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Contextuality, memory cost, and nonclassicality for sequential quantum measurements

In this talk, we will review basic notions and results connecting Kochen-Specker original approach to the sequential measurement scenario, together with a more recent extension of such an approach to the general problem of temporal correlations. First, we will motivate the choice of the sequential measurement scenario to overcome the difficulties associated with Kochen-Specker contextuality and imperfect measurements. Moreover, we will discuss the advantages and limitations of such an approach. In the sequential measurement scenario, one can naturally identify memory as the key resource to classically simulate correlations. We will review basic results on the "memory cost" of simulating contextual correlations. Finally, motivated by the above results, we will discuss a possible extension of this approach that takes the notion of memory as fundamental to define a notion of nonclassicality beyond that of quantum contextuality. We will present recent results on temporal correlations, in particular, inequalities able to distinguish classical and quantum theories with different amounts of memory available.