

# Recent results on lifted formulations for integer programs

*Date* Tuesday, November 18

*Time* 5 pm

*Location* Math 507

*Abstract:* Disjunctive programming is a classical technique for 0–1 linear optimization in which a set of vertices of the hypercube is approximated by the convex hull of (carefully selected) polyhedra. Through the work of Lovasz, Schriver, Serali and Adams, and others, this can be tied with the idea of 'lifting' a formulation to a higher dimensional space, again by carefully choosing additional variables.

In this talk we will describe a new use of this idea which leads to an approximation algorithm to the "minimum" knapsack problem:

$$\min \sum_j c_j x_j$$

s.t.

$$\sum_j a_j x_j \geq b \quad (*)$$

$$x_j = 0 \text{ or } 1, \text{ for all } j$$

We show that for each fixed error  $0 < \epsilon < 1$ , there is a polynomial-time algorithm that produces a 0–1 vector satisfying constraint (\*), whose value is at most a factor of  $(1 + \epsilon)$  larger than the optimum. This is the first such algorithm. If time permits, we will show generalizations of this result. Joint work with Ben McClosky.