



SCHOOL OF
MATHEMATICS

Workshop on Homological Mirror Symmetry: Methods and Structures

November 7-11, 2016

Agenda

** All talks will take place in Wolfensohn Hall

Monday, 11/7

10:00 am - 11:00 am Hiroshi Iritani, Kyoto University, "On the Gamma conjecture associated with toric flips"

Abstract: Gamma conjecture in a broad sense predicts a relationship between decompositions of quantum differential equations and those of derived categories. In this talk, I will discuss a partially compactified Landau-Ginzburg mirror symmetry for toric stacks. This picture naturally leads to a formal decomposition of the quantum differential equations of toric stacks under flips. Part of this talk is based on joint work with Tom Coates, Alessio Corti and Hsian-Hua Tseng.

11:30 am - 12:30 pm Ailsa Keating, IAS, "On symplectomorphism groups of some Milnor fibres"

12:30 pm - 2:30 pm LUNCH, Dining Hall

2:30 pm - 3:30 pm Alex Perry, Harvard, "Categorical joins"

Abstract: Homological projective duality is a powerful theory developed by Kuznetsov for studying the derived categories of varieties. It can be thought of as a categorification of classical projective duality. I will describe a categorification of the classical join of two projective varieties, its relation to homological projective duality, and applications to the derived categories of some Fano and Calabi-Yau varieties. This is joint work with Alexander Kuznetsov.

3:30 pm - 4:00 pm TEA, Fuld Hall Common Room

4:00 pm - 5:00 pm Lenhard Ng, Duke, "Knot contact homology and partially wrapped Floer homology"

Abstract: I'll describe how to prove that the conormal torus is a complete knot invariant, via holomorphic curves and an enhanced form of knot contact homology. The proof is motivated by an isomorphism between a partially wrapped Floer homology defined in this context and the group ring of the knot group. This is joint work with Tobias Ekholm and Vivek Shende.

Tuesday, 11/8

10:00 am - 11:00 am Daniel Huybrechts, University of Bonn, "Kuznetsov's Calabi-Yau categories: introduction and applications"

Abstract: The talk will start with a gentle introduction into Kuznetsov's construction of (fractional) Calabi-Yau categories associated with hypersurfaces. The relation to matrix factorizations will be mentioned, but the talk will mainly focus on the Fourier-Mukai aspects. As an application we will discuss a new proof of the Global Torelli theorem for cubic fourfolds (joint work with Jorgen Rennemo).

11:30 am - 12:30 pm John Calabrese, Rice University, "DT curve counting for CY3's and birational transformations"

Abstract: For Calabi-Yau threefolds, Donaldson-Thomas curve counts are close cousins of Gromov-Witten invariants. I will discuss how these behave under birational transformations using Joyce's Hall algebras and derived categories.

12:30 pm - 2:30 pm LUNCH, Dining Hall

3:30 pm - 4:00 pm TEA, Fuld Hall Common Room

Wednesday, 11/9

10:00 am - 11:00 am Emmy Murphy, MIT, "Mirror symmetry for the trefoil knot"

Abstract: We will compute the wrapped Fukaya category of the affine variety $\{xyz+x+z=0\}$, in particular showing that it is self mirror. The result isn't new, but the methods are. The tools used are Legendrian contact homology and a bunch of soft techniques. Hopefully the talk will illustrate why the tools work for general affine varieties of arbitrary dimension, without induction on dimension.

11:30 am - 12:30 pm Jingyu Zhao, IAS, "Periodic symplectic cohomology and the Hodge filtration"

Abstract: For an open symplectic manifold, the homological mirror symmetry conjecture states that there is an derived equivalence between the wrapped Fukaya category of the symplectic manifold and the category of matrix factorizations of its mirror Landau-Ginzburg model. It is conjectured in the work of Kontsevich-Katzarkov-Pantev that the periodic cyclic homology of a smooth and proper DG-category admits a non-commutative Hodge structure. Motivated by this, in this talk we define the periodic cyclic homology of the wrapped Fukaya category. Due to the non-properness of the wrapped Fukaya category, the usual definition of periodic cyclic homology is not well-behaved with respect to localization. To resolve this, we propose another definition, called periodic symplectic cohomology, and define the corresponding Hodge filtration on it.

