Advanced Balanced Search Tree

Segment Tree

Discretization

08-XD1

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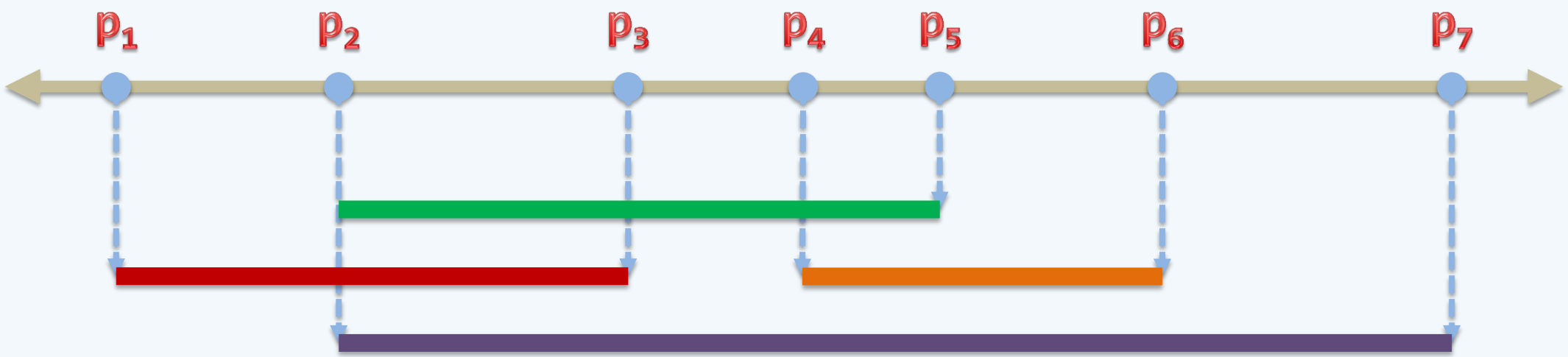
Elementary Interval

❖ Let $I := \{ [x_i : x_i'] \mid i = 1, 2, \ldots, n \}$ be n intervals on the x-axis

