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A Geometry of Entanglement and Entropy

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Abstract: This paper explores the fundamental relationship between the geometry of entanglement and von Neumann entropy, shedding light on the intricate of quantum correlations. We provide a comprehensive overview of entanglement, highlighteing its crucial role in quantum mechanics. We primarily focus on the connection between entanglement, von Neumann entropy, a measure of the information content within quantum systems and the geometry of composite Hilbert spaces. We discuss various methods for quantifing and characterizing entanglement through a geometric perspective and elucidate how this connection unveils the nature of quantum entanglement, offering valuable insights into the underling structure of quantum systems. This study underscores the significance of geometry as a key tool for understanding the rich landscape of quantum correlations and their implications across various domains of physics and information theory. An example of entanglement as an indispensable resource for the task of state teleportation is presented at the end.

Keywords : Generalised concurrence, Geometry of entanglement, Wedge product, Entropy of entanglement, Teleportation.