theory2

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1 Task

Let's look at the problem point by point:

1. If the vertex Z gets objects, it would take $O(Z^2D)$ operations for the optimal separation ($O(ZD)$ for possible splits and $O(Z)$ to sum error for each of Z objects).
2. Every level takes through precisely N objects. Then we can calculate total time on every level using conclusions of p.1: $\sum DK^2 = D(\sum K)^2 = DN^2$
3. Tree has $logN$ levels.

p.2 and p.3 $\Rightarrow$ the total complexity is $O(N^2DlogN)$

2 Task

- Sort objects by feature i $O(NlogN)$
- Choose value of the mean object $O(1)$

3 Task

The binary tree is balanced and it has depth n $\Rightarrow$ it has 2^n leafs. The number of permutations of different classes in the leafs equals k^{2^n}.