

CSCI5010 Exercise List 6

Problem 1 (3-Dimensional kd-Tree). Prove that in \mathbb{R}^3 the kd-tree answers an orthogonal range query in $O(n^{2/3} + k)$ time.

Problem 2 (Range Searching on Rectangles). Let S be a set of n axis-parallel rectangles in \mathbb{R}^2 . Given an axis-parallel rectangle q , a query reports all the rectangles $r \in S$ such that $r \cap q \neq \emptyset$. Describe a data structure of $O(n)$ size that answers such a query in $O(n^{3/4} + k)$ time.

Problem 3 (Range Counting). Let P be a set of n points in \mathbb{R}^2 . Given an axis-parallel rectangle q , a query reports the number of points in $q \cap P$. Describe a data structure of $O(n)$ size that answers such a query in $O(\sqrt{n})$ time.