Matchings and Independent Sets: Problems, Conjectures and Results

Shmuel Friedland
Department of Mathematics, Statistics and Computer Science
University of Illinois at Chicago
Chicago, Illinois 60607-7045

April 29, 2006

Abstract

Let $G = (V, E)$ be a graph. A k-matching is a set of k edges with no common vertices, and a k-independent set in G a k-anticlique. It is of interest to study the following problems:

(a) Give good upper an lower bounds on the number of k-matching and k-independent sets in G.
(b) Give fast deterministic and probabilistic algorithms for computing, with good precision, the number of k-matchings and k-independent sets.
(c) Asymptotic versions of (a) and (b) to infinite graphs, as the d-dimensional integer lattice $\mathbb{Z}^d$ in $\mathbb{R}^d$.

We will survey some conjectures, results and techniques for special kinds of graphs: bipartite graphs, regular bipartite graphs and $\mathbb{Z}^d$.