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On the positive mass problem for initial data with a positive cosmological constant

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The concept of mass for time-symmetric initial data has been extensively explored and is now a cornerstone in the study of contemporary Mathematical General Relativity, especially in relation to spacetimes with zero or negative cosmological constants. However, the case of a positive cosmological constant presents a distinct challenge, as our understanding is still unsatisfactory at the present stage. The renowned counterexample by Brendle, Marques, and Neves to the Min-Oo conjecture highlights that even the rigidity statement in a potential positive mass theorem has not been correctly identified yet in this context. In this presentation, I will propose approaches to address this issue and, if time allows, explore applications in characterizing the de-Sitter spacetime.

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