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Updating density matrices with data and moments

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In [1] it is shown that the standard and quantum relative entropies are tools designed for the purpose of updating probability distributions and density matrices, respectively. The derivation of the standard and quantum relative entropy are completed in parallel and originate from the same inferential principles and design criteria. In [2], the Quantum Bayes Rule (POVMs) is derived as a special case of the quantum maximum entropy method when the constraints on the density matrix take the form of data. This result is the quantum mechanical analog of [3], which shows that (standard) Bayes Rule is a special case of the standard maximum entropy method when the probability distribution take the form of data. Here we find the quantum mechanical analog of [4] -- the quantum maximum entropy method is able to process both data and moment constraints simultaneously that neither a Quantum Bayes nor a von Neumann maximum entropy procedure can process alone. This implies that the quantum maximum entropy method is a general density matrix inference scheme, that is, updating.

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