

# Polynomial Affine Gravity

Jose Perdiguero, PhD. student

June 23, 2021

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. In  $3 + 1$  dimensions the field equations in the torsion free sector contain Einstein's vacuum equations, moreover, it is possible 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. Similar analysis can be done in  $2 + 1$  dimensions. 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 space-null-time like self-parallel curves, providing a way to differentiate trajectories of massive and massless particles.