

DEPARTMENT OF MATHEMATICS & STATISTICS



Thursday
February 20, 2020
4:10 - 5:00 pm Ag 1030

Reception before the talk:
Ross Hall 261 at 3:30 pm



Dr Emily King
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The Algebra, Geometry, and Combinatorics of Frames

Abstract: Frames are generalizations of orthonormal bases which yield redundant representations of data. Such systems are the foundation of applied harmonic analysis and are also closely related to quantum measurements. When one wants an optimally robust representation of data, one often looks for frames that have some sort of spread, be it geometric (vectors as non-parallel as possible) or algebraic (no nontrivial linear dependencies). Over the last few years, it has been discovered that the relationship between these two types of spread is more complicated than had previously been believed. Furthermore, methods from algebra, geometry, and combinatorics have recently proven themselves to be very useful in the study of frames.

For example, combinatorial design theory has led to new characterizations and novel constructions of optimal line (or, more generally, subspace) configurations which are also frames. Also, almost all desirable classes of frames form real algebraic varieties, and certain known results in frame theory have also been found to be equivalent to concepts in matroid theory and arrangements of hyperplanes.

In this talk, some of the currently known connections between these objects from harmonic analysis / quantum information theory and combinatorics / algebraic & discrete geometry will be presented. A couple of open conjectures in frame theory and quantum information theory will also be discussed.