KEE LAM, University of British Columbia, Vancouver, BC, Canada
On Yuzvinsky's conjecture arising from the study of sums of squares

An intercalate matrix M of type (r, s, n) is an r by s matrix each entry of which is colored by one of n given colors such that

(i) the colors along each row are mutually distinct, and likewise along each column,

(ii) any 2 by 2 submatrix of M contains either 2 colors or 4 colors.

Historically, interest in such matrices dated back to the classical work of Hurwitz and Radon on identities involving sums of squares. Let F be the field of 2 elements and P be the truncated polynomial ring $F[u,v]/(u^r, v^s)$, where (u^r, v^s) denotes the ideal generated by the r-th power of u and the s-th power of v. Let ros denote the "height" (or nilpotency) of $u+v$ as an element in P. It was conjectured by S. Yuzvinsky that the number of colors required to make an r by s matrix intercalate must be at least ros. In this talk I will give a proof to some special cases of this conjecture. While combinatorial in content, the proof is suggested by, and is closely analogous to, ideas from topology and geometry. Bringing out such analogy as clearly as possible will be the main objective of my talk.