Agenda

- converting LPs
- Steel company operations
- The moment problem
- Chebyshev center

Logistics

- HW4 out, due Friday Feb 25 at 9pm
- Midterm 1 Thurs March 3 in class
- Spring break the following week
- A bit of a break until HW5 due
  - Friday March 25

Converting LPs

we'd like to convert $\min_x \|Ax-b\|_1$ s.t. $\|x\|_\infty \le k$

$A \in \mathbb{R}^{m,n}$, $b \in \mathbb{R}^m$, $x \in \mathbb{R}^n$, $k \in \mathbb{R}$

into 2 forms

form (1)

$$\min_x c^T x \quad \text{s.t. } Ax \le b,\ Cx = d$$

form (2)

$$\min_x c^T x \quad \text{s.t. } Ax = b,\ x \ge 0$$

Steel Company Operations

- Steel company can produce bands and coils
- Goal is to maximize revenue

	Production rate (tons/hr)	revenue ($/ton)	upper bounds (tons) from orders
Bands	200	25	6000
Coils	140	30	4000

- There are 40 hours of production time this week
- Decide how many tons of bands and coils should be produced to maximize revenue

The moment problem

- Suppose that Z is a random variable taking values in the set $\{0, 1, \ldots, K\}$ with probabilities $p_0, \ldots, p_K$
- We are given $\mathbb{E}[Z] = \sum_{i=0}^{K} p_i \, i$

$$\mathbb{E}[Z^2] = \sum_{i=0}^{K} p_i \, i^2$$

- We would like to obtain upper and lower bounds on the 4th moment: $\mathbb{E}[Z^4] = \sum_{i=0}^{K} i^4 p_i$
- Show how LPs can be used to approach this problem

Chebyshev Center

- Consider a set P described by linear inequality constraints

$$P = \{ x \in \mathbb{R}^n \mid a_i^T x \leq b_i \quad i = 1, \ldots, m \}$$

- Goal: find a ball with the largest possible radius which is entirely contained within the set P
- Provide an LP formulation of this problem