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Eddington gravity with matter: An emergent perspective

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We describe an action principle, within the framework of the Eddington gravity, which incorporates the matter fields in a simple manner. Interestingly, the gravitational field equations derived from this action is identical to Einstein's equations, in contrast with the earlier attempts in the literature. The cosmological constant arises as an integration constant in this approach. In fact, the derivation of the field equations demands the existence of a nonzero cosmological constant, thereby providing the *raison d'être* for a nonzero cosmological constant, implied by the current observations. Several features of our approach strongly support the paradigm that gravity is an emergent phenomenon and, in this perspective, our action principle could have a possible origin in the microstructure of the spacetime. We also discuss several extensions of the action principle, including the one which can incorporate torsion into the spacetime. We also show that an Eddington-like action can be constructed to obtain the field equations of the Lanczos-Lovelock gravity.

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