

Title and abstract

Zhiwei Yun: Introduction to the theory of Shtukas

Abstract: Shtukas are invented by Drinfeld to prove the Langlands conjectures over function fields in characteristic p . These are vector bundles over an algebraic curve with additional structures related to the Frobenius map. The moduli space of Shtukas are function-field analogues of modular curves or more generally Shimura varieties. We will start from the basic definitions, and sketch how Shtukas are used to realize the Langlands correspondences for groups over function fields.

Ziquan Zhuang: Birational superrigidity and K-stability

Abstract: Birational superrigidity and K-stability are properties of Fano varieties that have many interesting geometric implications. For instance, birational superrigidity implies non-rationality and K-stability is related to the existence of Kähler-Einstein metrics. In this talk, I will introduce the basic definitions and backgrounds, discuss the relation between these two notions and explain how to verify them for certain families of Fano varieties.

Botong Wang: Singular Hodge theory of combinatorial geometry

Abstract: Matroids are combinatorial structures arising from graphs and vector configurations. They are posets (partially ordered sets) subject to some conditions. I will discuss various ways to encode matroid structures in algebraic varieties, and obtain combinatorial consequences from algebraic geometry. In particular, I will talk about the work of Adiprasito-Huh-Katz on the log-concavity of characteristic polynomials of matroids and the current joint work with Braden, Huh, Matherne and Proudfoot on the “top-heavy” conjecture and the non-negativity of the Kazhdan-Lusztig polynomials of matroids.