

Empirical Analysis of Sum of Maximum Subarray

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1 Problem statement

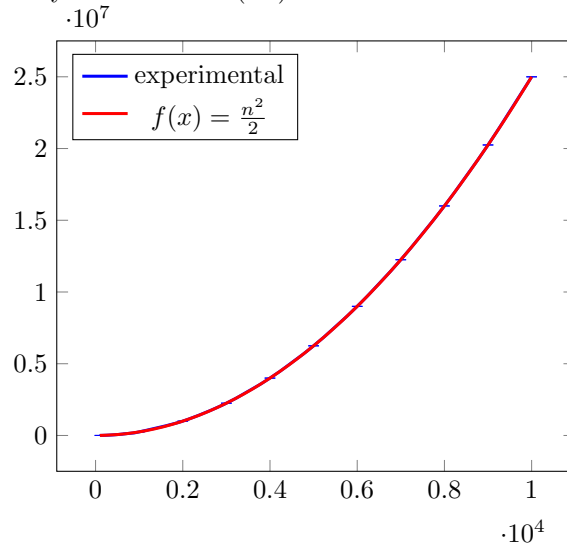
The *maximum subarray* of a given sequence is the contiguous subarray within a one-dimensional array of numbers which has the largest sum. The task is to find the maximum subarray within a one-dimensional array. This is solved by using Kadane's algorithm. This is already a solved issue.

A far more interesting question is – given a randomly generated sequence of a given length what is the average number the maximum subarray sums to?

That is, given a randomly generated one-dimensional array of a given length, we want to find the function that relates the maximum subarray sum to the length of the array.

2 Experiment setup

To generate a sequence of length N each element is independently generated using uniform distribution of integers in the range $[0, \text{maxintnumber}]$ using a Mersenne Twister algorithm. For each N we performed 200 experiments, solving the Maximum Subarray Sum using Kadane's algorithm. The blue graph below shows the average value of the longest increasing subsequence plus-minus standard deviation. The red graph shows function $f(x) = \frac{x^2}{2}$ which grows almost at the same rate, supporting the hypothesis that average sum of maximum subarray of size N is $O(N^2)$.



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