Integer Programming

- An integer programming problem is an LP in which some or all of the variables are required to be non-negative integers. LP relaxation of the IP is the LP obtained by ommiting integer constrains.
- The feasible region from any IP must be contained in the feasible region fro the corresponding LP relaxation. Optimal z-value for LP relaxation $\geq$ optimal z-value for IP.

Cutting plane algorithms for pure integer programming

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1. Solve the continuous problem as an LP
2. If the optimal variables are integer then optimum solution has been found.
Otherwise
3. Generate a cut:  i.e.  a constraint which is satisfied by all interger solutions to the problem but n
    -  Choose a basic variable $x_i$ which is currently non-integer.
    -  Construct the corresponding constraint and add it to the problem
    -  Go to step 1.
4. Add this new constraint and go to step 1.
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- The algorithm could take an excessive amount of time in some cases. If the algorihtm is stopped prematurely then one does not have a good suboptimal solution.

Branch and bound algorithm for integer programming

- most successful to this date.
- Algo:
    1. solve the continuous LP problem.

Simplex algorithm

1.

References:

1. Operations Research: Applications and Algorithms. Winston.