CS 577 - Homework 6
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1   Graded written problem

Input: In a library, there are n books that must be stored in alphabetical order in adjustable height shelves. Each book b_i has height h_i and a thickness t_i. Each shelf has width w. The next shelf will be placed on top of $\max(h_i)$ on the given shelf.

Output: Minimize the total height of the shelves to store all the books.

1.1   Algorithm

Our dynamic programming algorithm begins by considering the b_i and traversing the array while summing up the thickness t_i of each. We stop when the summation of t_i has reached w. Now we find the $\max(h_i)$ and then place the next shelf right above it. We continue this till all the books have been shelved. The only place where we can make a decision is the last book kept on the shelf that completes the t_i summation to w. If the h_i is greater than the rest of the books on the shelf, we compare it with the next shelf books whose thickness sums upto w. If the book is less than the $\max(h_i)$, then we place it on the next shelf, else we place it on the same shelf. This helps us reduce the delta height that the lower shelf make add to the entire book shelf height.