

$$\begin{aligned}T(n) &= 3T(n/2) + n^2 \\&= 3(3T(n/4) + (n/2)^2) + n^2 \\&= 9T(n/4) + n^2(3/4 + 1) \\&= 9(3T(n/8) + (n/4)^2) + n^2(3/4 + 1) \\&= 27T(n/8) + n^2(9/16 + 3/4 + 1) \\&\dots \dots \\&= 3^k T(1) + n^2 \left( \sum_{j=0}^{k-1} (3/4)^j \right) \\&= 3^k + 4n^2(1 - (3/4)^k) \\&= 3^{\lg n} + 4n^2(1 - (3/4)^k) \\&= n^{\lg_2 3} + 4n^2(1 - (3/4)^k)\end{aligned}$$

$T(n) = \Theta(n^{\lg_2 3} + n^2)$  and  $\lg_2 3 < 2$ , so  $T(n) = \Theta(n^2)$ .