

wlog assume  $m \leq n$ .

Enumerate the top edge and the bottom edge in  $O(m^2)$ . Then we need to solve the 1D problem (1099. Two Sum Less Than K), by prefix sum and sorting in  $O(\text{sort}(n))$ , or expected  $O(n)$ . The total running time is  $O(m^2 \cdot \text{sort}(n))$  or  $O(m^2 n)$ . see my article <https://leetcode-cn.com/problems/max-sum-of-rectangle-no-larger-than-k/solution/onm2-c-16ms-beats-100-by-hqztrue-wlyz/>.

Remark.

1. lower bound: the problem of finding the maximum sum rectangle (which is APSP-hard [1]) can be reduced to this problem, so it is hard to solve this in  $O(n^{3-\epsilon})$ . [https://en.wikipedia.org/wiki/Maximum\\_subarray\\_problem](https://en.wikipedia.org/wiki/Maximum_subarray_problem)
2. can we modify the slightly subcubic algorithm for the maximum sum rectangle problem [2], and also get slightly subcubic running time?
3. the testcase is very weak.

27 / 27 test cases passed.

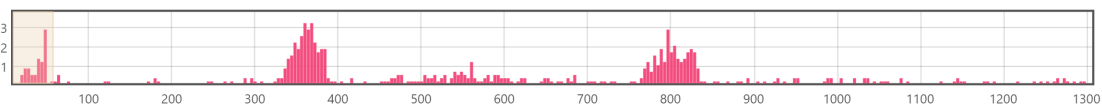
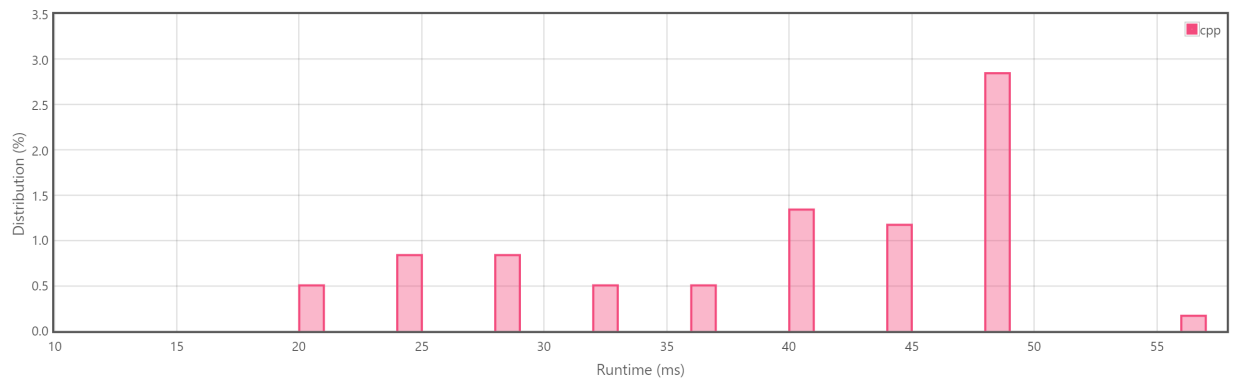
Runtime: 8 ms

Memory Usage: 9.6 MB

Status: Accepted

Submitted: 0 minutes ago

#### Accepted Solutions Runtime Distribution



Runtime: 8 ms, faster than 100.00% of C++ online submissions for Max Sum of Rectangle No Larger Than K.

Memory Usage: 9.6 MB, less than 91.12% of C++ online submissions for Max Sum of Rectangle No Larger Than K.

## References

- [1] Arturs Backurs, Nishanth Dikkala, and Christos Tzamos. Tight hardness results for maximum weight rectangles. In *43rd International Colloquium on Automata, Languages, and Programming (ICALP 2016)*, 2016.
- [2] Tadao Takaoka. Efficient algorithms for the maximum subarray problem by distance matrix multiplication. *Electronic Notes in Theoretical Computer Science*, 61:191–200, 2002.