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**WORKSHOP AND SCHOOL ON TOPOLOGICAL ASPECTS
OF CONDENSED MATTER PHYSICS
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TOPOLOGICAL ORDERS AS PATTERN OF LONG RANGE ENTANGLEMENTS

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Abstract:

Local unitary transformations define an equivalence relation and the equivalence classes are nothing but the universality classes that define the different phases for gapped quantum systems, which are beyond Landau symmetry breaking theory. The equivalence classes are also pattern of long range entanglements. So topological orders are pattern of long range entanglements. Using this point of view, we obtain a complete classification of all gapped quantum phases in 1D. We also classify a large class of topological orders (the gapped quantum phases without any symmetry) in higher dimensions.