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Deconstruction and conditional erasure of quantum correlations[1]

MARIO BERTA, FERNANDO BRANDAO, California Institute of Technology, CHRISTIAN MAJENZ, University of Copenhagen, MARK WILDE, Louisiana State Univ - Baton Rouge — We define the deconstruction cost of a tripartite quantum state on systems ABE as the minimum rate of noise needed to apply to the AE systems, such that there is negligible disturbance to the marginal state on the BE systems and the system A of the resulting state is locally recoverable from the E system alone. We refer to such actions as deconstruction operations and protocols implementing them as state deconstruction protocols. State deconstruction generalizes Landauer erasure of a single-party state as well the erasure of correlations of a two-party state. We find that the deconstruction cost of a tripartite quantum state on systems ABE is equal to its conditional quantum mutual information (CQMI) $I(A;B|E)$, thus giving the CQMI an operational interpretation in terms of a state deconstruction protocol. We also define a related task called conditional erasure, in which the goal is to apply noise to systems AE in order to decouple system A from systems BE, while causing negligible disturbance to the marginal state of systems BE. We find that the optimal rate of noise for conditional erasure is also equal to the CQMI $I(A;B|E)$. State deconstruction and conditional erasure lead to operational interpretations of quantum discord and squashed entanglement.

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