



*Institute of Mathematical Research
Department of Mathematics*

WORKSHOP ON GEOMETRY

May 7, 2009

Room 517, Meng Wah Complex, HKU

Morning Session:

10:30 - 11:30am

Florent Schaffhauser, Keio University, Japan

Stable holomorphic bundles and anti-holomorphic involutions on compact Riemann surfaces

Abstract

The moduli space of polystable bundles with fixed rank and degree over a compact Riemann surface is, by a theorem of Mehta and Seshadri, in bijective correspondence with the space of unitary representations of certain central extensions of the fundamental group of this surface. This bijection can be used to give that moduli space a symplectic structure. In this talk, we study anti-symplectic involutions of the moduli space induced by anti-holomorphic involutions of the fixed Riemann surface. We devote extra attention to giving sufficient conditions for the fixed-point set of such involutions of the moduli space to be non-empty, which provides examples of (non-empty) Lagrangian submanifolds in moduli spaces of (poly)stable bundles.

11:30 - 12:30pm

Kai Ming To, University of Hong Kong

On intersections of conjugacy classes and Bruhat cells

Abstract

For a connected complex semi-simple Lie group G and a fixed pair (B, B^-) of opposite Borel subgroups, we answer the question when a conjugacy class C in G and a (B, B^-) -double coset BwB^- intersect.

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Afternoon Session:

2:30 - 3:30pm

David Li-Bland, University of Toronto, Canada

Courant algebroids and Poisson geometry

Abstract

Given a manifold M with an action of a quadratic Lie algebra d , such that all stabilizer algebras are co-isotropic in d , we show that the product $M \times d$ becomes a Courant algebroid over M . If the bilinear form on d is split, the choice of transverse Lagrangian subspaces g_1, g_2 of d defines a bivector field π on M , which is Poisson if (d, g_1, g_2) is a Manin triple. In this way, we recover the Poisson structures of Lu-Yakimov, and in particular the Evens-Lu Poisson structures on the variety of Lagrangian Grassmannians and on the de Concini-Procesi compactifications. Various Poisson maps between such examples are interpreted in terms of the behaviour of Lagrangian splittings under Courant morphisms.

3:30 - 4:30pm

Ping Xu, Penn State University, USA

Geometry of Maurer-Cartan elements in complex manifolds

Abstract

The semi-classical data attached to stacks of algebroids in the sense of Kashiwara and Kontsevich are Maurer-Cartan elements on complex manifolds, which we call extended Poisson structures as they generalize holomorphic Poisson structures. A canonical Lie algebroid is associated to each MC element. We study the geometry underlying these MC elements in the light of Lie algebroid theory. In particular, we extend Poisson cohomology and Kozul-Brylinski homology to the realm of extended Poisson manifolds; we establish a sufficient criterion for these to be finite dimensional; we describe how homology and cohomology are related through the Evens-Lu-Weinstein duality module; and we describe a duality on Kozul-Brylinski homology, which generalizes the Serre duality of Dolbeault cohomology. This is a joint work with Chen and Stiennon.

All are welcome