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12 noon
258 Hurley Hall

Title: Enumerative algebraic geometry complex and real

Abstract:

Enumerative geometry was one of the most popular branches of mathematics in the 19th century. Our toy example will be: How many lines intersect 4 given lines of generic position in space? Hermann Schubert worked out a method---later called Schubert calculus---which was very effective in solving similar problems. However the lack of rigorous foundation compelled Hilbert to add this task as the 15th of his famous list of problems. It took about a century (finished by Kleiman and Laksov in the seventies) to do that, and it became clear that it is essentially a problem in homology theory.

I will outline how homology theory comes into the picture, give some examples, then turn to a recently developing version: Real enumerative algebraic geometry. Schubert Calculus works only over the complex numbers. The answer for a complex problem is a number, but for a real problem it is a finite list of numbers. Consider the simplest: the number of roots of a generic polynomial of degree d. The complex answer is d, the real is d,d-2, etc. I will explain that for some problems a real version of Schubert Calculus gives the "signed sum" of the solutions (like in the trivial problem above), in particular we have lower and upper bounds as well. I will mention some results which is joint work with Akos Matszangosz.