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Quasiorthogonality of Commutative Algebras and Implications for Quantum Information

The notion of quasiorthogonality for operator algebras was introduced to provide a quantitative measure of the geometric relationships between algebras. Pivotal to the development and motivation for considering quasiorthogonality were applications in quantum information theory. We deepen the theory of quasiorthogonal operator algebras through an analysis of the commutative algebra case. We give a new approach to calculate the measure of orthogonality between two such subalgebras of matrices, based on a matrix-theoretic notion we introduce that has a connection to complex Hadamard matrices. We also show how this new tool can yield significant information on the general non-commutative case.