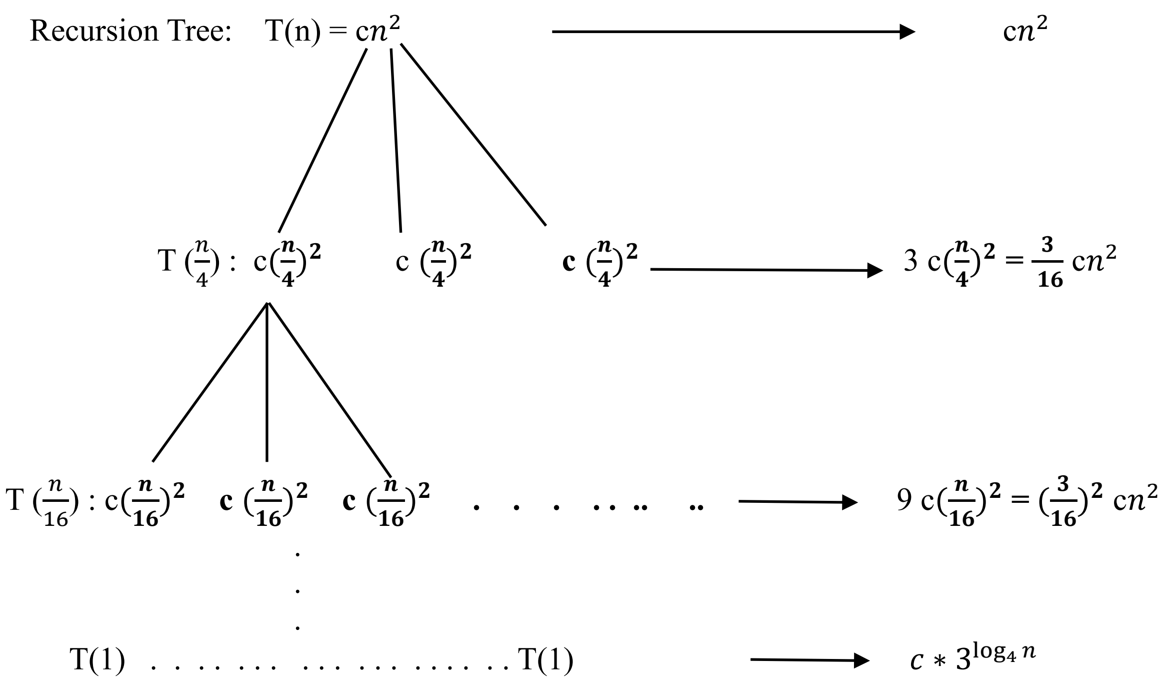
$$T(n) = 3T(\frac{n}{4}) + cn^2$$

T (1) = T($\frac{n}{4^i}$) => $\frac{n}{4^i}$ = 1 => n = 4^i
=> $\log_4 n$ = i (height of the tree)

Number of nodes in the last level = 3 $^{\text{height of tree}}$ = $3^{\log_4 n}$

Recursion Tree:



$$cn^2 + cn^2\left(\frac{3}{16}\right) + cn^2\left(\frac{3}{16}\right)^2 + \ldots\ldots\ldots\ldots\ldots\ldots + c * 3^{\log_4 n}$$

$$= cn^2 \sum_{i=0}^{\log_4 n - 1}\left(\frac{3}{16}\right)^i + c * 3^{\log_4 n}$$

$$\rightarrow \sum_{i=0}^{\log_4 n - 1}\left(\frac{3}{16}\right)^i < \sum_{i=0}^{\infty}\left(\frac{3}{16}\right)^i$$

$$\sum_{i=0}^{\infty}\left(\frac{3}{16}\right)^i = \frac{1}{1-\frac{3}{16}} = \frac{16}{13} \quad \text{using: } \sum_{i=0}^{\infty} x^i = \frac{1}{1-x}$$

$$\left.\begin{array}{l} \Rightarrow cn^2 \sum_{i=0}^{\log_4 n-1} \left(\frac{3}{16}\right)^i < cn^2 \left(\frac{16}{13}\right) \Rightarrow O(n^2) \\[2ex] \text{Also: } 3^{\log_4 n} = n^{\log_4 3} \rightarrow cn^{\log_4 3} = O(n) \end{array}\right\} \text{Maximum is: } O(n^2)$$