

# Polynomial Affine Gravity in $3 + 1$ dimensions

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## Introduction

The polynomial affine gravity is an alternative model to describe gravitational interactions using the affine connection as the sole mediator. The action is built using a sort of *dimensional analysis* technique and preserving the invariance under diffeomorphisms. Interestingly, the coupling constants are dimensionless, which is desirable from a quantum field stand point, and, additionally there is a finite number of terms that can go into the action. In  $3+1$  dimensions the field equations in the torsion free sector contain Einstein's vacuum equations [1,2]. Moreover, it is possible to interpret the symmetric part of the Ricci tensor or a special combination of the product of two torsion tensors as an emergent metric in this model [3,4]. Therefore, starting from a purely affine geometrical model, we can obtain a metric tensor, and consequently define physical quantities such as the redshift, classification of self-parallel curves into space-, null- or time-like, providing a way to differentiate trajectories of massive and massless particles.

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## References

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