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Fourientations and the Tutte Polynomial

Abstract for the Combinatorics Seminar 2015 September 22

A fourientation of a graph is a choice for each edge whether to orient that edge one way or another, to leave it unoriented, or to bidirect it. In joint work with Spencer Backman we produce a list of 64 classes of fourientations defined by cuts and cycles that are enumerated by generalized Tutte polynomial evaluations. Our result unifies and extends results due to many authors starting with Stanley's celebrated theorem that the number of acyclic orientations of a graph is T(2,0).

I will explain how I entered into this project via the study of the bigraphical hyperplane arrangement. Time permitting, I may also discuss connections to graphic Lawrence ideals, monomizations of power ideals and zonotopal algebras, or combinatorial Riemann-Roch theory. At the end I will also mention future work involving “fourientation activities.”
