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Contributory: Breaking the Taylor Barrier in Cosmology

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We present a unified analysis of the late-time cosmic expansion by bridging model-independent cosmography with modified gravity, using the latest DESI DR2 BAO data. A comparative study of Taylor, Padé, and Chebyshev expansions shows that while Taylor breaks down beyond low redshift, Padé approximants, especially (2,1), deliver stable, high-redshift reconstructions and are strongly preferred by information criteria, closely tracking LCDM. Leveraging this, we embed the Padé (2,1) framework within $f(T)$ gravity and contrast it with direct dynamical solutions of the modified Friedmann equations. A comprehensive MCMC analysis with DESI DR2 and complementary probes reveals remarkable agreement between the two approaches, with both outperforming LCDM. Our results establish Padé cosmography as a powerful and reliable interface between data-driven reconstruction and fundamental gravity.

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