SFWR ENG 4O03

Kemal Ahmed

Dr. Deza

Fall 2015

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# Linear

**Linear Program**: an optimization problem in which the objective function is linear and each constraint is a linear inequality or equality

**Decision variables**: describe our choices that are under our control

**Objective function**: describes a criterion that we wish to max/minimize; doesn’t have an in/equality

e.g. max 40x + 30y

**Constraints**: describe the limitations that restrict our choices for our decision variables, always *inequalities*.

## Converting constraints to equalities

**Slack variable**: equation variable greater than constraint, added

**Surplus variable**: equation variable less than constraint, subtracted

**Hyperplane**: a hyperplane in Rx is a shape in Rx–1, e.g. line in R2

**Optimal Solution**:

**Standard form**: when you take inequalities and use slack variables to turn them into equalities.

* Note: all variables need to be ≥ 0.
* All remaining constraints are expressed as equality constraints.

### e.g.)

2x1 + 4x2 – x3 – x4 ≥ 1

2x1 + 4x2 – x3 – x4 + s = 1

## Simplex Method

**Simplex Method**: useful for solving linear optimization problems cheaply

* Cannot be done with **strict inequalities**, i.e. when there is no possibility of being equal
* Can only work if your objective function is in *standard form*

**Simplex Tableau**: visual representation of stuff