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# A Bandit Approach to Discriminating Two Unknown Quantum States

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We address the problem of distinguishing two unknown quantum states with as few experiments as possible. Instead of estimating the full density matrix via tomography, we treat each measurement as an online decision-making problem. This problem can be formulated as a linear bandit, in which the probability of each outcome is a linear function of an unknown vector encoding the true state. Using standard bandit methods such as LinUCB and Thompson Sampling, we develop adaptive strategies that choose the next measurement basis on the fly. Numerical simulations confirm that our method requires fewer experiments for state discrimination than full-state tomography.

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