

MIST VIII: Mathematics Inspired by String Theory

September 23, 2016 (Friday)

Jointly organized by The Institute of Mathematical Sciences & Department of Mathematics, CUHK

Room 502a, 5/F, Academic Building No. 1
The Chinese University of Hong Kong

Program

- 09:00 - 09:45 **Conan LEUNG** (CUHK)
SYZ transformation of coisotropic branes
- 09:45 - 10:30 **Qingyuan JIANG** (CUHK)
Generalization of Homological Projective Duality Theorem
- 10:30 - 11:00 *Tea Reception*
- 11:00 - 12:00 **Nigel James HITCHIN** (University of Oxford)
Spinors, Lagrangians and Higgs bundles
- 14:30 - 15:15 **Yat Sun POON** (University of California at Riverside)
Holomorphic Poisson Manifolds and their Cohomology On Torus Bundles
- 15:15 - 15:45 *Tea Reception*
- 15:45 - 16:30 **Chi Kwong FOK** (National Taiwan University)
Representation stability and moduli spaces
- 18:30 *Banquet*

~ All are welcome ~

Representation stability and moduli spaces

Chi Kwong FOK

National Taiwan University

Abstract: A sequence of spaces is said to be representation stable if their cohomology, when viewed as representations of their own symmetry, stabilises. Introduced by Church and Farb, representation stability is ubiquitous among various kinds of moduli spaces with permutation symmetry. In this talk I will explain this notion and discuss its appearance in the moduli spaces of flat connections over higher dimensional tori.

Spinors, Lagrangians and Higgs bundles

Nigel James HITCHIN

University of Oxford

Abstract: Given a symplectic representation of a group G , we consider holomorphic sections ψ of the associated vector bundle $V \otimes K^{1/2}$ on a Riemann surface, essentially solutions of the Dirac equation. Applying the moment map gives us a Higgs field and we have a distinguished subvariety of the moduli space of Higgs bundles, which for general reasons one expects to be Lagrangian with respect to the holomorphic symplectic form. In physicists's language this is a BAA brane. The talk will discuss some examples in the simplest case of $G = SL(2, C)$ and some possible applications.

Generalization of Homological Projective Duality Theorem

Qingyuan JIANG

The Chinese University of Hong Kong

Abstract: In this talk, I will talk about the joint work with Prof. Conan Leung and Mr. Ying Xie. In order to study the derived categories of coherent sheaves of linear sections of projective varieties, Kuznetsov introduced the concept of Homological Projective Duality (HPD), and showed that there are concrete relations between the derived categories of dual linear sections of an HP-pair (X, Y) (HPD-theorem). Using a generalization of Richard Thomas' method of mutations in his Notes on HPD, we show that HPD type theorem holds for any fiber product (X_T, Y_S) of (X, Y) by another HP-pair (S, T) , as long as they intersect properly. This enables us to produce many examples of semi-orthogonal decomposition (SOD) of varieties as well as give descriptions of the interesting parts. In particular, when (S, T) are taken to be dual linear projective subspaces (L^\perp, L) , our method gives a more direct and categorical proof of Kuznetsov's original HPD-theorem without referring to the concrete geometries of Grassmannians.

SYZ transformation of coisotropic branes

Conan LEUNG

The Chinese University of Hong Kong

Holomorphic Poisson Manifolds and their Cohomology On Torus Bundles

Yat Sun POON

University of California at Riverside

Abstract: The cohomology of any holomorphic Poisson structure is calculated by the spectral sequence of a bi-complex. On torus bundles over some compact complex manifolds, we find holomorphic Poisson structures for which the spectral sequence degenerates on the second page. Examples include torus bundles over the blow-up of the complex projective planes at up to three generic points.