Review: The many faces of Information Geometry by F. Nielsen

The work presents a nice, easily readable account of the basic mathematical tools (*i.e.*, Fisher-Rao metric tensor and distance, Kullback-Leibler divergence, f-divergences, Bregman divergences, exponential and mixture parametric models, dual connections and dually flat structures) and results of classical information geometry. Different aspects, problems, and applications of classical information geometry are reviewed with a dynamic and engaging style that helps the reader digest the information provided without too much effort. The work is intended as a sort informative review rather than a research paper/review, and thus the level of technical detail is necessarily not the most sophisticated possible. However, the author has been able to find an optimal compromise that makes the reader always understand what is going on and then refers to the appropriate literature for all the details and proofs.

Particular attention is also given to a sort of historical reconstruction of the key events in the development of classical information geometry so that the interested reader is able to easily find the very sources containing the original seeds of some of the most important concepts in this field.

The only (absolutely minor) flaw I can find in this work is not citing the seminal work of Cencov and Morozowa [1] and that of Petz [2] when briefly mentioning the non-uniqueness of the quantum analogue of the Fisher-Rao metric tensor.

In conclusion, I would strongly recommend this work to both people already working in classical or quantum information geometry and to people who are simply curious about this fascinating field of research.

References

[1] E. A. Morozowa and N. N. Cencov. Markov invariant geometry on state manifolds. *Journal of Soviet Mathematics*, 56(5):2648 – 2669, 1991. ↓1

[2] D. Petz. Monotone metrics on matrix spaces. *Linear Algebra and its Applications*, 244:81 – 96, 1996. ↓1