

Bethe Ansatz for the Propagator of the Multi-Species Totally Exclusion Process.

We explore the dynamics of the N -species totally asymmetric simple exclusion process (N-TASEP) on a one-dimensional lattice, where different species of particles exhibit hierarchical dynamics depending on arbitrary parameters. We employ the Algebraic Bethe Ansatz method to establish a framework that enables the calculation of finite-time conditional probabilities for the positions of a finite number of particles across multiple species. This formalism is analogous to a propagator operator for quantum spin chains and can be viewed as a stochastic vertex model, leading to explicit formulas which simplifies to a determinantal form in particular situations, generalising thus the work of Schütz et al. for the single-species case. The formalism relies on a new method of Baxterization for R -matrices that depends on two separate spectral parameters with a braid-like algebra that was proposed by Ragoucy et al. This is a joint work with Luigi Cantini.

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