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Nonextensive Entropies as Holographic Dark Energy in Cosmology

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A plethora of various entropic forms have been presented in the literature recently starting with famous Tsallis q -entropic statistics [1]. Like the Bekenstein-Hawking (horizon) entropy, which is nonextensive due to its scaling with the area and not with the volume, they go beyond the standard extensive and additive Boltzmann-Gibbs formulation of thermodynamics. However, they fit perfectly to gravity due to taking into account long-range interactions between subsystems.

During my talk, I will briefly present the properties of the selected nonextensive entropies (Tsallis, Tsallis-Cirto, Barrow, Renyi, Tsallis-Jensen, Sharma-Mittal, Kaniadakis) and show their application for the explanation of the dark energy phenomenon in the universe (known as Holographic Dark Energy (HDE) models) making statistical comparison against LCDM using the Bayesian evidence criterion [2]. Interestingly, Barrow and Tsallis-Cirto entropies have the property of “near-extensivity” which agrees with our previous result [3].

References

1. M.P. Dąbrowski, Entropy, 26, 814 (2024).
2. I. Cimdiker, M.P. Dabrowski, V. Salzano, arXiv: 2503.18320, European Physics Journal C (to appear).
3. T. Denkiewicz, V. Salzano, M. P. Dąbrowski, Phys. Rev. D108, 103533 (2023).

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