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Expanding General Relativity in the Speed of Light

I will introduce the ultra-local expansion of general relativity, explain its connection to the 3+1 decomposition, and discuss some non-trivial solutions. There has recently been remarkable progress in the covariant description of non-relativistic gravity. In particular, it was realized that a non-relativistic, large speed of light expansion of general relativity leads to dynamical Newton-Cartan-type geometry, which led for the first time to a derivation of the Poisson equation of Newtonian gravity from an action principle. In this talk, I will review some of these developments, and I will also introduce the opposite ultra-local, small speed of light expansion of General Relativity and its corresponding dynamical Carroll geometry. The latter expansion leads to a rich theory at leading and next-to-leading order, and I will discuss some of its possible applications in cosmology and flat space holography.

Type of contribution

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