Vienna School of Mathematics

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Extendibility of Spacetimes and Lorentzian Length Spaces (University of Vienna, Supervisor: M. Kunzinger)

The theory of length spaces is a well-established branch of geometry with applications in diverse mathematical disciplines, such as differential geometry, group theory, dynamical systems and partial differential equations. It has led to identifying the 'metric core' of many results in differential geometry, to clarifying the interdependence of various concepts, and to generalizations of central notions in the field to low regularity situations. In particular, the synthetic approach to (sectional) curvature bounds in the theory of Alexandrov and CAT(k)-spaces has turned out to be of fundamental importance.

As a close analogue, the theory of Lorentzian length spaces has recently been introduced and aims at creating a similar framework generalizing Lorentzian geometry and causality theory beyond the setting of differentiable manifolds and spacetime-metrics. The role of the metric here is taken over by the time separation function, in terms of which all fundamental notions are formulated. Although still in its infancy, the theory has already found several applications to relevant models of General Relativity and Lorentzian geometry.

The aim of this thesis is to employ and develop curvature comparison methods in Lorentzian length spaces to study the problem of extendibility of spacetimes beyond the smooth category. In particular, the candidate should investigate the constraints that (synthetic) curvature bounds impose on extensions of spacetimes, both as manifolds and in the more general length space setting.

Applications have to be sent via the Job Center of the University of Vienna at the Reference number 10408. The deadline for application is **February 20, 2020**.