

Quickest Change-point Detection With Continuous-Variable Quantum States

Christos Gagatsos

We generalize the quantum CUSUM (QUSUM) algorithm for quickest change-point detection, previously analyzed in finite dimensions, to continuous variables quantum systems (i.e. infinite-dimensional systems). Our analysis relies on a novel generalization concerning the asymptotics of quantum relative entropy, which we establish for the infinite-dimensional setting. This enables us to prove that the QUSUM strategy retains its asymptotic optimality, characterized by the relationship between the expected detection delay and the average false alarm time for any pair of states with finite relative entropy. We apply our methods to systems described by Gaussian states.