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Abstract for the Combinatorics Seminar 2018 Tuesday, October 9

These talks are part of Ting Su's dissertation defense. The dissertation committee consists of Laura Anderson (chair), Michael Dobbins, Leslie Lander (outside examiner), and Thomas Zaslavsky.

All are invited to attend.

Single-Element Extensions of Matroids Over Hyperfields

Matroids over hyperfields provide an algebraic framework simultaneously generalizing the notion of linear subspaces, matroids, oriented matroids, phased matroids, and some other “matroids with extra structure.”

A single-element extension of a matroid M over a hyperfield is a matroid M^ over the same hyperfield that is obtained from M by adding one more element. Crapo characterized single element extensions of ordinary matroids, and Las Vergnas characterized single element extensions of oriented matroids, in terms of single element extensions of their rank 2 contractions. The results of Crapo and Las Vergnas don't generalize to matroids over hyperfields, but I will show a necessary and sufficient condition on hyperfields, called “Pathetic Cancellation”, such that the result can generalize to weak matroids over hyperfields.

A Partial Classification of Doubly Distributive Hyperfields

A hyperfield F is doubly distributive, if for any a, b, c, d ∈ F, (a ⊞ b)(c ⊞ d) = ac ⊞ ad ⊞ bc ⊞ bd. Doubly distributive hyperfields behave in many ways like fields. In particular, double distributivity implies Pathetic Cancellation. For doubly distributive hyperfields, I find a strong version of the main result in my first talk. I also provide a partial classification of doubly distributive hyperfields.
