The Time Compression Lagrangian (TCL): A Scalar Unification Framework with Emergent Local Time

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Abstract:

While watching a Veritasium interview with Geraint F. Lewis, I heard something that stuck with me: “Physicists are hunting for a [unified] Lagrangian.” So, I decided to give it a try.

I have no formal training in quantum field theory but with a little persistence, I built a working model that solved the longstanding-rift between multiple Lagrangian frameworks. The solution came from treating time not as a fixed global parameter, but as an emergent, local scalar field. I introduced a variable, τ, that allows time to be decoupled and extracted cleanly from the Ricci scalar, enabling full reintegration with quantum field structures (ψ and φ) and gauge terms (EM).

This Time Compression Lagrangian (TCL) is composed entirely of scalar, covariant terms. It merges general relativity, quantum fields, electromagnetism, and time compression into a single, frame-invariant action:

$$\mathcal{L} = \frac{1}{2\kappa}R + \frac{1}{2}\partial_\mu\phi\ \partial^\mu\phi - V(\phi) + \bar{\psi}\left(i\gamma^\mu D_\mu - m\right)\psi - \frac{1}{4}F_{\mu\nu}F^{\mu\nu} + \alpha\left(\partial_\mu\tau\right)\left(\partial^\mu\tau\right) - \beta\tau R$$

While the Time Compression Lagrangian may not be the final answer, it offers a simple and scalar-consistent foundation that may help bridge gaps between quantum mechanics, relativity, and gauge theory. I submit it here not as a definitive solution, but as a contribution—open to refinement, discussion, and challenge by others who share the goal of making physics more complete and more coherent.