Cosmic Self-Generating Theory (CSGT)
Geometric Resolution of the H_0 Tension

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Abstract

We present the Cosmic Self-Generating Theory (CSGT), a cosmological framework in which the cosmic expansion history is constrained by a global information-geometric condition. Rather than modifying early- or late-time physics, CSGT introduces a purely geometric correction to the Friedmann–Robertson–Walker (FRW) dynamics, becoming observationally relevant only at intermediate redshifts.

The resulting Hubble parameter is given by

$$H(z) = H_0\sqrt{\Omega_m(1+z)^3 + \Omega_\Lambda}\,\frac{|z - z_*|}{|z_*|}, \tag{1}$$

where z_* denotes an information anchor redshift.

Geometric Formulation

The standard FRW expansion law is

$$H_{\mathrm{FRW}}(z) = H_0\sqrt{\Omega_m(1+z)^3 + \Omega_\Lambda}. \tag{2}$$

CSGT postulates that the physically realized expansion rate is given by a geometrically constrained trajectory,

$$H(z) = H_{\mathrm{FRW}}(z)\,\Phi(z), \tag{3}$$

with

$$\Phi(z) = \frac{|z - z_*|}{|z_*|}. \tag{4}$$

Theorem

Theorem 1 (Geometric Origin of the H_0 Tension) *If the cosmic expansion history is subject to a global information-geometric constraint encoded by $\Phi(z)$, then the discrepancy between locally measured and CMB-inferred values of the Hubble constant H_0 emerges naturally as a projection effect at intermediate redshifts. This occurs without introducing new physics at early or late cosmic times.*

Interpretation

Local measurements probe the $z \to 0$ boundary condition, while CMB observations probe the $z \gg 1$ asymptotic regime. Since $\Phi(z) \to 1$ in both limits, both regimes are individually consistent with standard ΛCDM. Deviations arise only at intermediate redshifts, where the geometric constraint becomes observationally visible.

Conclusion

The H_0 tension need not indicate missing components or modified gravity. Instead, it may reflect a global geometric constraint on the cosmic expansion history. CSGT provides a minimal, testable framework realizing this possibility.