Session 25
Strategy 3: Divide-and-Conquer

Lecture Summary

Large Integer Multiplication

1. Multiplication: can we do better than n^2 *single-digit* multiplications?
2. Shortcut: 3 single-digit-multiplications instead of 4
3. Divide-and-conquer *n*-digit multiplication
4. Performance, asymptotic efficiency, and conclusions

> 🗝 Conclusion: find a shortcut for the basic case then apply D&C to use shortcut repeatedly and hope for gains to add up

Strassen's Matrix Multiplication (5 Points to Know & Remember)

1. KEY IDEA: using the same trick as in large integer multiplication
2. Divide-conquer algorithm breaks n-dim matrices into 7 smaller n/2-dim matrices
3. Performance based on multiplications
4. Additions performs similar *asymptotically*: see 🕮 Exercise 5.4:8
5. 🕮 There are better performing algorithms: $O(n^{2.376})$

Session Exercise

🕮 **Exercise 5.4** • 1, 2, 3, 4, 5, 7, 8

Reading List

🕮 5.4

Keywords

Asymptotic [efficiency]