

CMPSCI 711 SPRING '09: REVIEW (1/3)

1. THE STORY SO FAR...

What should I be able to do after the first 8 lectures?

- Be familiar with standard random variables including the binomial distribution and geometric distribution. Be able to compute expectations and variance and use probability generating functions, union bound and inclusion exclusion formula.
- Be able to analyze classic probability problems such as coupon collecting, balls and bins, and the birthday paradox.
- Be able to state, prove, and use Markov, Chebyshev, and Chernoff inequalities.
- Be able to cast a problem as an integer linear program, relax the constraints, and use randomized rounding.
- Be able to perform a simple probabilistic analysis of an algorithm.
- Be able to use the probabilistic method and be able to state, prove, and use the Lovász Local Lemma.
- Understand applications of the above to problems we studied in class: routing in a Boolean hypercube, global wiring in gate arrays, maximum satisfiability, satisfiability, minimum cut, maximum cut, stable matchings etc.

What chapters of [MR] should I have read by now?

- Appendix B: Mathematical Background
- Appendix C: Basic Probability Theory
- Chapter 1 up to and including section 1.4.
- Chapter 3.
- Chapter 4 up to and including section 4.3.
- Chapter 5 up to and including section 5.2, and section 5.5.

2. COMING SOON...

During the next 9 lectures (starting 24th February) we plan to cover

- Markov chains and random walks
- Expanders and applications
- Algebraic methods
- Martingales and Azuma's inequality.
- Entropy and some applications of information theory

In the last 10 lectures we'll start to look at some recent results using randomization. Everyone in class will be involved in presenting material. A list of possible papers will be posted on the class website but if there's particular material you'd like to present—it could be closely related to your own research—then please email me.

3. RESCHEDULED LECTURES

Remember there'll be no classes on 3, 5, 26 March. Make-up classed will be 9, 30 March at 1pm in Room 303.