Study on Tsallis Entropy applied on Network Inference

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Abstract

The inference of gene networks is still an open field for research. One of the different methods to evaluate the connection in a network is based on entropy. Previous works showed, through a series of experiments, that non-extensive entropy, or Tsallis entropy (TS), a type of theory generalization, give better results then Boltzmann entropy, if you use conditional entropy with the q parameter around 2.45. This parameter, when it is equal to 1, makes TS returns the same entropy as the Boltzmann one. In this work we prove analytically that systems with binary discretization (for example, when a gene is either ON or OFF) shows a greater ratio of signal to noise when evaluated with non-extensive entropy with q around 2.45. Also, we present a method to use non-extensive entropy to study systems with discretization values higher then 2, with the analysis of E. Coli gold standard network as an example.

Funding:
Link to Video: