An alternative approach to Quantum Information Geometry

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The first part of my talk discusses a new approach [1, 2] to Quantum Information Geometry. I start with a short introduction about von Neumann algebras. Two relevant examples are the algebra of n-times-n matrices and the algebra of L^∞-functions w.r.t. the Lebesgue measure. This highlights my first motivation: I am looking for a general theory which covers both quantum and non-quantum cases. My second motivation is to release the power of the theory of the modular automorphism group. The latter is intrinsically linked to the notion of an exponential family and of equilibrium states of Statistical Physics, the latter via the Kubo-Martin-Schwinger condition.

The second part of the talk deals with a rather straightforward translation [3] of part of a paper of Montrucchio and Pistone [4] to the quantum context. Here, the emphasis is on the technical difficulties raised by the non-commutativity. I will indicate how I try to avoid these difficulties in the work discussed in the first part of my talk.

References

[1] J. Naudts, *Quantum Statistical Manifolds,* Entropy 20, 472 (2018), https://doi.org/10.3390/e20060472; correction 20, 796 (2018).

[2] J. Naudts, *Log-affine geodesics in the manifold of vector states on a von Neumann algebra,* in preparation.

[3] J. Naudts, *Quantum statistical manifolds: The linear growth case,* To appear in Rep. Math. Phys.; arXiv:1801.07642v2 (2019).

[4] L. Montrucchio and G. Pistone, *Deformed exponential bundle: The linear growth case,* In Geometric Science of Information, GSI 2017 LNCS proceedings; Ed. F. Nielsen and F. Barbaresco (Springer, 2017), pp. 239–246.