

SE524/EC524 Optimization Theory and Methods

Yannis Paschalidis
yannisp@bu.edu, <http://ionia.bu.edu/>



Department of Electrical and Computer Engineering,
Division of Systems Engineering,
and Center for Information and Systems Engineering,
Boston University



Lecture 21: Outline

- 1 Integer Programming (IP) terminology.
- 2 IP formulations.
- 3 Comparing IP formulations.

Integer Programming terminology

$$\begin{array}{ll} \min & c'x + d'y \quad \text{(Mixed IP)} \\ \text{s.t.} & \mathbf{Ax} + \mathbf{By} = \mathbf{b} \\ & \mathbf{x}, \mathbf{y} \geq \mathbf{0} \\ & \mathbf{x} : \text{integer} \end{array}$$

Assume entries of matrices and vectors are integers.

- 1 If no continuous variable (\mathbf{y}) then **IP**.
- 2 If all variables zero-one then **ZOIP**.

Modeling Techniques

- Binary choice.
- Forcing constraints.
- Disjunctive constraints.
- Restrictive range of values.
- Piecewise linear cost functions.

Comparing formulations

Consider an IP problem and formulations A and B for that problem.

Let \mathcal{P}_A and \mathcal{P}_B denote the feasible sets of the LP relaxations of A and B , respectively.

Definition

We say A is at least as strong as B if $\mathcal{P}_A \subset \mathcal{P}_B$.