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EXPLORING IN SCIENCE FICTION: MACDONALD INTERSECTION POLYNOMIALS, SHUFFLE THEOREM AND BEYOND

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We introduce Macdonald intersection polynomials $\mathrm{I}_{\mu^{(1)},\ldots,\mu^{(k)}}[X; q, t]$, which are indexed by k-tuples of partitions $\mu^{(1)}, \ldots, \mu^{(k)}$. These polynomials are conjectured to be equal to the bigraded Frobenius characteristic of the intersection of Garsia-Haiman modules, as proposed by the science fiction conjecture of Bergeron and Garsia. In this talk, we establish a remarkable connection between $\mathrm{I}_{\mu^{(1)},\ldots,\mu^{(k)}}$, the character ∇e_{k-1} of the diagonal coinvariant algebra, and the shuffle formula $D_{k-1}[X; q, t]$. Furthermore, we will introduce recent findings on certain modification of Macdonald intersection polynomials and their connection to ∇s_λ in the Loehr-Warrington conjecture, proved by Blasiak-Haiman-Morse-Pun-Seelinger.

This is based on collaboration with Donghyun Kim and Seung Jin Lee, as well as another ongoing collaboration with Donghyun Kim.