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Negative correlation inequalities for random-cluster models

The (anti-ferromagnetic) q-state Potts model of a graph reduces to the number of proper q-colourings of the graph (when q is a natural number and the temperature is zero). The random-cluster expansion gives an interpretation of this partition function for any $q \geq 0$. When $q \geq 1$, the FKG inequality yields positive correlations among any increasing functions on the state space. (At $q = 1$ all the fundamental events are independent.) In the range $0 \leq q \leq 1$ negative correlations are known to hold in some forms, but not in others, and are conjectured to hold in many more. I will survey the current state of the problem, highlighting recent progress and potential applications.