A new class of entropy-power-based uncertainty relations

Petr Jizba

FNSPE, Czech Technical University in Prague

In my talk I will use the concept of entropy power to discuss a new one-parameter class of information-theoretic uncertainty relations for pairs of observables in an infinite-dimensional Hilbert space. This class constitute an infinite tower of higher-order cumulant uncertainty relations, which allows in principle to reconstruct the underlying distribution in a process that is analogous to quantum state tomography. I will illustrate the power of the new class by studying Schroedinger cat states and the Cauchy-type heavy-tailed wave function. Finally, I will also cast some fresh light on generalized uncertainty principle from the information theory point of view.

Related works

[1] P. Jizba, J.A. Dunningham and J. Joo, Special Relativity Induced by Granular Space, Annals of Physics 355, 87 (2015).

[2] P. Jizba, J.A. Dunningham, A. Hayes and Y. Ma, A new class of entropy-power-based uncertainty relations, Phys. Rev. E 93, 060104(R) (2016).

[3] P. Jizba, J.A. Dunningham and M. Proks, From Rényi Entropy Power to Information Scan of Quantum States, Entropy, 23(3), 334 (2021).

[4] P. Jizba and J. Korbel, P. Jizba and J. Korbel, Maximum Entropy Principle in Statistical Inference: Case for Non-Shannonian Entropies, Phys. Rev. Lett. 122, 120601 (2019).