CSE 312

Probability: reasoning under uncertainty

Motivation:

CSE examples:

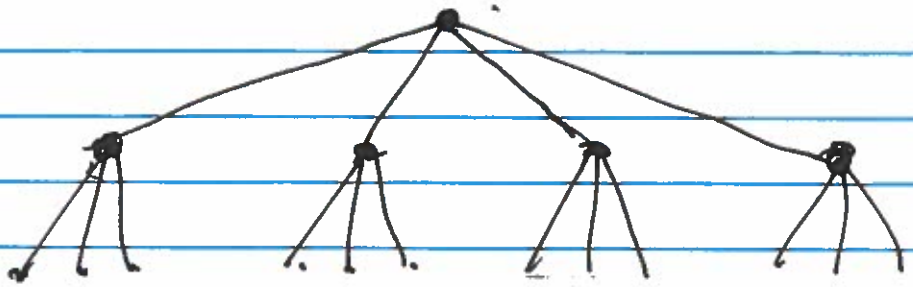
1. Performance: events happen randomly, such as component failures, arrivals of packets at servers, workloads
2. Patterns in data: data mining. Amazon recommendations for products, Netflix recommendations for movies, spam filtering
3. Algorithm design: using random numbers to speed up algorithms.

Counting.

Motivation: If some probabilistic experiment has a finite set Ω of equally likely outcomes (e.g., rolling a fair die), the probability of an event $A \subseteq \Omega$ is

$$P(A) = \frac{|A|}{|\Omega|}$$

Product rule: If there are m choices for step 1 and, for each choice, there are n choices for step 2, then there are mn choices in total.



$mn = 12$

Generalizes easily to s steps.

Ex: How many n-bit strings are there? $2^n = \underbrace{2 \cdots 2}_{n} \cdot 2$

Ex: How many 7-digit phone numbers, if the first digit can't be 0 or 1? 8×10^6