
GILAD GOUR, University of Calgary

Towards a complete classification of multipartite entanglement

Multi-particle entanglement is an essential resource for a variety of quantum information processing tasks. Yet, despite an enormous amount of literature dedicated to its study, our current understanding of it is still in its infancy. In this talk I will introduce a systematic classification of multipartite entanglement in terms of equivalence classes of states under stochastic local operations and classical communication (SLOCC). I will show that such an SLOCC equivalency class of states is characterized by ratios of homogenous polynomials that are invariant under local action of the special linear group. I will then introduce a complete construction of the set of all such SL-invariant polynomials (SLIPs). The construction is based on Schur-Weyl duality and applies to any number of qudits in all (finite) dimensions. In addition, I will introduce an elegant formula for the dimension of the homogenous SLIPs space of a fixed degree as a function of the number of qudits. The expressions for the SLIPs involve in general many terms, but for the case of qubits can be written in a much simpler form.