Speaker: Alexander Barvinok
Title: Counting magic squares, contingency tables, integer flows, and more

Abstract:

We introduce a functional, which, for various values of the parameters counts contingency tables (non-negative integer matrices with prescribed row and column sums), integer feasible flows in a network with prescribed balances at the vertices, and more. The functional is approximated by the integral of a certain efficiently computable log-concave density, which leads to efficient counting algorithms. In particular, we obtain a randomized algorithm which approximates the number of "magic squares" (non-negative integer nxn matrices with the row and column sums equal to t) within any given error in quasi-polynomial time, that is, in N^{log N} time, where N=nt. We implemented a version of the algorithm. Some parts of this ongoing project is joint work with Alex Samorodnitsky and Alex Yong.