

How to infer a quantum state from finite data

ABSTRACT:

Maximum entropy has long been established as a foundational principle of statistical mechanics. Recently this maximum entropy rationale has been extended to the description of small quantum systems, for example in quantum-state reconstruction from incomplete data, even though for such systems it is no longer justified to assume the thermodynamic limit, and it is not clear a priori which observables span the proper level of description. I show how in this situation the finiteness of the sample must be accounted for; how, in particular, prior knowledge continues to exert an influence on the state estimate; and how the proper level of description becomes itself a subject of statistical inference.