Knapsack Problem

$S = \{0,1\}^n$ the $|S| = 2^n$ (very big, very quick).

$x \in S \quad x = (x_1, \ldots x_n)$

$x_i = \begin{cases} 0, & \text{object not taken} \\ 1, & \text{take object.} \end{cases}$

$F = \sum_{i=1}^{n} x_i p_i$ where p_i is the value of item

Subject to $\sum_{i=1}^{n} x_i w_i \leq c$ where w is the weight
c is the capacity of the bag.

TSP (traveling salesman).

S = Set of permutation of n objects (cities)

$x \in S \quad x = (A, B, C, D, E)$ (Possible tour.)

$|S| = n!$

NK Problems

- graph connections.
- $S = \{0,1\}^n \quad |S| = 2^n$
- Find the n strategies that max profits.
- Assuming a function f_i gives success of agent i in the graph

ie: $F_1(X_1, X_2, X_6)$
$F_2(X_2, X_1, X_5)$

- So, find X in S such that maximize total profits

$$F = \sum_{i=1}^{n} F_i(X_i, X_{i_1}, X_{i_2}, \ldots X_{i_{K-1}})$$

K args

"MaxOne" Problem

- optimum of four bits pattern.
- allows us to test our metaheuristics