The hiring problem

- Describe the problem
- naive algo
- $O(c_i n + c_h m) = O(c_h n)$ in worst case

Probabilistic analysis
- Things are not that bad
- Make assumptions
- Compute avg. time over the dist. of all possible inputs
- Careful in making distributional assumptions
- Assumptions on hiring problem
  - equally likely

Randomized algorithm
- know little of i/p distribution
- Gaining control of the process
- Behavior determined by input and random number generator.
- Talk about random number generator.

- Analysis of the hiring problem

$$E[X] = \sum_{x=1}^{n} x \cdot Pr[X=x]$$

Do it

$X_i = 1$ if candidate i is hired

$= 0$ otherwise

$$X = X_1 + X_2 + \cdots X_n$$

$$E[X_i] = Pr[X_i \text{ is hired}]$$

$$= 1/i$$

$$E[X] = \sum_{i=1}^{n} 1/i \leq \int_{1}^{n+1} \frac{1}{x}\, dx$$

- Randomized algor.
  - Assumption could be wrong
  - Impose a distribution
  - Permute the input
  - Analysis is identical.

Sorting

- Why sorting? Different complexity measure
- Quicksort, Divide & Conquer
- My method
- Best case & worst case analysis
- Balanced partitioning
- Randomized quicksort
- Analysis I using Decision Trees
- Analysis II using I.R.V.s

$$\sum_{i=1}^{n-1} \sum_{j=i+1}^{n} \frac{2}{j-i+1}$$

$$= \sum_{i=1}^{n-1} \sum_{k=1}^{n-i} \frac{2}{k+1}$$

$$< \sum_{i=1}^{n-1} \sum_{k=1}^{n} \frac{2}{k}$$

$$= \sum_{i=1}^{n-1} O(\log n)$$

$$= O(n \log n)$$