CS120: Intro. to Algorithms and their Limitations Hesterberg & Vadhan

Lecture 25: Conclusions

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1 Announcements

Recommended Reading:

- Roughgarden IV, Epilogue
- MacCormick, Chapter 18

2 An Algorithmicist's Workflow

When confronted with a real-world algorithmic problem (like Web Search, Interval Scheduling, Census Data Releases, Google Maps, Kidney Exchange, Register Allocation, Programming Team, ...), you can tackle it using the skills from cs120 (and future classes) by looping through the following steps:

1. Mathematically model

2. Look for related problems (in class, in the literature, on the web) and try to obtain an algorithm by **reduction to** another problem:

3. Try to obtain an algorithm by **reduction to** other problems

4. Try to apply algorithmic techniques

5. Try to show hardness/unsolvability by **reduction from** other problems

6. And/or settle for weaker guarantees

3 Other Takeaways

- Universality

- Rigorous mathematical theory

- There is much we don't know!

4 CS120 Learning Outcomes

From the Syllabus: "By the end of the course, we hope that you will all have the following skills:

- To mathematically abstract computational problems and models of computation
- To design and implement algorithms using a toolkit of algorithmic techniques
- To recognize and formalize inherent limitations of computation
- To rigorously analyze algorithms and their limitations via mathematical proof
- To appreciate the technology-independent mathematical theory of computation as an intellectual endeavor as well as its relationship with the practice of computing."

5 Where to Learn More

- Theory of Computation seminar: http://toc.seas.harvard.edu/
- Many other CS courses, especially x2x. Look at grad (2xx) courses too. (CS120 may serve as a sufficient substitute for CS121/CS124 in some of them.)
- Read more of our textbooks (Roughgarden, MacCormick, CLRS, and the references therein)
- Come talk to us in office hours!