



Diagram illustrating a recursion tree for the recurrence relation  $T(n) = 2T(n/2) + O(n)$ .

The root node is  $T(n)$ . It branches into two children:  $T(n/2)$  and an empty box. The  $T(n/2)$  node branches into  $T(n/2^2)$  and an empty box. The empty box from the root branches into two children, each of which branches into two children, resulting in four empty boxes at the third level.

Annotations on the right side of the diagram:

- $O(n)$  (next to the root)
- $O(n/2) + O(n/2) = O(n)$  (next to the second level)
- $O(n)$  (next to the third level)

$$= 2^{\log n} = O(n) \quad \text{Therefore, } T(n) = \sum_{i=1}^{\log n} O(n) = O(n \log n)$$