

Topology and Geometry of Torus actions and related Combinatorics(TGTC) 2026 in Cheongju

- Titles and Abstracts -

Date : September 3-4, 2026

Venue : Natural Science Building #450, Chungbuk National University

Organizers:

- Suyoung Choi (Ajou University)
- Eunjeong Lee (Chungbuk National University)
- Seonjeong Park (Jeonju University)
- Jongbaek Song (Pusan National University)

Sponsors:

- 아주 수리과학 미래인재양성 교육연구팀 (AJOU Mathematical Sciences Team for Future Leaders)
- 충북대학교(Chungbuk University)
- 전주대학교(Jeonju University)
- 부산대학교(Pusan University)

Suyoung Choi (Ajou University)

Title: Symplectic structure of real toric spaces

Abstract: We study the existence of symplectic structures on real moment-angle complexes. We discuss how the combinatorial structure of the underlying simplicial complex influences the topology of the associated manifold and derive conditions for the existence or non-existence of symplectic structures.

Dohyeon Lee (KAIST)

Title: Discrete Morse Theory for Induced Subcomplexes of Bier Spheres

Abstract: Discrete Morse theory provides an effective combinatorial framework for studying the homotopy type and homology of a simplicial complex by constructing an acyclic matching on its face poset. The Bier sphere of a simplicial complex K is the simplicial sphere obtained as the deleted join of K and its combinatorial Alexander dual. Induced subcomplexes of such spheres are of particular interest in toric topology, and recently, Choi, Yoon, and Yu determined their homotopy types.

In this talk, we introduce the fundamentals of discrete Morse theory and apply it to induced subcomplexes of Bier spheres, recovering their homotopy types via explicit acyclic matchings. This gives an alternative to the approach of Choi, Yoon, and Yu.

Mikiya Masuda (OCAMI)**Title: Axial functions on complete graphs**

Abstract : Fix a graph Γ . A naive question is how many axial functions exist on Γ . It seems that this question has not been considered so far. In this talk, we make a small step toward this general question. Indeed, we consider the question when Γ is a complete graph K_n with n nodes. We show that an axial function on K_n is standard in some sense when the rank m of the acting torus is larger than $\lfloor n/2 \rfloor$, but this is not the case when $m = \lfloor n/2 \rfloor$ and n is even. This is joint work with Shintaro Kuroki and Hiroshi Maeda.

Takashi Sato (OCAMI)**Title: Modular law of type D**

Abstract: The cohomology of a regular semisimple Hessenberg variety X of type A has an action of the symmetric group. This cohomology as a graded representation coincides with the chromatic (quasi-)symmetric function of the graph associated with X in some sense. This is an important result connecting Hessenberg varieties, which are nice subvarieties of the flag manifold, with combinatorial objects related to coloring. It was known as Shareshian-Wachs conjecture and was proved by Brosnan and Chow. The essential reason behind this theorem lies in a principle called the modular law. A family indexed by nice subsets of a positive root system is said to satisfy the modular law if it satisfies a certain three-term relation. Both of these objects naturally satisfy the modular law. By appropriately applying the modular law, we can deduce the correspondence for a general X from the basic case where X is the full flag manifold. In this talk, I will report on ongoing work concerning the modular law in the case of type D and explain the difficulties we encounter.

Jongbaek Song (Pusan National University)**Title: Integral cohomology ring of 3-dimensional Gelfand-Zetlin toric variety**

Abstract: We compute the integral cohomology ring of the toric variety X associated with the three dimensional Gelfand-Zetlin polytope $GZ(3)$. This variety is singular that is not an orbifold. Nevertheless, its odd-degree cohomology vanishes, which identifies its equivariant cohomology with the ring of piecewise polynomials on $GZ(3)$. Using this description, we exhibit an additive basis of the integral cohomology of X and determine its multiplicative structure completely. This work is an explicit case study of several general questions.