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MADALGO seminar by Allan Grønlund Jørgensen, Aarhus University

Selecting Sums in Array

In an array of n numbers each of the $\binom{n}{2} + n$ contiguous subarrays define a sum. In this paper we focus on algorithms for selecting and reporting maximal sums from an array of numbers. First, we consider the problem of reporting k subarrays inducing the k largest sums among all subarrays of length at least l and at most u . For this problem we design an optimal $O(n + k)$ time algorithm. Secondly, we consider the problem of selecting a subarray storing the k 'th largest sum. For this problem we prove a time bound of $\Theta(n \cdot \max\{1, \log(k/n)\})$ by describing an algorithm with this running time and by proving a matching lower bound. Finally, we combine the ideas and obtain an $O(n \cdot \max\{1, \log(k/n)\})$ time algorithm that selects a subarray storing the k 'th largest sum among all subarrays of length at least l and at most u .

Joint work with Gerth S. Brodal