

Some geometric properties of spacetime - Lecture 1

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Content

The Einstein equations imply certain curvature inequalities on spacelike hypersurfaces in spacetime. These inequalities are responsible for successful notions of gravitational mass and energy, and they impose certain local constraints on the geometry. In the simplest case this leads to the study of Riemannian manifolds with non-negative scalar curvature. From a physical point of view, notions of quasi-local mass and their positivity, are a reflection of such local constraints. From a geometric point of view comparison with a model space is a basic notion. In recent years both of these directions have been very active, and some of the results that have been obtained will be introduced and compared. In many of these results involving scalar curvature, the theory of stable minimal hypersurfaces plays a key role. In the general case this is replaced by the theory of stable MOTS (marginally outer trapped surfaces). This more general theory and some of its applications will be discussed.

Summary

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