Paul S. Aspinwall
"Non-Commutative Resolutions and Toric Geometry"

Corina Baciu
"Graded Ulrich Modules over the Affine Cone of the Simple Node"

Matrix factorizations of all isomorphism classes of indecomposable rank two graded Ulrich modules over the homogeneous hypersurface ring $k[y_1,y_2,y_3]/< y_1^3+y_1^2y_3-y_2^2y_3 >$ are constructed.

Igor Burban
"Cohen-Macaulay modules on non-isolated surface singularities"

My talk is based on a joint paper with Drozd arXiv:0803.0117 and another joint work in progress. In the first part, I am going to make an overview of some known results on a classification of Cohen-Macaulay modules over simple hypersurface singularities (McKay correspondence) and minimally elliptic surface singularities.

In the second, I shall show that the category of Cohen-Macaulay modules over the so-called degenerate cusps is representation-tame. In particular, our method gives a description of all Cohen-Macaulay modules (= matrix factorizations) over k[[x,y,z]]/xy (A_infty singularity) and k[[x,y,z]]/x²y (D_infty singularity) as well as over k[[x,y,z]]/xyz (degenerate cusp).

Andrei Caldararu
"Hochschild homology and cohomology of Landau-Ginzburg models"

In my talk I shall describe joint work in progress with my student Junwu Tu to define and compute the Hochschild homology and cohomology of LG models. In the ungraded case we do this by studying curved A infinity algebras. In the graded case (of interest to algebraic-geometers and to physicists), we have a conjectural picture, similar to one proposed by Walcher, which should allow a complete computation as well.

Nils Carqueville
"Cyclic A-infinity structures"

Open topological string theories are the same as cyclic, unital and minimal A-infinity-categories. Establishing this structure for matrix factorizations that describe topological branes in Landau-Ginzburg models provides both a better

conceptual understanding of such theories as well as a practical way to approach effective superpotentials and deformation theory.

Duiliu Diaconescu
"Local Donaldson-Thomas Theory via ADHM Sheaves"

ADHM sheaves are framed representations of a certain quiver with relations in the abelian category of coherent sheaves on an algebraic variety. In this talk we will construct an algebraic moduli space of stable ADHM sheaves on a smooth complex projective variety. If the variety in question is a curve we will prove that this moduli space is virtually smooth and related via Beilinson spectral sequence to a recent curve counting construction of Pandharipande and Thomas. This yields a new conjectural construction of the local Donaldson-Thomas theory of curves as well as a natural higher rank generalization.

Stefan Fredenhagen
"Matrix factorisations in supersymmetric coset models"

B-type boundary conditions in Landau-Ginzburg models can be described by matrix factorizations. Some Landau-Ginzburg models admit in the infrared a description as an exactly treatable superconformal field theory, and we would like to understand how the matrix factorization description fits with the construction of superconformal boundary states. I will discuss some results on the identification of factorizations and boundary states in a class of N=2 supersymmetric coset models (Kazama-Suzuki models).

Kentaro Hori
"Phases of N=2 theories in 1+1 dimensions with boundary"

We study B-type D-branes in linear sigma models with Abelian gauge groups. The most important finding is the grade restriction rule. It classifies representations of the gauge group on the Chan-Paton factor, which can be used to define a family of D-branes over a region of the K\"ahler moduli space that connects special points of different character. As an application, we find a precise, transparent relation between D-branes in various geometric phases as well as free orbifold and Landau-Ginzburg points. The result reproduces and unifies many of the mathematical results on equivalences of D-brane categories, including the McKay correspondence and Orlov's construction.

Bradford Hovinen
"Matrix factorizations of the classical discriminant"

The classical discriminant detects whether a univariate polynomial over a field has repeated roots. Classical results of Cayley, Legendre, Sylvester, and Bézout show that there exist nontrivial determinantal formulae for the classical discriminant, allowing for more efficient evaluation. However, the classical formulae are all equivalent in the sense that the cokernels of the matrices are all isomorphic. This begs the question of whether there are any nontrivial inequivalent determinantal formulae.

This talk will describe a new determinantal formula for the classical discriminant which is inequivalent to the classical formulae: the presentation matrix of the "open swallowtail" studied by Arnol'd and Givental. The associated matrix is smaller than that of any of the classical formulae and carries information on the root structure of the polynomial which the classical formulae cannot detect.

Some work on using deformation theory to classify determinantal formulae for the classical discriminant will also be described. In particular, by constructing versal deformations of maximal Cohen-Macaulay modules on certain curve singularities, it is possible to construct a moduli space of graded rank-1 MCM modules on the discriminant. A moduli space of such modules on the discriminant of degree 4 polynomials will be shown, along with some observations relating the geometry of the discriminant to the structure of the moduli space.

Hans Jockers
"D-brane monodromies from a Landau-Ginzburg point of view"

Probe branes encircling singularities in the Kähler moduli space give rise to non-trivial transformations on the set of B-type branes. These transformations are described by their action on matrix factorizations of the associated Landau-Ginzburg superpotential. Moreover the singularities are further characterized by specifying B-type defects, which again are captured by certain matrix factorizations of yet another but closely related superpotential.

