

Algorithm Design
M. T. Goodrich and R. Tamassia
John Wiley & Sons
Solution of Exercise C-12.3

Use a balanced binary tree, T , which stores the points of S in its external nodes, ordered by their keys. At each internal node, v , store the number of external nodes in the subtree rooted at v . With this additional information, we can perform a binary search for any rank in the set. Thus, we can use an algorithm similar to the `1DTreeRangeSearch` to find all the items with ranks in the range $[a, b]$ in $O(\log n + k)$ time, where k is the number of answers.