

Algebraic Geometry Seminar

(2019. 5. 23–7. 26)

Dates	Speakers	Title
26-Jul	Qile Chen (Boston College)	The logarithmic gauged linear sigma model
12-Jul	Junliang Shen (MIT)	Perverse sheaves, the Katz-Klemm-Vafa formula, and the P=W conjecture
9-Jul	Yuchen Liu (Yale)	K-stability of cubic threefolds
5-Jun	Song Sun (UC Berkeley)	Complex structure degeneration and metric collapsing of Calabi-Yau manifolds
23-May	Xinyi Yuan (UC Berkeley)	Tate-Shafarevich group under relative Frobenius morphisms

Abstracts for AG Seminar

Qile Chen (Boston College)

June 12, 2019

The logarithmic gauged linear sigma model

We introduce the notion of log R-maps generalizing the notion of stable maps with p -fields, and develop a proper moduli stack of stable log R-maps in the case of a hybrid gauged linear sigma model. Two virtual cycles (canonical and reduced) are constructed for these moduli stacks. The main results are two comparison theorems relating the reduced virtual cycle to the Kiem-Li cosection localized virtual cycle, as well as the reduced virtual cycle to the canonical virtual cycle. This sets the foundation of a new technique for computing higher genus Gromov - Witten invariants of compact Calabi - Yau manifolds.

Junliang Shen (MIT)

June 12, 2019

Perverse sheaves, the Katz-Klemm-Vafa formula, and the $P=W$ conjecture

Perverse sheaves and their associated invariants appear naturally in the study of certain abelian fibrations. A striking example is the $P=W$ conjecture by de Cataldo, Hausel, and Migliorini connecting the topology of Hitchin systems and Hodge theory of character varieties via non-abelian Hodge theory. I will discuss recent progress on the $P=W$ conjecture including a proof for the case of genus 2 and arbitrary rank, as well as connections to enumerative geometry for K3 surfaces and topology of hyperkaehler manifolds. Based on joint work with Qizheng Yin, and joint work in progress with Mark de Cataldo and Daves Maulik.

Yuchen Liu (Yale)

June 09, 2019

**Complex structure degeneration and metric collapsing of Calabi-Yau
manifolds**

K-stability for Fano varieties is an algebraic stability condition to detect the existence of Kähler-Einstein metrics. It is widely expected and partially proven that K-stability gives nicely behaved moduli spaces for Fano varieties. In this talk, we will show that the K-moduli space of cubic threefolds is isomorphic to the corresponding GIT moduli space. The main ingredient of our proof is an estimate in dimension 3 of the local volume of klt singularities introduced by Chi Li. This is joint work with Chenyang Xu.

Song Sun (UC Berkeley)

June 05, 2019

**Complex structure degeneration and metric collapsing of Calabi-Yau
manifolds**

A Calabi-Yau manifold is a compact Kahler manifold with trivial canonical bundle. Yau's solution to the Calabi conjecture yields canonical Ricci-flat Kahler metrics (Calabi-Yau metric) on such a manifold. It is an interesting question to understand how the Ricci-flat metrics develop singularities when the complex structure degenerates. An especially intriguing phenomenon is that these metrics can collapse to lower dimensions and exhibit very non-algebraic features, and it is challenging to describe the corresponding geometric behavior. In this talk I will review the status of this problem and explain some recent progress.

Xinyi Yuan (UC Berkeley)

May 23, 2019

Tate-Shafarevich group under relative Frobenius morphisms

In this talk, I will first review some basics of the BSD conjecture and the Tate-Shafarevich conjecture, with an emphasis over function fields. Then I will introduce a partial finiteness result on the Tate-Shafarevich group, namely, the subgroup of the Tate-Shafarevich group trivialized by the relative Frobenius morphisms is finite.