem and explore classical aspects such as Kantorovich duality. I will then explain how these costs lift to the space of probability measures, inducing a spacetime structure and, in particular, a notion of geodesics. Finally, I will address the characterisation of timelike lower Ricci curvature bounds for this class of costs. This is an ongoing work with Argam Ohanyan (University of Toronto).

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Session Classification: Geometric Analysis and Geometric Topology