

Algebra and Geometry Seminar

Speaker: Lucas Gagnon (York University)

Title: Quasisymmetric varieties, excedance classes, and bases for the Temperley–Lieb algebra.

Abstract: This talk will be an accessible introduction to a new equivalence relation on the symmetric group and the way it relates to the three problems in algebraic combinatorics. First, the Temperley–Lieb algebra $TL_n(2)$ is a well-known diagram algebra which also occurs as a quotient of the symmetric group, and it is natural to ask which sets of permutations descend to a basis of $TL_n(2)$. Second, the Bruhat order is a fundamental poset in algebraic combinatorics, but it can be quite opaque, so it is desirable to find new symmetries and structure within this poset. Finally, the coinvariant ring for the symmetric group gives a grading of the regular representation using the combinatorics of symmetric functions, and one may look for a similar result involving quasisymmetric functions. While the most obvious “quasisymmetric generalization” of the coinvariant ring does not fully work, an alternate, geometric approach to coinvariants using the coordinate ring for the vertices of the regular permutohedron can be generalized to the quasisymmetric case, and I will explain this approach. The mechanics of this solution, and answers to the other two questions above appear in the combinatorics of our equivalence relation, which can be computed in a completely elementary way using the excedance statistic. Based on joint work with Nantel Bergeron.