GRADUATE SEMINAR

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Probability of Entanglement

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Abstract: For Hilbert spaces $\mathcal{H}$ and $\mathcal{K}$, with $2 \leq \dim \mathcal{H} \leq \dim \mathcal{K} < \infty$, the set of isometries from $\mathcal{H}$ to the direct sum of r copies of $\mathcal{K}$, denoted $V^r(\mathcal{H}, \mathcal{K})$, can be associated with the set of extensions of a faithful state ω of $\mathcal{B}(\mathcal{H})$ to states of $\mathcal{B}(\mathcal{K} \otimes \mathcal{H})$ that have rank at most r, denoted $E^r(\omega)$. More precisely, there is a natural left action of scalar $r \times r$ matrices on $V^r(\mathcal{H}, \mathcal{K})$ such that the quotient $V^r(\mathcal{H}, \mathcal{K})/U(r)$ is in bijection with $E^r(\omega)$. This allows probability measures on $E^r(\omega)$ to be constructed from measures on $V^r(\mathcal{H}, \mathcal{K})$. The construction and properties of $V^r(\mathcal{H}, \mathcal{K})$ will be discussed, with particular attention given to the efficacy of using geometric methods to measure the probability that a given extension is entangled.

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