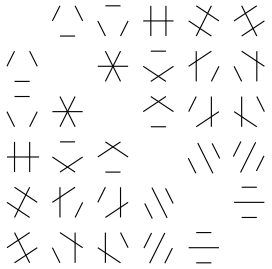
Mathematics Seminar



Rocky Mountain Algebraic Combinatorics Seminar

Tensor Isomorphism

Joshua Grochow
University of Colorado, Boulder

Full title: Tensor Isomorphism: completeness, graph-theoretic methods, and consequences for Group Isomorphism

We consider the problems of testing isomorphism of tensors, p-groups, cubic forms, algebras, and more, which arise from a variety of areas, including machine learning, group theory, computational complexity, and cryptography. Despite a perhaps seeming similarity with Graph Isomorphism, the current-best algorithms for these problems (when given by bases) are still exponential - for most of them, q^{n^2} over GF(q). Similarly, while efficient practical software exists for Graph Isomorphism, for these problems even the best current software can only handle very small instances (e.g., 10 x 10 x 10 over GF(13)). We will discuss what is known (some of it very recent) about algorithms and complexity for these problems. A small spoiler: They are all equivalent! Even isomorphism of d-tensors and isomorphism of 3-tensors. Various parts based on joint works with V. Futorny & V. V. Sergeichuk (Lin. Alg. Appl. , 2019; preprint arXiv:1810.09219), Y. Qiao (arXiv:1907.00309), and P. Brooksbank, Y. Li, J. B. Wilson, & Y. Qiao (arXiv:1905.02518).

Enumerating Anchored Permutations with Bounded Gaps

Maria Gillespie
CSU

Suppose you start on the bottom stair of a staircase with n stairs and climb to the top stair, using up or down steps of no more than k stairs at a time, such that every stair is stepped on exactly once. In how many different ways can you climb the stairs?

We will show that there always exists a finite-depth homogeneous linear recurrence relation to enumerate such stair climbing patterns, which may be expressed as permutations with bounded differences of consecutive entires. We provide explicit recursions for $k = 2$ and $k = 3$, resolving a conjecture that was previously listed on OEIS A249665. We then use techniques from spectral graph theory to give asymptotic bounds for the sequences for all k.

This is joint work with Ken G. Monks and Ken M. Monks.

Weber 223
4–6 pm, Friday, Nov 15, 2019
(Refreshments in Weber 117, 3:30–4 pm)
Colorado State University

This is a joint Denver U / UC Boulder / UC Denver / U of Wyoming / CSU seminar that meets biweekly.
Anyone interested is welcome to join us at a local restaurant for dinner after the talks.

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