

CSCI 5020 External Memory Data Structures: Exercise List 2

In the following problems, B is the block size, and M is the memory capacity.

Problem 1 (Batched Range Searching). Let R be a set of rectangles and P a set of points, all in \mathbb{R}^2 . Give an algorithm to report all such pairs $(r, p) \in R \times P$ that rectangle r covers point p . Your solution should perform $O(\frac{|R|}{B} \log_{M/B} \frac{|R|}{B} + \frac{|P|}{B} \log_{M/B} \frac{|P|}{B} + K/B)$ I/Os, where K is the number of pairs reported.

Problem 2 (Batched Range Counting). Let R be a set of rectangles and P a set of points, all in \mathbb{R}^2 . Give an algorithm to report, for each rectangle $r \in R$, a pair (r, c) where c is the number of points in P that are covered by r . Your solution should perform $O(\frac{|R|}{B} \log_{M/B} \frac{|R|}{B} + \frac{|P|}{B} \log_{M/B} \frac{|P|}{B})$ I/Os.