CSC373 Worksheet 6 Solution

August 12, 2020

1. **Notes:**

- **Linear Programming**
  - Is a method to achieve the best outcome (such as maximum profit or lowest cost) in a mathematical model whose requirements are represented by linear relationships. [1]
  - Is named to make it sound cool for government funding
    - Like dynamic programming
  - Applications
    - Microeconomics (maximize profits, minimize costs)
    - Company management
- **Standard Form**
  - Is a form of linear programming
  - Are about maximizing, not minimizing [2]
  - All variables involved are restricted to be non-negative [3]
  - All constraints are equalities, with constant, non-negative right-hand [3] sides

Example:

Minimize

$$80x + 60y$$

subject to

$$\begin{aligned} x + y - s_1 &= 1 \\ -.05x + .07y + s_2 &= 0 \\ x,\ y,\ s_1,\ s_2 &\geq 0. \end{aligned}$$

- **Converting Linear Programming to Standard Form**
  1) Mutliply inequality by -1 to get non-negative RHS [3]
  2) Convert inequalities to equalities by adding or subtracting non-negative slack variables [3]
  3) Resolve unrestrictive variables by writing the variable as the difference of two new non-negative variables [3]

Example:

Minimize

$$80x + 60y$$

subject to

$$\begin{aligned} x + y &\geq 1 \\ -.05x + .07y &\leq 0 \\ x,\ y &\geq 0. \end{aligned}$$

References:

1) Wikipedia, Linear Programming, link
2) Instituto de Mathematicas, Standard form for Linear Programs, link
3) University of Notre Dame, Converting an LP to standard form, link