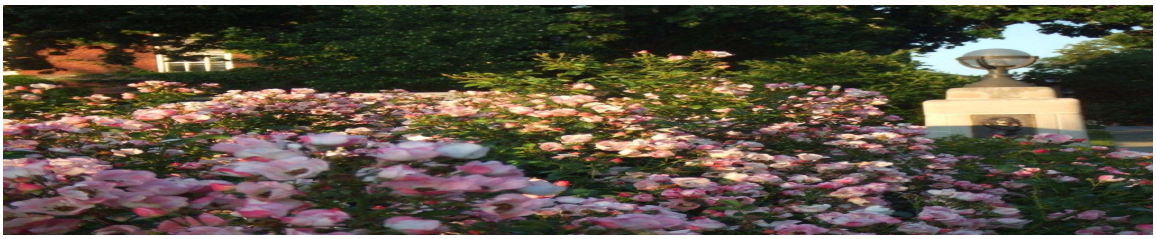
ISU ALGEBRA SEMINAR



Date: Wednesday, February 6, 2019
Time: 10:00 AM-10:50 AM
Location: STV 325

Speaker: Fusun Akman

Talk title: Subspace Partitions With Direct Sums II

Abstract: Set partitions of a finite set with n elements and integer partitions of n are objects of great interest in discrete mathematics. Their combinatorial q-analogues are subspace partitions of the finite vector space F_q^n (where F_q is the finite field with q elements) and the multisets of dimensions of the subspaces in such partitions, which we call Gaussian partitions. However, the set of all subspace partitions of F_q^n (kinda like all finite simple groups) is too irregular and certain partitions that exist for one prime power q cannot be duplicated for all other q. Hence, (1) we argue that those subspace partitions of F_q^n that "contain a direct sum" (i.e., have the summands of a direct sum that is equal to F_q^n) form a very natural family that generalizes the concept of set partitions, and (2) we fully generalize our previous result about where to find subspace partitions containing direct sums to an arbitrary number of distinct dimensions of subspaces in a partition.

This is ongoing joint work with Papa Sissokho. We were partly inspired by crystallography and partly by the new theory of "polynomials in base x" (in this case, in base q) when looking for the correct generalization. By the way, a "subspace partition" of a finite vector space is a collection of subspaces such that every nonzero vector is contained in exactly one subspace of the collection. It is very much like the idea of cosets, but of course all subspaces must contain the common vector zero. I like to think of it as a bunch of sets like a paint fan deck with one common point (unlike this picture, subspaces may have different dimensions):

So, when do we have a subset of different colors that add up to the whole space?