

Nonextensive Entropies for Black Hole and Cosmological Horizons

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Gravity is a long-range interaction and this fact has to be taken into account while considering the mutual correlations between gravitational subsystems. As a consequence, it emerges that even the fundamental notion of Schwarzschild black hole entropy - the Bekenstein-Hawking entropy - is nonadditive and nonextensive. This makes motivation to generalizations of Boltzmann-Gibbs (BG) statistics applied to gravitational systems which have expanded vastly in recent years.

During my talk I will review the properties of a number of nonextensive statistics (Tsallis, Kaniadakis, Tsallis-Cirto, Barrow, Renyi, Tsallis-Jensen, Sharma-Mittal, Viaggiu) and show their application to black holes and their validity for the explanation of the dark energy phenomenon in the universe as represented by the idea of holographic screens. In the latter case, I will present the bounds on nonextensivity parameters of non-BG entropies from observational data in cosmology.

Literature:

1. M.P. Dabrowski, Look Beyond Additivity and Extensivity of Entropy for Black Hole and Cosmological Horizons, *Entropy*, 26, 814 (2024). <https://doi.org/10.3390/e26100814>

2. I. Cimdiker, M.P. Dabrowski, V. Salzano, Generalized Nonextensive Entropy Holographic Dark Energy Models Verified by Cosmological Data, *European Physics Journal* 85, 775 (2025) <https://doi.org/10.48550/arXiv.2503>