Hiroshige Kajiura
"Triangulated categories of matrix factorizations associated with regular systems of weights II
--- The case of ADE (epsilon=1) and the case e=-1 ---"

In this talk, I plan to talk about the structure of strongly exceptional collections of the triangulated categories of graded matrix factorizations associated to regular

systems of weights in the case of type ADE (epsilon=1) and the case epsilon=-1. In particular, in the latter case, a strongly exceptional collection defines a quiver of wild type which is an extension of a Dynkin quiver.

Anton Kapustin
"Three-dimensional topological field theory and matrix factorizations"

Rozansky and Witten showed that 3d supersymmetric sigma-model with a Hyper-Kahler target space can be twisted into a 3d Topological Field Theory. This field theory can be thought of as a categorification of the B-model. I will explain how to construct a large class of boundary conditions for this theory, as well as defect lines separating different boundary conditions. Unexpectedly, the categories of defect lines are closely related to the categories of matrix factorizations.

Johanna Knapp and Emanuel Scheidegger
"Towards Open String Mirror Symmetry for One-Parameter Calabi-Yau Hypersurfaces"

This talk is concerned with branes and differential equations for one-parameter Calabi-Yau hypersurfaces in weighted projective spaces. For a certain class of B-branes we derive the inhomogeneous Picard--Fuchs equations satisfied by brane superpotential. One central ingredient is the representation of these branes by matrix factorizations. Using the physical realization of the equivalence of categories of matrix factorizations and coherent sheaves, we relate them to geometry. In this way we arrive at Griffiths' normal function for the branes and the prediction for the real BPS invariants for holomorphic maps of worldsheets with low Euler characteristics, ending on the mirror A-branes.

Daniel Krasner
"Equivariant sl(n)-link homology"

For every positive integer n, M. Khovanov and L. Rozansky constructed a bigraded link homology theory with Euler characteristic the quantum sl(n)-link polynomial. Matrix factorizations played an integral part in their construction. I will discuss these theories and a generalization that is motivated by the "universal" rank two Frobenius extension studied by M.
Khovanov, earlier, for sl(2)-homology. This equivariant sl(n)-link homology should be a starting point of unraveling some inherent structural properties of the Khovanov-Rozasnky link homology and related theories.

Calin Lazaroiu
"The framed bicategory of B-type toplogical defects in Landau-Ginzburg models"

Using the matrix factorization description, I show that B-type topological defects in Landau-Ginzburh models form a framed monoidal bicategory with duality involution in the sense of Shulman and May. This parallels a similar description of B-type topological defects in nonlinear sigma models.

Alexander Quintero Velez
"McKay correspondence for Landau-Ginzburg models"

The McKay correspondence is a principle that relates the geometry of a resolution of singularities of a quotient variety M/G and the equivariant geometry of the group action. In this talk, we discuss an analogue of the McKay correspondence for Landau-Ginzburg models. This leads naturally to a generalized notion of the McKay correspondence as an isomorphism of `noncommutative spaces' (in Kontsevich's sense).

Andreas Recknagel
"Some observations concerning deformations of matrix factorisations"

Boundary deformations of topological branes can be computed via computer algebra using Laudal's Massey product algorithm.
I discuss a number of examples -- and some general ideas that arise from playing with them.

Daniel Roggenkamp
"Defects and Bulk Perturbations of Boundary Landau-Ginzburg orbifolds"

In this talk I will explain how defect lines in two dimensional field theories can be used to analyse the behaviour of boundary conditions under bulk renormalisation group flows. This is discussed in detail for the case of Landau-Ginzburg models, where both B-type boundary conditions, as well as B-type defects can be described in the context of matrix factorisations.

Lev Rozansky
"Matrix factorizations and categorification of polynomial invariants of links"

Polynomial invariants of links, such as the HOMFLY SU(N) polynomial, originate

from correlators of Wilson lines in the chern-Simons-Witten TQFT. Khovanov suggested that these polynomials are Euler characteristics of chain complexes of graded vector spaces, associated to links up to homotopy, and cobordisms between links translate into chain maps of link complexes. He constructed a categorification complex for the Jones polynomial, which corresponds to SU(2). I will explain how to use matrix factorizations in order to categorify the SU(N) polynomial.

Greg Smith
"Toric Varieties as Fine Moduli"

In this talk, we examine how the combinatorics of quivers are connected with the geometry of toric varieties. In particular, we realize every projective toric variety as a fine moduli space of stable representations for an appropriate bound quiver. We will also discuss relationships to the derived category of coherent sheaves.

Atsushi Takahashi
"Triangulated categories of matrix factorizations associated with
regular systems of weights I
---Three equivalent triangulated categories and category generating lemma---"

After recalling the notion of regular systems of weights, I will briefly review three equivalent triangulated categories -- the category of graded matrix factorizations, the category of maximal Cohen-Macaulay modules, and the category of singularity. Then I will explain what we call the category generating lemma, that a special class of objects generates these triangulated categories, which plays a key role in obtaining full strongly exceptional collections in our work.