Winter Colloquium Series

Cohomology of Toric Poisson Structures

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Abstract:

Manifolds equipped with a Poisson structure are fundamental objects of study in mathematical physics. Every Poisson manifold is foliated by symplectic manifolds, the basic domains of Hamiltonian mechanics, so one can think of a Poisson manifold as a family of symplectic manifolds on which one could study a family of mechanical systems. There is a cohomology theory for Poisson manifolds which is unfortunately difficult to compute and whose interpretation remains somewhat mysterious. In part, this is because Poisson manifolds can come in a wide range of types. At one extreme, any smooth manifold can be given the zero Poisson structure and in such a case the Poisson cohomology is isomorphic to the infinite dimensional vector space of all multi-vector fields on the manifold. At the other extreme, if the Poisson manifold (as a family) consists of a single symplectic manifold, then the Poisson cohomology is isomorphic to the finite dimensional de Rham cohomology of that space. For Poisson manifolds of type in between these extremes, the cohomology contains a mix of local differential information and global topological information. Toric Poisson structures form finite families of symplectic manifolds and are quite close to one extreme, but it is unknown if their cohomology is even finite dimensional. This talk will offer an introduction to Poisson manifolds and the cohomology problem, and survey some methods and results for addressing this problem for toric Poisson structures. This is joint work with Prof. Berit Givens.

Wednesday, January 27, 1:05 - 1:50pm in 3-1639