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Quantum States as Probabilities from Symmetric Informationally Complete Measurements[1]

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If you pick d^2 symmetrically spread vectors in a d-dimensional Hilbert space, you get a symmetric informationally complete set of quantum states (or SIC for short). SICs have applications within quantum information science, such as to quantum state tomography and quantum cryptography, and are also of interest for foundational studies of quantum mechanics. In this talk I will review the representation of quantum states as probability distributions over the outcomes of a SIC measurement. Not all probability distributions correspond to quantum states, thus quantum state space is a restricted subset of all potentially available probabilities. We will explore how this restriction can be characterized. A recent publication (Fuchs and Schack, arXiv:0906.2187) advocates the SIC-representation and suggests that the Born rule rewritten in this language can be taken as a postulate for quantum mechanics. This motivates the introduction of so-called maximally consistent sets (Appleby, Ericsson, and Fuchs, arXiv:0910.2750); one such set is quantum state space.

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