

Practice Problems

CS 412-R1 Algorithms: Design & Analysis

Spring 2023

Famous recurrence classes:

1. Master's Theorem: $T(n) = aT\left(\frac{n}{b}\right) + f(n)$
2. Linear Homogeneous: $T(n) = a_1.T(n-1) + a_2.T(n-2) \dots + a_k.T(n-k)$
3. Akra-Bazzi Method: $T(n) = f(n) + a_1.T\left(\frac{n}{b_1}\right) + a_2.T\left(\frac{n}{b_2}\right) \dots + a_k.T\left(\frac{n}{b_k}\right)$

Solve or find approximation for the following recurrences:

1. $T(n) = 2T(n/2) + n^3$
2. $T(n) = 7T(n/2) + n^2 \log(n)$
3. $T(n) = T(n-1) + T(n-2)$; $T(0) = 0, T(1) = 1$
4. $a_n = a_{n-1} - a_{n-2}$; $a_0 = 0, a_1 = 1$
5. $M(n) = 6M(n-3) - 11M(n-2) + 6M(n-1)$;
 $M(0) = 3, M(1) = 6, M(3) = 36$
6. $T(n) = T(n/5) + T(7n/10) + n$; where for $n < n_0$, $T(n) = O(1)$
7. $T(n) = 3T(n/3) + 8T(n/4) + n \log(n)$
8. $T(n) = T(n-2) + n^2$; $T(0) = 0$