12:30 pm - 2:30 pm LUNCH, Dining Hall

2:30 pm - 3:30 pm Nick Sheridan, IAS, "Versality for the relative Fukaya category"

Abstract: We expand on Seidel's definition of the Fukaya category relative to a normal-crossings divisor, and we prove a general 'versality' result in this context. We apply the versality result to prove homological mirror symmetry for Greene-Plesser mirrors. The latter result is joint work with Ivan Smith.

3:30 pm - 4:00 pm TEA, Fuld Hall Common Room

4:00 pm - 5:00 pm Ivan Smith, University of Cambridge, "Mirror symmetry for the mirror quartic, and other stories"

Abstract: Symplectic topological applications of homological mirror symmetry remain somewhat scarce. I will explain how to understand certain features of the symplectic topology of certain K3 surfaces starting from computations in the derived category of the mirror. The key ingredient is a theorem of Bayer and Bridgeland which determines the autoequivalence group of a complex algebraic K3 surface of Picard rank one. A related (more speculative) circle of ideas leads to a symplectic viewpoint on Kuznetsov's K3 category of a cubic four-fold.

Thursday, 11/10

10:00 am - 11:00 am Fabian Haiden, Harvard, "Flow on quiver representations, nested logarithms, and weight filtrations in artinian categories"

Abstract: I will discuss some recent results which came out of the study of the flow on metrized quiver representations. This flow is a finite-dimensional toy model for non-linear heat-type flows, such as lagrangian mean curvature flow. In joint work with Katzarkov, Kontsevich, and

Pandit, we find that the asymptotics of the flow on a given quiver representation define a filtration (indexed by \mathbb{R}^{∞}) which has a purely algebraic interpretation. A novel feature is the existence of non-linear walls, on which asymptotics of the metric are described by nested logarithms.

11:30 am - 12:30 pm Zach Sylvan, IAS, "Partially wrapped Floer theory"

Abstract: I'll define a version of Floer theory associated to a Liouville domain with "stops", which are Liouville hypersurfaces of the boundary. I'll then use this to describe the Viterbo restriction maps on wrapped Fukaya categories and explain what the new description has to say about mirrors to reducible divisors.

12:30 pm - 2:30 pm LUNCH, Dining Hall

2:30 pm - 3:30 pm Sheel Ganatra, IAS, "Localizing the Fukaya category of a Weinstein manifold"

Abstract: I will describe a class of Liouville manifolds with boundary called "Liouville sectors" which have well-defined, covariantly functorial wrapped Fukaya categories. Then, I will describe ways that coverings of a Liouville manifold by Liouville sectors can be used to understand wrapped Fukaya categories of the total space. A primary source of examples comes from Weinstein manifolds whose Lagrangian skeleta have "nice" singularities (for instance arboreal singularities in the sense of Nadler). This is joint work in progress with John Pardon and Vivek Shende.

3:30 pm - 4:00 pm TEA, Fuld Hall Common Room

4:00 pm - 5:00 pm Dmitry Tamarkin, Northwestern University, "Microlocal category over divided powers"

Abstract: In my preprint the microlocal category is defined over the Novikov ring with rational coefficients. I will explain how to modify the construction so as to define the microlocal category over the divided power version of Novikov ring over integers, where the coefficient of T^c is of denominator factorial of the floor of c .

Friday, 11/11

10:00 am - 11:00 am Kenji Fukaya, Stonybrook University, "Equivariant Kuranishi structure and its (potential) applications"

Abstract: In this talk I will explain how we can perform the construction of virtual fundamental chain in an equivariant way with respect to the group action on the target space. I will also explain various possible application of it.

11:30 am - 12:30 pm Mohammed Abouzaid, IAS, "Family Floer theory and mirror symmetry"

Abstract: I will explain a strategy for proving HMS for symplectic manifolds admitting Lagrangian torus fibrations without singularities.

12:30 pm - 2:30 pm LUNCH, Dining Hall

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