

Abstract

In the Riemann geometry, we consider the extension of the Hilbert-Einstein gravity to Lagrangians which are polynomial in terms of the Riemann tensor and its covariant derivatives, and the metric minimally couples to the matter fields. For a given set of families of Lagrangians, there exists a non-trivial subset giving rise to a differential equation for the metric with lower degree than that of a general Lagrangian. Lovelock gravity is this subset of Lagrangian when general functional of the metric and Riemann tensor is considered: $L = L(g_{ij}, R_{jklm})$. We provide this subset of Lagrangians for Lagrangians in the form of a general functional of the metric and the first covariant derivative of the Riemann tensor: $L = L(g_{ij}, \nabla_i R_{jklm})$.