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Quiver varieties and quantum groups

The purpose of this course is to give some applications of Nakajima's quiver varieties to representation theory.

1. In part one we will recall Lusztig's construction of the canonical basis of the positive part of the quantized enveloping algebra of a Lie algebra of symmetric Kac-Moody type. Among Lusztig's perverse sheaves, we will also describe those corresponding to the canonical bases of the irreducible integrable highest weight modules.

Then we will give Lusztig's construction of the positive part of the enveloping algebra of a Lie algebra of symmetric Kac-Moody type via Lagrangian cycles, and we will explain the corresponding construction of the irreducible integrable highest weight modules.

2. In part two we will explain the basics of level zero modules of quantum affine algebras. Then we will give Nakajima's geometric construction of the simple and standard modules for the symmetric types.

3. Part three is devoted to the computation of the Euler characteristic of quiver varieties and its representation theoretic meaning. The main tool is Nakajima's q,t -character.