Statistical physics models belonging to the generalised exponential family

J. Naudts

Departement Fysica, Universiteit Antwerpen,

Groenenborgerlaan 171, 2020 Antwerpen, Belgium

The first part of the talk reviews the notion of the generalised family of statistical models. A characterisation is given in terms of the variational principle. Some geometric aspects are discussed. In particular, Amari's duality is generalised.

A second part deals with certain models of statistical physics and shows that they belong to the generalised exponential family. Some of them belong to the subclass of q-exponential models and are studied in the area known as non-extensive thermostatistics. In particular, the q-Gaussian will be discussed, as well as the configurational density of states of a classical microcanonical ensemble. Other models need the full generality of the formalism. In this context, both the percolation model and the classical spin interacting with its environment are shortly mentioned.

[1] J. Naudts, *Estimators, escort probabilities, and phi-exponential families in statistical physics,* J. Ineq. Pure Appl. Math. **5**, 102 (2004).
[2] P.D. Grünwald and A.P. Dawid, *Game theory, maximum entropy, minimum discrepancy and robust bayesian decision theory,* Ann. Stat. **32**, 1367 (2004).
[3] J. Naudts, *Generalised exponential families and associated entropy functions,* Entropy **10**, 131—149 (2008).
[4] J. Naudts,*The q-exponential family in statistical physics,* in preparation.