

A new combinatorial formula for the modified Macdonald polynomials

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Abstract: Macdonald polynomials are a remarkable family of symmetric functions that are known to have connections to combinatorics, algebraic geometry and representation theory. The modified Macdonald polynomials are obtained from the Macdonald polynomials using an operation called plethysm. A combinatorial formula for the latter was given by Haglund, Haiman and Loehr in a celebrated work (JAMS, 2004). We will give a new combinatorial formula (arXiv:2011.06117).

Recently, a formula for the symmetric Macdonald polynomials was given by Corteel, Mandelshtam and Williams in terms of objects called multiline queues, which also compute probabilities of a statistical mechanics model called the multispecies ASEP on a ring. It is natural to ask whether the modified Macdonald polynomials can be obtained using a combinatorial gadget for some other statistical mechanics model. We answer this question in the affirmative via a multispecies totally asymmetric zero-range process (TAZRP) in (arXiv:2209.09859).

These are joint works with J. Martin and O. Mandelshtam.