Geometric Foundations of Gravity 2025



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New quantum foundations for metric-affine gravity

Like general relativity, we would expect metric-affine gravity to be a non-renormalisable and perturbative quantum theory. In such cases, effective field theories are crucial for deriving universal low-energy predictions, and have enjoyed huge success. They must, however, must be constructed according to certain rules, and in particular they demand symmetry. We perform an exhaustive and systematic search for the possible tree-level symmetries of the distortion field, which carries most of the unwanted particles in metric-affine gravity. We include also un-free symmetries with scalar, vector and tensor generators, going beyond the previous search which led to the discovery of extended projective symmetry (see GeomGrav2024). We identify multiple new ghost-tachyon-free models that serve as attractive quantum foundations for metric-affine gravity. We also uncover a new approach for the non-linear completion of the Fronsdal theory from within metric-affine gravity.

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