On the space of initial value pairs satisfying the dominant energy condition strictly

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An initial value pair (g, K) on a manifold M consists of a Riemannian metric g and a symmetric $(0, 2)$-tensor K. They typically arise as follows: If M is a spacelike hypersurface of a Lorentzian manifold, take g to be the induced metric and K the second fundamental form. When the Lorentzian manifold satisfies the dominant energy condition, the induced pair (g, K) satisfies a certain inequality, which reduces to $\mathrm{scal}^g \geq 0$ if $K \equiv 0$.

In this talk, we want to study the space $\mathcal{I}^+(M)$ of all initial value pairs that satisfy this inequality strictly. In order to do so, we introduce a Lorentzian α-invariant $\overline{\alpha}\colon \pi_k(\mathcal{I}^+(M)) \to KO^{-n-k}(*)$ for n-dimensional closed spin manifolds M. By comparing this to the classical α-invariant, which is known to detect non-trivial homotopy groups in the space of positive scalar curvature metrics, we will be able to conclude that $\overline{\alpha}$ is non-trivial.