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Optimal error regions for quantum state estimation

Rather than point estimators, states of a quantum system that represent one's best guess for the given data, we consider optimal regions of estimators. As the natural counterpart of the popular maximum-likelihood point estimator, we introduce the maximum-likelihood region—the region of largest likelihood among all regions of the same size. Here, the size of a region is its prior probability. Another concept is the smallest credible region—the smallest region with pre-chosen posterior probability. For both optimization problems, the optimal region has constant likelihood on its boundary. We discuss criteria for assigning prior probabilities to regions, and illustrate the concepts and methods with several examples.

Reference
J. Shang, H. K. Ng, A. Sehrawat, X. Li, and B.-G. Englert, arXiv:1302.4081v2[quant-ph]

26. April 2013, 14:00 Uhr

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