Deformationally strong singularities on modified gravity

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We show that the absence of unbounded algebraic curvature invariants constructed from polynomials of the Riemann tensor cannot guarantee the absence of strong singularities. As a consequence, it is not sufficient to rely solely on the analysis of such scalars to assess the regularity of a given space-time. This conclusion follows from the analysis of incomplete geodesics within the internal region of asymmetric wormholes supported by scalar matter which arise in two distinct metric-affine gravity theories. These wormholes have bounded algebraic curvature scalars everywhere, which highlights that their finiteness does not prevent the emergence of pathologies (singularities) in the geodesic structure of space-time. By analyzing the tidal forces in the internal wormhole region, we find that the angular components are unbounded along incomplete radial time-like geodesics. The strength of the singularity is determined by the evolution of Jacobi fields along such geodesics, finding that it is of strong type, as volume elements are torn apart as the singularity is approached.

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