

Seminario de Geometría y Topología



Geometry of character varieties of abelian groups

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Abstract:

The description of the space of commuting elements in a compact Lie group is an interesting algebro-geometric problem with applications in Mathematical Physics, notably in Super-symmetric Yang Mills theories. When the Lie group is complex reductive, this space is the character variety of a free abelian group. Let K be a compact Lie group (not necessarily connected) and G be its complexification. We consider, more generally, an arbitrary finitely generated abelian group A , and show that the conjugation orbit space $\text{Hom}(A, K)/K$ is a strong deformation retract of the character variety $\text{Hom}(A, G)/G$ (this can also be shown for nilpotent groups replacing A , and possibly more generally). As a Corollary, when G is connected and semisimple, we obtain necessary and sufficient conditions for $\text{Hom}(A, G)/G$ to be irreducible. This relates to G -Higgs bundles over abelian varieties, to intriguing problems on irreducibility of the variety of k -tuples of n by n commuting matrices, and to the Hilbert scheme of n points on C^k .

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