ECS 122A: Algorithm Design and Analysis

Week 3 Discussion

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A few words on logistics

- Homework 2 due tomorrow (Apr 15) at midnight
- Homework 3 is released, due next Tuesday (Apr 20) at midnight
- When submitting, please select page(s) to each question, preferably in PDFs
- Homework is graded by attempting (50%) + one selected problem (50%)
- Midterm 1 is next Thursday, will cover up to and including homework 3

Outline

- Divide and Conquer: Key idea
- Solve Divide and Conquer Recurrence: Master Theorem

Divide and Conquer: Key idea

1. **Divide** the problem into a number of subproblems that are smaller instances of the same problem.
2. **Conquer** by solving the subproblems recursively.
3. **Combine** the solutions to the subproblems to produce the solution to the original problem.

Divide and Conquer: Key idea

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$$T(n) = aT(\frac{n}{b}) + f(n)$$

So far, we demonstrated three problems that use divide and conquer paradigm:

- Merge Sort
- Maximum Subarray
- Matrix-matrix multiply (Strassen's algorithm)

Using Master Theorem

What is the asymptotic bound for the given recurrence?

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

$a =$
$b =$
$f(n) =$

Using Master Theorem

What is the asymptotic bound for the given recurrence? Does Master Theorem apply to this recurrence?

$$T(n) = 2T(\frac{n}{2}) + n \lg n$$