Agenda

RANDOMIZED ALGORITHMS – INTRODUCTION

- MODEL
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Randomized Algorithms

- A randomized algorithm is an algorithm that
  - is allowed access to a source of independent unbiased random bits, and
  - is allowed to use these random bits to influence its computation.
- The performance of a randomized algorithm can be proved by relying solely on the random choices
  - i.e. without any assumptions about inputs
- Contrast this with probabilistic analysis where
  - one assumes a distribution on the inputs

Randomized Algorithms

- Cost of randomization:
  - Cost model:
    - Sampling of a random element from a set S is done by
      - choosing O(log|S|) random bits and then
      - using these bits to index an element in S
  - Thus cost of choosing a random number in a set of N numbers is O(logN)
    - assuming a single random bit can be obtained in unit time from an unbiased source or random bits (e.g. a single coin flip)

Randomized Algorithms

- Advantages over deterministic algorithms:
  - They provide better *expected* performance
    - Worst case performance may not be better!
  - Their performance is not dependent on the input
  - They are often easier to design and implement
    - assuming library support for random number generation