

CSE 312

Probability: reasoning under uncertainty

Legal example: OJ Simpson trial 1995

Defense: fewer than 1 in 2500 men committing domestic abuse go on to homicide.

Wrong question: If a woman is abused and then murdered, chances are 90% that the murderer is the husband.

CSE examples:

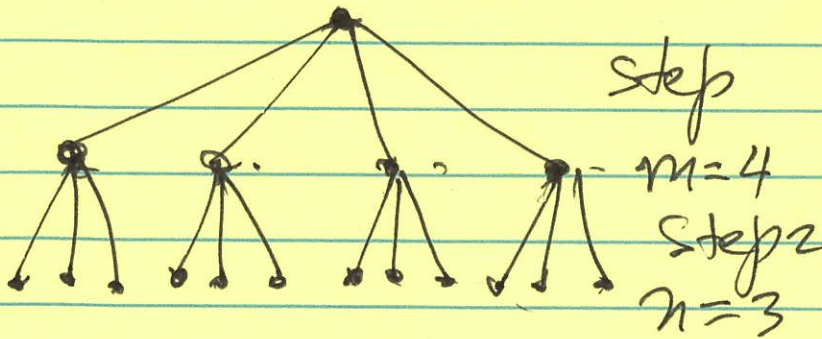
1. System performance: events happen randomly: failures of components, unpredictable arrivals of work, unpredictable work loads
2. Patterns in data (machine learning). Netflix or Amazon recommendations, collected from statistics of many customers. Google hits on page 1.
3. Scientific data analysis. Measurement errors in the lab cause uncertainty in the analysis.
4. Algorithm design: speed up algorithm by using a random number generator.

Counting

Motivation: If some probabilistic experiment has a finite set Ω of equally probable outcomes (e.g., roll 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.



$mn = 12$ choice in total.