Distributional and synthetic curvature bounds
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Over the past five years, a new direction of research in Lorentzian geometry has emerged: The theory of Lorentzian length spaces is a close analogue of the theory of length spaces in metric geometry. The role of the metric in this setting is played by the time separation function (basically measuring the proper time between two causally related events in a spacetime). The theory has undergone rapid development and has found manifold applications, in particular in mathematical general relativity.

One of the most important directions of research currently lies in the synthesis of methods from Optimal Transport and metric measure spaces with synthetic Lorentzian geometry. This has led to characterizations of (timelike) Ricci curvature bounds similar to the Sturm/Lott/Villani theory in the metric setting. Together with the generalization of sectional curvature bounds via triangle comparison akin to Alexandrov and CAT(k)-spaces, it forms the foundation of a rich geometric framework that is currently being explored by several international research groups.

The aim of this thesis project is to work out the relation between synthetic Ricci curvature bounds based on convexity properties of entropy functionals in measured Lorentzian length spaces and the distributional approach to Ricci curvature in spacetimes of low regularity.