Universal and almost universal spacetimes in higher-order gravities

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Field equations of generalized gravities are typically much more complicated than the Einstein equations. Consequently, very few exact solutions to higher-order theories of gravity are known. Rare examples of such solutions are the so-called universal spacetimes, which simultaneously solve vacuum equations of all theories with the Lagrangian constructed from the Riemann tensor and its arbitrary covariant derivatives. Furthermore, it can be shown that for a more general class of almost universal spacetimes, when using an appropriate frame, all field equations of such theories of gravity reduce to a single (theory dependent) differential equation. This result then greatly simplifies the construction of vacuum solutions of higher-order gravities. We will discuss necessary and sufficient conditions for universality and almost-universality and provide Weyl type N, III and II examples of such spacetimes in four and higher dimensions. We will also briefly discuss related results for non-linear modifications of Maxwell's equations for p-forms.

References:

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