

INFORMATION GEOMETRY of MAXIMUM ENTROPY PRINCIPLE

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Abstract

The maximum entropy principle has played a guiding rule in many problems related to stochastic phenomena. The entropy is a concave functional of probability distributions, and its maximization is treated in the space of probability distributions with a number of reasonable constraints. Information geometry studies invariant structures of the space of probabilities, giving an invariant Riemannian metric and a pair of dual affine connections. The duality plays a fundamental role in it. We give a brief introduction to information geometry. The maximum entropy principle is then studied in this framework, giving a unified understanding of how it works. The maximum entropy principle is applied to time series and stochastic realizations, among others. A minimum entropy idea is also demonstrated. The idea can be generalized to give the maximum principle of the Renyi alpha entropy or Tsallis alpha entropy.