

Algorithms – CS-37000

The “Interval Sum” problem

Problem. We are given an array of real numbers $x[1], \dots, x[n]$. The sum of the interval $[i, j]$ is the quantity $S[i, j] := \sum_{k=i}^j x[k]$. Find the maximum interval sum $S_{\max}$. Find this value in *linear* time (i.e., the number of operations should be $O(n)$). Describe your solution in pseudocode.

Note: you are not required to output the interval with the maximum sum, just the value of the maximum sum. Observe the following convention:

Convention. If $j < i$, we say that the interval $[i, j]$ is *empty*; the sum of the empty interval is zero. Empty intervals are admitted in the problem. Therefore $S_{\max} \geq 0$ even if all the $x[i]$ are negative.

Instructions. Use dynamic programming: embed the problem in an array of problems. Half the credit goes for the clear and simple definition of this array of problems (the “brain” of the solution). Explain the meaning of your variables! *Elegance* and *simplicity* count.