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## **Tsallis non-extensive statistical mechanics of the self-gravitating gas**

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It is well known that the study of many-body systems in the presence of long-range interactions ( $1/r^a$ ,  $a>1$ ) within the context of Boltzmann-Gibbs statistical mechanics is unsuccessful. The configurational integral contained in the partition function diverges, preventing us from a proper probabilistic analysis of the system. This motivates us to describe our system by a non-additive and non-extensive entropy, i.e. the Tsallis entropy. Non-extensive statistical mechanics emerge as a powerful way to describe these systems. We present an analysis of a self-gravitating non-relativistic gas at thermal equilibrium using Tsallis non-extensive statistical mechanics, proposing an alternative more consistent way to study astronomical self-gravitational systems, and discuss the results and possible issues arising with our approach.

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