

# Federico Holik

Consejo Nacional de Investigaciones Científicas y Técnicas (National Scientific and Technical Research Council),  
Argentina

## Interpretation and informational aspects of non-Kolmogorovian probability theory

We discuss generalized probabilistic models for which states not necessarily obey Kolmogorov's axioms of probability. We analyze the particular cases of probabilities appearing in classical and quantum mechanics. We argue for considering quantum probabilities as the natural probabilistic assignments for rational agents dealing with contextual probabilistic models [1,2]. In this way, the formal structure of quantum probabilities as a non-Boolean probabilistic calculus is endowed with a natural interpretation [3]. In this setting, we explore the possibility of defining information measures [4,5] and discuss the status of information theory [4] and information-based principles, such as MaxEnt [6,7].

### References:

- [1] F. Holik, A. Plastino and M. Sáenz, “ A discussion on the origin of quantum probabilities ”, *Annals of Physics*, Volume 340, Issue 1, 293310, (2014).
- [2] F. Holik, A. Plastino and M. Sáenz, “ Natural Information Measures In Cox Approach For Contextual Probabilistic Theories ”, *Quantum Information & Computation*, vol. 16, p. 87-104, (2016).
- [3] F. Holik, S. Fortin, G. Bosyk and A. L. Plastino, “ On the Interpretation of Probabilities in Generalized Probabilistic Models ”, Edited by de Barros J., Coecke B., Pothos, E., *Quantum Interaction-QI 2016*, Lecture Notes in Computer Science, vol 10106, Springer.
- [4] F. Holik, G. M. Bosyk y Guido Bellomo, “ Quantum Information as a Non-Kolmogorovian Generalization of Shannon's Theory ”, *Entropy*, (2015), 17, 7349-7373; doi:10.3390/e17117349.
- [5] M. Portesi, F. Holik, P.W. Lamberti, G. Bosyk, G. Bellomo and S. Zozor, “ Generalized entropies in quantum and classical statistical theories ”, *The European Physical Journal - Special Topics*, in press (2018); arXiv:1802.08673v1.
- [6] F. Holik and A. Plastino, “ Quantal effects and MaxEnt ”, *Journal of Mathematical Physics*, 53, 073301, (2012).
- [7] F. Holik, C. Massri and A. Plastino, “ Geometric probability theory and Jaynes's methodology ”, *International Journal of Geometric Methods in Modern Physics*, Vol. 13, 1650025 (2016).