AGNES @ Northeastern - Abstracts

François Charles (Université Paris-Sud): Remarks on arithmetic ampleness
Abstract: We will discuss some aspects of arithmetic ampleness for schemes over $\mathrm{Spec}(\mathbb{Z})$, discussing the analogues of basic results in algebraic geometry – vanishing of cohomology, restriction of sections, Bertini irreducibility, etc. We will try to emphasize the role of numerical invariants that should be understood as analogues over the field with one elements of usual dimensions for cohomology groups. This is partly joint with Bost.

Emily Clader (San Francisco State University): Wall-crossing in Gromov-Witten theory
Abstract: Gromov-Witten theory is a technique for counting curves in a variety, and while it admits beautiful structure, it is notoriously difficult to compute. Ciocan-Fontanine and Kim recently introduced a generalization of Gromov-Witten theory, the theory of "quasimaps", which depends on an additional stability parameter varying over positive rational numbers. When that parameter tends to infinity, Gromov-Witten theory is recovered, while when it tends to zero, the resulting theory encodes information related to the physical "B-model" that is in some cases more tractable or more directly related to other theories. We discuss a new proof of Ciocan-Fontanine and Kim's "wall-crossing formula" exhibiting the dependence of the theory on the stability parameter, and applications of these ideas. This is joint work with Felix Janda and Yongbin Ruan.

Daniel Halpern-Leistner (Columbia University): Beyond geometric invariant theory
Abstract: Geometric invariant theory is an essential tool for constructing moduli spaces in algebraic geometry. Its advantage, that the construction is very concrete and direct, is also in some sense a drawback, because for a given moduli problem it is often intractable to explicitly describe GIT semistable objects in an intrinsic and simple way. Recently a theory has emerged which treats the results and structures of geometric invariant theory in a broader context. The theory of Theta-stability applies directly to moduli problems without the need to approximate a moduli problem as an orbit space for a reductive group on a quasi-projective scheme. I will discuss some new progress in this program: joint with Jarod Alper and Jochen Heinloth, we give a simple necessary and sufficient criterion for an algebraic stack to have a good moduli space. This leads to the construction of good moduli spaces in many new examples, such as the moduli of Bridgeland semistable objects in derived categories.

Ljudmila Kamenova (Stony Brook University): On Kobayashi's conjectures and algebraic non-hyperbolicity of hyperkähler manifolds
Abstract: The Kobayashi pseudometric d_M on a complex manifold M is the maximal pseudometric such that any holomorphic map from the Poincare disk to M is distance-decreasing. Kobayashi conjectured that this pseudometric vanishes on Calabi-Yau manifolds, and in particular, Calabi-Yau manifolds have "entire curves". Using ergodicity of complex structures, together with S. Lu and M. Verbitsky we prove this conjecture for all K3 surfaces and for many classes of hyperkähler manifolds. In the talk I will also give an algebraic version of hyperbolicity. Together with M. Verbitsky we prove that projective hyperkähler manifolds with Picard rank at least two are algebraically non-hyperbolic.

Mircea Mustaţă (University of Michigan): D-modules, Hodge ideals, and V-filtrations
Abstract: For a reduced hypersurface in a smooth complex algebraic variety, Saito's theory of mixed Hodge modules gives a sequence of invariants, the Hodge ideals, that encode information about the singularities of the hypersurface. I will give an introduction to these invariants and if time permits, I

will discuss a generalization to the case of Q-divisors, and a description in terms of V-filtrations. This is joint work with Mihnea Popa.

Georg Oberdieck (MIT): Two questions in the enumerative geometry of hyperkähler varieties
Abstract: The Yau-Zaslow formula relates the number of rational curves on a K3 surface to the modular discriminant, a particular modular form. An analog of K3 surfaces in higher dimensions are the irreducible holomorphic-symplectic or hyperkähler varieties. The question here is to enumerate the number of uniruled divisors. This is the first question we consider and for which a partial answer is known. The second question concerns counting elliptic curves with fixed j-invariant on the hyperkähler and is open in general. In a parallel not unrelated question progress was recently made in joint work with Pixton that I will discuss.

Angela Ortega (Humboldt Universität): Generic injectivity of the Prym map for double ramified coverings
Abstract: Given a finite morphism of smooth curves one can canonically associate it a polarized abelian variety, the Prym variety, defined as the kernel of the norm map between the Jacobians of the curves. This induces a map from the moduli space of coverings to the moduli space of polarized abelian varieties, known as the Prym map. In this talk we will consider the Prym map between the moduli space $\mathcal{R}_{g,r}$ of double coverings over a genus g curve ramified at r points, and $\mathcal{A}^{\delta}_{g-1+r/2}$ the moduli space of polarized abelian varieties of dimension $g-1+r/2$ with polarization of type δ. It is a classical result that the Prym map is generically injective for tale double coverings ($r=0$, principal polarized). We will show the generic injectivity of the Prym map in the cases (a) $g=2$, $r=6$ and (b) $g=5$, $r=2$. In the first case the proof is constructive and can be extended to the range $r \geq max6, 2/3(g+2)$. This completes the work of Marcucci and Pirola who proved the generic injectivity for the cases: $r \geq 8$ and $g \geq 1$, $r=4$ and $g \geq 4$, $r=2g \geq 6$. This a joint work with J.C. Naranjo.

Xiaolei Zhao (Northeastern University): Derived categories of K3 surfaces, O'Grady's filtration, and zero-cycles on holomorphic symplectic varieties
Abstract: The Chow groups of algebraic cycles on algebraic varieties have many mysterious properties. For K3 surfaces, on the one hand, the Chow group of 0-cycles is known to be huge. On the other hand, the 0-cycles arising from intersections of divisors and the second Chern class of the tangent bundle all lie in a one dimensional subgroup. In my talk, I will first recall some recent attempt to generalize this property to hyper-Khler varieties. Then I will prove a conjecture of O'Grady using methods from derived category, and explain a conjectural connection between the K3 surface case and the hyper-Khler case. If time permits, I will also discuss how to extend this connection to Fano varieties of lines on a cubic fourfold containing a plane. This talk is based on a joint work with Junliang Shen and Qizheng Yin.