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Quantum probabilistic approach to spectral analysis of growing graphs

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The basic idea of quantum probability is to replace a probability space $(\Omega, \mathcal{F}, P)$ with a $*$-algebra with a state $(\mathcal{A}, \varphi)$, and a (classical) random variable X with a quantum random variable $a \in \mathcal{A}$. A classical random variable is realised as a quantum random variable in a canonical manner. Then quantum probabilistic techniques are available for analyzing a classical random variable through *quantum decomposition*. I will illustrate this idea to obtain the asymptotic spectral distribution of the adjacency matrix of a growing regular graph. We prove the quantum central limit theorem for the adjacency matrix of a growing regular grap! h in the vacuum and deformed vacuum states. The condition for the growth is described in terms of simple statistics arising from the stratification of the graph. The asymptotic spectral distribution of the adjacency matrix is obtained from the classical reduction.

References

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