

DEFORMATIONS OF GROTHENDIECK RINGS AND CLUSTER ALGEBRAS

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Abstract:

The problem of describing the q -characters of all simple representations of the quantum affine algebra $U_q(\hat{\mathfrak{g}})$ was solved by Nakajima by considering a certain one-parameter deformation \mathcal{K}_t of the Grothendieck ring associated to the category of finite-dimensional representations of $U_q(\hat{\mathfrak{g}})$.

\mathcal{K}_t has geometric origin, it was in fact introduced for simply-laced Lie algebras by works of Nakajima and Varagnolo-Vasserot in terms of perverse sheaves on quiver varieties. On the other hand, it is known from works of Hernandez-Leclerc, Bittmann, and Qin that it corresponds to a quantization of a cluster algebra structure on the classical Grothendieck ring.

The algebraic construction of \mathcal{K}_t given by Hernandez shows how additional quantum parameters can naturally appear in the picture. We will then consider deformations of quantum Grothendieck rings with several parameters. Surprisingly, we observe that the dependence in the additional parameters also comes from a certain deformation of quantum cluster algebra structures. This is a joint work with David Hernandez.