

CS303 (Spring 2008) - Assignment 9

Due: 04/02/2008

- (1) Suppose you want to schedule jobs you perform in order to maximize your profit. In each week i , you have a choice between not doing any job, doing a “lightweight” job with value $\ell_i \geq 0$, or doing a “heavy” job with value $h_i \geq 0$. In order to do a heavy job, you must rest the previous week, i.e., if you do a heavy job in week i , then you must have done no job in week $i - 1$. If you do a lightweight job in week i , you are free to do any kind of job (or no job at all) in week $i - 1$.
 - (a) A simple greedy algorithm for this problem would be to compare h_{i+1} with $\ell_i + \ell_{i+1}$. If it is larger, rest in week i and do the heavy job in week $i + 1$; otherwise, do two light jobs. Then move on to $i + 2$. Give an example input on which this algorithm *does not* find the best solution.
 - (b) Design and analyze a polynomial-time algorithm to determine the maximum total value you can obtain over the course of n weeks, given the values ℓ_i and h_i for each week. First derive and justify a recurrence relation (be sure to be clear about what exactly you denote by OPT etc.). Then turn it into a bottom-up solution.
- (2) Problem 15-2 from the textbook.
- (3) Problem 15-4 from the textbook.