Sort all the endpoints into $\{ p_1, \ldots, p_m \}$, $m \leq 2n$

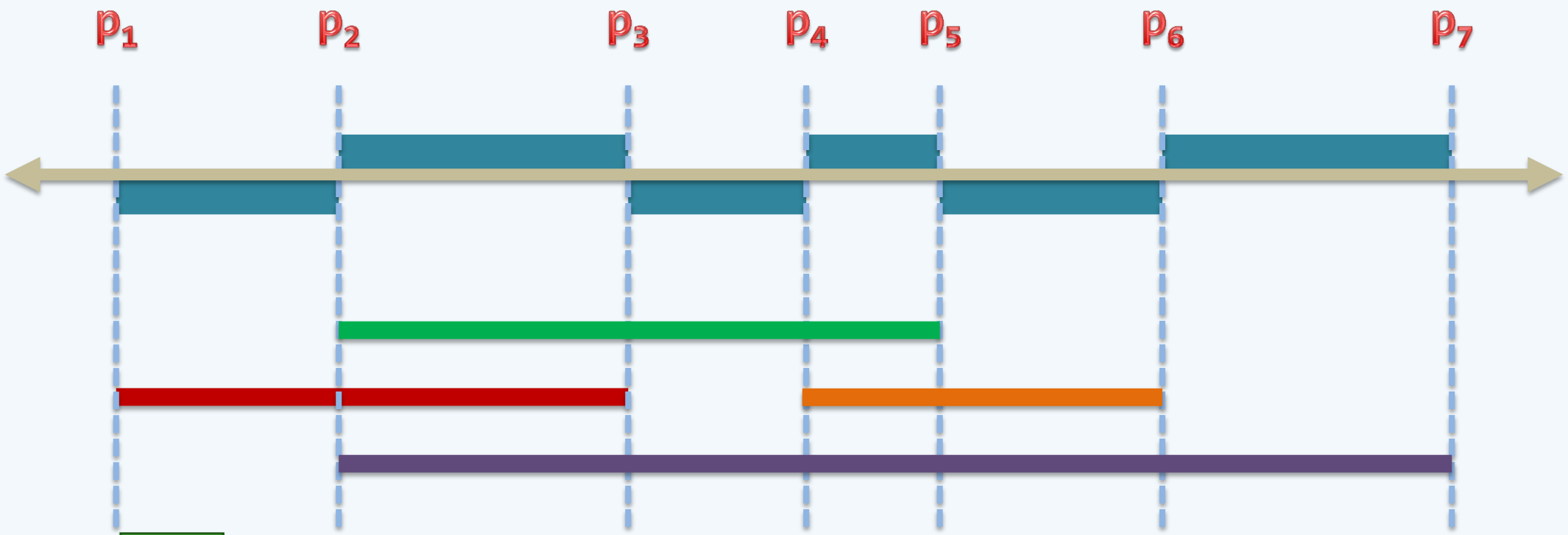


❖ m + 1 elementary intervals are hence defined:

