Probability: reasoning under uncertainty

CSE examples

2. Patterns in data: data mining. Netflix or Amazon recommendations, Google ranking of hits, spam detection.
3. Scientific data analysis: measurement error.
4. Algorithm design: randomization.

Counting

Motivation: If some probabilistic experiment has a finite sample space \( \Omega \) of equally likely outcomes (e.g., roll of a fair 6-sided die), the probability of an event \( A \subseteq \Omega \) is

\[
P(A) = \frac{|A|}{|\Omega|}.
\]

\( \Omega = \{1, 2, 3, 4, 5, 6\} \)
\( A = \{3, 5\} \)
\[
P = \frac{|A|}{|\Omega|} = \frac{3}{6} = \frac{1}{2}.
\]

Counting the sizes of \( A \) and \( \Omega \) can be complicated (e.g., how many 5-card hands have 2 clubs?), and we'll be studying this this week.