Representation theory of W-algebras

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W-algebras are vertex algebras that can be thought as generalizations of affine Kac-Moody algebras and the Virasoro algebra. Each W-algebra is constructed from a pair of a semisimple Lie algebra and its nilpotent orbit. These algebras first appeared in the work of Zamolodchikov in the 80's in a special case. They were defined by Feigin and Frenkel in 90's in the case of the nilpotent orbit is regular, and the most general definition was given by Kac, Roan and Wakimoto in the beginning of 2000's. W-algebras can be also considered as affiniztion of finitte W-algebas, or as quantization of the arc spaces of Slowody slices.

In my lectures I am going to emphasize connections between W-algebras and affine Kac-Moody algebras. I will use the quantum Drinfeld-Sokolov reduction functor to describe the representation theory of W-aglerbas, such as the characters of irreducible representations, the lisse quotients of W-algebars, and the rationality of minimal series W-algebras.

1. What are W-algebras?
2. Finite and Affine W-algebras
3. Representation theory of W-algebras via the quantum Drinfeld-Sokolov reduction functor
4. Kac-Wakimoto admissible representations and rationality of W-algebras