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Lagrangian formulation of General Relativity

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This study explores the Lagrangian formulation of General Relativity, a mathematical framework that connects geometry and field theory. Initially developed through the Einstein-Hilbert action, this formulation derives the fundamental Einstein field equations, uniting gravity and matter interactions. I then transitioned to modified gravity theories, emphasizing New Massive Gravity (NMG), a three-dimensional extension incorporating higher-curvature terms. A black hole solution within NMG is examined, revealing a curvature singularity covered by an event horizon, analogous to the BTZ black hole in classical GR. This research underscores the Lagrangian approach as a robust tool for advancing theoretical physics and extending GR's applications to broader gravitational phenomena.

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