Short Course
Robust Optimization and Machine Learning

Overview

Laurent El Ghaoui

EECS and IEOR Departments
UC Berkeley

Spring seminar TRANSP-OR, Zinal, Jan. 16-19, 2012

Course topics

Course topics

Let's try again . . .

1. Convex optimization.
2. Robust optimization.
3. Machine learning applications:
   - *Unsupervised learning:* data analysis, covariance estimation.
   - *Supervised learning:* Model fitting, regression, classification, sentiment analysis.
4. Applications, mostly in text analytics.

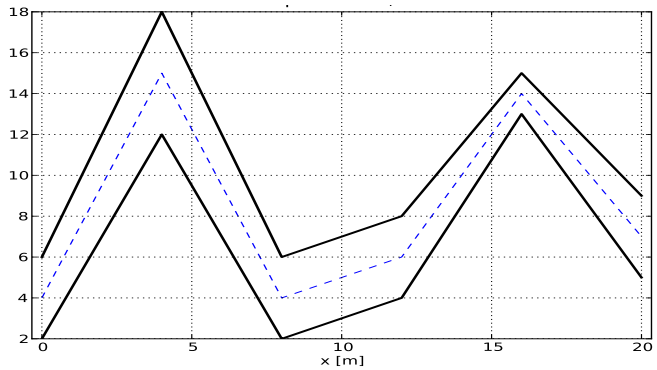
Course outline

- Jan. 16:
  1. Lecture 1: Optimization models.
  2. Lecture 2: Convex optimization.
- Jan. 17: Lecture 3: Optimization models in supervised learning.
- Jan. 18:
  1. Lecture 4: Optimization in unsupervised learning.
  2. Lecture 5: Robust optimization overview.
- Jan. 19:
  1. Lecture 6: Robust optimization in supervised learning.
  2. Lecture 7: Sparse optimization for text analytics.

Speaking of slopes...

An optimization problem you can think about while skiing

A two-dimensional skier must slalom down a slope by going through n parallel gates of equal width. The first gate's middle position is $(0, 0)$; the i-th gate is separated by a distance σ_i^2. We assume that the skier comes from uphill situated very far away from the start of the gate, with its initial direction set at a given angle.



Slalom problem with $n = 5$ obstacles. "Uphill" is on the left side. Middle path in blue.

Problem: Find the path that minimizes the total length of the path. Your answer should come in the form of an optimization problem.