Character formulae and tensor products of prime representations of quantum affine $\mathfrak{sl}_{n+1}$

We study the family of prime representations of quantum affine $\mathfrak{sl}_{n+1}$ introduced in the work of Hernandez and Leclerc. These are defined by using an A_n-quiver; in the case of the sink-source quiver and the monotonic quiver they proved that the associated subcategory of finite–dimensional representations of the quantum affine algebra was a monoidal categorification of a cluster algebra with the prime representations corresponding to cluster variables.

In this talk we shall work with an arbitrary quiver and give a necessary and sufficient condition in terms of Drinfeld polynomials for a tensor product of prime representations to be irreducible. We also state precisely the "exchange relations " in the case when a tensor product is reducible; in other words we describe the Jordan–Holder series of the tensor product.

As a consequence of our results we write an explicit formula for the character of a prime representation as an alternating linear combination of characters of the local Weyl modules for quantum affine algebras. In the case of the sink source and the monotonic quiver we give a second character formula; in the language of cluster algebras this formula express an arbitrary cluster variable in terms of the original seed. Equivalently, our formula gives the character of a prime representation in terms of the fundamental representations and the Kirillov–Reshetikhin modules.

The talk is based on joint work with Matheus Brito.