$(\infty, p_1], (p_1, p_2], (p_2, p_3], \ldots, (p_{m-1}, p_m], (p_m, +\infty)$

Discretization

- Within each EI, all stabbing queries share a same output

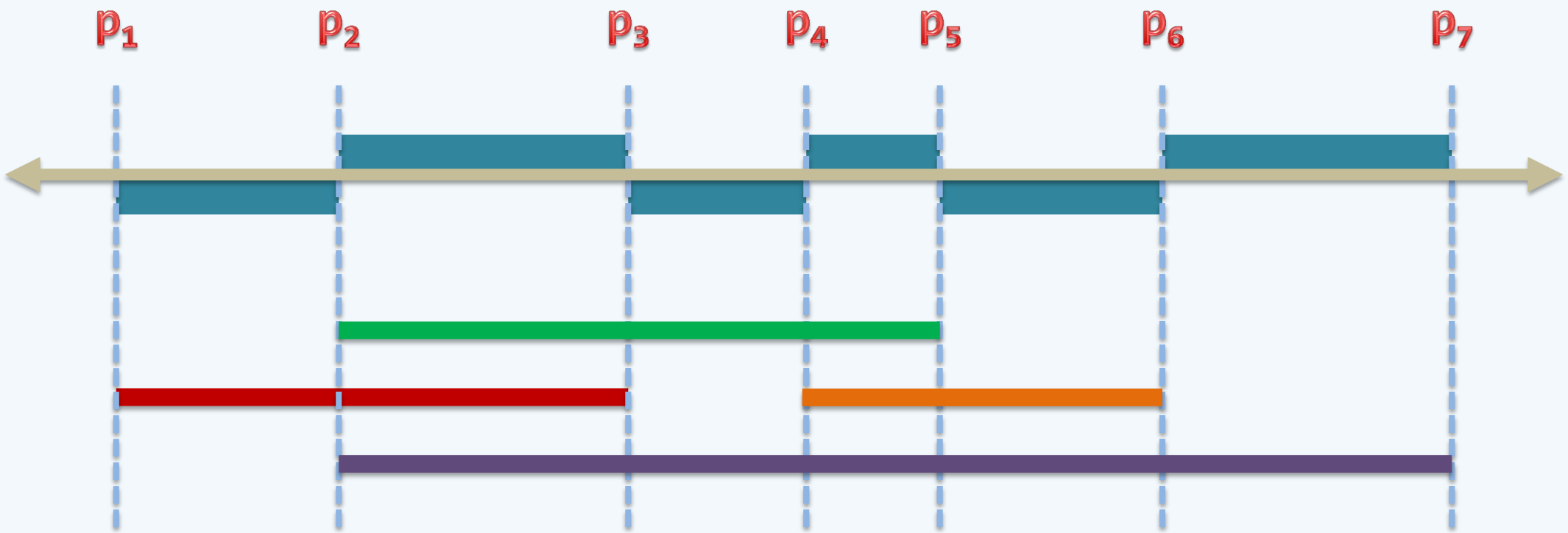


∴ If we sort all EI's into a vector and

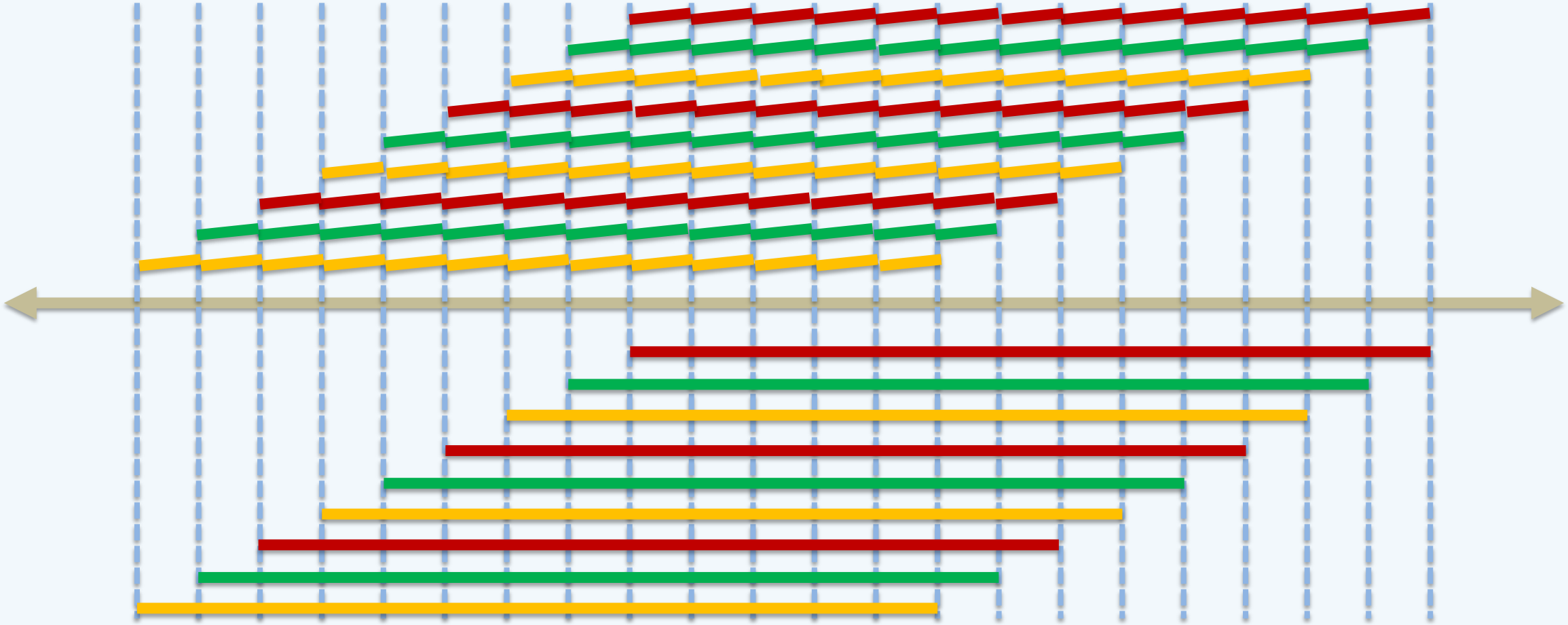
store the corresponding output with each EI, then ...

Sorted Vector

∴ Once a query position is determined, //by an $O(\log n)$ time binary search



the output can then be returned directly //$O(r)$

Worst Case

❖ Every interval spans $\Omega(n)$ EI's and a total space of $\Omega(n^2)$ is required