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Kempf-Ness Theory and Character Varieties

Let V be a complex vector space equipped with an action of a reductive algebraic group $G \subset \mathrm{GL}(V)$. If $K \subset G$ is a maximal compact Lie subgroup then there is always a natural symplectic structure on V for which the action of K is Hamiltonian. In this setting we can consider two "quotients" of V: the geometric invariant theory quotient of V by G and the symplectic reduction of V by K. Kempf-Ness theory describes striking connections between these two worlds and in this talk I will explain how these ideas can be adapted to understand the topology of $G-$character varieties of finitely generated nilpotent groups.