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A free version of the de Finetti theorem

The de Finetti theorem is a foundational result on distributional symmetries and invariance principles in probability. It states that an infinite sequence of random variables which joint distributions are invariant under permutations is already conditionally i.i.d.

Recently we have found its counterpart in free probability. Here the role of permutations is replaced by quantum permutations. This leads to a notion of quantum exchangeability. Our main result is that quantum exchangeability of an infinite sequence of noncommutative random variables is equivalent to freeness with amalgamation over the tail algebra of this sequence. In particular, this gives a new characterization of freeness with amalgamation.

This is joint work with Roland Speicher.