

Pseudo-Bayesian Quantum Tomography with Rank-adaptation

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Quantum state tomography, an important task in quantum information processing, aims at reconstructing a state from prepared measurement data. Bayesian methods are recognized to be one of the good and reliable choice in estimating quantum states. Several numerical works showed that Bayesian estimations are comparable to, and even better than other methods in the problem of 1-qubit state recovery. However, the problem of choosing prior distribution in the general case of n qubits is not straightforward. More importantly, the statistical performance of Bayesian type estimators have not been studied from a theoretical perspective yet. In this paper, we propose a novel prior for quantum states (density matrices), and we define pseudo-Bayesian estimators of the density matrix. Then, using PAC-Bayesian theorems, we derive rates of convergence for the posterior mean. The numerical performance of these estimators are tested on simulated and real datasets.