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Inflations for representations of shifted quantum affine algebras

It is well-known that the only finite-dimensional simple Lie algebra admitting a 2-dimensional irreducible representation is $\mathfrak{sl}_2$. The restriction functors appearing in classical Lie theory are therefore not dense on simple modules. The goal of this talk is to show that this density property is however satisfied in the setting of shifted quantum affine algebras (SQAs for short).

SQAs are infinite-dimensional algebras parametrized by a finite-dimensional simple Lie algebra $\mathfrak{g}$ and a coweight of this Lie algebra. They are of fundamental importance in the modern formulation of representation theory and play an essential role in geometry, in quantum integrable systems and in the study of cluster algebras. Let us fix a SQA and denote it by U. Then, like in classical Lie theory, for any choice of simple root of the Lie algebra $\mathfrak{g}$ underlying U, there is a corresponding subalgebra U' which is isomorphic to a SQA of rank 1 (i.e. whose underlying Lie algebra is $\mathfrak{sl}_2$). A natural question to ask is thus whether or not any simple representation of this subalgebra can be lifted to a simple representation of U. The answer is yes and we can even choose these "lifts" so that the action of another important subalgebra of U (which is almost complementary to U' in some sense) is trivial. These special "lifts" are called *inflations*.

The main result of this talk will be an existence theorem for inflations of representations of rank 1 SQAs. We will also present several potential applications of this theorem.