

Quantum Dynamics as Generalized Conditional Probabilities

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Quantum theory can be regarded as a non-commutative variant of classical probability theory. From this point of view, one expects that quantum dynamics should be analogous to classical conditional probabilities. We derive an alternative variant of the well-known isomorphism between completely positive maps and bipartite density operators that makes this connection much more explicit. The new point of view is applied to further elucidate the connection between no-cloning/no-broadcasting theorems and the monogamy of entanglement.

If time permits, I will show how the new isomorphism may be used to derive a family of completely positive descriptions for the dynamics of systems that are initially entangled with the environment, which naturally generalizes the usual construction for product states. This is of interest, since the assumption of complete positivity in this context has been questioned by several researchers.