Combinatorics of a Sequence to Self-Avoiding Walk Channel

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We study an interesting channel which probabilistically maps binary sequences to self-avoiding walks in $\mathbb{Z}^2$, inspired by a model of protein folding from statistical physics. The channel is characterized by a Gibbs distribution with a free parameter corresponding to temperature. We give bounds on the free energy which exhibit an interesting phase transition with respect to temperature, and we study the existence of a connective constant for classes of self-avoiding walks with a density constraint. Proving these results and generalizing them raises challenging probabilistic and combinatorial questions in the theory of self-avoiding walks, on which we make some progress.