Takuro Abe

Title: Projective dimension of logarithmic modules of hyperplane arrangements

Abstract: In the research of hyperplane arrangements, the freeness has been played an important role since it connects algebra, algebraic geometry, topology and comibnatorics based on Terao's factorization, Yoshinaga's criterion and so on. Freeness is equivalent to zero-projective dimension. In this talk, we investigate a ``close'' structure to freeness in terms of projective dimensions, and minimal generating sets of several logarithmic modules. As a conclusion, we prove the ``projective dimension-one'' version of the addition-deletion theorem. This is a joint work with Graham Denham.

Yoshinori Gongyo

Title:MMP and abundance

Abstract: I will give a overview on a dimensional inductive approach to complete to the existence of minimal model and the abundance conjecture. This approach is basically released from the study of singularities likes Shokurov's conjecture for minimal log discrepancies. Some evidences of success on this approach is the work of Birkar—Cascini—Hacon—Mckernan and the base point free theorem after Shokurov—Kawamata. However this success is due to use the ample divisors and construction of plt centers. In general, we could not expect the existence such a good divisor. I will explain the story along this point of the view and obstructions to the approaches.

Victoria Hoskins

Title: The geometry and cohomology of moduli stacks of vector bundles on curves

Abstract: Moduli of vector bundles on a smooth projective curve can be studied using the moduli space of semistable vector bundles or the moduli stack of all vector bundles. Often the latter is used to study the former and this talk will focus on the moduli stack. I will describe the geometry of these moduli spaces and survey some results on their various cohomological invariants. Finally I will present a formula for the motive of this moduli stack, which unify different cohomological invariants and also encode Chow groups. This is joint work with Simon Pepin Lehalleur.

Chen Jiang

Title: Classification of 3-dimensional terminal singularities revisit

Abstract: Terminal singularities, introduced by Reid, appear naturally in minimal model program and play important roles in the birational classification of higher dimensional algebraic varieties. Such singularities are well-understood in dimension 3, and the full classification was given by

Mori in 1985. I will briefly recall the methods used in the classification and explain how to apply it to "classify" 3-dimensional singularities which are almost terminal.

Anne Sophie Kaloghiros

Title: The Calabi problem for Fano 3-folds

Abstract: I will discuss progress on the Calabi problem for Fano 3-folds. The 105 deformation families of smooth Fano 3-folds, were classified by Iskovskikh, Mori and Mukai. We determine whether or not the general member of each of these 105 families admits a Kähler-Einstein metric. In some cases, it is known that while the general member of the family admits a Kähler-Einstein metric, some other member does not. This leads to the problem of determining which members of a deformation family admit a Kähler-Einstein metric when the general member does. This is accomplished for most of the families, and I will present a conjectural picture for some of the remaining families. This is a joint project with Carolina Araujo, Ana-Maria Castravet, Ivan Cheltsov, Kento Fujita, Jesus Martinez-Garcia, Constantin Shramov, Hendrik Süss and Nivedita Viswanathan.

Yusuke Nakamura

Title: Minimal log discrepancies of quotient singularities

Abstract: The LSC (lower semi-continuity) conjecture is an important problem in birational geometry, which is related to the conjecture of termination of flips. Ein, Mustata, and Yasuda proved the LSC conjecture for smooth varieties using the theory of jet schemes and arc spaces. In this talk, we prove the LSC conjecture for quotient singularities using Yasuda's theory of jet stacks and arc spaces. The point of the proof is that quotient singularities have crepant resolutions in the category of Deligne-Mumford stacks, and hence it allows us to generalize Ein, Mustata, and Yasuda's methods to this setting.

Elisa Palezatto

Title: k-Lefschetz properties and hyperplane arrangements

Abstract: The notions of weak and strong k-Lefschetz properties were introduced by Harima and Wachi as a generalization of the weak and strong Lefschetz properties. In this talk, we present how to reduce the study of the k-Lefschetz properties to the monomial case using $rgin(I)$, the generic initial ideal with respect to the ordering DegRevLex. Moreover, we describe the k-Lefschetz properties for non-Artinian algebras, proving that several known results in the Artinian case can be generalized in this setting. We then apply the obtained results to the study of the Jacobian algebra of hyperplane arrangements, with particular attention to the class of free arrangements.

Takehiko Yasuda

Title: Introduction to algebraic stacks (with emphasis on application to singularities)

Abstract: In this series of expository talks, I will explain the notion of algebraic stacks with emphasis on application to singularities. Algebraic stack is generalization of schemes. Originally, this had been used mainly in the study of moduli problems. Recently, one often uses it in application to varieties having quotient singularities. The goal of the talks is to get a feeling of stacks and to understand why they are necessary and useful, in particular, in the study of quotient singularities.

Masahiko Yoshinaga

Title: Geometry of arrangements and enumerative problems.

Abstract: Arrangements of simple objects (e.g. hyperplanes, subtori, etc) in an ambient space provide interesting objects to study from geometric and combinatorial viewpoints. In this talk, we first recall some classical results on hyperplane arrangements (matroids, characteristic polynomial etc). Then we will survey two different topics. One is recent generalizations of classical results in hyperplane arrangements to arrangements of subtori. The other one is concerning the log-concavity of the coefficients of the characteristic polynomial after June Huh.